BOOK NO.
1051

RECORDS

of the

INDIAN MUSEUM

(A JOURNAL OF INDIAN ZOOLOGY)

Vol. IV, 1910—1912.

EDITED BY

THE SUPERINTENDENT

OF THE

INDIAN MUSEUM.

Calcutta:

PUBLISHED BY ORDER OF THE TRUSTEES OF THE INDIAN MUSEUM,

BAPTIST MISSION PRESS.

1912.

ZOOLOGICA
Acc. No. P694
Dt. 15/5/07

CONTENTS.

No. I, February, 1910.

Page

Second Report on the collection of Culicidae in the Indian Museum, with descriptions of new genera and species .. 1

Nos. II—III, March, 1910.

The Indian species of Papataci Fly (*Phlebotomus*) 35

Taxonomic values in Culicidae 53

No. IV, July, 1910.

Revision of the Oriental Bloodsucking Muscidae (*Stomoxinae*, *Philaematomyia*, Aust., and *Pristirhynchomyia*, gen. nov.) 59

No. V, November, 1910.

A new arrangement of the Indian *Anophelinae* 95

No. VI, March, 1911.

A revision of the species of *Tabanus* from the Oriental Region, including notes on species from surrounding countries .. 111

No. VII, June, 1911.

New Oriental Nemocera 259

Miscellanea (pp. 317—320) :—

Synonymy in Corethrinae 317

Further notes on Indian Phlebotomi 319

Nos. VIII—IX, December, 1911.

A revision of the Oriental species of the genera of the Family Tabanidae other than *Tabanus* 321

Contributions to the Fauna of Yunnan—

Part VII.—Tabanidae 401

No. X, March, 1912.

Annotated Catalogue of Oriental Culicidae—Supplement .. 403

LIST OF PLATES.

	Follow page
Plates I—III (Culicidae)	34
Plates IV—VI (Phlebotomi)	52
Plates VII—VIII (Muscidae)	94
Plates IX—XII (Anophelinae)	110
Plates XIII—XIV (Tabanidae)	258
Plates XV—XVIII (Tabanidae)	402

LIST OF AUTHORS.

Annandale, N., D.Sc. ..	The Indian species of Papataci Fly (*Phlebotomus*), p. 35.—Further notes on Indian Phlebotomi, p. 319.
Brunetti, E.	Taxonomic values in Culicidae, p. 53.—Revision of the Oriental Bloodsucking Muscidae, p. 59.—New Oriental Nemocera, p. 259.—Synonymy in Corethrinae, p. 317.—Annotated Catalogue of Oriental Culicidae, p. 403.
James, Major S. P., M.D.	A new arrangement of the Indian Anophelinae, p. 95.
Ricardo, Gertrude ..	A revision of the species of Tabanus from the Oriental Region, including notes on species from surrounding countries, p. 111.—A revision of the Oriental species of the genera of the Family Tabanidae other than *Tabanus*, p. 321.—Contribution to the Fauna of Yunnan, Pt. VII, Tabanidae, p. 401.
Theobald, F. V., M.A. ..	Second Report on the collection of Culicidae in the Indian Museum, with descriptions of new genera and species, p. 1.

INDEX.

[*N.B.*—An asterisk (*) preceding a line denotes a new variety or subspecies: a dagger (†) indicates a new species: and a double-dagger (‡), a new genus; synonyms are printed in Italics.]

A

Page

Acalleomyia .. 487, 490, 491
obscura .. 491
"obscurus" .. 491
Acanthocera 361
Aedeomyia .. 487, 488
catasticta .. 488
squamipenna .. 488
"squammipenna" 26, 488
"squamipennis" .. 488
Aedeomyinae .. 56, 413, 450, 453, 486, 487
Aedinae .. 407, 409, 450, 485, 486, 487, 504
Aedes 54, 439, 487, 488, 489, 491
butleri .. 489
malaya 490
nigrescens 490
Aedimyia 440
Aioretomyia .. 487, 489
aedes 490
ostentatio .. 490
perdita .. 490
singularis .. 490
taeniata .. 490
varietas .. 491
Aldrichia 95, 100, 106, 410, 433
error .. 100, 106, 407
Aldrichinella 410, 433
error 433
Amauromyia 450
Ancylorhynchus 410
Anisocheleomyia 493
albitarsis .. 494
alboannulata .. 493
Ankylorhynchus 410
Anopheles 54, 95—97, 106, 411, 412, 415—417, 435, 517
aconita 415
aitkenii .. 96, 106, 415
arabiensis .. 434
barianensis .. 415
bifurcatus .. 97
cohaesa 415
costalis .. 2, 421
culiciformis .. 434
deceptor 434
dthali .. 415, 419
elegans 417

Page

Anopheles formosaensis 415, 416
formosus 416
gigas 96, 106, 416, 417
immaculatus 96, 106, 416
indiensis 428
jesoensis 426
lindesayi 96, 106, 416, 417
* var maculata 1, 106, 416
maculipennis 97, 407
nigerrimus .. 425
perplexeus .. 413
pictus .. 419, 434
plumiger 426
pseudopictus .. 434
punctulata .. 432
simlensis .. 416, 417
subpictus .. 434
tesellatum .. 432
treacherii .. 417
vincenti 434
wellcomei 417, 434
Anophelina .. 410, 419, 433
Anophelinae 55, 56, 95—109, 405—407, 409, 412—415, 440
Anthomyidae .. 56, 59
Anthrax 57
†Apistomyia trilineata .. 315
Armiger 441
Armigeres 441
panalectoros .. 442
Arribalzagia .. 415, 431
Asilus 57
Asiphonatae 55
Asiphoniata 55
Atylotus 112, 133, 135, 145, 153, 159, 173, 184, 190, 194, 195, 197, 200, 209, 211 212, 217, 219, 226, 236, 237, 244, 246—248 251
andamanicus .. 218
bituberculatus .. 134
(?) *conicus* .. 153, 154
ditaeniatus .. 248
flaviventris .. 214
fulvus .. 133, 248
fuscipes 248
achrymans 156, 157
latistriatus.. .. 248

Page

Atylotus *macer* .. 150, 152
microloma 152
nigromaculatus .. 134
phyrrhoceras 238, 239
rufidens .. 244, 245
rusticus .. 248, 252, 253

B

Banksiella .. 471, 477
luteolateralis .. 477
Bdellolarynx .. 61, 62
sanguinolentus .. 62
Bellardia .. 112, 149, 202
sinicus .. 167, 170
Bibio .. 273—280
†abdominalis .. 273, 276
†approximatus 274, 277
bicolor 273
clavipes 280
†defectus .. 274, 280
†discalis .. 273, 278
†fuscitibia .. 273, 279
†hortulanoides 273, 274
hortulanus 275
johannis .. 273, 278
laniger 279
marci .. 274—278
obscuripennis 273—276, 278
†proximus .. 274, 275
†rufifemur .. 273, 279
varipes 280
venosus .. 277, 278
Bibionidae 269
Binotia 493
Bironella gracilis 433
Blanchardiomyia .. 440, 441
apicalis .. 441
aureolineata .. 441
fusca .. 441
joloensis .. 441
jugraensis .. 441
obturbans 441, 442
panalectros 441, 442
†Blepharocera indica .. 316
Blepharoceridae 315
‡Bolbodeomyia .. 31, 492
†complex 31, 492
Bolbodimyia 492
Bombylidae 433
Bombylius 57
Brevipalpi 55
Brevirhynchus .. 8, 442, 444
†annulipalpis 6, 442
†apicalis 7, 443
magnus 6 443
Brunettia 289, 290, 291, 310, 311
superstes .. 290, 310, 311
travancorica 310—312

C

Calveria .. 410, 433
Calvertia 410
lineata 433

Page

Calvertina .. 410, 428
lineata 433
Calvertius .. 410, 433
Carolia 410
Carollia 410
Carrollia .. 12, 14, 410, 454
Cecidomyia 57
Cellia .. 54, 95, 96, 99, 100, 101 102, 105, 106, 107, 428, 431
flava 431
kochi 431
pulcherrima .. 3, 99, 102, 106, 407, 432
punctulata 432
Chaetomyia .. 452, 453
Chagasia .. 415, 433
Chaoborus 317, 318, 504, 505
antisepticus .. 317
asiatica .. 504, 505
cornfordi 504
crystallina 317, 318
manilensis 505
plumicornis 317, 318
punctipennis .. 318
Chironomidae 57
Chironomus 57
Christya 415
‡Christophersia .. 102, 103, 105, 106, 107, 407, 428, 431
halli 100, 102, 103, 106, 407, 431
Chrysoconopas aurites .. 482
Chrysoconops .. 479, 480
aurites .. 480
brevicellulus .. 481
conopas .. 481
"conopas" .. 481
ochraceus .. 481
pygmaeus 25, 481
Chrysops 57, 365, 374, 377, 378, 401
albicinctus 377
alter .. 374, 376, 387
bifasciata .. 374, 377 378, 380, 382
cincta .. 374, 376, 393
clavicrus .. 374, 393, 394
costatus 378
†designata 374, 376, 383, 401
dispar .. 374 375, 378, 380, 381, 382, 386, 390, 396
fasciata .. 375, 376, 390, 391, 393, 394
fixissima 375, 376, 392, 393
flaviventris 375, 377, 396
flavocincta .. 375, 377, 395
impar .. 375, 380, 382
indiana .. 375, 376, 390
iranensis .. 375, 378, 379
ligata .. 375, 380, 381
lunata 375
manilensis .. 375, 377
mlokosiewiczi 375, 378, 379, 401

Page

Chrysops parallelus 363
pellucidus .. 375, 376, 377, 385, 386, 388
rufitarsis 375, 376, 384, 394
semicircula 375, 380, 381
signifer 375, 376, 393, 394
sinensis .. 375, 376, 388
stimulans .. 375, 376, 389
striata 375, 378, 379, 401
terminalis .. 375, 380, 381
translucens 375, 376, 385, 388, 396
unizonata .. 375, 392, 393
punctifera 390
flavipes 397
perspicillaris .. 397
Chrysozona 321
Coelodiazesis barberi .. 405
Colonemyia .. 488, 498, 499
caeruleocephala .. 498
hybrida 498
mendacis 498
Conopomyia 453
aurea 453
hybrida 453
metallica .. 454
Conops 63
Corethra .. 54, 56, 317, 318, 405, 504, 505
cinctipes .. 317, 318
culiciformis .. 317, 318
effoetus .. 317, 318
fusca 317
pallida .. 317, 318
plumicornis .. 317, 318
punctipennis 318
velutina .. 317, 318
Corethrella brakeleyi .. 318
Corethridae .. 56, 413
Corethrinae 55, 56, 317, 318, 409, 411, 504
Corizoneura .. 364, 365, 367
longirostris 365, 367
*subsp. varipes 367, 369
rufa 369
taprobanes .. 367
Crematogaster difformis .. 504
Culex .. 1, 19, 31, 39, 40, 41, 43, 54, 56, 57, 95, 410, 439, 440, 445, 446, 459, 460, 465, 467, 471, 477, 489
albolineatus 466
albopictus 9
albopleura 466
albus 466
alis 466
angulatus 466
annulatus .. 412, 459
annuliferus .. 466, 471
annulioris 466
annulus 466
anxifer 468
arabiensis 467
argentinotus 467
auratus 467
aureopunctis 517
aureostriatus .. 467, 471

Page

Culex biro 467
caecus 467
cantans 467
christophersi 467
concolor .. 20, 411, 468
fatigans 5, 17, 406, 411, 442, 468, 469, 475, 476, 483
var. trilineatus 469
flavifrons 467
foochowensis 469
fragilis 469
fuscanus 469
fuscocephalus .. 17, 469
gelidus 462
graminis 470
gnophodes 470
halifaxii 470
hirsuteron 470
impellens .. 1, 15, 411, 470
imprimens 470
infula 470
japonicus .. 471, 474
var. ceylonica .. 471
†longifurcatus .. 19, 471, 474
longipalpis 471
longipes .. 471, 472
loricatus 471
ludlowi .. 466, 471
luteola 471
luteolateralis 471
macr pus .. 471, 472
maculatus 467
mediolineatus 472
microannulatus 411, 472
mimet cus .. 9, 472
minimus 472
minor 473
multimaculosus .. 473
nigricephalus 473
occidentalis 467
pallidostriatus 473
pallidothorax 473
†parascelos .. 18, 473
perplexus 473
†pettigrewii .. 15, 474
pipiens .. 457, 469, 487
pseudolongifurcatus 471, 474
pseudostenoetrus .. 474
pulchriventer 474
pullus 474
pungens .. 468, 469
quasipipiens 474
quasiunivittatus .. 474
reesii 474
rizali 474
rolandi 472
sepositus 475
sericeus .. 411, 475
sitiens 475
stenoetrus 475
taytayensis 475
tigripes .. 19, 411, 475
tipuliformis 475
trilineatus 476
trimaculatus 476
tritaeniorhynchus .. 476
uncus 476

Page

Culex uniformis 476
univittatus 476
vagans .. 14, 476
ventralis 442
viridis 476
viridiventer 476
vishnui 476
Culicada .. 54, 461
erythrosops 462
minuta 462
nipponii .. 21, 462
suknaensis .. 21, 462
Culicales .. 409 439
Culicidae 1—33, 40, 53—58, 403—406, 408—414, 435, 504
Culicimorphae 55
Culicina 410
Culicinae 55, 56, 405, 407, 409, 413, 439, 440, 450, 485, 486, 504
Culicini 54
Culiciomyia .. 456, 474
alis 457
annulata 457
annuloabdominalis .. 457
ceylonica 457
inornata 457
minutissima .. 457
nigerrima .. 457
pulla 457
Culiseta 54
Cyathomyia 517
jenseni 517
Cyclolepidopteron grabhamii .. 415
Cyrtoneura stabulans .. 67

D

Dactylomyia ceylonica .. 517
Daniela 458
Danielsia albotaeniata .. 458
Dasymyia fusca 453
Dasyneura 57
Deinoceratinae 413
Deinocerites 487
Dendromyia 54, 501, 502, 503
achaetae 503
aureochaeta .. 503
communis .. 503
scintillans .. 503
Dendromyinae 410
Desvoidea 6
†apicalis 5
obturbans 4
panalectros 5, 468
"Desvoidia" 441
Desvoidya .. 440, 441, 453
obturbans 411
Diachlorus 321, 361, 363, 364
flavipennis .. 364
Diatomineura .. 364, 365
Dichelacera 361
Dilophus graciosus 280
Dinoceratinae 409
Diplonema .. 38, 41, 310
Diptera 40, 42, 53, 58
Ditylomyia .. 370, 371

Page

Dixa .. 54, 57, 259, 264—269
†bifasciata .. 265, 269
†bistriata .. 265, 268, 269
maculata 266
†maculipennis .. 265, 266
†montana .. 264, 265
†ochrilineata .. 265, 267
Dixidae 264
Drymeia 56

E

Eatonisca 38
Ectenopsis 373
Ekrinomyia aureostriata .. 440
Epialurgi 409
Erephopsis 365
"Etorilepidomyia" 410
Etiorleptiomyia 484
completiva .. 484
luzonensis .. 484
"Etorlepitiomyia" .. 440, 453, 484
Eucorethra underwoodi .. 318
Euculicidae 55
Exoprosopa 57

F

Feltidia 461
Ficalbia 487, 494
longirostris 494
minima 494
simplex 494
tenax 517
Filaria bancrofti 425
Finlaya .. 485, 517
aranetana 485
poicilia 486
Finlayia 440

G

Gastroxides .. 365, 370, 372
ater .. 370, 371
ornatus 371
Geitonomyia 459
Goeldia 501
Grabhamia .. 54, 461, 489
ambigua 461
jamaciensis .. 461
ochracea 461
pulcripalpis .. 14
spenceri 461
sollicitans 461
taeniarostris .. 461
Grahamia .. 27, 489

H

Haemagoginae 413
Haemagogus .. 12, 488
Haematobia .. 61, 62, 63, 66, 82, 83
exigua 86
ferox 63
geniculata .. 63

	Page
Haematobia *irritans* ..	.. 63
†rufipes ..	64, 65
sanguisugens	64, 65
serrata ..	.. 63
stimulans	59, 63, 64, 65
tibialis ..	.. 63
Haematobosca	59, 60, 61, 62
atripalpis	.. 62
Haematopota	321—361, 375, 401
†annandalei	321, 335, 337, 338
asiatica	321, 340, 341
†assamensis	321, 343, 345
atomaria	321, 331, 332, 333
†bilineata	321, 331, 350
borneana	321, 329
brevis	322, 349
cana ..	322, 330
cilipes ..	322, 339, 360
cingalensis	322, 349, 350, 351
cingulata	322, 326, 327
cordigera	322, 351, 357
decora ..	.. 337
†dissimilis	322, 331
dorsalis	.. 337
†fasciata	322, 358
fuscifrons	322, 357
†immaculata	322, 359
†inconspicua	322, 358, 359, 360
indiana	.. 328
irrorata	322, 352
javana ..	321, 322, 334, 340, 341, 344, 349
lata ..	322, 336, 338, 339, 344, 345, 361, 401
†latifascia	322, 356, 358
limbata	322, 325, 326
lunata ..	380, 381
lunulata	322, 354, 355, .. 356
†marginata	322, 347
nigra ..	322, 340, 341
pachycera	322, 336, 337
pallens	.. 348
pluvialis	323, 340, 341
punctifera	322, 327
pungens	352, 353
roralis	322, 323, 330
rubida	322, 327, 336, 337, 338, 339
†sinensis	322, 345
singularis	322, 327, 337, 338, 339
tessellata	322, 348, 350
unizonata	322, 332
†validicornis	322, 333, 335, 337, 338
vittata ..	.. 337
Harpagomyia ..	444, 504
splendens	.. 504
Heliconia brasiliensis	404, 442, 449
" Hebotomus " minutus	 320

	Page
Heinzmannia ..	502, 503
Heptaphlebomyinae ..	54, 409
Hodgesia	487, 500
malayi ..	.. 500
quasisanguinae	.. 501
sanguinea ..	.. 501
Howardia ..	.. 423
Howardina	54, 423, 485, 490
chrysolineata	.. 456
greeni ..	.. 456
himalayana	.. 456
" Hulecoeteomyia " ..	.. 455
Hulecoetomyia ..	.. 455
fluviatilis	.. 455
jugraensis	.. 455
pseudotaeniata	.. 455
trilineata	14, 455

K

Kerteszia megregori ..	.. 431
Kingia annandalei ..	.. 443

L

Lamellibranchiata ..	.. 55
Laphria	.. 57
Laverania ..	.. 428
Leicesteria ..	453, 454, 485
annulitarsis	.. 454
apicalis ..	.. 454
cingulata ..	.. 454
" dolicocephala "	.. 455
dolichocephala	.. 455
longipalpis	.. 455
Leicesteriomyia ..	452, 453
flava ..	.. 453
Lemna arrhiza ..	.. 404
minor ..	.. 404
Lepidotomyia	458, 459, 486, 487
alboscutellata	.. 458
magna ..	458, 459
taeniata	.. 459
Leptosomatomyia lateralis	.. 488
Leucomyia	411, 462, 463, 478, 480
gelida ..	.. 20
var. cuneata	.. 20
var. *sinensis*	20, 463
sinensis ..	.. 20
Limatinae ..	407, 410
Limatus	.. 501
Limnobiinae ..	.. 55
Longipalpi ..	.. 55
" Lophocelomyia " ..	.. 427
Lophoceratomyia ..	.. 463
†bicornuta	25, 463
brevipalpis	25, 463
eminentia	.. 463
fraudatrix	25, 26, 463
mammilifer	.. 463
minor	.. 463
niger	.. 463
rubithoracis	.. 463
sylvestris	.. 465
taeniata	.. 465
uniformis	.. 465
variata	.. 465

Page

Lophomyia asiatica 427
Lophoscelomyia .. 424, 427
asiatica .. 427
Ludlowia 493
chamberlaini .. 493
minima 493
Lyperosia 60, 61, 66, 82, 83
exigua .. 60, 83, 86, 89
†flavohirta .. 83, 89
irritans .. 59, 83, 87, 89
minuta .. 60, 83, 84, 88
serrata 83
titillans 83

M

Malaya 501, 503
genurostris 503
Mansonia 440, 481, 483
annulata 482
annulifera 482
annulipes .. 411, 482, 483
anopheloides 412
arabica 482
chrysogona 482
nevo 482
seguini .. 482, 483
septempunctata .. 483
uniformis 22, 406, 482, 483
Mansonioides .. 440, 482, 483
annulifera 22, 483
septemguttata .. 483
Megalorhini 409
Megalorhinina 410
Megarhinae .. 407, 409
Megarhininae .. 413, 434
Megarhinus .. 435, 437, 439
amboinensis .. 435
ferox 438
gilesii 436
immisericors 438, 439
lewaldii 435
minimus .. 435
splendens .. 435
subulifer .. 436
Melanoconion 54, 484, 489, 490
juxtapallidiceps .. 484
ornatus .. 484
pallidiceps .. 484
uniformis .. 484
Mesomyia 373
Metanototricha 409
Metantotrichina 410
Micrococcus melitensis .. 459
Mimomyia 453, 487, 488, 492, 493
chamberlaini 492, 493
minuta .. 30, 492
Mochlonyx .. 317, 318, 405
effoetus 317
velutina 317
Musca .. 59, 91
corvina 82
domestica .. 89, 90
pungens 68
Muscidae .. 56, 59—93
Mucidus .. 439, 440
laniger 440

Page

Mucidus mucidus 440
scatophagoides 4, 440
Musciuae .. 56, 83, 493
Mycetophila 57
Mycteromyia .. 365, 373
nigrifacies .. 373
Myzomyia 54, 95, 97, 98, 101, 103—107, 415—418, 421, 422, 517
albirostris 418, 421
annularis 418
aurirostris .. 517
azriki 418
barbirostris .. 406
christophersi 2, 98, 418, 420
culicifacies 2, 96, 97, 98, 106, 404, 407, 418, 420, 422
var. punjabensis 98, 106
deceptor .. 418, 434
dthali 419
elegans 106, 109, 417, 419
fuliginosus .. 406
funesta .. 406, 419, 424
var. umbrosa .. 419
var. sub-umbrosa .. 419
indefinita .. 406, 419
jehafti 419
kumasii 419
leptomeres 96, 97, 98, 106, 419, 434
leucophyrus 417, 420
listoni 96, 97, 98, 106, 420
ludlowii .. 406, 419, 420
pseudobarbirostris .. 406
punctulata 420, 421, 432
rossii .. 2, 106, 406, 411, 419, 421, 433
var. *indefinita* .. 419
tessellata 422
thorntoni 422
turkhudi .. 96—99, 106, 404, 422, 424
sinensis 434
vanus 406
Myzorhynchus .. 95, 99, 100, 102, 103, 105, 106, 107, 109, 415, 424
albotaeniatus .. 424
alboannulatus .. 424
barbirostris 3, 99, 102, 103, 106, 407, 424—427
indiensis .. 427
minutus .. 425
nigerrimus 99, 102, 103, 106, 425
peditaeniatus .. 425
philippinensis .. 426
pictus 427
pseudobarbirostris 426
pseudopictus .. 426
separatus .. 426
sinensis 4, 99, 102, 103, 106, 411, 424, 425, 426, 427

Page

Myzorhynchus umbrosus .. 427
vagus 102, 420, 427

N

Neocellia .. 95, 96, 100, 101, 105, 106, 107 428, 432
dudgeoni 100, 102, 106, 432
indica .. 100, 101, 102, 106, 407, 432
intermedia 100, 102, 106, 432
stephensi .. 102, 106, 430
willmori .. 102, 106, 430
Neomacleaya indica 458
var. simplex .. 458
Neomyzomyia .. 109, 418
elegans 109, 417, 419, 423
leucophyrus 417, 420
"Neonyssorhynchus" .. 101
Nemocera 38
Nemopalpus 38
‡Neostethopheles .. 97, 98, 103, 104, 106, 407, 415, 422
aitkeni 98, 106, 407, 422
culiciformis 98, 106, 422, 423
immaculatus 98, 106
‡Neotobanus .. 321, 363
†ceylonicus .. 363
Nepenthes alata 501
rafflesiana .. 438
‡Nyssomyzomyia .. 101, 104, 106, 108, 418, 420
ludlowi 421, 422
punctulata 421, 422, 432
rossii 106, 407, 421, 422
Nyssorhynchus .. 95, 96, 99, 100, 101, 104, 106, 107, 109, 415, 423, 428, 431
fuliginosus 3, 99, 100, 106, 428
var. adiei 106
var. nagpori 106
var. pallida 428
indiensis 428, 429
jamesii 3, 99, 100, 106, 429
karwari 99, 100, 101, 106, 429
leucophyrus .. 417
maculatus 3, 99, 100, 106, 407, 429
maculipalpis 99, 100, 101, 106, 429
var. indiensis 106
nivipes 429, 430
philippinensis 426, 430
pseudowillmori .. 430
punctulata .. 432

Page

Nyssorhynchus stephensi 3, 99, 106, 430
theobaldi 99, 100, 106, 430
willmori 3, 99, 106, 430

O

Oculeomyia fulleri 485
sarawakii .. 485
"Oculiomyia" 485
Odontomyia 57
Oestridae 59
O'Reillia 484
Orthopodomyia .. 440, 485, 486
albipes 30, 486
†maculata 29, 486
maculipes .. 486
nigritarsis .. 486

P

Pangonia 57, 365, 366, 367, 373
amboinensis 365, 366, 368
conica 373
longirostris 365
rufa 367
Pangoniuae .. 364, 370, 374
Panoplites 482
‡Parabrunettia .. 289, 290, 291 310, 311
†albohumeralis 311, 312
argenteopunctata 311, 312
artisquamis 311, 312
†flavicollis 311, 312, 314
†longichaeta 311, 312, 314
†9-notata 311, 312, 313
squamipennis 311
Pardomyia aurantia.. .. 460
quadripunctis .. 460
Parhaematopota .. 337, 338
cognata .. 337
‡Patagiamyia 97, 98, 104, 106, 107, 109, 407, 415, 416, 417
gigas .. 98, 106, 407
lindesayi 99, 106
var. maculata 106
Pecomyia .. 459, 460
caeca 459
maculata 460
Pelorempis americana .. 318
Penthetria 270
melanaspis 269
Pericoma 38, 39, 41, 289, 290, 291, 301—310
annandalei 301, 304
appendiculata 289, 302, 304
bella .. 289, 302, 304, 305, 307
gilvipes 303, 306, 307, 308
†impunctata 303, 309
lacteitarsis 303, 306, 307, 308
marginipotata 289, 290, 297, 302, 304—308, 311

Page

Pericoma †metatarsalis 302, 305
†mixta .. 303, 306, 307
†proxima .. 303, 307, 308
spinicornis 289, 290, 302, 304
†squaminervis 301, 303
†unicolor .. 303, 309
Phagomyia gubernatoris .. 456
Philaematomyia insignis 90, 93
Philodendromyia barkeri .. 503
Phlebotomi 319
Phlebotomiella 37
Phlebotomus 35—52, 289, 319, 504
angustipennis 38, 51, 52
argentipes 37, 38, 42—44, 46, 47, 49—51, 319, 320
var. marginatus 319
†babu .. 37, 44, 49—52, 319, 320
*var. niger .. 320
cruciatus .. 37
duboscqui 37, 38
†himalayensis 37, 44, 50, 51, 319
†major 37, 44, 46, 47, 51, 319, 320
*var. grisea .. 320
†malabaricus 37, 44, 48 50, 289
marginatus .. 319
mascittii 37, 38
minutus.. .. 37
papatasi 35, 37, 38, 44, 51. 52, 289, 319, 320
perturbans 35, 38, 44, 47—49, 289
tipuliformis .. 37
vexator 37
Phlebotominae .. 38, 39, 289
Philaematomyia .. 59, 89. 91
Phoniomyia .. 501, 502
bimaculipes .. 502
caeruleocephala .. 502
indica 502
"Phonomyia" 502
Plecia .. .. 270—272
†atra .. 271, 272
fulvicollis .. 270, 271
†indica .. 270, 271
melanaspis .. 269, 271
†obscura .. 271, 272
subvarians 271
tergorata .. 270, 271
thoracica 271
‡Pleciomyia 269
melanaspis 270, 271
Polylepidomyia argenteiventris .. 502
Popea 410, 485
lutea .. 485, 517
Poppea 410, 485
Potisa 337
‡Pristirhynchomyia .. 59, 91
†lineata 91, 92
Promachus 57
‡Pseudocarrollia .. 12, 454
†lophoventralis 13, 454

Page

Pseudograbhamia .. 460, 489
maculata 14, 460
‡Pseudograhamia .. 26, 460, 489
†aureoventer 27, 460, 489
Pseudohowardina chrysoscuta .. 456
"Pseudomyzomyia" 95, 100, 101. 106, 421, 422
rossi 95, 100, 101, 106
Pseudoskusea .. 450, 488
mediolineata .. 451
multiplex .. 450
nigrotarsis .. 450
Pseudostegomyia 443
Pseudotheobaldia niveitaeniata .. 478
Pseudouranotaenia parangensis .. 494
triangulata .. 494
Psorophora 439
Psorophorinae 413
Psychoda 38, 39, 41, 289—301, 310—315
albonigra 289, 292, 294, 295
albonotata 289, 294, 298
†albopicta .. 293, 296
†apicalis .. 291, 294, 301
argenteopunctata 290, 311
artisquamis .. 310, 311
bengalensis 289, 290, 292, 295, 303, 308, 312, 314
†decora .. 294, 299
†distans .. 293, 296
distincta 289, 290, 294, 298, 311
†fulvohirta .. 293, 297, 298
†geniculata .. 292, 294
†hirtipennis .. 294, 300
†maculipennis 294, 299
nigripennis .. 289, 290, 293, 297—300
†orbicularis 292, 293, 298
squamipennis 290, 311
†transversa .. 294, 299, 300
vittata .. 289, 293, 298
Psychodidae .. 38, 40, 43, 57, 289
Psychodinae .. 38, 289
Ptychopterinae 55
Pyretophorus 95, 97, 99, 104, 106, 107, 418, 423, 433
costalis .. 99, 407
elegans .. 96, 97, 99, 106, 417, 423
freerae 423
jeyporiensis 96, 97, 99, 106
minimus .. 423
nigrifasciatus 96, 97, 99, 106, 424
nursei 96, 97, 99, 106, 424
palestinensis 99, 407
philippinensis .. 430
punctulata 96, 97, 99, 106
watsonii .. 424

Q

Page

Quasistegomyia .. 443, 447
gardneri .. 443

R

Rachionotomyia ceylonensis .. 485
Radioculex clavipalpus 26, 465
Ramcia 504, 505
inepta 505
Reedomyia .. 458, 486, 487
"alboscutella" .. 487
alboscutellata .. 487
lowisii 487
niveoscutellata .. 487
pampangensis .. 487
Rhinomyza .. 365, 369
fusca 369
Rhynchomyia 493
Rhyphidae 259
Rhyphus .. 259—263
†distinctus 260, 262, 263, 264
†divisus .. 260, 263, 264
fenestralis 259, 261, 264
*var. indicus .. 259, 261
indicus 261
maculipennis 259, 260, 261
†pulchricornis 259, 260
punctatus .. 259, 262
Runchomyia .. 493, 501
philippinensis .. 493

S

Sabethes 501
Sabethinae 405
Sabethini 54
Sabethoides 501
Sayomyia 317, 318, 504, 505
Scatopse brunnescens .. 281
†nigronitida 281
Sciara 57
Scutomyia .. 448, 452, 453
albolineata .. 452
nivea 452
notoscripta .. 452
subsp. samarensis .. 452
sugens 452
treubi 517
Silvius 365, 373
†indianus 374
vituli 373
Simulium 56, 282—288, 445
†aureohirtum 282, 286, 287
†griseifrons 282, 285
†grisescens .. 282, 283, 284
indicum 282, 284, 286, 288
†metatarsalis 282, 284, 285
†rufibasis .. 282, 285
†rufithorax 282
†senilis .. 282, 288
Siphona 66
Siphonatae 55
Siphoniata 55

Page

Skeiromyia .. 488, 498, 500
fusca 500
Skusea 450, 488
culiciformis 451
diurna .. 33, 451
funerea 458
var. ornata .. 451
mediofasciata 451
†pseudodiurna .. 32, 451
pseudomediofasciata .. 451
†uniformis .. 33, 451
‡Squamomyia .. 28, 489
†inornata 28, 489
Stegomyia 10, 12, 439, 443, 444, 447, 448, 453, 456
†albipes .. 11, 444
albolateralis .. 444
albopictus 449
amesii 444
†annandalei 10, 444
annulirostris .. 444
argenteomaculata .. 444
assamensis 12, 445
aurostriata .. 445
brevipalpis .. 445
calopus .. 406, 446
crassipes 445
desmotes 445
dissimilis 445
fasciata 8, 406, 411, 436, 446, 449
var. luciensis .. 446
frater 446
fusca .. 447, 491
gardneri 447
gracilis 447
imitator 447
leucomeres .. 447
medio-punctata .. 447
microptera .. 447
†minutissima 9, 11, 444, 448
nigritia 517
nivea 448
periskelata .. 448
perplexa 448
pipersalata .. 448
pseudonivea .. 448
punctolateralis .. 448
scutellaris 8, 9, 446, 448, 449
subsp. samarensis .. 449
sexlineata 449
striocrura 449
thomsoni 450
tripunctata .. 450
w-alba 450
Stethomyia 95—97, 106, 415
culiciformis 96, 106, 423
fragilis 423
pallida 423
Stomoxinae .. 59, 60
Stomoxys 56, 59, 61, 63, 66, 67, 81, 82, 83
aculeata 69
aurifacies 69
bengalensis 68, 71, 79, 80

Page

Stomoxys brunnipes .. 74, 76
calcitrans .. 59, 63, 66, 67, 68, 73—76, 79, 81, 82, 87
chrysocephala .. 69
claripennis 69
cunctans 69
dacnusa 81
dira 69
flavescens 69
indica 59, 68, 77, 78, 79, 80
infesta 69
inimica .. 69, 72
irritans 66
? libatrix .. 69, 72
limbata (?) 68, 77, 78, 79, 80
minuta 69
nigra 79
†oblongopunctata 67, 73
omega 81
plurinotata .. 67, 73
praecox 69
pulla .. 59, 68, 80, 81
pungens 69
pusilla .. 68, 80, 81
rubrifrons 69
sellata 74
sitiens .. 68, 75, 76
stimulans 66
sugillatrix 69
tessellata 68
†triangularis .. 68, 77
vulnerans 69
Stygeromyia .. 59, 61, 62, 82
maculosa 82
Sycorax 38

T

Tabanidae 112, 321, 401, 492
Tabaninae 321
Tabanus 58, 111—258, 321, 361, 363, 364, 380, 401
abazus .. 246, 247
abbreviatus 117, 153, 231, 232, 235
abscondens 118, 161, 231, 235
†adjacens .. 247, 248
administrans 167, 168, 171, 231
agricola 133, 135, 231, 248
albilateralis .. 128, 231
albilinea 246
albimedius .. 118, 151, 154, 155, 156, 157, 231, 233, 234, 235
albocostatus 146, 190, 231
†albofasciatus 116, 146, 231, 235
alboscutatus 122, 139, 231, 235
albulus .. 136, 231
alexandrinus .. 247
amaenus 119, 167, 169, 231, 235, 236
andamanicus .. 217, 231

Page

Tabanus angusticornis 236, 237
angustus .. 212, 231
annamitus 117, 149, 231, 235
apicalis .. 182, 216, 231
apricus .. 246, 247
ardens 200, 224, 231, 235
aspahanicus .. 247, 255
assamensis .. 194, 231
astur 243
†atrohirtus 125, 209, 231, 235
atricinctus .. 231, 239
auriflamma .. 117, 143, 148, 231, 235
†auristriatus .. 118, 149, 161, 231, 235
aurotestaceus 119, 149, 163, 231, 235
autumnalis .. 155, 168, 169, 170, 171, 247, 253
barbarus .. 231, 239
basalis 116, 147, 190, 231, 235
bicallosus 114, 129, 231, 234
†bicinctus 115, 132, 133, 231, 234, 235
bifarius .. 247, 254
bipunctatus 134
birmanicus .. 124, 200, 201, 231, 235
bituberculatus 231, 236
borniensis 126, 216, 231, 235
bovinus .. 185, 245
bromius .. 246, 247
brunneus .. 121, 167, 176, 192, 231, 235
†brunnipennis 118, 160, 231, 235
bubali 149, 166, 231, 235
bucolicus 186, 187, 231
buddha .. 236, 238, 239
caerulescens 124, 200, 203, 205, 225, 232, 235
calidus .. 156, 157, 231
canipalpis .. 246, 247
ceylonicus 127, 129, 222, 223, 231, 233, 235
chinensis 152, 231
chrysurus 236, 237, 238, 239
cinctus 147
cinerascens 215, 219, 220, 231
clausacella 167, 171, 231, 236
conformis 232
confucius .. 236, 244, 245
conicus .. 232
consanguineus 123, 197, 232, 235
consocius .. 195, 196, 232
cordiger 236, 239, 244, 247, 254
costalis .. 153, 198, 232
crassus .. 122, 148, 189, 232, 235, 236
cyanops 247
†cyprianus .. 247, 248
decorus 247
†discrepans 122, 185, 232, 235

Page

Tabanus †dissimilis .. 121, 180, 181, 232, 235
ditaeniatus .. 115, 133, 134, 135, 232, 234, 235, 236
†diversifrons 120, 213, 214, 220, 232, 235
dives 186, 206, 207, 232
dorsiger 198
dorsilinea .. 150, 152, 232
eggeri .. 187, 247, 249
equestris .. 139, 140, 232
erythrocephalus .. 136
explicatus 122, 191, 232, 235
factiosus 121, 179, 232, 235
felderi 167, 186, 231, 232, 236
fervidus 232
finalis 182
†flavicinctus .. 115, 130, 232, 234
†flavissimus 125, 207, 232, 235
flaviventris 126, 213, 214, 232, 235, 236
†flavothorax 124, 201, 232, 235
flexilis 116, 140, 141, 143, 232, 233
†formosiensis 127, 220, 232, 236
fulvicornis .. 246, 247
fulvimedius .. 123, 197, 198, 232, 233, 235, 236
fulvissimus 125, 205, 207, 232, 235
fulvus 112, 115, 133, 134, 231, 232, 235, 236
fumifer 112, 121, 167, 173, 174, 175, 177, 179, 180, 185, 186, 208, 217, 232, 235
fumipennis 200, 225, 232, 235
fuscicauda 126, 214, 217, 231 232, 235
†fuscicornis 116, 144, 232, 235
†fuscomaculatus 122, 183
geniculatus 188, 200, 232, 235
gigas 247
glaber .. 161, 247, 249
graecus 247
gratus 129
guineensis 198
hilaris 117, 153, 164, 232, 235
hirticeps 236
†hirtipalpis 114, 129, 232, 234
†hirtistriatus 118, 158, 232, 235
hirtus .. 127, 227, 232
hoang .. 134, 236
humilis 236
hybridus 118, 149, 162, 163, 232, 235
ignobilis 121, 180, 181, 232, 235
immanis .. 149, 166, 200, 232, 235

Page

Tabanus incultus 188, 199, 232, 235
†indianus 120, 175, 185, 232, 233, 235, 236
indicus .. 198, 232
infuscatus .. 246, 247
†inobservatus 124, 204, 205, 226, 232, 235
inscitus 232
intermedius .. 187, 249
internus 173, 177, 232, 233
ispahanicus .. 247, 255
ixion 200, 226, 233, 235
japonicus 236
javanus 115, 138, 233, 235
joidus 125, 147, 209, 211, 212, 233, 235
jucundus 119, 164, 233, 235
justorius 123, 192, 193, 233, 235
khasiensis 123, 193, 233, 235
lacrymans 233
lama 236
laotianus 200, 212, 226, 233, 235
leucocnematus 115, 130—132, 233, 234
†leucohirtus 125, 208, 209, 233, 235
leucopogon 122, 184, 188, 233, 235
leucopterus 136
leucosparsus 167, 187, 233, 235
lineola 198
longicornis 138
lunatus 247
macer 233
†malayensis .. 121, 175, 178, 233, 235
mandarinus 119, 168, 170, 233, 234, 235, 236, 237
manilensis 150, 152, 233
megalops .. 150, 152, 233
melanognathus 200, 226, 233, 235
melanopygatus 197, 233
mentitus (?) 175, 176, 233
minimus .. 221, 233
†miyajima .. 247, 250
monilifer .. 159, 173, 233
monotaeniatus 118, 159, 160, 233, 235, 401
montanus .. 246, 247
mühlfeldi 247
†negativus .. 115, 137, 233, 235
nemocallosus 115, 137, 233, 234
nephodes .. 116, 145, 233, 235
nexus 121, 181, 233, 235
nicobarensis 123, 191, 233, 235
nigrita 247
nigromaculatus 233, 235
nigropictus 125, 210, 233, 235

Page

Tabanus nigrotectus 124, 202, 233, 235
nitidulus .. 223, 233
niveipalpis .. 246, 247
†non-optatus .. 116, 140, 233, 235
obconicus .. 126, 215, 233, 235
obscuratus .. 203, 205
obsoletus 198
occidentalis 198
optatus 116, 139, 140, 141, 231, 232, 233, 234, 235
orientalis 188, 196, 198, 233, 235
orientis 123, 195, 196, 197, 198, 228, 232, 233, 235, 401
oxyceratus 123, 184, 195, 233, 235
pagodinus .. 197, 233
pallidepectoratus 125, 209, 233, 235
palpalis 125, 212, 231, 233, 235
par .. 206, 207
partitus .. 150, 152, 233
pauper 125, 207, 233, 235
†perakiensis 124, 204, 233, 235
perlinea .. 195, 196, 233
†persis .. 247, 251
pictipennis .. 140, 141, 143, 233
polygonus .. 247, 252
polyzonatus 247
†pratti 116, 143, 144, 145, 233, 235
priscus .. 156, 157, 233
puella .. 136, 233
pulchellus 247
pulchriventris 236, 243
pulverifer .. 247, 254
pusillus 222, 223, 236, 242
†puteus 119, 165, 234, 235
pyrausta .. 188, 234
pyrrhoceras 236
pyrrhus .. 134, 234, 236
quadrifarius .. 247, 254
quinquevittatus .. 198
†rarus 114, 128, 234, 235
rectus .. 171, 253
reducens 157
rubicundus 120, 166, 172, 181, 232, 234, 235
rubidus 118, 151 155, 156, 157, 234, 235
rubiginosus 234
rufidens 236
rufiventris .. 167, 185, 234
rufocallosus .. 150, 152, 234
rusticus .. 112, 135
sabuletorum 247, 254
sanguineus 123, 194, 231, 234, 235, 236
servillei 122, 188, 234, 235
†sexcinctus 115, 133, 234

Page

Tabanus †siamensis 125, 212, 234, 235
signatipennis 167, 236
signifer 122, 167, 181, 182, 234, 236
†significans 122, 182, 234, 235, 250
simplissimus 127, 221 224, 233, 234, 235
sinicus 150, 152, 234, 236
solstitialis 247
†speciosus 118, 157, 234, 235, 236
spectabilis 247, 253, 255
speculum 143
spoliatus 171
†stantoni 120, 174, 186, 207, 208, 232, 234, 235
striatus 117, 129, 149 151—153, 155, 156, 198, 231, 232, 233, 234, 235
†subcallosus 127, 227, 234
†subcinerascens 126, 215, 234, 235
subhirtus 127, 219, 231, 234, 235
sumatrensis .. 234
taeniatus 112
taeniola 153
tataricus .. 236, 242
tenebrosus 124, 203, 234, 235, 237, 243
tenens .. 150, 152, 234
(Therioplectes) 112, 113, 127, 227, 236, 247
albilateralis .. 230
hirticeps 236
hirtus .. 228
pulchriventris 236
†subcallosus .. 227, 234
†wyvillei .. 229, 234
†tinctothorax 124, 202, 234, 235
triangularis .. 167
tricolor 247
trigeminus 170, 171, 234, 237
trigonus .. 237, 243, 244, 245
trilineatus 198
tristis 119, 163, 234, 235
trivittatus 198
†tuberculatus 127, 220, 234, 235
umbrinus 247
umbrosus .. 156, 157, 234
unifasciatus .. 247
†uniformis 127, 218, 234, 235
univentris 125, 186, 206, 207, 232, 234, 235
vagus .. 156, 157, 234
vanderwulpi 116, 140, 141, 143, 234, 235

Page

Tabanus varicolor 120, 172, 234, 235
variegatus .. 172, 234
virgo 115, 136, 231, 233, 234
vittatus 138
†wyvillei .. 127, 234
yao 236, 237, 244, 245
yokoamensis 237, 240
Tabanus (Atylotus) 112, 236, 237, 244, 246, 247
Tachinidae .. 441, 453, 502
Taeniorhynchus 468, 478, 480, 481
ager .. 22, 478
argenteus 462, 478
aureosquammatus 478
aurites 479, 482
brevicellulus .. 479
confinnis .. 479
conopas .. 479
domesticus .. 479
†epidesmus 22, 24, 479
lineatopennis .. 479
†luteoabdominalis .. 23, 479
ochraceus .. 479
pagei 480
tenax .. 22, 480
var. ocellata .. 480
var. maculipes 480
var. maculipes arabiensis 480
whitmorei .. 480
Teromyia .. 438, 439
acaudata 438
ater 438
funestus 438
magnificus .. 438, 439
quasiferox 439
raris 439
Theobaldia annulata .. 459
spathipalpis .. 459
Theobaldiomyia .. 462, 478, 480
argentea .. 462
gelidus 411, 462
var. bipunctata 463
var. cuneata .. 463
sinensis .. 463
whitmorei .. 462
Theobaldinella .. 54, 459
Theobaldius 459
Therioplectes 112, 113, 127, 227, 231, 232, 234
albilateralis .. 235
hirtus .. 229, 230, 235
†subcallosus .. 235
†wyvillei .. 235
Tipula 57, 318
culiciformis 317
flavicans 317
pallida 317
plumicornis 317
punctipennis 317
Tipulinae 55
Tipulidae .. 55, 57
Topomyia .. 488, 499
argyropalpis .. 499
argyroventralis 499, 500

Page

Topomyia decorabilis .. 499
durbitans .. 499
gracilis 499
minor 500
nigra 500
rubithoracis .. 500
"rubithorax" .. 500
tipuliformis 499, 500
Toxorhynchites 435, 436, 437, 439
amboinensis .. 435
argenteotarsis .. 435
brevipalpis .. 435
gilesii 435
immisericors 4, 435, 436, 437, 438
inornatus .. 436
javaensis .. 436
leicesteri .. 437
lewaldii .. 437
marshalli .. 435
"metallica" .. 437
metallicus .. 437
minimus .. 437
speciosus .. 435
splendens .. 437
subulifer .. 437
Trichomyia 38
Trichopronomyia annulata .. 477
Trichoprosoponinae .. 410, 413
Trichorhynchomyia fuscus .. 477
Trichorhynchus 477

U

Udenocera .. 321, 361, 363
brunnea 362
Uranotaenia 439, 453, 487, 493, 494, 495, 498
argyrotarsis .. 495
ascidiicola .. 517
atra 495
bicolor 495
bimaculata .. 495
bimaculialia .. 495
caeruleocephala var. *lateralis* .. 495, 496
campestris .. 495
cancer 496
ceylonica .. 496
fusca 496
lateralis 496
longirostris .. 496
lutescens .. 496
maculipleura .. 496
malayi 496
maxima .. 495, 497
micans 497
minima 497
modesta .. 497
nitidoventer 493, 497
nivea 497
nivipleura .. 497
powelli 497
testacea .. 26, 497
trilineata .. 498
unilineata .. 498

	Page
Uranotaenia unimaculata ..	498
unimaculiata ..	495
Uranotaeniinae ..	409, 443

V

Veprius	373
Verallina..	487
Verralina	489
Verrallina ..	490, 491
butleri	491
fragilis ..	491, 492
imitator	491
indecorabilis ..	492
malayi ..	491, 492
pygmaea	495
Verrallina virilis	492

W

Worcesteria	439
Wyeomyia	54, 447, 498, 501
aranoides ..	501
funerea	501
greenii	501
metallica	501
nepenthicola ..	501
Wyeomyinae	501

Z

Zeugnomyia ..	487, 498, 490
gracilis	498

PREFATORY NOTE TO VOLUME IV.

So many papers have been received and promised for the *Records of the Indian Museum* this year that it has been decided to publish a special volume (vol. iv) devoted to the systematic and geographical study of Diptera proved to be or likely to prove of economic or medical importance. The papers that constitute this volume will be issued as they are ready, concurrently with the parts of volume v, which will be devoted to general zoology.

The preparation of vol. iv has been rendered possible by the untiring industry of Mr. E. Brunetti, by the assistance generously given by private collectors (notably by Lt.-Col. E. A. W. Hall, I.M.S.) and by the liberality with which the Trustees of the Indian Museum have permitted their scientific officers to travel through India to collect and observe. These circumstances have combined to render our collection of Indian Diptera one of great importance and have enabled the Museum to resume the position as a centre of entomological work that it held in the days of Wood-Mason and de Nicéville.

In addition to Mr. Theobald's report on recent additions to the collection of mosquitoes with which it commences, this volume will contain a revision of the Oriental Gad-flies by Miss Ricardo, a revision of the Oriental blood-sucking Muscidæ by Mr. Brunetti, an account of the Indian Papataci flies (*Phlebotomus*) by Dr. Annandale, a revision of the Oriental Diptera Pupipara by Dr. Speiser, a revision of the Oriental Trypetidæ (fruit-flies) by Prof. Bezzi, and other papers and notes. An account of the Indian Chironomidæ (including many blood-sucking species) has been received from Prof. Kieffer and is now in the press, but as the group is a large one and has hitherto been almost completely neglected so far as Indian forms are concerned, this paper will be published in the *Memoirs of the Indian Museum*.

N. ANNANDALE,
Superintendent.

Indian Museum,
Calcutta:
Feb. 9th, 1910.

I. SECOND REPORT ON THE COLLECTION OF CULICIDÆ IN THE INDIAN MUSEUM, CALCUTTA, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES.

By FRED. V. THEOBALD, *M.A., etc.*

NOTE.

The following report and descriptions of new species of Culicidæ is based on further collections belonging to the Indian Museum, Calcutta, sent me in 1908.[1] The types will be found in that Museum, but some co-types, where possible, have been retained for the British Museum of Natural History. Twenty new species are described and four new genera, also one new variety of an Anopheline.

The series of banded-proboscis *Culex* provisionally placed as *Culex impellens*, Walker, must be specially worked out, as I find such wide variation that it is impossible to separate them and it is likely that several of the more recently described banded-proboscis species will have to sink as subspecies under one of the older names. This cannot be settled off-hand, males and females must be bred and the genitalia of the former and the larvæ examined before any further advance can be made in this group of *Culex*.

SPECIES IN THE COLLECTION.

Family CULICIDÆ.

1. *Anopheles lindesayi*, Giles, var. *maculata*, var. nov.

A very distinct variety of this marked species. The wings have a dense black spot of scales at the base of the long vein, a dense black spot of scales at the cross-veins, another at the base of the first fork-cell, a smaller one at the base of the second fork-cell and the outer edge of the costa, the first long vein and the base of the branches of the first fork-cell all very dark. There are no pale spots on the wing fringe.

Habitat Kurseong, 5,000 feet, Darjiling district, E. Himalayas (*Annandale*).

Time of capture 5-vii-08.

[1] The first report was published in the *Records of the Indian Museum*, vol. i, part iii, Oct. 1908, pp. 287—302. The species figured in the plates accompanying this report were described in the former report —ED., *Rec. Ind. Mus.*

ACC. No. P694
Dt. 15/5/67
ZOOLOGICAL GARDEN Kolkata 700 022

Observations.—A single perfect female. Evidently only a variety of Giles's species, but the marked maculation of the wings gives it a very different appearance.

2. *Myzomyia rossii*, Giles.

Journ. Trop. Med., Oct., 1899.

Additional Localities and Dates.

Bengal.—Calcutta, "in house," 10 and 11-viii-08 (*R. E. Lloyd*) and 28-viii-08 (2) (*I. H. Burkill*); "common below leather hoods of hired carriages and in public galleries of Indian Museum," vii-08 (*Annandale*); Balliganj, near Calcutta, 9-x-08 (2) (*T. Bentham*); Bamungachi, Howrah, near Calcutta, 2 and 9-ix-08 (*J. Caunter*); Port Canning, Lower Bengal (2), 9-x-08. Katihar, Purneah district, N. Bengal, 6-viii-07 and 4—5-x-08 (2) (*C Paiva*). Sur lake, near Puri, Orissa, 25 and 26-x-08 (2), "biting by day when disturbed from old wells" (*Annandale*).

E. Bengal and Assam.—Chittagong, E. Bengal, 7-viii-08, 19 and 21-ix-08 (*Lt.-Col. Hall*).

Madras Presidency.—Gopkuda Id., Chilka lake, Ganjam district, near Bengal frontier, 7—15-viii-07 (*R. Hodgart*).

Travancore State.—Trivandrum, Vaikum (coastal region), Shencottah on the Madras frontier (e. side of W. Ghats), Kulattupuzha (w. base of W. Ghats): all collected by Dr. Annandale between 5 and 25-xi-08.

The Punjab—Ferozepore (*Lt.-Col. Adie*) (34).

At sea.—On board ship 10 miles off Coconada on the Madras coast, 17-iv-08 (*C. Paiva*).

Note.—One specimen from Calcutta, quite typical, with label stating that it was determined by Giles as *Anopheles costalis*; he does not mention this in his Handbook.

3. *Myzomyia culicifacies*, Giles.

Entomologist's Monthly Magazine, p. 197, 1901.

Localities and Dates.

Bengal.—Rajmahal, 31-viii-07 (*R. Hodgart*).

Burma.—Mandalay, ♂ and ♀ "in bathroom," 13 and 14-iii-08 (*Annandale*).

The United Provinces—Lucknow, 21-i-08 (*R. Hodgart*).

The Punjab.—Ferozepore (*Lt.-Col. Adie*).

4. *Myzomyia christophersi*, Theob.

Proc. Royal Soc., lxix, p. 378, Jan. 1902.

Localities and Dates.

Bengal.—Calcutta (*Lt.-Col. Alcock*).

E. Bengal and Assam.—Meenglas, Dooars, Jalpaiguri, 13-viii-07 (*C. Wallich*) (1); Sylhet, Assam, 2-v-05 (*Lt.-Col. Hall*).

5. *Nyssorhynchus jamesii*, Theob.

Mono. Culicid., i, p. 134, 1901.

Localities and Dates.

Bengal.—Calcutta, 5-viii-08 (*Annandale*); Shamnagar, 3-viii-05 (*C. A. Gourlay*) (3).

6. *Nyssorhynchus fuliginosus*, Giles.

Handbk. Gnats, p. 160, 1st Edit., 1900.

Additional Localities and Dates.

Bengal.—Calcutta (Museum premises), 15-vii-08 and 12-viii-08, "at light in house," 14-viii-08, "in bungalow at light" (*Annandale*); Balighai near Puri, Orissa, 23 and 24-x-08, "numerous in old wells, resting by day" (*Annandale*).

The Punjab.—Ferozepore (20) (*Lt.-Col. Adie*).

7. *Nyssorhynchus maculatus*, Theob.

Mono. Culicid., i, p. 171, 1901.

Localities and Dates.

Nepal.—Nara Ghat, Bengal frontier, 25 and 26-11-08; Thamaspur, Bengal frontier, 18 and 20-11-08 (*mus. collr.*), ♂ and ♀.

Three rather large specimens but otherwise quite typical; the apical abdominal scales quite distinct.

One ♂ from the Punjab (?) has the outer costal border very dark, showing no third pale costal spot.

8. *Nyssorhynchus willmori*, James-Theobald.

Mono. Culicid., iii, p. 100, 1903.

E. Bengal.—Meenglas, Dooars, Jalpaiguri, 13-vii-07 (*C. Wallich*).

9. *Nyssorhynchus stephensi*, Liston.

Ind. Med. Gaz., xxxvi, No. 12, 1901.

Bengal.—Calcutta, "flying by day in Museum garden," 15-vii-08 (*Annandale*).

10. *Cellia pulcherrima*, Theob.

Proc. Royal Soc., p. 369, vol. lxix, 1902.

The Punjab.—Ferozepore (*Lt.-Col. Adie*).

11. *Myzorhynchus barbirostris*, Van der Wulp.

Leyden Museum Notes, vi, p. 46, 1884.

Localities and Dates.

E. Bengal and Assam.—15-i-07, Chittagong, 15-viii-08 (*Lt.-Col. Hall*).

Travancore State.—Nedumangad, ten miles N.E. of Trivandrum, 14-xi-08 (*Annandale*).

12. *Myzorhynchus sinensis*, Wiedemann.

Ausser. Zweifl. Ins., p. 547, 1828.

Additional Localities and Dates.

Bengal.—Calcutta (Museum premises), 9-vi-08, 28-vii-08, and viii-08, "in bathroom" (*Annandale*); Damukdia Ghat, R. Ganges, 30-iv-08, "at light on board steamer" (*Annandale*).

Assam.—Sylhet, 13-i-03, 13-i-04, 20-i-03, 26-i-03, 23-ii-05, 27-v-00, 4 and 7-vi-05, 24-vii-08 (*Lt.-Col Hall*); Ukhrul, Manipur, 6,400 feet, lat. 25° N., long. 94-95° E., viii-08 (*Rev. W. Pettigrew*) (16).

The Punjab.—Ferozepore (*Lt.-Col. Adie*).

Travancore State.—Maddathorai, w. base of W. Ghats, 18-ix-09 (*Annandale*).

13. *Toxorhynchites immisericors*, Wlk.

Journ. Proc. Linn. Soc. Lond., p. 91, 1860.

♀. Thorax clothed with metallic green and bronze scales, pale apple-green and pale blue at the sides in front and up to the base of the wings; pleuræ densely silvery white-scaled, dark above and below; head with a rich brown tinge in some lights, green in others, paler around the eyes; palpi and proboscis metallic purple and violet with mauve scales at the apex of the palpi. Abdomen as in the male but the tail tuft more pronounced. Fore legs with the metatarsals and first tarsal segments creamy white, rest dark: mid legs with the base of the metatarsals creamy white and all the first three tarsals; hind legs with the first two tarsals white.

Note.—The ♀ is redescribed here as the specimen in the British Museum was too damaged to do so.

Additional Localities and Dates.

Bengal.—Calcutta (Museum compound), 6-i-07, 2, 16, 28 and 31-vii-07 (6), 2, 5, 6 and 26 viii-07 (19) (*Annandale*); (Zoological Gardens), 9-vii and 12-viii-08 (2) (*Annandale*).

E. Bengal and Assam.—Chittagong, 3-ix-08 (*Lt.-Col. Hall*); Sylhet, Assam, 5-v-05 (*Lt.-Col. Hall*).

The Himalayas.—Bhim Tal, 4,500 feet, Kumaon, 19 and 22-ix-06 (*Annandale*).

14. *Mucidus scataphagoides*, Theob.

Mono. Culicid., i, p. 277, 1901.

N. Bengal.—Purneah, 5-viii-07 (1 ♀) (*C. Paiva*).

15. *Desvoidea obturbans*, Wlk. (and varieties).

Proc. Linn. Soc. Lond., iv, p. 91, 1860.

Additional Localities and Dates.

Bengal.—Calcutta, 21-i-08, 13-iii-07, 16-iii-07, 15-vii-07, 22-vii-07, 2-viii-07, 6-viii-07 (5), 28-i-08 (*Annandale*), 3 and 4-viii-07 (2), 15-viii-07, 2-viii-07, 23-viii-07, 4, 7 and 15-xii-08, "biting by day" (*C. Paiva*); Balliganj, near Calcutta, 30-ix, 9 and 11-x-08 (*T. Bentham*); Rajmahal, 30-vii-07 (*R Hodgart*).

The Himalayas.—Sukna, 500 feet, base of E. Himalayas, Darjiling district, 1-vii-08, "in deep jungle" (*Annandale*); Kurseong, 5,000 feet, Darjiling district, E. H malayas, 5-vii-08 (*Annandale*).

Travancore.—Trivandrum, 14-xi-08 (*Annandale*).

"Numerous specimens of this species were reared in July, 1909, by Mr. G. H. Tipper, from a glass of water left standing on a table in the office of the Geological Survey of India, Calcutta" (*Annandale*).

16. *Desvoidea panalectros*, Giles.

The co-type (Reg. No. $\frac{5455}{13}$) is nothing but an immature large *Culex fatigans*, Wied., with distinct abdominal banding.

17. *Desvoidea apicalis*, sp. nov.

Head dark brown, paler around the eyes; palpi and proboscis black. Thorax bronzy brown, with a pale line around the front and sides; pleuræ brown with silvery white-scaled areas. Abdomen black with prominent apical yellow bands and snowy white lateral spots. Legs black, unbanded, bases and venter of femora white.

♀. Head clothed with flat violet-black scales, some white ones forming a central line and small creamy curved ones forming a border around the eyes; a tuft of pale golden chætæ projecting between the eyes, dark ones at the sides; clypeus black with small creamy spindle-shaped scales; palpi and proboscis deep violet-black; antennæ black, the basal segment testaceous and black with small creamy scales, base of the second segment bright ferruginous.

Thorax black with narrow-curved almost hair-like bronzy scales, broader and pale ones forming a border around the front and sides of the mesothorax, the scales longer, broader and larger before the scutellum; a dense tuft of brown chætæ over the roots of the wings; scutellum clothed with flat violet scales, border bristles rich brown; metanotum brown; pleuræ brown with patches of flat white scales.

Abdomen black with violet reflections, all the segments but the first and last two with broad yellow apical bands, narrowed at the sides, and not passing quite to the edges; posterior border bristles small, brown with pale reflections; large lateral white spots, most marked on the apical segments.

Legs black, unbanded, femora pale beneath, the hind pair white below and at the base; chætæ dark (in some lights the legs have a brassy sheen); fore and mid ungues equal and uniserrate, hind equal and simple.

Wings with short fork-cells, nearly equal in length; the first submarginal narrower than the second posterior, its base a little nearer the apex of the wing, its stem nearly as long as the cell, stem of the second posterior as long as the cell, about one-and-a-half times its own length distant from the mid. Halteres with a pale testaceous stem, fuscous scales towards the white knob.

Length 6 mm.

Habitat Balighai near Puri, Orissa.

Time of capture 24-x-08 (*Annandale*).

Observations.—Described from a single perfect ♀. It is a typical *Desvoidea* and can be told at once by the very pronounced apical yellow abdominal bands.

18. *Brevirhynchus magnus*, Theob. (Pls. ii and iii, wing and wing scales.)

Rec. Ind Mus., ii, p. 293, 1908.

Additional Localities and Dates.

The Himalayas.—Sukna, 500 feet, base of E. Himalayas, Darjiling district, 1-vii-08, "in thick jungle" (*Annandale*).

Travancore.—Maddathorai, w. base of W. Ghats, 17-xi-08 (*Annandale*) (1 ♀).

19. *Brevirhynchus annulipalpis*, sp. nov.

Thorax black with scanty dull golden scales, arranged in rather obscure lines, sides and front of the mesonotum pale scaled; pleuræ with patches of white scales. Head black, pale in middle. The rather long black palpi with a snow-white band. Proboscis black, unbanded. Abdomen black with snowy white bands near the apex of some of the segments and with long thin lateral creamy spots. Legs dark with basal pale bands and pale chætæ.

♀. Head clothed with rather large, loose, flat dark scales, showing dull violet reflections, similar creamy ones forming a narrow median area, some creamy ones around the eyes and small almost white lateral flat scales, a few thick black chætæ at the eye borders and golden ones between the eyes; clypeus dark with small flat pale scales; proboscis rather short, thick and uniformly black, metallic. Palpi about half the length of the proboscis, black with metallic violet reflections, a broad white band about the middle and a narrow creamy one nearer the base; antennæ black, basal segment and base of the second bright testaceous, the former with small flat dark and creamy scales. Thorax black, clothed with long narrow-curved black, coppery and creamy scales, the latter in rather indistinct lines, sides of the mesonotum with rather broader pale creamy curved scales, which also pass around the front; the scales are larger, long and lanceolate over the roots of the wings, creamy and violet; dense dark brown chætæ also over the roots of the wings; scutellum large, clothed with loosely applied flat violet and creamy scales and with rich brown border

bristles; metanotum shiny black, shagreened over its surface; pleuræ brown with irregular patches of creamy white scales, which extend up to the edge of the pale areas of the mesonotum; prothoracic lobes with flat creamy white scales.

Abdomen black with violet reflections, the first segment unbanded, with very fine pale hairs, second segment with a large creamy median basal spot, traces of a pale area on each side near the apex, but not nearly forming a band, the third to fifth segments with almost complete white bands towards the apical borders; a trace of pale scales on the sixth, similar to the second; apical segment with a brassy sheen and some golden brown chætæ, a yellow lateral line on each segment; venter black and white.

Legs black with white basal bands; femora black, pale beneath, in the hind pair white at the base and below except at the apex; a pale, almost white spot at the base of the fore metatarsals and first two tarsi, in the mid legs the banding is slightly more pronounced, especially on the metatarsi, in the hind legs all the tarsi have basal white bands and the chætæ are prominently pale, ungues equal and simple.

Wings with dense brown scales; the first submarginal cell longer and narrower than the second posterior cell, its base nearer the base of the wing, its stem less than one-third the length of the cell; stem of the second posterior not quite as long as the cell; posterior cross-vein nearly twice its own length distant from the mid; halteres with the stem grey, then fuscous and the knob creamy white.

Length 5 5 mm.

Habitat Maddathorai, w. base of W. Ghats, Travancore (*Annandale*).

Time of capture 16-xi-08.

Observations.—Described from a single perfect ♀. At once told from any other known member of the genus by the banded palpi. The abdomen is relatively long and thin. The proboscis is short and thick but not so bent as in the type of the genus.

20. *Brevirhynchus apicalis*, sp. nov.

Head ochreous with a median and two lateral black patches; proboscis and palpi black. Thorax deep golden brown scaled with a pale ochreous border around the sides and front; pleuræ brown with creamy patches of scales; abdomen black, with apical yellow bands, showing some faint traces of a median pale line, lateral median white spots and ochreous venter. Legs brown with narrow apical pale bands.

♀. Head with flat ochreous scales, a small median dark-scaled patch in front, then a large and then a small dark-scaled lateral patch, borders of the eyes ochreous, golden chætæ projecting between them, brown ones at the sides; eyes coppery red; clypeus brown, palpi long and thin, black, traces of a narrow pale

band towards the base; proboscis black; antennæ brown, basal segment bright ferruginous, with small flat grey and fuscous scales, base of the second segment ferruginous.

Thorax black, thickly clothed with narrow-curved deep golden brown to bronzy scales, with a distinct ochreous border surrounding the sides and front, some paler broader scales and golden brown chætæ over the roots of the wings; scutellum clothed with flat black and ochraceous scales, mixed together; border bristles golden; metanotum chestnut-brown; pleuræ brown with patches of small flat creamy scales.

Abdomen black, the second to sixth segments with prominent broad yellow apical bands, expanded in the middle but not continued quite to the edge of the segments, seventh with a few pale scales, eighth mostly ochreous scaled; each segment with a median lateral pale spot; venter ochreous. Legs brown, hind femora pale beneath, apex of tibiæ with a pale ochreous spot continued on to the base of the metatarsus, the tibiæ with narrow apical and basal pale yellow bands; fore and mid ungues uniserrate, hind equal and simple.

Wings with rather short fork-cells; the first submarginal cell a little longer and narrower than the second posterior cell, its base slightly nearer the apex of the wing, its stem more than half the length of the cell, stem of the second posterior not quite as long as the cell; posterior cross-vein long, twice its own length distant from the mid. Halteres with pale stem and fuscous knob.

Length 8 mm.

Habitat Sylhet, Assam (*Lt.-Col. Hall*).

Time of capture 26-vi.-5.

Observations.—Described from a single ♀. It is a large and distinct species easily identified by the apical and basal leg banding, apical abdominal bands and ochreous venter. The length of the palpi and short thick proboscis agree with *Brevirhynchus*, but the head and thoracic scales, although of the same general form, are not so large as in the other two species. I see no reason however to separate it from that genus.

21. *Stegomyia fasciata*, Fabricius.

Syst. Antl., p. 36, 13, 1805.

Additional Localities and Dates.

Bengal.—Calcutta, 27-vii-07, 27-viii-07 (*C. Paiva*), 28-vii-08 (*I. H. Burkill*), "in Museum building," vii-08 (*T. Bentham*), July and August 07 (*mus. collr.*); Puri, Orissa coast, 18 and 19-i-09 (*Annandale*). "Not so common in Calcutta as *S. scutellaris*" (*Annandale*).

E. Bengal and Assam.—Chittagong, 21-ix-03 (*Lt.-Col. Hall*).

Madras Presidency.—Madras town, 31-x-08 (*R. Hodgart*).

Burma.—Rangoon, "in house, biting by day," 25-ii-08; Mandalay, 12-iii-08 (*Annandale*).

At sea.—On board ship, Bay of Bengal, between mouth of R. Hooghly and Rangoon, 22 and 23-ii-08 (*Annandale*); on board ship, 10 miles off Coconada on the Madras Coast, 15-iv-08 (*C. Paiva*). "I found this species common on board ship all the way from Calcutta to Rangoon in February" (*Annandale*).

22. *Stegomyia scutellaris*, Wlk.

Journ. Proc. Linn. Soc. Lond., iii, p. 77 (1859).

Additional Localities and Dates.

Bengal.—Calcutta, 11-iii-08 (2), 15 and 23-vii-07, 6-viii-07 (1), 19-ix-07 (6), 31-vii-07, 5-viii-07, (Zoological Gardens) 12-vii-08, 2-viii-07 (*Annandale*); Purneah, N. Bengal, 5-viii-07, Bhogaon, Purneah district, N. Bengal, 7-x-08 (8), 9-x-08 (1) (*C. Paiva*); Balighai near Puri, Orissa, 23 and 26-x-08 (*Annandale*). "Very abundant in Calcutta between March and November" (*Annandale*).

The Himalayas.—Sukna, 500 feet, base of E. Himalayas, Darjiling district, 1 and 2-vii-08 (7), "only troublesome during day" (*Annandale*); Bhim Tal, 4 500 feet, Kumaon, "breeds in hollow trees in jungle," ix-06 (*Annandale*).

Madras.—Madras town, 30-x-08 (7) (*R. Hodgart*).

Travancore State.—Trivandrum, 14-xi-08 (2), Maddathorai (w. base of the Western Ghats), 18-x-08 (*Annandale*).

The United Provinces.—Shahjahanpur, "day biting" (*G. M. Giles*), one ♀ named by Giles *Culex albopictus*, Sküse.

Burma.—Mandalay, 11-iii-08, "not uncommon in house" (*Annandale*).

Ceylon.—Colombo, Victoria Gardens, 26-iv-08 (*C. Paiva*).

23. *Culex mimeticus*, Noë.

Bull. Soc. Ent. Ital., xxxi, p. 240, 1899.

The Himalayas.—Theog, 8,000 feet, Simla Hills, 2-v-07 (1 ♀) (*Annandale*).

Nepal.—Thamaspur, Bengal frontier; 18 and 20-ii-08 (1 ♂), large specimen (*mus. collr.*).

24. *Stegomyia minutissima*, sp. nov.

Head black, a white border to eyes and white median spot in front between them; palpi black with white apices; proboscis black. Thorax deep brown with a small grey-scaled area in front, grey scales in front of the roots of the wings and three short creamy lines behind. Abdomen black with narrow white basal bands and white lateral spots. Legs dark brown with basal white bands; mid femora with a marked median white spot and white apex: hind femora white at base. Very small species.

♀. Head clothed with flat black scales, a large median triangular white-scaled area in front and a pale border to the eyes; clypeus dark brown; palpi black with snowy white apices;

proboscis black; antennæ deep brown, basal segment with white scales; some golden brown chætæ project between the eyes.

Thorax black, the greater surface clothed with bronzy brown longer narrow-curved scales, a small area near the head and a small wedge-shaped area on each side in front of the wings with dull white scales, some pale creamy scales which form three indistinct lines behind in some lights; scutellum with flat black scales with dull violet reflections and some white ones on the lateral lobes; pleuræ brown with flat white-scaled spots. Chætæ brown and black. Abdomen black with narrow basal white bands and basal snowy white lateral spots. Legs deep brown; the first pair with a basal white band to the first tarsal, the mid with a median white spot on the femora, the apex white and a basal white band to the metatarsal and first tarsal; the hind with the femora white at the base, and all the segments with a basal white band except the last; some large black chætæ at the apices of the segments in the hind legs; fore and mid ungues uniserrate, hind simple.

Wings with typical large brown Stegomyian scales on the basal region, dense narrow linear ones on the apical areas of the veins; the first submarginal cell longer and narrower than the second posterior, their bases nearly level. Stem of the first fork-cell about half the length of the cell, stem of the second posterior about two-thirds the length of the cell; posterior cross-vein twice its own length distant from the mid.

Length 2·5 mm.

Habitat Sukna, 500 feet, base of E. Himalayas, Darjiling district (*Annandale*).

Time of capture 1-vii-08.

Observations.—Described from 3 ♀'s. One of the smallest *Stegomyiæ* I have seen. It can easily be told by the thoracic ornamentation and the white round spot on the femora of the mid legs. One specimen was taken in a bungalow.

25. *Stegomyia annandalei*, sp. nov.

Head black with a large median white patch; palpi black with snowy white apices; proboscis black. Thorax black-brown with a snowy white patch in front and one over the roots of the wings.

Abdomen jet-black with snowy white basal bands which gradually swell out laterally. Legs black banded with snowy white, the hind legs with a band at the base of the metatarsals, first tarsals and the whole of the third white.

♀. Head clothed with flat black scales, with a large median triangular snowy white patch and a small dull white lateral patch, some black chætæ in front; palpi black-scaled with broad snowy white apices; proboscis black; antennæ deep brown, basal segment with dense snowy white scales.

Thorax shiny black, clothed with long bronzy brown narrow-curved scales, except for a small snowy white patch of similar scales in front and a patch of flat snowy white scales over the base

of the wings on each side; supra-alar chætæ dense, black and long; scutellum with the mid lobe clothed with flat black scales, the lateral lobes with flat white scales; border bristles black; metanotum deep brown; pleura dark with numerous white patches of scales.

Abdomen black with four snowy white basal bands on the last four segments, which broaden out laterally, the two preceding segments with basal white lateral spots.

Legs black, the fore and mid with basal white bands on the metatarsi and first tarsal; the hind with a basal white band on the metatarsi and first tarsal segments, the second all dark, the third nearly all white, the fourth dark; ungues *apparently* all simple.

Wings with brown scales; fork-cells short, the first submarginal longer and narrower than the second posterior, its stem a little nearer the base of the wing than that of the second posterior, its stem about two-thirds the length of the cell; stem of the second posterior nearly as long as the cell; posterior cross-vein rather more than twice its own length distant from the mid.

Length 2·8 mm.

Habitat Sukna, 500 feet, base of E. Himalayas, Darjiling district (*Annandale*).

Time of capture vii-08.

Observations.—Described from a single perfect ♀. It resembles *Stegomyia minutissima* but can at once be told by the banding of the posterior legs and still more definitely by the *flat* white scales forming the lateral thoracic patches. The specimen was taken in a bungalow.

26. *Stegomyia albipes*, sp. nov.

Thorax brown, a small silvery white patch in front and a white-scaled line running down to the base of the wings where there is a large snowy white patch extending on to the dorsum and scutellum. Head black, white in the middle; palpi black with snowy apex; proboscis black. Abdomen black with narrow basal white bands and large snowy white lateral basal spots. Legs with broad basal white bands, last two hind tarsi white; mid femora and tibiæ with a median white round spot.

♀. Head black, clothed with flat black scales at the sides, white in the middle; chætæ black; proboscis and clypeus black; palpi black with snowy white apices; antennæ dark drown, basal segment with dense flat snowy white scales.

Thorax dark with narrow-curved deep bronzy brown scales, snowy white ones forming a broadish line in front and extending laterally towards the wings before which they spread out into a large white patch, which passes on to the dorsum; this is composed of narrow-curved scales above and flat ones below; there is also a white line of narrow-curved scales on each side just past the roots of the wings and a few white scales here and there before the scutellum; supra-alar chætæ black; scutellum clothed with rather

large flat snowy white scales; metanotum black; pleuræ black with silvery white puncta.

Abdomen black with narrow basal snowy white bands and very large basal lateral white spots; posterior border bristles pale, short.

Legs black with white bands and spots; the fore femora pale at the base ventrally, fore tibiæ with a white median spot; knee spot white; white bands to metatarsi and first tarsals; mid femora with prominent white median spot (almost a band), a smaller one basally and a white apex, metatarsi and first tarsal basally white; hind femora white basally, and on most of the venter, apex white; tibiæ with a white band on the apical half, metatarsi and first two tarsi basally snowy white, and all the last two tarsi; chætæ black; ungues equal and simple.

Wings with dark scales, base pale; first submarginal cell longer and narrower than the second posterior, its base nearer the base of the wing, its stem about half the length of the cell; stem of the second posterior about as long as the cell; posterior cross-vein rather more than twice its own length distant from the mid. Halteres with testaceous stem and deep fuscous knob.

Length 3 mm.

Habitat Maddathorai, w. base of W. Ghats, Travancore (*Annandale*).

Time of capture 17-xi-08.

Observations.—Described from a perfect ♀. At once separated from any other *Stegomyia* by the last two hind tarsi being white and by the thoracic ornamentation, especially by the prealar white patch being composed of narrow-curved scales above, flat ones below. The femoral and tibial markings are also very distinctive.

27. *Stegomyia assamensis*, Theob.

Rec. Ind. Mus., ii, p. 290, 1908.

Travancore.—Pallode, twenty miles N.E. of Trivandrum, 15-xi-08 (*Annandale*), 1 small ♀.

Genus Pseudocarrollia, gen. nov.

Head clothed with flat scales and upright forked scales, a border of spindle-shaped scales around the eyes. Palpi of ♀ about one-fourth the length of the proboscis. Thorax with narrow-curved scales; scutellum with flat scales. Abdomen with dense ventral scale tufts on some of the apical segments. Fork-cells rather short, vein-scales rather thick.

Allied to *Carrollia* (Lutz) but differs in having the scutellum with all flat scales and in the absence of narrow-curved scales forming a median basal area on the head.

The marked ventral abdominal scale tufts resemble those of *Carrollia* and *Hæmagogus*.

28. *Pseudocarrollia lophoventralis*, sp. nov.

Head black, a white border to eyes, eyes silvery above; proboscis and palpi jet-black; thorax with the front bright silvery white, also the scutellum, the posterior half of the mesonotum rich brown; pleuræ with silvery white puncta. Abdomen black with a dull greenish tinge, basal lateral snow-white spots and basal white ventral bands, and ventral black scale tufts. Legs banded with white, base and apex of metatarsi white, also base of the front and hind first tarsal, base and apex of the mid; femora white at base and with a white apical spot on hind pair.

♀. Head black, clothed with flat black scales and a narrow border of spindle-shaped white ones around the eyes; narrow black upright forked scales and black chætæ projecting forwards; clypeus, palpi, antennæ and proboscis all deep black; eyes silvery around the edges, black in the centre.

Thorax black, clothed on the front half with dense long narrow-curved snowy white scales, not quite extending to the pleuræ on each side, forming more of a large round patch, remainder of mesonotum with rich bronzy scales except for a few snowy white ones over the roots of the wings; supra-alar chætæ long and black; scutellum black, thickly clothed with snowy white flat scales and golden border bristles; pleuræ rich brown, with six or seven white spots; metanotum black.

Abdomen black, with the scales black, showing in some lights green and peacock-blue reflections, the green mainly at the tips of the scales; the segments with prominent basal lateral snow-white spots, six on each side, last segment small, basally white; posterior border bristles pale; venter black with snow-white basal bands, the fifth to the seventh segments with dense black outstanding scales, giving a tufted appearance. Legs black with white bands; front legs with apex of tibiæ and metatarsi white, and base of first tarsal; mid legs with femora white at the base ventrally, a small white apical spot, a white spot at the apex of tibiæ, a white band at base and apex of metatarsi, also base and apex of first tarsal and a trace at the base of the second tarsal; in the hind legs the base of the femora are snowy white and there is a large white apical band and the base and apex of the metatarsi banded white, also base of first tarsal; leg bristles black; fore and mid ungues uniserrate, hind simple.

Wings with short fork-cells, the first submarginal narrow but no longer than the second posterior, its stem more than half the length of the cell; stem of the second posterior also more than half the length of the cell; posterior cross-vein about twice its own length distant from the mid, the latter and the supernumerary are in a straight line; scales brown, rather dense on the branches of the fork-cells. Halteres with testaceous stems and fuscous knobs.

Length 5·5 mm.

Habitat Purneah, N. Bengal (*C. Paiva*).

Time of capture 6-viii-07, "resting on under side of leaf of *lichi* tree during day" (*C. Paiva*) (1 ♀).

Observations.—Described from a single perfect ♀. It clearly comes in a new genus, related to Lutz's *Carrollia*. The very marked thoracic, abdominal and leg ornamentation will at once separate it from any species coming in the Stegomyian group. The ventral abdominal tufts are very marked.

29. *Hulecœteomyia trilineata*, Leicester.

The Entomologist, xxxvii, p. 163, 1904.

E. Himalayas.—Kurseong, 5,000 feet, Darjiling district, 3-vii-08 (*Annandale*), 1 ♂ and 2 ♀'s.

Note.—These answer exactly to Leicester's carefully described species, but one ♀ shows distinct white abdominal basal bands and also the ♂; the second ♀ is quite typical.

[30. *Grabhamia pulcripalpis*, Rondani.

Bull. Soc. Ent. Ital., iv, p. 31, 1872.

Egypt.—On board ship at night, Suez Canal, 9-x-07 (Reg. Nos. $\frac{4\,5\,4\,3}{1\,5}$ and $\frac{4\,5\,4\,0}{1\,5}$), 2 ♀'s (*Annandale*). Rather small specimens.]

31. *Pseudograbhamia maculata*, Theobald.

Journ. Bomb. Nat. Hist. Soc., xvi, p. 244, 1905.

Madras.—Madras town, 30-x-08 (*R. Hodgart*), 1 ♀.

32. *Culex vagans*, Wiedemann.

Ausser. Zweifl. Ins., p. 545.

♂. Head brown with pale scales; palpi longer than proboscis by about the apical segment, which is slightly shorter than the penultimate, deep brown, the last two segments with bright basal creamy bands and flaxen brown and brown hair tufts, long on the inner side of the penultimate segment and a long dark tuft on the apex of the ante-penultimate, which is swollen, two other broad pale bands below. Antennæ brown with pale internodes and flaxen brown plume hairs.

Thorax deep, rich brown with small narrow-curved golden brown scales; scutellum with paler narrow-curved scales, larger in size, with brown border bristles; metanotum brown. Abdomen deep brown, almost black, with basal white bands; hairy, hairs pale brown; basal lobes of genitalia very hairy, claspers broadish, with a large spine on the side near apex giving a bifurcate appearance and with dense fine hairs all along the outer edge. Legs deep brown, paler at the base with basal pale bands, ungues of fore and mid pairs unequal, uniserrate, the mid pair large (hind ? uniserrate). Wings with rather short fork-cells, the first longer and narrower than the second which is rather broad, their

bases about level, the stems nearly as long as the cells; mid cross-vein about twice as long as the supernumerary and in a straight line with it; posterior cross-vein about the same length as the mid, about its own length distant from it.

Length 5·2 mm.

Habitat Madras town (*R. Hodgart*).

Time of capture 31-x-08.

NOTE.—This is the only ♂ of this species I have seen, so I have redescribed it.

33. *Culex impellens*, Wlk. (?).

Proc. Linn. Soc. Lond., iv, 91.

Localites and Dates.

Bengal.—Calcutta, 31-i-08, 5 and 7-iii-07, 3-vi-08, 12-vii-08, 21-vii-08, 27 and 28-vii-08, 30-vii-07, 31-vii-08, 2—6-viii-07, 10-viii-08, 13 and 14-viii-08, "in bungalow" (*Annandale*), 18-viii-08, 22-viii-08, "in bathroom" (*Annandale*), 19-ix-07, 26-ix-08; Balliganj, near Calcutta, 20-vi-08 (3) (*T. Bentham*); Port Canning, Lower Bengal, 19-x-08 (*Annandale*); Rajmahal, 31-vii-07 (2) (*R. Hodgart*); Purneah, N. Bengal, 6-viii-07, Bhogaon, Purneah district, N. Bengal, 3-x-08 (2), 6-x-08 (1) (*C. Paiva*); Bettiah, Champaran 7-iii-08 (*R. Hodgart*); Balighai near Puri, Orissa, 25-x-08 (3), 26-x-08 (8), 24-x-08 (2), "in house, bites occasionally by day," 23-x-08 (6), "in house, comes to light" (*Annandale*).

E. Bengal and Assam.—Chittagong, E. Bengal, 26-vii-08 (*Lt.-Col. Hall*).

The Himalayas.—Sukna, 500 feet, base of E. Himalayas, Darjiling district, 1 and 2-vii-08 (5), "in deep jungle, biting by day" (*Annandale*).

Nepal.—Thamaspur, Bengal frontier, 10—14-ii-08, Sukwani, Bengal frontier, 15 and 16-ii-08 (*Butchu, mus. collr.*).

Burma.—Moulmein, L. Burma, 27-ii-08, "abundant in house," Rangoon, 24 and 25-ii-08, Mandalay, 11 and 12-iii-08 (*Annandale*).

The United Provinces.—Lucknow, 21-iv-07 (1) (*Annandale*).

Travancore and Cochin States.—Shencottah, Madras frontier (e. side of W. Ghats) (4); Pallode, twenty miles N.E. of Trivandrum; Shasthancottah, twelve miles N.N.E. of Quilon; Trivandrum; Nedumangad, ten miles N.E. of Trivandrum (2); Vaikum (coastal region); Kulattupuzha (w. base of W. Ghats); Tenmalai, W. Ghats (w. side); Ernakulam, Cochin State. All collected by Dr. Annandale between 4 and 25-xi-08.

At sea.—At light on board ship five miles off Aleppey, Travancore, 4-v-08 (2) (*C. Paiva*).

34. *Culex pettigrewii*, sp. nov.

Head brown with pale scales; palpi brown, pale-scaled apices; proboscis pale except for a small dark band at the apex and base; thorax rich brown, ornamented with a paler curved line on each

side, another short one over the roots of the wings and two indistinct median pale lines in front, each with a central dark line. Abdomen deep brown, with basal grey bands, two grey median spots to the segments, almost joining on to the bands, sixth to eighth segments with many scattered ochreous scales; venter bright ochreous with scattered pale scales. Legs dark, minutely banded, apically and basally on the tarsi, the femora and tibiæ with a pale creamy ventral line. *Wings with the subcostal vein pale-scaled.*

♀. Head dark, clothed with rather large narrow-curved creamy scales and flat creamy lateral ones and dark chætæ in front; upright forked scales dark, a few pale ones in front; clypeus brown with grey sheen; palpi brown with creamy scales at the apex and some nearer the base; proboscis dark at base and apex, the median creamy area with some scattered dark scales; antennæ dark brown, base of the second segment bright testaceous. Thorax dark brown clothed with rich brown narrow-curved scales; a pale-scaled twice curved line on each side and a pale-scaled short line on each side in front and over the roots of the wings; in middle (in front) are traces of two parallel narrow dark lines with somewhat paler scales on each side; supra and prealar chætæ brown with pale apices, the supra-alar long and darker than the others; scutellum pale brown with narrow-curved pale scales and long brown posterior border bristles; the scales at the back of the mesonotum are similar in colour to those of the scutellum; metanotum bright brown; pleuræ brown with patches of pale scales.

Abdomen with the basal segment ochreous with pale scales, the second to fifth segments dark with grey basal bands which spread out in the middle and with two ochreous spots nearly touching them, most pronounced on the fourth and fifth segments, the sixth with many ochreous scales dotted over the dark area, the seventh and eighth almost entirely ochreous; posterior border bristles thin and pale golden; venter bright ochreous-yellow with pale scales, a few dusky ones in the mid region.

Legs rather long, dark, femora and tibiæ pale below, those of the fore and mid legs with a pale-scaled line in addition; faint traces of very narrow apical and basal pale banding to the hind tibiæ, metatarsi and tarsi, scarcely perceptible on the fore and mid legs; bases of the legs pallid; femora and tibiæ slightly spinose, pallid; ungues equal and simple.

Wings with brown scales, a few creamy ones at the base of the costa and on all the subcostal vein and a few pale scales on the first long vein; first submarginal cell much longer and narrower than the second posterior cell, its base much nearer the base of the wing, its stem about one-third the length of the cell, stem of the second posterior nearly as long as the cell, posterior cross-vein not quite its own length distant from the mid cross-vein.

Halteres ochreous with some fuscous scales on the knob.

Length 6 mm.

Habitat Ukhrul, Manipur, 6,400 feet, lat. 25° N., long. 94—95° E. (*Rev. W. P. Pettigrew*).

Time of capture viii-08.

Observations.—Described from a perfect ungorged ♀. Three other ♀'s were fully gorged and black. The marked character of this species is the pale-scaled subcostal vein. The pale scales also occur here and there on the upper surface of the first long vein. The abdomen in the type is very marked but in two of the others, which are somewhat rubbed, the spots on the segments are not so distinguishable.

35. *Culex fuscocephala*, Theobald.

Mono. Culicid., iv, p. 420, 1907.

Travancore.—Pallode, twenty miles N.E. of Trivandrum, 15-xi-08 (*Annandale*), 1 ♀.

36. *Culex fatigans*, Wiedemann.

Ausser. Zweifl. Ins., p. 10, 1828.

Additional Localities and Dates.

Bengal.—Calcutta, 7, 13 and 22-i-08, 31-i-08, 1-ii-07, 17-ii-08, 13-iii-07 (3), 29-iii-08, 4-iv-08, 1-v-08 (6), 21-vi-08, 21, 27 and 28-vii-07 (4), 3—7-viii-07, 25-iii and 22-vii-08, "common in Museum premises" (*Annandale*), Balliganj, near Calcutta, 5 and 6-ii-08 (12) (*J. B. Richardson*); Rajmahal, 31-viii-07 (3) (*R. Hodgart*); Bettiah, Champaran, 4-iii-08 (27), 5-iii-08 (8) (*R. Hodgart*); Puri, Orissa coast, 18 and 19-i-08 (7), 20 and 21-i-08 (1) (*Annandale*), 2-iii-08 (2) (*C. Paiva*); Balighai near Puri, Orissa, 25-x-08 (*Annandale*).

E. Bengal and Assam.—Rajshahi, 1—6-ii-07 (*Annandale*); Ukhrul, Manipur, 6,400 ft., lat. 25° N., long. 94—95° E., viii-08 (*Rev. W. Pettigrew*).

The Himalayas.—Naini Tal, Kumaon, 6—7,000 feet, 1908 (*R. E. Lloyd*); Dharampur, 5,000 feet, Simla hills, 13 and 14-v-08 (*Annandale*); Kurseong, 5,000 feet, E. Himalayas, Darjiling district, 3—5-vii-08, Sukna, 500 feet, base of E. Himalayas, Darjiling district 1-vii-08 (*Annandale*).

Nepal.—Thamaspur, Bengal frontier, 18—20-ii-08 (2), Dahawangahary Hill, near Bengal frontier, 16-ii-08 (*Butchu, collr.*); Khatmandu (two ♀'s), Oct. 1906 (*R. Hodgart*).

Burma.—Mandalay, 6-iii-08, 11, 12, 13 and 17-iii-08 (*Annandale*); Rangoon, 1-i-05 (3), 3-i-05, 23-ii-05 (8) (*Brunetti*), 24-ii-08 (3), 25-ii-08 (3), 15-iii-08, in house (*Annandale*); base of Dawna hills, 4-iii-08, Moulmein, 27-i-08 (11), 7-ii-08, 27-ii-08 (2), 28-ii-08, 6-iii-08 (4), 12-iii-08 (2) (*Annandale*).

Travancore State.—Tenmalai (w. side of W. Ghats), 22-xi-08 (*Annandale*).

The United Provinces.—Lucknow, 21 and 27-i-08 (2), 5-ii-08 (*R. Hodgart*), 21-iv-07 (4) (*Annandale*), 7-viii-07 (*Brunetti*); Agra,

4-iv-05 (*Brunetti*); Dhikala, Naini Tal district, 22-iv-08 (4), 26-iv-08 (5), Chuharwala, Naini Tal district, 15-iv-08 (3), Patair Naini Tal district, 27-iv-08 (3) (*Hodgart*).

The Punjab (plains).—Lahore, 8-v-08 (11) (*Annandale*); Ferozepore (*Lt.-Col. Adie*).

At sea.—Bay of Bengal, on ship between mouth of R. Hooghly and Rangoon, 22 and 23-ii-08 (*Annandale*).

Java.—Soerabaya, 16—25-vii-06 (*Brunetti*).

Philippines.—Manilla, 10—16-iii-06 (*Brunetti*).

37. *Culex parascelos*, sp. nov.

Thorax golden brown, and with three paler median parallel lines, the areas between them darker than the sides; head, palpi and proboscis bright ochreous, apex of the latter black. Abdomen entirely clothed with ochreous scales. Legs ochreous-brown above, pale ochreous below with dark and ochreous linear ornamentation. Wings with ochreous and brown scales on the veins near costa; fork-cells short; ungues large, all uniserrate.

♀. Head brown with small narrow-curved pale golden scales, ochreous upright forked scales, somewhat darker behind; ochreous chætæ; clypeus and palpi bright ochreous, almost golden yellow, the latter with prominent black chætæ; proboscis the same colour, dark at the apex, with black chætæ. Antennæ brown, ochreous at base. Thorax deep brown, clothed with scanty small narrow-curved pale golden and rich golden brown scales, the former making two prominent lateral median lines and an indistinct median one; chætæ bright golden brown; scutellum brown with narrow-curved pale golden scales and golden brown chætæ; metanotum brown; pleuræ brown with patches of flat ochraceous scales. Abdomen dark, densely clothed with bright ochreous-yellow scales and pale border bristles; venter pale ochreous.

Legs ochreous with dusky scales above, femora pale below; a marked yellow and black line showing on the femora and tibiæ; ungues dark, all equal and uniserrate, rather thick.

Wings tinged with yellow, some pale scales on the costa and sub-costal, remainder dark, except for a few creamy ones on the base of the first long vein; first submarginal cell much longer and narrower than the second posterior cell, its base slightly nearer the base of the wing, its stem about two-and-a-half times the length of the cell; stem of the broad second posterior as long as the cell; posterior cross-vein about the same length as the mid, not its own length distant from it.

Length 5·5 mm.

Habitat Madras town (*R. Hodgart*).

Time of capture 30-x-08.

Observations.—Described from two ♀'s. A very marked species easily told by the thoracic ornamentation, ochreous-scaled abdomen and lined legs.

38. *Culex longifurcatus*, sp. nov.

Thorax uniformly fuscous and smoky; head much the same colour but with some paler scales; palpi, proboscis and antennæ smoky brown; abdomen deep brown, with basal pale bands spreading out in the middle to form median patches; legs uniformly smoky brown; wings rather long and narrow, fork-cells long, the veins and scales very thin. Male palpi thin, no hair tufts.

♀. Head dark, clothed with dull creamy narrow-curved scales, small flat creamy lateral ones, numerous dark upright forked scales, some paler ones in front; palpi, clypeus, proboscis and antennæ brown.

Thorax dark brown with fuscous-brown scanty narrow-curved scales and brown chætæ; scutellum brown with similar narrow-curved scales; metanotum brown and testaceous; pleuræ dark brown and grey. Abdomen deep brown, with basal, almost white bands which are enlarged in the middle forming more or less pronounced spots; border bristles pallid; venter all grey-scaled. Legs long and thin, uniformly brown, except the venter of the femora which is completely creamy white; ungues equal and simple. Wings large and long; fork-cells long; first submarginal cell longer and narrower than the second posterior, their bases nearly level, its stem about one-third the length of the cell; stem of the second posterior less than one-third the length of the cell; posterior cross-vein longer than the mid about one-and-a-half times its own length distant from it; lateral vein scales on the apical areas of the veins long and thin.

Length 5 mm.

♂. Palpi long and thin, dark brown, acuminate, no hair tufts, a few dark hairs and chætæ; apex of proboscis swollen. Wings with relatively long fork-cells; first submarginal cell narrower and longer than the second posterior, its stem less than one-third the length of the cell; stem of the second posterior rather more than half the length of the cell; posterior cross-vein nearly twice its own length distant from the mid. Fore and mid ungues unequal, both uniserrate, the larger with a large tooth, hind equal and simple.

Length 4 to 4·5 mm.

Habitat Dahawangahary Hill, near Bengal frontier, Nepal (*Butchu, mus. collr.*).

Time of capture 16-ii-08.

Observations.—Described from two ♀'s and one ♂. A very marked *Culex* with obscure ornamentation, easily told by the long fork-cells, very thin veins and large wings and long legs. The male genitalia seem very marked but there is not enough material to dissect them.

39. *Culex tigripes*, Grandpré.

Additional Localities and Dates.

The Himalayas.—Kurseong, 5,000 feet, E. Himalayas, Darjiling district, 4-viii-08 (*Annandale*).

Burma.—Mandalay, 11-iii-08 (*Annandale*).

40. *Culex concolor*, Desvoidy.

Mem. Soc. d'Hist. Nat. de Paris, iv, 405.

Localities and Dates.

Bengal.—Calcutta (Museum compound), 7-iii-07, 4-vii-07, 5-vii-07 (6), 15-vii-07, 23-vii-07, 31-vii-07, 3, 4 and 5-viii-07 (*Annandale*), also in June, September, October and November (*Annandale*), (Zoological Gardens), 12-vii-08 (2) and 26-vii-08 (6) (*Annandale*); Balliganj near Calcutta (*T. Bentham*); Port Canning, Lower Bengal, December; Purneah, N. Bengal, 4—6-viii-07 (*C. Paiva*); Damukdia Ghat, R. Ganges, July.

Assam.—Sylhet, February, April, May, December (*Lt.-Col. Hall*); Manipur, August (*C. A. Gourlay*).

Travancore State.—Kulattupuzha (w. base of W. Ghats), 19-xi-08, "in bungalow" (*Annandale*).

41. *Leucomyia gelida*, Theob.

Mono. Culicid., ii, p. 21, 1901.

Additional Localities and Dates.

Bengal.—Calcutta (Museum premises), 3—4-viii-07, 5-viii, 7-viii and 9-viii-07 (*Annandale*); Bhogaon, Purneah district, N. Bengal, 30-ix-08 (5), 1-x-08 (2), 3-x-08 (2), 7-x-08 (*C. Paiva*).

E. Bengal.—Rajshahi, 1—6-ii-07 (*Annandale*).

Burma.—Rangoon, 25-ii-08 (*Annandale*).

Madras Presidency.—Madras town, 30-x-08 (2), 31-x-08 (1) (*Hodgart*).

Travancore and Cochin States.—Kulattupuzha (w. base of W. Ghats); 19-xi-08, coastal region, 5-xi-08; Ernakulam, 4-xi-08 (*Annandale*).

42. *Leucomyia gelida*, var. *cuneata*, Theob.

Mono. Culicid., ii, p. 22, 1901.

Localities and Dates.

Bengal.—Balighai near Puri, Orissa, 23-x-08, "at light" (*Annandale*).

Travancore State.—Vaikum, coastal region, 5-xi-08; Kulattupuzha (w. base of W. Ghats), 19-xi-08 (*Annandale*).

43. *Leucomyia sinensis*, Theob.

Syn. *L. gelida* var. *sinensis*, Theob.

Mono. Culicid., iii, p. 180, 1903.

Bengal.—Balighai near Puri, Orissa, 23-x-08, "at light in house, becoming active after dark" (*Annandale*).

44. *Culicada suknaënsis*, sp. nov.

Thorax ornamented with rich brown and dull golden yellow scales, the latter forming a curved line on each side in front and two rather indistinct median lines in front, the rich brown showing up as four obscure spots. Head dull golden yellow with two dark spots. Abdomen deep brown with basal creamy bands and large basal creamy lateral spots. Legs brown, pale at the base, with narrow basal yellow bands. Wings with a brownish yellow tinge.

♀. Head dark brown, with small narrow-curved golden scales in the middle, dark upright forked scales behind, rich ochreous ones in front, a patch of dark flat scales at the sides bordered along the eyes with pale creamy scales and flat creamy ones placed still more laterally, the pale scales bordering the eyes are small narrow-curved ones; chætæ between the eyes bright golden brown, followed by some darker ones at the sides; clypeus, palpi and proboscis deep brown; antennæ brown, basal segment bright golden yellow, with some small pale flat scales, base of second segment pale testaceous.

Thorax deep rich brown, clothed with golden yellow and rich brown curved scales, the former as two obscure curved lateral lines and two broad median ones (the latter almost in one) and scattered irregularly over the posterior portion; a few paler ones in front of the roots of the wings and some short pale golden and brown chætæ; supra-alar chætæ brown; scutellum brown with small narrow-curved pale scales; metanotum almost black; pleuræ deep brown, with patches of pale flat scales and tufts of golden brown chætæ.

Abdomen deep brown, with basal yellow curved bands, and yellow prominent lateral spots; posterior border bristles pale golden; venter mostly clothed with large flat yellowish scales, almost white towards the base. Legs brown, femora pale ventrally, metatarsi and all the tarsi with narrow pale yellow bands, pale knee spots, femora and tibiæ spinose, spines dusky and golden; ungues all equal and uniserrate.

Wings with short fork-cells; the first submarginal longer and narrower than the second posterior, its stem about two-thirds the length of the cell; its base nearly level with that of the second posterior cell; stem of the latter as long as the cell; posterior cross-vein longer than the mid, nearly twice its own length distant from it; *the base of the subcostal and first long vein prominently densely scaled with black scales.* Halteres with ochreous stems, fuscous knobs with pale creamy apical scales.

Length 4 to 5 mm.

Habitat Sukna, 500 feet, Darjiling district, E. Himalayas (*Annandale*).

Time of capture 1 and 2-vii-08.

Observations.—Described from four perfect ♀'s. It comes near *Culicada nipponii*, Theobald, but can be told by the absence of pale apical abdominal scales and median grey scales and dark flat-scaled lateral cephalic patches. The abdomen in all four is

thick and short, but this may be due to ingested blood. The ornamentation of the thorax varies in different lights. The dark thick-scaled area at the base of the wing is very characteristic. The specimens were taken in dense jungle and bit during the day.

45. *Mansonioides annulifera*, Theob.

Mono. Culicid., ii, p. 183, 1901.

N. Bengal.—Bhogaon, Purneah district, 7-x-08 (9) (*C. Paiva*).

46. *Mansonia uniformis*, Theob.

Mono. Culicid., ii, p. 180, 1901.

Additional Localities and Dates.

Bengal.—Calcutta, 2-vii-07 (*mus. collr.*); Bhogaon, Purneah district, N. Bengal, 30-ix-08 (2), 1-x-08; Katihar, Purneah district, N. Bengal, 4—5-x-08 (4) (*C. Paiva*); Balighai near Puri, Orissa, 23-x-08 (3) (*Annandale*).

Burma.—Rangoon, 25-ii-08 (*Annandale*).

Travancore and Cochin States.—Maddathorai (w. base of W. Ghats), 19-xi-08; Kulattupuzha (w. base of W. Ghats), 19-xi-08; Ernakulam, Cochin State, 4-xi-08 (8), "very common in bungalow" (*Annandale*).

47. *Tæniorhynchus ager*, Giles.

The Entomologist, p. 196, July 1901.

Additional Localities and Dates.

Bengal.—Calcutta, 2-ii-08 (*Annandale*); Balighai near Puri, Orissa, 26-x-08 (2) (*Annandale*).

Burma.—Mandalay, 12-ii-08 (*Annandale*).

Travancore State.—Pallode, twenty miles N. E. of Trivandrum, 14-xi-08; Kerumadi, s. end of Vimbanad Lake, 6-xi-08 (*Annandale*).

48. *Tæniorhynchus tenax*, Theob.

Mono. Culicid., ii, p. 198, 1901.

Bengal.—Balighai near Puri, Orissa, 23-x-08, one ♀ "at light" (*Annandale*). Rather smaller than the type.

49. *Tæniorhynchus epidesmus*, sp. nov.

Thorax brown, mottled with creamy scales and some grey ones in front of the roots of the wings; proboscis pale with a narrow black base and broader black apex. Abdomen black with very narrow golden ochraceous basal bands and very broad apical ones, a dark lateral line on each side of the segments, most pronounced on the apical ones, the penultimate all golden ochreous, the apical with two deep black spots. Legs ochreous brown with apical and basal pale banding on the darker tarsi. Wings with a

yellowish tinge, brownish scales and a pale spot towards the tip on the costa.

♀. Head brown, clothed with pale creamy and ochreous narrow-curved scales and broadly expanded black upright forked scales, paler in the middle of the head, chætæ brown and pale ochreous; clypeus ochreous; palpi black-scaled with some ochreous scales and creamy scaled apices; proboscis with a very broad ochreous pale band, base and apex black; antennæ brown towards the apices, testaceous towards the base.

Thorax deep brown, clothed with creamy and brown narrow-curved scales, some paler before the roots of the wings, giving it a mottled appearance; some short thick black chætæ just before the roots of the wings, long brown and ochreous ones over the roots and behind them; scutellum brown, with small narrow pale scales and golden brown long border bristles; metanotum pale ochreous with a grey sheen; pleuræ brown and ochreous with patches of flat pale scales and golden hairs.

Abdomen brown with violet reflections, basal segment golden ochreous with two small dark patches of scales; the remaining segments with narrow basal and very broad apical bright golden ochreous bands, except the last segment which has two prominent black spots; the other segments have more or less marked thin black lateral lines, except on the last two or three apical segments where there are pale creamy lateral spots; venter ochreous-yellow. Legs ochreous with scattered dark scales, prominent at the apices of the femora and tibiæ and on their upper surfaces; tarsi slightly darker with apical and basal pale bands except on the last tarsal; ungues equal and simple.

Wings with brown scales, a pale ochreous spot towards the tip on the costa and first long vein; the first submarginal cell longer and narrower than the second posterior, its base slightly nearer the base of the wing, its stem nearly one-fourth the length of the cell; stem of the second posterior not quite half the length of the cell; posterior cross-vein about twice its own length distant from the mid. Halteres pale ochreous, with some small flat pale ochreous scales on the knob.

Length 5·5 mm.

Habitat Bhogaon, Purneah district, N. Bengal (*C. Paiva*).

Time of capture 2-x-08.

Observations.—Described from a single perfect female. The very bright and marked abdominal banding will at once separate this from other *Tæniorhynchi*, together with the marbled thorax

50. *Tæniorhynchus luteoabdominalis*, sp. nov.

Thorax brown, marbled with bright yellowish brown and grey scales on the front two-thirds, the rest bright brown-scaled, the pale scales most prominent on the posterior edge of the brown and pale-scaled area, also traces of a dark curved lateral line on each side before the wings. Head yellowish brown, slightly darkened

at the sides, pale around the eyes; proboscis with a broad pale band, slightly darkened at the base and apex. Abdomen entirely clothed with golden ochreous scales. Legs unbanded, ochreous with slightly darkened tarsi. Wings with yellowish brown scales, the apex paler above.

♀. Head brown, clothed with narrow-curved pale scales, especially around the eye border, bright ochreous upright forked scales in the middle, darker ones at the sides; small flat pale lateral scales; clypeus brown; palpi clothed with brown scales, a few pale ones dotted about and many at the apex; proboscis with a broad pale band, the dark base and apex with a few scattered pale scales; antennæ brown, basal half gradually becoming bright testaceous. Thorax brown, the front two-thirds mainly clothed with very pale grey narrow-curved scales, particularly prominent on the posterior border of this region, two ochreous-brown-scaled spots in front amongst the pale scales and a somewhat nude dark curved line on each side in front of the roots of the wings, the hinder region of the mesothorax with mostly golden brown narrow-curved scales, but some pale ones arranged in lines; two prominent lines of rich golden brown chætæ behind and similar coloured chætæ over the roots of the wings; scutellum pale ochreous with small narrow-curved pale scales and nine bright golden brown posterior border bristles to the mid lobe; metanotum brown; pleuræ brown and bright ochreous with some patches of small dull creamy flat scales.

Abdomen clothed with bright golden ochreous scales, the second, third and fourth segments with a band towards their bases of similar coloured scales, darker at their apices, not forming distinct bands, last segment with two median lateral dark spots; venter all golden ochraceous, also the whole of the first segment which has many pale golden thin hairs; posterior border bristles pale golden.

Legs uniformly ochreous but with some dark scattered scales on the femora, with very pale reflections, no trace of banding; ungues equal and simple.

Wings with yellowish brown scales, the outer part of the apex slightly pale-scaled; first submarginal cell longer and narrower than the second posterior cell, its base nearer the base of the wing, its stem not quite half the length of the cell, stem of the second posterior nearly two-thirds the length of the cell; posterior cross-vein about twice its own length distant from the mid; halteres very pale ochreous, almost creamy white.

Length 5·8 mm.

Habitat Katihar, Purneah district, N. Bengal (*C. Paiva*).

Time of capture 4 or 5-x-08.

Observations.—Described from a single perfect ♀. It comes very near *Tæniorhynchus epidesmus*, described previously, but the total absence of leg banding, the more marked thoracic ornamentation and more marked pale wing spot separate it probably from that species. If it is the same it is a most marked variety.

51. *Chrysoconops pygmæus*, Theobald. Pls. i and iii, wing and wing scales.

Rec. Ind. Mus., ii, p. 300, 1908, ♀.

♂. Head ochreous-brown with small narrow-curved golden scales and rich golden brown upright forked scales and golden chætæ; palpi and proboscis black, the apical segment a little more than half the length of the penultimate, bluntly acuminate, long dark hairs on the last two segments. Antennæ brown with white internodes and dark brown plume hairs. Thorax shiny bright brown with narrow-curved golden scales and golden chætæ. Abdomen ochreous when pointed from the light, dark when to the light, of violet hue, the latter showing only on the apical borders in some lights. Genitalia with the claspers curved on themselves, broader and flat apically with a short, thick subapical dark spine. Legs uniformly dark brown with ochreous reflections, pale at their bases; fore ungues unequal, the larger with a small lateral basal tooth and a very large one near the middle, the smaller simple; mid ungues unequal, the smaller simple, the larger with a large basal tooth and a narrower and more basal central one; hind ungues equal and simple. Wings with short fork-cells, the first longer and narrower than the second, its base nearer the apex of the wing, its stem as long as the cell; stem of the second posterior as long as the cell; posterior cross-vein as long as the mid, about twice its own length distant from it.

Length 5 mm.

Habitat Purneah, N. Bengal (*C. Paiva*); Rajmahal, Bengal (*R. Hodgart*); and Calcutta (*Annandale*).

Time of capture 6-viii-07 31-vii-07, 17-vii-07.

Observations.—The ♀ was described in the first report. One ♂ has been retained as a co-type for the British Museum collection.

Dr. Annandale says the eyes of the male are iridescent green in life.

52. *Lophoceratomyia bicornuta*, sp. nov.

Head of male very similar to *L. fraudatrix* but the antennal organs quite distinct. Thorax rich brown. Abdomen dark brown unbanded, ochreous ventrally. Legs brown unbanded, base of femora paler. Two prominent lateral horn-like processes on the basal segments of the antennæ.

♂. Head similar to that of *L. fraudatrix*. Palpi brown, a little longer than the proboscis, bluntly acuminate, the apical segment slightly longer than the penultimate, the whole palpi with short, scanty hairs; no trace of the basal process seen in *fraudatrix*.

Antennæ plumose, plume hairs brown, internodes pale, basal segment with a large horn-like process on the inner side as in *brevipalpus*, with a series of fine hairs on the upper side; antennal organs on four segments.

Thorax rich brown, showing two median parallel brighter brown broad lines; covered scantily with very small curved

brown to bronzy scales; brown to deep brown chætæ; scutellum paler with similar scales and four black border bristles to the mid lobe; metanotum brown. Abdomen deep brown, unbanded, pale hairs; venter ochreous brown. Legs brown, unbanded, fore and mid ungues unequal, the former uniserrate, the mid simple; hind small, equal and simple.

Wings with rather short fork-cells, the first submarginal longer and narrower than the second posterior, its base very little nearer the apex of the wing than that of the latter, its stem slightly longer than the cell, stem of the second posterior cell longer than the cell; mid cross-vein longer than the supernumerary, the posterior longer than the mid, not quite twice its own length distant from it.

Length 4·5 mm.

Habitat Dawna Hills (base) near Kawkareik, Lower Burma.

Time of capture 4-iii-08 (*Annandale*).

Observations.—Described from a single dissected ♂. Closely related to *L. fraudatrix*, Theobald, but differs in the antennal organs, the absence of the accessory process at the base of the palpi and in wing venation.

53. *Radioculex clavipalpus*, Theobald. (Pls. i and ii, wing and head.)

Rec. Ind. Mus., ii, p. 295, 1908.

Additional Localities and Dates.

Bengal.—Katihar, Purneah district, N. Bengal, 4—5-x-08 (*C. Paiva*).

Burma.—Rangoon, 25-ii-08 (*Annandale*).

Travancore State.—Vaikum, coastal region, 5-xi-08 (*Annandale*).

54. *Uranotænia testacea*, Theobald.

Ann. Mus. Nat. Hist. Hung., iii, p. 113, 1905.

Burma.—Base of Dawna Hills, 4-iii-08 (2 ♀ 's), "in thick but dry jungle" (*Annandale*).

55. *Ædeomyia squammipenna*, Arribalzaga.

El. Nat. Arg., i, 151, 3, 1878.

Burma.—Base of Dawna Hills, L. Burma, 2-iii-08, "in bungalow at light" (*Annandale*).

At sea.—At light on board ship four miles off Tuticorin, S. India, 25-v-08 (*C. Paiva*).

Genus Pseudograhamia, gen. nov

Head clothed with flat scales; proboscis more than half the length of the body, curved upwards, slightly swollen at the apex; palpi of the ♀ very small and densely scaly.

Thorax densely clothed with large narrow-curved scales, closely appressed and with a median line of *flat* metallic scales, and a patch of flat scales on each side in front; scutellum clothed with flat scales, large and rounded apically; metanotum apparently nude.

Apex of hind tibiæ and base of metatarsi with rather dense short outstanding scales. First fork-cell slightly expanded basally and the veins densely scaled apically, considerably larger than the second posterior cell.

A very marked genus coming near *Grahamia*, Theobald, but at once distinguished from it by the more normal form of proboscis.

56. *Pseudograhamia aureoventer*, sp. nov.

Head black, with a central silvery white spot; proboscis and antennæ deep brown; palpi pale creamy, very small. Thorax black with a broad silvery white line in front, silvery white prothoracic lobes and a creamy patch in front at the sides. Abdomen black with large basal triangular creamy lateral patches which extend upwards almost to form narrow dorsal bands; venter pale dull golden. Legs deep black.

♀. Head covered with flat closely appressed blackish brown scales with a large median triangular silvery white area with two long black straight chætæ projecting forwards between the eyes, a few small black ones curved inwards on each side and a large black one laterally, along the ocellar rim; proboscis deep black, curved upwards, slightly swollen apically; palpi very small, densely clothed with creamy scales; antennæ deep brown; clypeus bright rich brown.

Thorax deep rich brown, densely clothed with long narrow-curved closely appressed deep blackish brown scales, a median line in front of flat scales, semi-transparent, with white and pale mauve and silvery reflections, a large area of flat dull creamy to ochreous scales on each side in front reaching up to the base of the wings; prothoracic lobes with flat silvery white scales with pale blue reflections in certain lights; scutellum clothed with large flat silvery white scales, some appearing dusky on the lateral lobes; metanotum deep brown; pleuræ brown with flat creamy scales.

Abdomen flattened laterally with large basal silvery white lateral patches, extending upwards to the dorsum as narrow areas; base and venter of the abdomen pale dull golden, with metallic sheen.

Legs deep blackish brown; coxæ pale ochreous with white scales; femora pale ochreous below; tibiæ with the scales expanded apically and with some incurved chætæ; base of metatarsi with the scales slightly projecting, particularly on the hind legs; ungues equal and simple.

Wings with moderately long fork-cells; the first submarginal much longer and about the same width as the second fork-cell, its

base much nearer the base of the wings than that of the latter, its stem half the length of the cell; the cell somewhat expanded basally and each branch densely scaled apically, stem of the second fork-cell longer than the cell; supernumerary cross-vein longer than the mid, the mid the same length as the posterior; the latter about its own length distant from the mid.

Halteres with long stem, base ochreous, apex and knob fuscous.

Length 4·8 mm.

Habitat Pallode, twenty miles N.E. of Trivandrum, Travancore (*Annandale*).

Time of capture 16-xi-08.

Observations.—Described from a single ♀. A very marked and beautiful species which cannot be confused with any other Culicid.

Genus Squamomyia, gen. nov.

Head clothed with flat scales and upright forked ones behind; *clypeus densely scaled, scales long and broad*; antennæ of male plumose; palpi small and thin, proboscis long and thin, not as long as the body.

Thorax with spindle-shaped scales, small flat ones at the sides in front; broad spindle-shaped ones on the prothoracic lobes, densely covering them; scutellum with flat scales. Wings of male with short fork-cells. Abdomen clothed with very large flat scales, somewhat loosely applied.

This forms a very distinct genus easily told by the densely scaled clypeus. The male genitalia also seem very marked, but have not been dissected.

A male only occurs in the collection.

57. *Squamomyia inornata*, sp. nov.

Head deep brown, a pale border around the eyes; clypeus prominently pale-scaled; palpi, proboscis and antennæ deep brown. Thorax deep brown, grey in front and at the sides in front, pleuræ white. Abdomen deep blackish brown above, white below and at the sides. Legs deep brown.

♂. Head clothed with flat brown scales with violet reflections, a border of flat white ones around the eyes, spreading out laterally, dull ochreous-brown upright forked scales behind; two bright golden chætæ projecting between the eyes in front, and a few short dark ones at the sides; clypeus ochreous with long white scales, especially dense in front; proboscis thin, black, not as long as the whole body, curved downwards; palpi ochreous, dark-scaled above, thin, very short; antennæ very pale brown, with dark plume hairs; basal segment bright ochreous except on the inner side where they are dark.

Thorax black with bronzy brown spindle-shaped scales, white in front near the head and small flat white scales on each side in

front, prothoracic lobes densely clothed with white spindle-shaped scales; scutellum brown with brown flat scales, those at the sides with pale ochreous reflections: pleuræ black with flat white scales.

Abdomen narrow, clothed with deep blackish brown scales with violet reflections and with white scales laterally and ventrally.

Legs deep brown with violet reflections, unbanded, coxæ pale with white scales; venter of femora white; fore and mid ungues unequal; simple; hind equal and simple.

Wings with short fork-cells; the first very little longer, but narrower than the second, its base nearer the apex of the wing, its stem more than two-thirds the length of the cell, stem of the second posterior two-thirds the length of the cell; posterior cross-vein as long as the mid and more than its own length distant from it.

Length 5 mm.

Habitat w. slopes of Dawna Hills, L. Burma, 2,000—3,000 feet (*Annandale*).

Time of capture 2 or 3-iii-08.

Observations.—Described from a single ♂. It is a very marked Ædine at once told by the densely long-scaled clypeus.

58. *Orthopodomyia maculata*, sp. nov.

Thorax rich brown, ornamented with golden and creamy scales; head with pale creamy scales; proboscis with one small median white band; palpi of male about three-fourths the length of the proboscis, white at base and apex and with two median white bands. Abdomen black with basal white bands and two median white spots to some segments. Wings with dark scales and white spots. Fore and mid legs unbanded, hind with prominent white bands and last segment all white.

♂. Head brown with narrow-curved and upright forked scales of a pale creamy to almost white hue, the fork scales numerous and uniformly scattered over the head; antennæ with pale creamy and brown bands, plume hairs brown to flaxen, basal segment black with small broad creamy scales dotted over it; the first few segments of the flagellum with long white and creamy scales; palpi black, white-scaled at the apex, a few white scales at the base and two median white bands, one near the apex, golden chætæ at the apex, about three-fourths the length of the proboscis, the latter black with one median narrow white band.

Thorax black, clothed with large narrow-curved creamy scales, the majority golden, but some white ones in front, at the sides and over the roots of the wings and before the scutellum and some areas of dark bronzy ones; chætæ long, golden and brown; scutellum black with long silvery white scales and long golden border bristles; metanotum black; pleuræ brown with patches of flat white scales and some long thin ones beneath the wings; prothoracic lobes with flat white scales.

Abdomen jet-black with snowy white basal bands and on some of the segments two small white median spots; venter black with basal white bands and all the bristles golden.

Legs black, femora and tibiæ speckled with pale creamy scales, fore legs unbanded, but the apex of the tibiæ white; mid legs with two pale bands involving the joints of the metatarsal and first tarsal, and first and second tarsals; hind legs with a narrow band involving the metatarsal and first tarsal joint, a very broad one involving the first and second tarsal joint, a narrower one the second and third, apex of third white and all the fourth.

Wings with black scales over most of the veins but with white spots as follows:—four large ones on the costa and three small basal ones; the first two spread on to the first and second veins, the third on to the first, second, third and fourth, the fourth on to the first and second, the basal ones small and irregular, there is also a spot on the first between the third and fourth costal spots, one on the base of the second fork-cell and at the tips of the branches, one at the apex and another near the base of the outer branch of the fifth and one at its base, and a small one just past the cross-vein on the fourth. Halteres all pale. Fork-cells rather short, the first narrower and about the same length as the second, its stem about half as long again as the cell; stem of the second as long as the cell; cross-veins pale, the posterior about twice its own length distant from the mid.

Length 5 mm.

Habitat Maddathorai, w. base of W. Ghats, Travancore (*Annandale*).

Time of capture 17-xi-08.

Observations.—Described from a single ♂, taken resting on a tree trunk in jungle. A very marked and beautiful species near *O. albipes*, Theobald, but easily told by having only the last hind tarsal white.

59. *Mimomyia minuta* Theobald. (Pls. i and iii, wing and wing scales.)

Rec. Ind. Mus., ii, p. 301 (♂), 1908.

Thorax shiny brown; head pale creamy yellow; abdomen brown with basal pale yellow bands spreading out laterally. Legs with apical and basal pale banding; last hind tarsal pale creamy.

♀. Head clothed with flat pale creamy scales and some black upright forked ones at the back; two long pale chætæ projecting forwards in the middle in front and some dark incurved ones at the sides; antennæ deep brown, basal segment black.

Thorax shiny black, with scattered long curved black scales and very long black chætæ; scutellum shiny black with long curved black scales and black border bristles; metanotum black; pleuræ ochreous.

Abdomen ochreous with deep brown scales, rather scanty basally giving a false banded appearance, with basal lateral areas of pale scales; border bristles pale.

Legs brown to almost black; coxæ and venter of femora pale; apex of femora and tibiæ white, the remaining segments with apical and basal pale creamy bands, last hind tarsal with all pale scales, in the other legs pale in certain lights.

Wings with the first fork-cell very little longer and narrower than the second, its stem nearly as long as the cell; stem of the second fork-cell not quite as long as the cell; posterior cross-vein longer than the mid, rather more than its own length distant from it; scales large and brown.

Length 2·5 mm.

Habitat Calcutta (*Annandale*).

Time of capture 30-vii and 3 or 4-viii-07.

Observations.—One ♀ and one ♂. The ♂ was described from Sylhet, Assam (*Records Indian Museum*, vol. ii, p. 301, 1908). In the description of the proboscis it reads as if it were long and thin as in *Culex*; this is not so, it is very swollen apically, almost club-shaped in some views, with a long thin stem.

Genus BOLBODEOMYIA, gen. nov.

Head clothed with flat scales; palpi very short in the ♀, slightly longer in the ♂, antennæ pilose in both sexes; thorax with spindle-shaped scales; prothoracic lobes with small flat scales, scutellum with flat scales; metanotum with a bunch of chætæ posteriorly. Wings with normal venation with rather long lateral vein scales on the apical areas of the veins and with very prominent long dense lateral vein scales on the fifth vein, along the stem and one branch. Complex ♂ genitalia, the claspers ending in a bulbous process. A very marked genus.

60. *Bolbodeomyia complex*, sp. nov.

Head, thorax, legs, antennæ and palpi and proboscis brown. Abdomen brown above, pale grey below in ♀, ochreous in the ♂.

♂. Head clothed with flat brown scales with violet reflections and a pale creamy border around the eyes and at the sides; chætæ dark; clypeus, palpi and proboscis deep brown, palpi very small; antennæ deep brown, basal segment brown, pilose.

Thorax shiny deep brown with scattered brown and paler spindle-shaped scales; prothoracic lobes covered with small flat creamy scales, scutellum ochreous-brown with flat dull scales; metanotum brown with a large area of pale hairs posteriorly, arising from black points; pleuræ ochreous-brown with flat white scales. Abdomen deep brown, traces of some pale scales at the bases of the apical segments; venter pale grey, the integument ochreous.

Legs deep brown, coxæ ochreous with white scales, venter of femora pale.

Wings with short fork-cells, the first longer, but slightly narrower than the second, its base slightly nearer the base of the wing, its stem two-thirds the length of the cell; stem of the second as long as the cell; posterior cross-vein about two-and-a-half times its own length distant from the mid.

Male genitalia very complex; the clasper thick, long, ending in a rounded knob, with a group of small curved hairs; lateral process at apex short, very thick and dark; a blunt long, finger-like process from near base of clasper; on the inner corner of the basal lobes four flat chætæ.

Length 3·8 mm.

♀. Very similar to the male, but rather more white scales in front of the head, and the palpi smaller.

The abdomen has some traces of basal white lateral spots and the venter has some narrow apical black bands. Wings with the first fork-cell slightly longer and about the same width as the second, its stem about half the length of the cell; stem of the second rather more than half the length of the cell; posterior cross-vein rather more than twice its own length distant from the mid, some long lateral vein scales, the fifth long vein, except on its upper branch, *densely clothed with long thin scales.*

Length 3 mm.

Habitat Dawna Hills, 2,000—3,000 feet, L. Burma (♂), and jungle at base of Dawna Hills (♀) (*Annandale*).

Time of capture 1 and 2 or 3-iii-08.

Observations.—Described from one ♂ and one ♀, practically perfect, but with slightly rubbed thorax. A small obscure Ædine, but at once told when examined microscopically by the complex male genitalia and the long lateral scales along one side of the fifth vein.

61. *Skusea pseudodiurna*, sp. nov.

Head dusky or pale according to the light. Thorax bright reddish brown. Abdomen with basal white lateral spots. Legs brown unbanded.

♂. Head dark, clothed with a mixture of flat dusky and pale grey scales and numerous dark upright forked scales and many black chætæ projecting forwards; antennæ with dark plume hairs, and pale grey internodes, dusky at the tip; palpi very small, dark brown; proboscis deep brown. Thorax bright deep reddish brown, with scanty, scattered bronzy narrow-curved scales and with black chætæ, especially thick over the roots of the wings; scutellum testaceous with narrow-curved dull creamy and bronzy scales, to the mid lobe, dark ones to the lateral lobes; metanotum bright chestnut-brown.

Abdomen black with basal white lateral spots, most prominent on the last few segments, with pale brown border bristles; venter dusky. Legs uniformly deep brown, except the coxæ and venter of the femora which are pale; fore and mid ungues unequal and uniserrate; hind equal and simple. Wings with short fork-

cells, the first longer and narrower than the second, stem of the first nearly as long as the cell, stem of the second longer than the cell; posterior cross-vein its own length distant from the mid.

Length 4 mm.

Habitat Sukna, base of E. Himalayas, 500 feet, Darjiling district (*Annandale*).

Time of capture 1-vii-08.

Observations.—Described from a single ♂. Very near *Skusea diurna*, but the bright reddish brown thorax at once separates it.

62. *Skusea uniformis*, sp. nov.

Head black with a pale border around the eyes. Thorax rich brown.

Abdomen deep brown, unbanded, dull ochreous below. Legs uniformly deep brown, but the femora pale ochreous below.

♀. Head black with small flat black scales, except for a pale area around the eyes and at the sides and some dark upright forked scales; clypeus, palpi and proboscis black; antennæ deep brown, basal segment black, base of segment pale ochreous. Thorax rich deep brown with narrow-curved bronzy brown scales scattered over its surface; scutellum shiny black with narrow-curved bronzy black scales, the surface pale in some lights, four dark median posterior border bristles; metanotum chestnut and dull brown; pleuræ brown with dull flat white scales.

Abdomen deep brown with dull brown scales, dull ochreous to grey-scaled venter.

Legs uniformly deep brown except the coxæ and venter of femora which are ochreous; ungues equal and simple.

Wings with short fork-cells, the first slightly longer and narrower than the second posterior, their bases about level, the stem about two-thirds as long as the cell; stem of the second posterior as long as the cell; posterior cross-vein longer than the mid, about one-and-a-half times its own length distant from it.

Length 4 mm.

Habitat Pallode, twenty miles N.E. of Trivandrum, Travancore (*Annandale*).

Time of capture 15-xi-08.

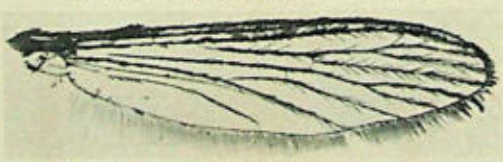
Observations.—Described from a single ♀. The abdomen somewhat denuded, but there is no trace of any pale scales.

Plate I.

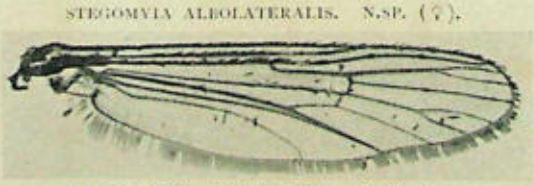
STEGOMYIA TRIPUNCTATA. N.SP. (♀).

CULEX MINOR. N.SP. (♀).

CHRYSOCONOPS PYGMÆUS. N.SP. (♀).



STEGOMYIA ALBOLATERALIS. N.SP. (♀).



RADIOCULEX CLAVIPALPUS. N.SP. (♀).

MIMOMYIA MINUTA. N.SP (♂).

WINGS OF NEW INDIAN CULICIDÆ.

Plate II.

WING OF BREVIRHYNCHUS MAGNUS. N.SP. (♀).

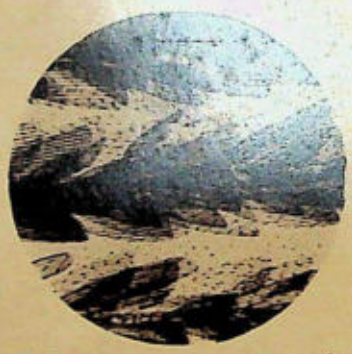
HEAD OF RADIOCULEX CLAVIPALPUS. N.SP. (♂).

WING OF LEICESTERIA APICALIS. N.SP. (♀).

PLATE III.

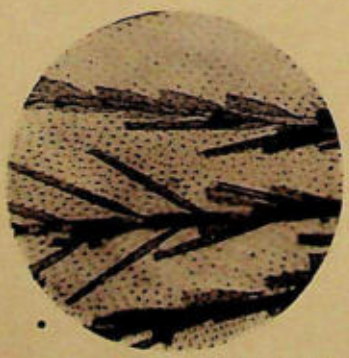
STEGOMYIA [illegible] (♀)

LEICESTERIA [illegible] (♂)

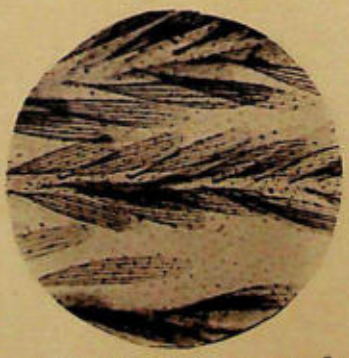


BREVIRHYNCHUS MAGNUS, N. SP. (♀)

MIMOMYIA MINUTA, N. SP. (♂)



STEGOMYIA ALBOLATERALIS, N. SP. (♀)



CHRYSOCONOPS PYGMAEUS, N. SP. (♀)

ENLARGED WING SCALES.

II. THE INDIAN SPECIES OF PAPATACI FLY (*PHLEBOTOMUS*).

By N. ANNANDALE, *D.Sc., Superintendent, Indian Museum.*

INTRODUCTION.

The importance of the genus *Phlebotomus* from a medical point of view has recently been demonstrated by Grassi and others so far as southern Europe is concerned, and there can be little doubt that in India too fevers of a certain type are carried by these flies, which, in common with several others, are commonly known as "sand-flies" in this country. The descriptions of the species described below are based on specimens in the collection of the Indian Museum, some of which have been sent me by Mr. F. M. Howlett, Second Imperial Zoologist; but I have been able to examine all the species except *P. papatasi* in a living condition. The types of all the species except *P. papatasi* and *P. perturbans* are preserved in the Indian Museum. My thanks are due to Mr. E. Brunetti for much assistance.

The study of the material at my disposal has convinced me of the necessity of *not* relying solely on pinned specimens in examining minute and delicate insects such as *Phlebotomus*. Not only do certain structures shrivel and become distorted when dried, but it is impossible to make out the exact arrangement of others without proper examination under a high power of the microscope. So delicate, for example, is the venation of the wing of some species of *Phlebotomus* that its details cannot be seen unless the wing is dealt with in the manner in which any similar organ belonging to any animal but an insect would be dealt with, that is to say, unless it is mounted on a glass slide under a cover-slip in a suitable medium, after having been artificially stained. Pinned specimens even of *Phlebotomus* are valuable, as showing the natural colour and appearance of the insect; but specimens preserved in spirit are much more valuable, as enabling structural characters to be investigated with greater ease and surety.

As Mr. Howlett is working at the habits of the Indian *Phlebotomi*,[1] I need only say that specimens are to be found in the corners of bathrooms during the day and round the lamp at night; but a few hints as to their collection and preservation

[1] For full details regarding one Indian species (*viz.*, *P. papatasi*) see Grassi's "Ricerche sui Flebotomi" in the memoirs of the Italian Society of Science (1907) and also Doerr, Franz and Taussig's *Das Pappatacifieber* (Leipzig and Vienna, 1909).

may be useful. The most satisfactory method, so far as my experience goes, is the following :—Take a small glass tube full of strong spirit and a fine camel's hair brush. Dip the latter in the spirit and lightly touch the *Phlebotomus* as it rests on a wall or table. It will adhere to the brush and may then be washed off in the spirit, in which it may be permanently preserved.

Dried specimens should be pinned in the same way as mosquitoes, but, owing to their small size, this is a difficult process. Specimens packed loose in a pill box with tissue paper crumpled up not too tightly are, however, useful, provided that there is a considerable number of them.

When the specimens preserved in spirit have to be examined, they may be carefully removed to a watch-glass and examined superficially under a low power of the microscope. After such details have been made out as can be made out in this way, a specimen should be removed to a small stoppered bottle of absolute alcohol,[1] care being taken that it is not allowed to dry up during the process and that the stopper is not left out of the bottle of absolute alcohol longer than is necessary.

After the *Phlebotomus* has remained in absolute alcohol for about half an hour it should be removed to a watch-glass containing oil of cloves, in which it must be left until it is quite transparent. Important details can often be made out while it is in this watch-glass, for the point of view can be readily altered. Finally the specimen should be mounted in canada balsam under a thin cover-slip in the ordinary way. It will then be possible to study the general form and also such structures as the antennæ, limbs and genitalia with comparative ease.

To render the wings fit for detailed study, however, it is necessary to stain them artificially. While the specimen is in spirit in a watch-glass they should be snipped off at the base by a fine pair of scissors and carefully transferred to some preparation of hæmalum or hæmatoxylin. I find Ehrlich's acid hæmatoxylin, Delafield's hæmatoxylin and Mayer's hæmalum all good for the purpose. Although these stains are rapid in their action, it is as well to leave the wing in them for about twenty-four hours. After this it should be washed in tap-water, removed to 70 % spirit, in which it need only remain for a few minutes, and then to absolute alcohol. Finally it should be cleared in oil of cloves and mounted in canada balsam. Owing to the toughness of the wings, in spite of their apparent delicacy, it is not necessary to pass them through different strengths of alcohol in the process of dehydration.

---

[1] In the damp climate of many parts of India absolute alcohol absorbs atmospheric moisture with great rapidity ; but this may be remedied by keeping the bottom of the bottle in which the absolute alcohol is stored covered with a layer of burnt (*i.e.*, dehydrated) copper sulphate. The copper sulphate in this condition is white ; when it begins to turn green in the alcohol, it is clear that the alcohol is absorbing water, which is again being absorbed by the copper sulphate. In this case the alcohol should be poured off and freshly burnt copper sulphate placed in it ; or the old powder may be removed, burnt again and replaced.

LIST OF KNOWN SPECIES OF *PHLEBOTOMUS* AND OF PAPERS IN WHICH THEY ARE DESCRIBED.

SPECIES.

Europe.	*Phlebotomus*	*papatasi*, Scopoli (1, 9) (S. Europe).
	,,	*minutus*, Rondani (2) ,,
	,,	*mascittii*, Grassi (10) (Italy).
	,,	*tipuliformis*, Meunier (5, 6) (fossil in Baltic amber).
America.	,,	*vexator*, Coquillet (8) (Maryland).
	,,	*cruciatus*, ,, (8) (Guatemala).
Africa.	,,	*duboscqui*, Neveu-Lemaire (7) (Soudan).
Asia.	,,	*papatasi*, Scopoli (15) (Northern India; ? Java).
	,,	*himalayensis*, sp. nov. (lower Himalayas).
	,,	*malabaricus*, sp. nov. (Travancore, S. India).
	,,	*perturbans*, Meijere (15) (Java; base of Eastern Himalayas).
	,,	*babu*, sp. nov. (plains of India).
	,,	*major*, sp. nov. (outer Himalayas; Paresnath, W. Bengal).
	,,	*argentipes*, Annandale and Brunetti (11) (plains of India).

LITERATURE.

1. 1786. Scopoli: *Deliciæ faunæ et floræ insubricæ*, etc. [*P. papatasi* described.]
2. 1843. Rondani: *Ann. Soc. ent. France* (11), vol. i, p. 263. [*P. minutus* described and *P. papatasi* redescribed.]
3. 1864. Loew: *Fauna Austriaca*, Dipt. 11, p. 630. [A general description of the genus.]
4. 1903. Kertesz: "Psychodidæ" in *Katalog der Palaarktischen Dipteren*, i. [A bibliography of the genus.]
5. 1905. Meunier: *Ann. Mus. Hung.*, iii, p. 254. [*P. tipuliformis* described.]
6. 1906. ,, *Naturaliste*, p. 103. [*P. tipuliformis* described as a type of a new genus (*Phlebotomiella*) I think unnecessarily.]
7. 1906. Neveu-Lemaire: *Bull. Soc. zool. France*, xxxi, p. 64. [*P. duboscqui* described.]
8. 1907. Coquillet: *Ent. News*, Philadelphia, Pa., p. 101. [*P. vexator* and *P. cruciatus* described.]

9. 1907. Grassi: *Mem. d. Soc. ital. d. Sci.* (iii), xiv, p. 353. [*P. papatasi* fully redescribed with many figures.]
10. 1908. Grassi: *Att. Reale Accad. Lincei* (v), vol. xvii, fasc. 12, 2nd senustre, p. 68. [*P. mascittii* described.]
11. 1908. Annandale: *Rec. Ind. Mus.*, vol. ii, p. 101. [*P. argentipes* described.]
12. 1909. Doerr, Franz and Taussig: *Das Pappatacifieber* (Leipzig and Vienna).
13. 1909. Austen: *African Bloodsucking Flies*, pl. i, fig. 4 (B. M., London). [*P. duboscqui* figured.]
14. 1909. Annandale: *Nature*, vol. 81, p. 518. [*P. papatasi* recorded from India.]
15. 1909. Meijere: "Blutsaugende Micro-Dipteren," *Tijd. voor Entom.*, vol. lii, p. 191. [*P. perturbans* and *P. angustipennis* (synonym of *P. papatasi*?) described.]

TAXONOMIC POSITION OF *PHLEBOTOMUS* AND ITS SPECIES.

FAMILY PSYCHODIDÆ.

Small Nemocera with relatively large wings, which are densely covered with scales or hairs. At least six longitudinal veins present in addition to the costal (anterior border) and subcostal; cross-veins few in number, often practically invisible, absent from the distal part of the wing.

Subfamily Phlebotominæ.

Psychodidæ in which the second longitudinal vein has either two or three branches, which arise at a considerable distance from the point at which the main branch of the vein is joined to the third longitudinal vein. Female devoid of a horny ovipositor; the external genitalia of the male consisting of at least three pairs of appendages in addition to an intromittent organ. Genera—*Phlebotomus*,* *Nemopalpus*, *Sycorax*, *Trichomyia*, *Eatonisca*, *Diplonema*.*

Subfamily Psychodinæ.

Psychodidæ in which the lowest of the three branches of the second longitudinal vein always present is very distinct from the two upper ones, and joins the middle branch at a point nearer the base of the wing than the apex. Females with a horny ovipositor consisting of two longitudinal valves; external genitalia of the male consisting of two pairs of appendages. Genera—*Psychoda*,* *Pericoma*.*

The genera whose names are marked with a * are known to occur in India. They may be distinguished as follows :—

PHLEBOTOMINÆ—

A. Wings broadly heart-shaped, densely covered with scales; mouth not forming a proboscis .. .. .. *Diplonema.*

B. Wings relatively narrow, devoid of scales except at the base; mouth parts forming a proboscis .. .. .. *Phlebotomus.*

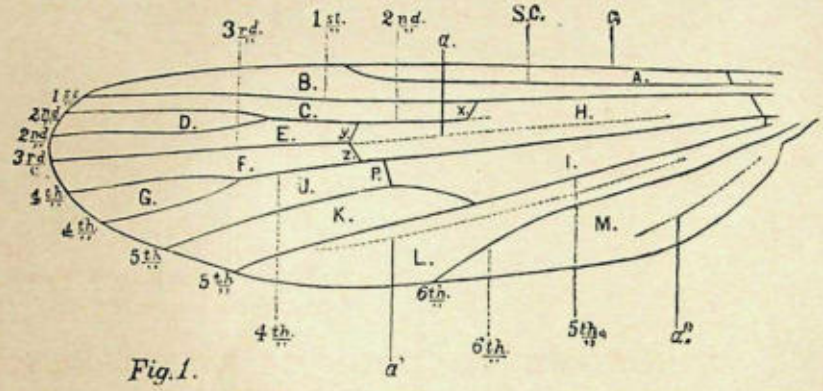


Fig. 1.

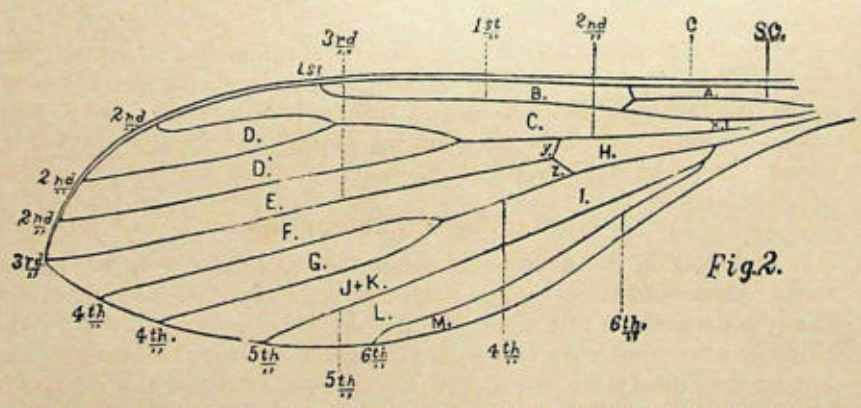


Fig. 2.

FIG. 1.—Wing of *Culex* (after Theobald). FIG. 2.—Wing of *Phlebotomus*.

c., costal vein; s c., subcostal; 1st to 6th, first to sixth longitudinal veins; a, a', and a", incrassations (a' called by Austen the 6th vein, a" the 8th); y., supernumerary cross-vein; z., mid cross-vein; P., posterior cross-vein; A., costal cell; B., subcostal cell; C., marginal cell; D., first submarginal cell; E., second submarginal cell; F., first posterior cell; G., second posterior cell; J., third posterior cell; K., anal cell; H., first basal cell; I., second basal cell; L., auxiliary; M., spurious cell.

PSYCHODINÆ—

A. The third longitudinal vein runs to the apex of the wing, dividing the wing into two approximately equal halves .. *Psychoda.*

B. The third longitudinal vein terminates distally at a point below the apex of the wing *Pericoma.*

Wing— *Some Diagnostic Characters.*

There is some dispute as to the proper nomenclature of the venation of the wing of the Psychodidæ ; but I think it will be sufficient for the purposes of this paper if I compare the wing of *Phlebotomus* with that of the Culicidæ, for not only are the Psychodidæ (and especially *Phlebotomus*) closely allied to that family, but more attention has perhaps been paid to the anatomy of the Culicidæ in recent years than to that of any other group of Diptera. I have therefore reproduced the figure of the wing of *Culex* (fig. 1) given by Theobald in the first volume (p. 18) of his *Monograph of the Culicidæ* side by side with one of the wing of *Phlebotomus* (fig. 2) on which the same lettering is used.

In accordance with Theobald's figure and with the views of many dipterologists, the thickened anterior or upper border of the wing is called the costa, while the short parallel vein running immediately below it is called the subcosta. The first parallel vein that reaches the distal margin of the wing is known as the first longitudinal, those posterior to it being numbered in numerical succession. In both genera six longitudinal veins can be distinguished.

The subcosta in *Culex* turns upwards at the tip and joins the costa, while in *Phlebotomus* it turns downwards and joins the first longitudinal. This is a point that will be considered later when the cross-veins are discussed. There is no radical difference as regards the first longitudinal in the two genera except that in the Psychodid it turns upwards at the tip and so assumes a superficial resemblance to the subcosta in *Culex*, in which it turns downwards. In *Culex* the second longitudinal forks once, while in *Phlebotomus* it forks twice. In both genera the third longitudinal is simple and practically straight ; it is much longer in the Psychodid than in *Culex*. The fourth longitudinal is once forked in both genera, but the fifth is simple in *Phlebotomus* and bears a branch in *Culex* ; in both genera the sixth longitudinal is simple and directed downwards at the distal end.

The cross-veins are easily detected in *Culex*, but in *Phlebotomus* they are very difficult to see owing to their extreme delicacy. In stained preparations, however, their exact position can be detected, at any rate in some specimens. The most noticeable difference as regards them is that while in *Culex* the more important cross-veins are situated on the distal part of the wing, in *Phlebotomus* they are confined entirely to the proximal part. Considering first the anterior half of the wing, we find in *Culex* a minute cross-vein (the " humeral " cross-vein, not numbered or lettered in the diagrams) joining the subcosta to the costa. In *Culex* it is situated near the base of the wing, while in *Phlebotomus* it is practically at the distal end of the very short subcosta, which therefore appears to be forked. A careful examination shows, however, that the lower branch of the apparent fork is really in continuity with the main stem of the vein, while the cross-vein proceeds

from it at a distinct angle. In *Phlebotomus* this cross-vein is of extreme delicacy and, unlike the other veins, it is not provided with a double line of hairs. It can only be seen after prolonged staining of the wing, and even then is faint and indistinct. The next transverse vein that is apparent joins the base of the second longitudinal to the first and is marked *x* in the diagrams; it is further from the base of the wing in *Culex* than it is in *Phlebotomus*. Strictly speaking this is not a distinct vein but an upturned portion of the lower vein. The base of the third longitudinal in both genera ends in a small fork, one branch joining the vein to the second longitudinal, the other to the fourth. The former branch is called by Theobald the supernumerary cross-vein, the latter the mid cross-vein. In *Phlebotomus*, however, the lower branch appears to be in actual continuity wi h the vein, while the upper one joins it at an angle. This is more distinct in some species than in others. In *Culex* the fourth and sixth longitudinals do not appear to be joined together at the base; but in *Phlebotomus* the fifth arises from the base of the sixth, as can be seen distinctly in some species, while it is connected with the fourth by a short cross-vein close to its base.

The venation of *Phlebotomus*, taking into consideration the above facts, may therefore be said to resemble that of *Culex* in some essential points, but to differ from it mainly in the fact that the cross-veins are extremely delicate and are situated exclusively on the proximal part of the wing.

From a systematic point of view, as regards specific differentiation, the most important feature in the venation is the relative proportions between the length of the upper branch of the second longitudinal, the distance between the two forks of this vein, and that between the proximal fork and the point at which the vein is joined by the mid cross-vein to the third longitudinal.

In *Phlebotomus*, but not in some of its allies (*e.g.*, *Diplonema*), the wing is almost devoid of scales, a few of which occur at the extreme base on the costal and lower borders and on those veins which reach the base. Each vein except the small cross-vein that joins the subcostal to the costal, bears a double row of fine hairs, and the edge of the wing is deeply fringed with longer hairs.

External genitalia—

The visible female genitalia in *Phlebotomus* are simple in structure, consisting of two pairs (a superior and an inferior pair) of compressed, more or less leaf-like appendages covered with sensory hairs. They offer in their shape and proportions features of diagnostic importance but become shrivelled and distorted in dried specimens. There is no horny ovipositor such as is found in *Psychoda* and *Pericoma*.

The male genitalia are far more complicated and of much greater systematic importance. It is possible, moreover, to trace their specific differences even in specimens which have been dried, but even such specimens should be mounted in canada balsam for

a proper examination. It is difficult to homologize the different appendages exactly with those of other Diptera, because in all families great differences, often of no more than specific value, occur in different species. It is better, therefore, not to use technical terms in describing these appendages. In the male

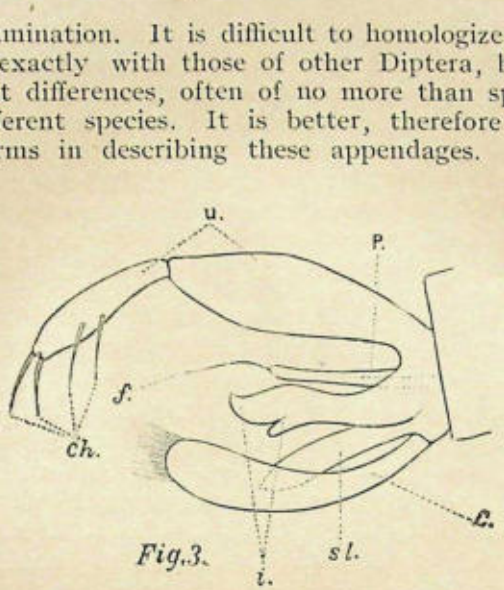


Fig. 3.

Diagram of the external male genitalia of *Phlebotomus*: u., upper or superior appendage; ch., chætæ; f., genital filament; i., intermediate appendage; P., intromittent organ; s.l., subgenital lamella; L., lower or inferior appendage.

genitalia of *Phlebotomus* five pairs of organs can be distinguished. They are shown in the accompanying diagram (fig. 3) which is a generalized sketch of the whole apparatus as seen from the right side and does not represent the organs of any one species. The

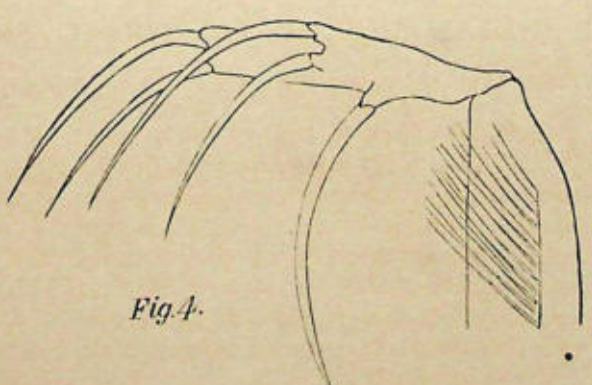


Fig. 4.

Distal joint of superior male appendage of *P. argentipes*, showing the chætæ.

uppermost appendage has two joints, the posterior (distal) of which bears a varying number of stout chætæ (fig. 4). The form, position and number of these chætæ are valuable diagnostic points. The intermediate appendage is morphologically a branch of the superior one but has often more than one lobe. The inferior appendage

never has more than one joint, but is often elbowed; it arises from a subgenital plate, which represents the last somite of the abdomen. This subgenital plate, which is highly developed in some Psychodidæ, is very inconspicuous in *Phlebotomus*, owing rather to its membranous nature than to its small size. In dried specimens it disappears almost completely. The intromittent organ, which lies between the two intermediate appendages, consists of a pair of slender, compressed chitinous valves, between which a pair of long, slender, chitinous filaments can be protruded.

Head—

The head in *Phlebotomus* is small and round but the anterior part is produced into a more or less cylindrical rostrum, which overhangs the mouth parts above. The eyes are large, invariably dark in colour and more or less emarginate opposite the base of the antennæ. The antennæ are long and filiform, having normally sixteen joints, two of which form the scape. They show great individual variation as regards the proportions of the joints and also differ as regards the exact outline of the last few distal joints in the two sexes. The sexual differences are, however, small. The palpi are generally stated to have four joints. In fresh specimens, however, a minute basal joint can sometimes be distinguished. This joint is often difficult to see and appears to be imperfectly separated from the others. Including it the number of the joints is five.

For an account of the mouth parts Grassi may be consulted. They do not appear to present features of merely diagnostic interest and closely resemble those of *Culex* in general structure.

THE INDIAN SPECIES OF *PHLEBOTOMUS*.

Table of the Indian species of Phlebotomus.

1. Length 2 mm. Dorsum of thorax dark, sides yellowish. Wing with the posterior border much more strongly arched than the anterior; the anterior branch of the second longitudinal vein longer than either the distance between the two forks of the vein or that between the posterior fork and the mid cross-vein; the latter distance shorter than that between the two forks .. .. *P. argentipes.*

2. Length 3-3·75 mm. Colour an almost uniform golden grey. Wing with the posterior border much more strongly arched than the anterior; the anterior branch of the second vein longer than either the distance between the two forks of the vein or that between the posterior fork and the mid cross-vein; the distance between the two forks shorter than

that between the posterior fork and the mid cross-vein .. .. .. *P. major.*

3. Length 2·5-3 mm. Colour dark greyish brown. Wing with the posterior margin as a rule more strongly arched than the anterior; the length of the anterior branch of the second vein, the distance between the two forks and that between the posterior fork and the mid cross-vein subequal .. .. *P. perturbans.*

4. Length 2·5 mm. Colour dark brown with a purplish tinge. Wing with the posterior margin hardly more strongly arched than the anterior; the anterior branch of the second vein four times as long as the distance between the two forks, which is much shorter than that between the posterior fork and the mid cross-vein .. .. .. *P. malabaricus.*

5. Length 1·5 mm. Colour silvery grey. Wing narrow, as a rule divided into two almost equal and similar halves by the third longitudinal vein; the anterior branch of the second vein shorter than either the distance between the two forks or that between the posterior fork and the mid cross-vein; the two latter distances being nearly equal .. .. *P. babu.*

6. Length 2 mm. Colour yellowish grey. Wing narrow, divided into two equal and similar halves by the third longitudinal vein; the anterior branch of the second vein nearly three times as long as the distance between the two forks, twice as long as that between the posterior fork and the mid cross-vein .. *P. himalayensis.*

7. Length 2·5 mm. Colour yellowish grey. Wing narrow, but with the posterior margin as a rule more strongly arched than the anterior; the anterior branch of the second vein nearly twice as long as the distance between the two forks, equal to that between the posterior fork and the mid cross-vein .. .. *P. papatasi.*

Phlebotomus argentipes, Annandale and Brunetti. (Pl. iv, fig. 3, wing, and pl. vi, fig. 6, male genitalia.)

P. argentipes, *Annandale, Rec. Ind. Mus.*, ii, p. 101, fig. (1908).

Size and proportions.—Total length in well-preserved specimens 2 mm. Length of wing 1·75 mm.; greatest breadth of wing 0·5 mm. Hind leg about twice as long as the head and body; the femur less than half as long as the tibia and distinctly shorter than the first joint of the tarsus, which is longer than the remaining joints together.

Colour.—Head (except eyes, which are black) and abdomen brown; dorsum of thorax dark brown or blackish; sides of thorax, coxæ and trochanters yellowish; legs, antennæ and palpi grey; the whole (especially the legs) exhibiting a strong silvery refulgence. Wings smoke-grey, with a strong bluish iridescence on the disk and a general silvery refulgence.

Head.—Rostrum elongate, sausage-shaped, ovoid as seen from above. Eyes distinctly emarginate on their internal upper border, narrowly separated. Antennæ with 14 joints in the flagellum, all of which are more or less elongate and each of which bears three or four somewhat irregular verticels of stiff, fine hairs; the proximal joint of the scape clearly separated from the head, rather slender, short; distal joint subspherical, bearing a circle of suberect, narrow, spatulate, curved scales and (alternating with and below the scales) another of stiff bristles. Palpi with five joints; the basal joint short, the second joint more than half as long as the third, which is as long as the fourth and fifth together.

Thorax.—The dorsum is covered with long, stiff, upright, curved hairs

Abdomen slender and cylindrical in both sexes, considerably shorter than the wings, covered with rather slender curved hairs of irregular length but never very long or stout.

Wings bluntly pointed; the posterior border much more strongly curved than the anterior. The anterior branch of the second longitudinal vein much longer than the distance between its base and the second fork; the stem of the vein between the second fork and the mid cross-vein slightly longer than the distance between the two forks; the posterior fork nearly on a level with the fork of the fourth vein.

External genitalia.—(♀) The superior appendages somewhat widely separated from the inferior, which are small, pointed and claw-shaped. (♂) All the appendages long and apparent. The inferior appendages somewhat slender, laterally compressed, longer than the basal joint of the superior appendages, obliquely truncated, devoid of spines, covered with stout hairs, which form a dense brush at the tip of the appendage; a distinct elbow not far from the base of the appendage; the intermediate appendages small, consisting of a stout, bluntly pointed dorsal lobe and a small ventral lobe which is a minute, pointed process bearing a bunch of bristles at the tip and attached to the ventral margin of the dorsal lobe. The superior appendage with the distal joint considerably shorter than the proximal one, bearing five stout, pointed chætæ, each nearly as long as the joint, arranged as follows:—a single chæta at a point about a third of the length of the joint from the base, a pair of slightly unequal chætæ near the middle of the joint, and a terminal equal pair. The proximal joint slightly longer than the last apparent segment of the abdomen. Intromittent organs relatively long, ensiform, consisting of two slender, pointed lateral valves, between which a pair of long filaments can be protruded.

This species is easily distinguished, except in the case of females distended with blood, from all other Indian forms by the strong contrast in colour between the dorsal surface and the sides of the thorax. It is a very common species in Calcutta at all times of the year, but only occasionally. Often it seems to disappear for a time (a few weeks or days) and then to reappear again in large numbers. It is commonly found in dark corners of bathrooms and basements in houses and round the lamp at night, and has the habit of biting people's ankles under the dinner table.

Distribution.—Probably all over the plains of India. I have examined specimens from Calcutta (all times of year), Rajmahal (July, February), Asansol (*Paiva*, February) and Pusa (*Howlett*) in Bengal, and from several localities in the coastal districts of Travancore (November).

Phlebotomus major, sp. nov. (Pl. v, fig. 4, wing, and pl. vi, fig. 4, male genitalia.)

Phlebotomus *sp.*, *Giles, Gnats or Mosquitoes* (2nd. ed.), p. 5, fig. 2 (1902).

Size and proportions.—Total length 3-3·75 mm. Length of wing 2·75 mm., greatest breadth 1 mm. Hind leg two-and-a-half times as long as the head and body; its femur less than half as long as the tibia and considerably shorter than the first joint of the tarsus, which is longer than the remaining joints together.

Colour.—A uniform golden grey with very strong silvery lights; the disk of the wings with a bluish iridescence; eyes black; legs sometimes darker than abdomen.

Head.—Rostrum somewhat conical, short, truncated in front. Eyes widely separated, emarginate above. Antennæ with the two joints of the scape subspherical; those of the flagellum elongate, slender, densely covered with soft hairs. Palpi with five joints; the basal joint very short, the second, third and fourth subequal, shorter than the fifth.

Thorax much as in *P. argentipes.*

Abdomen long and slender, clothed with long recumbent hairs and with tufts of longer, upright ones on the dorsal surface.

Wings rather narrower than in *P. argentipes*, pointed, with the posterior border much more strongly arched than the anterior. The anterior branch of the second longitudinal vein much longer than the distance between the two forks, which is considerably shorter than the distance between the second fork and the mid cross-vein; the second fork slightly nearer the base of the wing than that of the fourth longitudinal vein.

External genitalia.—(♂) Superior and inferior appendages similar to those of *P. argentipes* except that they are more slender and elongate, the basal joint of the superior appendage being nearly twice as long as the last apparent joint of the abdomen; intermediate appendages devoid of a ventral lobe; valves of the intromittent organs slender and blunt; genital filaments well developed.

This species is closely allied to *P. argentipes*, from which it is easily distinguished by its larger size, uniform golden colour, more elongate tarsi and male genitalia.

Distribution.—Outer Himalayas from the base up to 7,000 or 8,000 feet. Paresnath Hill, Western Bengal. I have examined specimens from Naini Tal and Bowali (Kumaon), Kurseong (Darjiling district), the Nepal Terai, and Paresnath Hill (Chota Nagpur). The fauna of this hill, which is separated by about 180 miles from the foot-hills of Nepal, the nearest part of the Himalayas, has a distinctly Himalayan facies, and I think that *P. major* may be regarded as the Himalayan representative of *P. argentipes*. All the specimens of the former species that I have taken myself have been taken at light in the evening. The only one I saw on Paresnath (a male) was taken at an altitude of 4,300 feet in April. The species appears to be common at Naini Tal and Kurseong and probably also at Simla in May and June. Dr. A. D. Imms took specimens at Bowali in July.

Phlebotomus perturbans, Meijere. (Pl. v, fig. 3, wing, and pl. vi, figs. 5, 5*a*, 5*b*, male genitalia.)

P. perturbans, *Meijere*, *Tijdschr. v. Ent.*, vol. lii, p. 201, pl. 12, fig. 13 (1909).

Size and proportions.—Total length 2·5–3 mm. Length of wing 3·25 mm.; greatest breadth of wing 0·7 mm. Hind leg 2¼ times as long as head and thorax; the femur a little more than half as long as the tibia, slightly longer than the first joint of the tarsus, which is distinctly shorter than the other joints together.

Colour.—Thorax, abdomen, femora, tibiæ, tarsi and antennæ brown, with the usual silvery lights; head (including palpi and proboscis), coxæ and trochanters yellowish; eyes black.

Head.—Rostrum short and thick, rounded at the tip. Antennæ with the basal joint of the flagellum not much longer than the second; the second joint of the scape bearing a circle of curved scales. Palpi long, with five joints; the fifth joint the longest; the second and third much longer than the fourth; the first very short.

Thorax much as in *P. argentipes*, except that the hairs are shorter.

Abdomen relatively shorter than in *P. major*, clothed with recumbent hairs and with a few upright curved ones on both the dorsal and the ventral surfaces.

Wing bluntly pointed, with the posterior border not much more strongly arched than the anterior. The length of the anterior branch of the second longitudinal vein, the distance between the two forks of this vein and that between the posterior fork and the mid cross-vein subequal; the fork of the fourth longitudinal distinctly nearer the tip of the wing than the posterior fork of the second longitudinal.

Genitalia.—(♀) The superior appendage considerably larger than the inferior, both leaf-like and rounded at the tip.

(♂) Inferior appendage shorter than the basal joint of the superior appendage, slender, bearing at the tip a bunch of long, stout bristles. Intermediate appendage without a ventral lobe, slender, pointed, with the tip curved. Superior appendage very long, the distal joint much shorter than the proximal, bearing four chætæ, which are less than half as long as the joint and are arranged in two pairs—an equal pair at the tip and one in which the two chætæ are not equal on the inner surface about half way along the joint; the proximal chætæ are blunt, the distal ones pointed. Intromittent organ very slender, the valves rounded at the tip; the genital filaments well developed.

This species is easily distinguished from all the other Indian forms I have seen except *P. malabaricus* (to which it bears a close superficial resemblance) by its dark brownish colour. It is abundant in the jungles at the base of the Eastern Himalayas at the beginning of the rains. Large numbers flew to my light in the forest bungalow at Sukna (alt. 500 feet) near the Darjiling Himalayan Railway on the evenings of July 1st, 2nd and 3rd, 1908. I have not seen it elsewhere.

Distribution.—Base of the Eastern Himalayas (Darjiling district); Java.

Phlebotomus malabaricus, sp. nov. (Pl. v, fig. 1, head, fig. 2, wing; and pl. vi, fig. 1, male genitalia.)

Size and proportions.—Total length 2·5 mm. Length of wing 2 mm., greatest breadth 0·5 mm. Hind leg $1\frac{1}{2}$ times as long as the thorax and abdomen; the femur nearly $\frac{3}{4}$ the length of the tibia, $1\frac{3}{5}$ that of the first joint of the tarsus, which is $\frac{3}{4}$ that of the remaining joints together.

Colour.—Thorax, abdomen and legs (except coxæ and trochanters) brown with a tinge of purple and with the usual silvery lights; wings purplish, strongly iridescent; head, coxæ and trochanters pale brown; eyes black.

Head.—Rostrum short, rounded in front. Antennæ normal; the second joint of the scape pear-shaped, with several circles of hairs and scales; the first joint of the flagellum much longer than the second. Palpi long, with five joints; the basal joint very short, the second shorter than the third or fourth; third and fourth joints subequal, together shorter than the fifth.

Thorax densely covered with upright curved hairs.

Abdomen covered with recumbent hairs.

Wings pointed; the posterior border not much more strongly arched than the anterior. The anterior branch of the second longitudinal vein very long, about four times as long as the distance between the two forks of the vein, which is much shorter than that between the posterior fork and the mid cross-vein; the fork of the fourth longitudinal almost level with the posterior fork of the second.

Genitalia.—(♀) Much as in *P. perturbans.* (♂) Inferior appendage slender, cylindrical, slightly shorter than the basal

joint of the superior appendage, bearing at its tip (in addition to a bunch of fine bristles) seven minute, conical, chitinous spines. Intermediate appendage without a ventral branch; the dorsal branch resembling that of *P. perturbans*. Superior appendage with the distal joint less than half as long as the proximal one, bearing four chætæ, each of which is as long as the joint; one pair of chætæ is situated at the tip of the appendage and the other a short distance nearer the base of the joint. Intromittent organ long and slender; the apices of the valves club-shaped; genital filaments well developed.

This species is closely related to *P. perturbans*, the place of which it takes in the jungles at the base of the Western Ghats in Travancore, where I took numerous specimens at light in November, 1908. The anterior branch of the second longitudinal vein, however, is much longer than it is in *P. perturbans* and the legs are shorter, while the chætæ of the male genitalia are much better developed.

Distribution.—Travancore, S. India, below the western slopes of the Western Ghats. I took specimens at Nedumangad, Pallode and Maddathorai in November.

Phlebotomus babu, sp. nov. (Pl. iv, fig. 1, wing, and pl. vi, figs. 3, 3*a*, male genitalia.)

Phlebotomus *sp.*, *Howlett*, in Maxwell-Lefroy's *Indian Insect Life*, p. 559, fig. 358 (1909).

Size and proportions.—Total length 2·5 mm. Length of wing 1·75 mm., greatest breadth of wing 0·25 mm. Hind leg rather less than twice as long as the thorax and abdomen; the femur slightly shorter than the tibia, which is more than twice as long as the first joint of the tarsus; the first joint of the tarsus less than half as long as the femur, shorter than the remaining joints together by half of its own length.

Colour.—Silvery grey; the fringes on the wings, the thorax and abdomen appear in certain lights to be darker than the wings themselves and the limbs: the usual silvery lights present.

Head.—Rostrum prominent, somewhat arched. Antennæ with the second joint of the scape bearing several rows of flat scales; the joints of the flagellum normal. Palpi with four joints; the first three subequal, short; the fourth nearly as long as these three together.

Thorax less tumid above than in *P. argentipes*.

Abdomen rather short, clothed in close-set upright hairs of different lengths and with a dense fringe of upwardly curved hairs running along each side of the abdomen near the ventral surface.

Wings narrow, pointed, the posterior border hardly more strongly arched than the anterior, the third longitudinal vein dividing the wing into two nearly equal and similar halves. The anterior branch of the second vein not much shorter than the second branch, shorter than the distance between the two forks of

the vein or the distance between the posterior fork and the mid cross-vein; the two latter distances nearly equal; the posterior fork nearer the base of the wing than the fork of the fourth vein.

Genitalia.—(♀) The superior appendage long and narrow, somewhat curved; the inferior appendage less than half as long, straight. (♂) The inferior appendage club-shaped, distinctly elbowed, about as long as the basal joint of the superior appendage, bearing (in addition to slender bristles) several chitinous spines at the tip and on the ventral surface. Intermediate appendage short, blunt, with the ventral lobe represented by a short process on its ventral margin. The superior appendage with the basal joint stout, about twice as long as the distal joint, which bears four pointed equal or subequal chætæ; the chætæ rather longer than the joint, situated two at the tip and two a short distance from it.

This species is the smallest with which I am acquainted. It is frequently found together with *P. argentipes*, from which it is easily distinguished by its smaller size, narrower wings and uniform grey colour; I have taken it also with *P. malabaricus*. In habits it resembles *P. argentipes*, than which it appears to be somewhat more common.

Distribution.—Probably all over the plains of India. I have examined specimens from Rawalpindi (*C. W. Mason*, September); from Allahabad (*A. D. Imms*, October); from Rajmahal on the Ganges (July); from Asansol (February, *Paiva*); from Purneah and Pusa (*Howlett*) in Northern Bengal; Calcutta (all times of year) and Port Canning, Lower Bengal; Puri, Orissa; Rambha in the north-east of Madras (March); Trivandrum, Pallode and Maddathorai, Travancore (November), and Igatpuri in the Western Ghats, Bombay (November).

Phlebotomus himalayensis, sp. nov. (Pl. iv, fig. 2, wing, and pl. vi, fig. 7, male genitalia.)

Size.—Total length 2-2·5 mm. Length of wing 1·5 mm.; greatest breadth of wing 0·4 mm.

Colour.—Yellowish grey with the usual silvery lights; the dorsum of the thorax slightly darker than the sides.

Head.—Rostrum rounded at the tip, stout and elongated. Antennæ normal, with two circles of flat scales and one of flattened hairs on the second joint of scape. Palpi with five joints; the fifth the longest.

Thorax and *abdomen* as in *P. babu*.

Wing narrow, obtusely pointed, the posterior margin slightly more strongly arched than the anterior; the anterior branch of the second longitudinal vein not much shorter than the second branch, at least four times as long as the distance between the two forks, which is about half as long as that between the posterior fork and the mid cross-vein; the posterior fork and the fork of

the fourth longitudinal almost level, the former being slightly nearer the tip of the wing than the latter.

Genitalia.—(♀) Appendages short and broad, the superior not much longer than the inferior. (♂) Inferior appendage slender, distinctly elbowed, rounded and slightly clubbed at the tip, nearly as long as basal joint of superior appendages, devoid of chitinous spines. Intermediate appendages simple, pointed, curved downwards at the tip. Superior appendages with the distal joint about half as long as the proximal, bearing at the tip three pointed chætæ, each of which is slightly shorter than the joint. Intromittent organ with two elongate, slender valves, which are truncated at the tip.

This species resembles *P. babu* in general appearance but is somewhat larger and yellower. The wing is easily distinguished from that of *P. babu* by the great length of the anterior branch of the second longitudinal vein. *P. himalayensis* frequently occurs together with *P. major*, just as *P. babu* does with *P. argentipes*.

Distribution.—The Himalayas between 4,000 and 7,000 feet. I have examined specimens from Naini Tal and Bowali in Kumaon (*A. D. Imms*, *R. E. Lloyd*) and Kurseong (Darjiling district). It is apparently common in both districts in May, June and July.

Phlebotomus papatasi, Scopoli. (Pl. iv, fig. 4, wing, and pl. vi, fig. 2, male genitalia.)

P. papatasi, *Grassi, Mem. d. soc. ital. d. Sci.* (iii), xiv, p. 353 (1907).
Phlebotomus *sp.* (♂ genitalia), *Howlett*, in Maxwell-Lefroy's *Indian Insect Life*, p. 560, fig. 359 (1909).
? P. angustipennis, *Meijere, Tijdschr. v. Ent.*, vol. lii, p. 202, pl. 12, fig. 14 (1909).

Size and proportions.—Total length 2·5 mm. Length of wing 2·25 mm.; greatest breadth 0·4 mm. Hind leg more than twice as long as thorax and abdomen; the femur a little less than ¾ the length of the tibia, which is nearly twice the length of the first joint of the tarsus; the first joint of the tarsus in the anterior legs distinctly shorter than the remaining joints together.

Colour pale yellowish grey.

Head.—Rostrum somewhat slender. Antennæ normal; the basal joint slender, the second joint of the scape subspherical, with a circle of scales and two of flattened hairs.

Palpi with (?) five joints; the basal joint indistinct, the second, third and fifth subequal, each longer than the fourth.

Thorax and *abdomen* offering no apparent peculiarities.

Wings narrow, pointed, with the posterior border markedly more arched than the anterior. The anterior branch of the second longitudinal vein much shorter than the second branch; the former longer than the distance between the two forks, shorter than that between the posterior fork and the mid cross-vein; the posterior fork slightly nearer the base of the wing than the fork of the fourth longitudinal.

Genitalia.—(♀) The superior and inferior appendages short, subequal. (♂) Inferior appendages slender, shorter than the basal joint of the superior appendages, bearing about six short chitinous spines at the tip. Intermediate appendages with three lobes, the proximal lobe slender, curved, filiform ; the middle lobe longer than either of the other two, slender, arched, with a fringe of hairs on the concave posterior margin ; the distal lobe concave above, pointed, clothed with fine hairs. The superior appendage with the distal joint rather longer than the proximal one, bearing five short, blunt chætæ, three at the tip (the middle one being shorter than that at either side of it) and two, one nearer the base than the other, on the middle part of the joint. The intromittent organ very short, pointed, the genital filaments well developed.

By the kindness of Dr. J. H. Ashworth, I have been able to compare Indian specimens with specimens from S. Europe (see *Nature*, vol. 81, p. 518, 1909).

Meijere's *P. angustipennis*, so far as is shown by his figure of the wing and his brief description, only differs from *P. papatasi* as regards the outline of the posterior border of the wing and the longitudinal vein adjacent to it. In some species (*e.g.*, *P. babu*) this is a variable character.[1]

Distribution.—Southern Europe and Northern India (plains) ; ? N. Africa. I have seen a number of specimens from Rawalpindi (collected by Mr. C. W. Mason in September) and a single male from Pusa, Bihar, Northern Bengal (*Howlett*). The Rawalpindi specimens were accompanied by specimens of *P. babu* and were for the most part infected by a parasitic fungus.

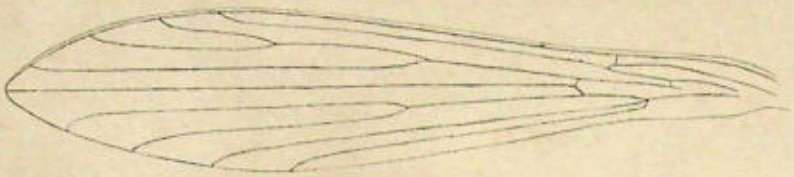
The importance of this species from a medical point of view is expounded in Doerr, Franz and Taussig's *Das Pappatacifieber* (1909).

[1] It would perhaps be more correct to say that this part of the wing is peculiarly liable to distortion in preserved specimens. A comparison of the different figures of the wing of *P. papatasi* that have been published proves very considerable apparent variation in this respect.

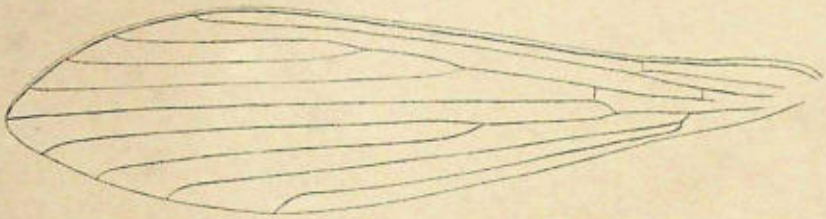
EXPLANATION OF PLATE IV.

WINGS OF INDIAN PHLEBOTOMI.

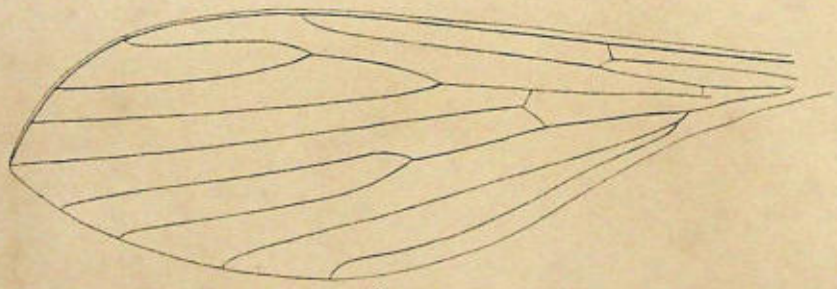
FIG. 1.—*Phlebotomus babu.*
,, 2.— ,, *himalayensis.*
,, 3.— ,, *argentipes.*
,, 4.— ,, *papatasi* (Rawalpindi).



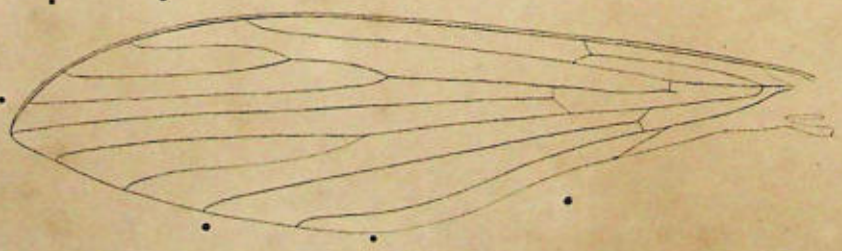
1 × 65.



2 × 65.



3 × 72.

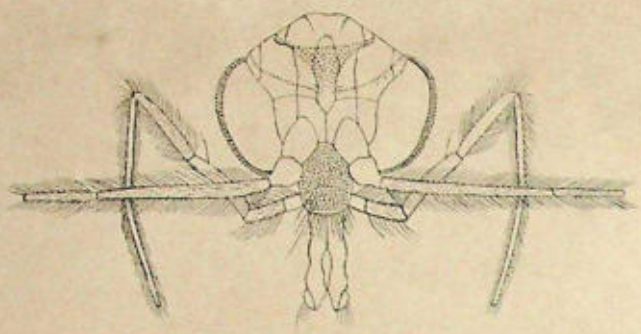


4 × 50.

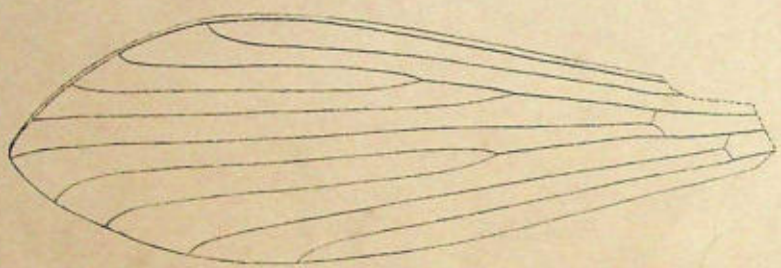
EXPLANATION OF PLATE V.

WINGS AND HEAD OF INDIAN PHLEBOTOMI.

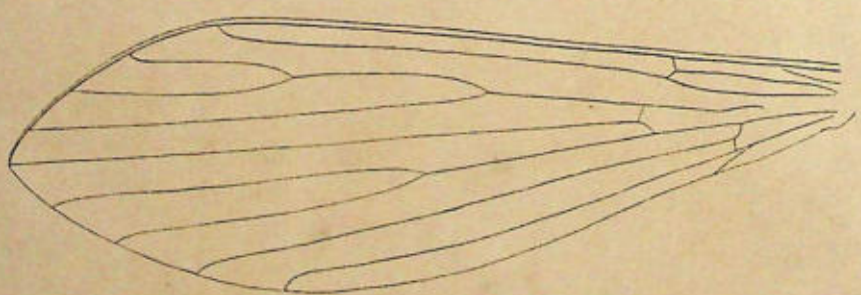
FIG. 1.—Head of *Phlebotomus malabaricus*, from in front
,, 2.—Wing of ,, ,,
,, 3.— ,, ,, ,, *perturbans*.
,, 4.— ,, ,, ,, *major*.



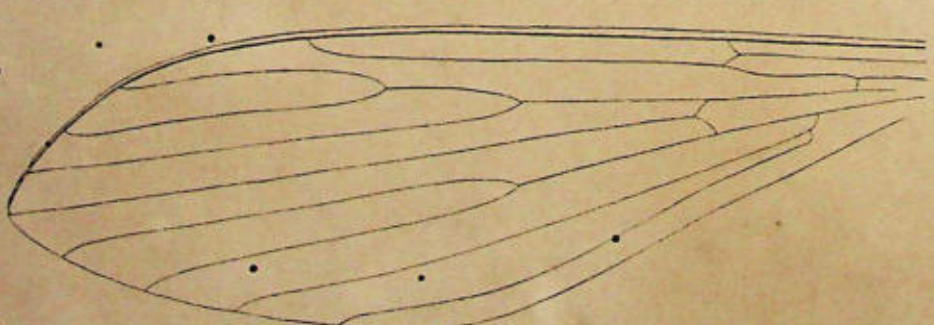
1×75.



2×62.



3×63.



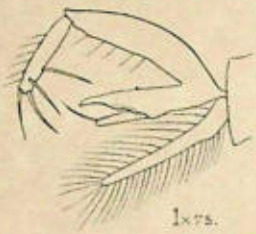
4×56.

EXPLANATION OF PLATE VI.

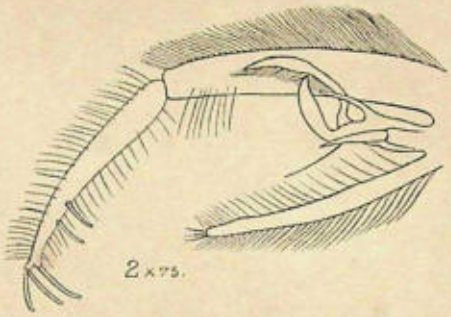
EXTERNAL MALE GENITALIA OF INDIAN PHLEBOTOMI.

(The sub-genital lamella is omitted in all the figures and the appendages have been denuded of fine hairs.)

FIG. 1.—Male genitalia of *Phlebotomus malabaricus.*
,, 2.— ,, ,, ,, ,, *papatasi.*
,, 3.— ,, ,, ,, ,, *babu* (chætæ removed).
,, 3*a*.— ,, ,, ,, ,, ,, (extremity of distal joint, showing the base of the chætæ).
,, 4.— ,, ,, ,, ,, *major.*
,, 5, 5*a*, 5*b*.— ,, ,, ,, *perturbans.*
,, 6.— ,, ,, ,, ,, *argentipes.*
,, 7.— ,, ,, ,, ,, *himalayensis.*

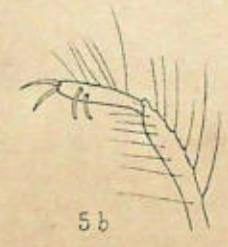


1×75.

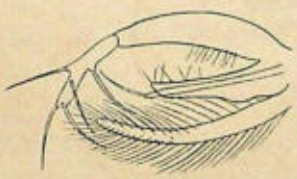


2×75.

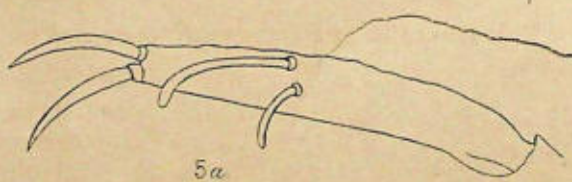
3a×380.



5b

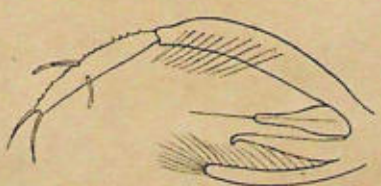


4×75.

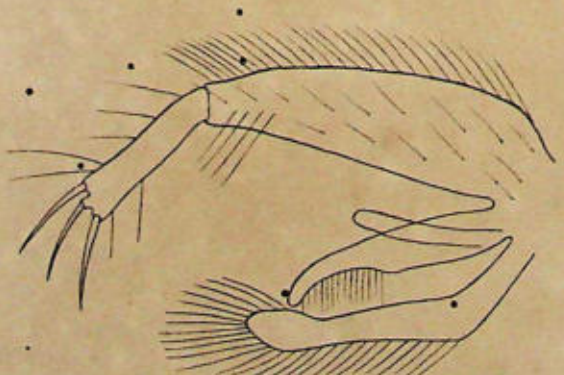


5a

6×75.



5×75



7×240.

3×240.

III. TAXONOMIC VALUES IN CULICIDÆ.

By E. BRUNETTI.

Since the connection between mosquitoes and malaria was definitely established a few years ago, numerous writers (medical, anatomical, biological, economical and so on,—practically everything but dipterological) have appeared, probably attracted by the economic aspect of the question. It is to be regretted that hardly any of these have possessed any general entomological knowledge, and the natural consequence has arisen; the differences between the various forms have been so grossly exaggerated taxonomically that a few years more progress at the same rate might see the Culicidæ elevated to the rank of a Sub-kingdom, with classes, subclasses, orders and so on. The absurdity of even the present state of things is so self-evident to everyone with a general knowledge of Diptera combined with some acquaintance with taxonomic values in other orders also, that a serious protest seems imperative.

The critical observations contained herein are not intended as any attack on what our American contemporaries amiably designate "mosquito sharps," but as a real and earnest protest against the utter disregard to zoological value and stability exhibited in the creation, on characters often of quite minor importance, of hosts of new "genera" and even "sub-families," to say nothing of species, the latter being a point on which opinion may for the present be reserved.

Prof. Williston is, so far as I am aware, the only systematic dipterologist to endeavour to stem the tide of irresponsible additions to the literature of this order,[1] but apparently with little success, and it seems incumbent on me to support dipterological opinion, having associated myself, at least clerically, with the Culicidæ of the Orient.

His most instructive paper should be carefully read by all, because the whole subject is presented with the greatest moderation yet with absolute conciseness, in spite of the present condition of things in this family being calculated to cause considerable irritation to the systematist.

To quote a few of his more pertinent observations, it is important that of the present-day writers on mosquitoes nearly all are non-dipterologists, "some indeed, whose only papers on entomology have been those proposing new subfamilies!"

"Their ignorance of related Diptera has more than once been deplorably shown by writers on the Culicidæ" and he observes "no one is competent to discuss philosophically the classification of any group of animal life, who is not well grounded in the principles of taxonomy as applied to related animals," for "the mosquitoes

[1] "The Classification of the *Culicidæ*," Can. Ent., xxxviii, 384.

are not organisms isolated from all other living creatures," though it would appear as if recent-day writers thought so.

Regarding the erection of new sub-families, the writer (who must be regarded as certainly one of America's leading dipterologists) is naturally even more severe. "Think of it, a subfamily distinguished ultimately by 'broad' or 'narrow' wing-scales" and he regards, justly with dismay, that character or its equivalent being used singly as a sub-family character in other families. He therefore rejects, naturally enough, such divisions, mentioning the case of the *Heptaphlebomyinæ*, erected on the bare character of the presence of scales on the 7th vein in the wing! He also declines to separate *Corethra* from Culicidæ, and is disposed to include *Dixa* also in the family.

Messrs. Dyar and Knab, in a general criticism of the too hasty erection of genera on unstable or weak characters,[1] say, referring to the construction of genera on secondary sexual characters. "While the separation of genera on such characters may have been allowable (for even yet, many systematists found genera on secondary sexual characters) their elevation to higher groups and sub-families, as has been done by Theobald and his followers, is indefensible. We are unaware of any other case where authors have presumed to found sub-families on secondary sexual characters in normal bisexual animals. * * * As the characters have really no fundamental importance whatever, it is not surprising to find that they tend to insensibly intergrade."

Nevertheless, these workers in Culicidæ propose (Can. Ent., xxxix, 47) a system of classification by which they divide the family into two parts, the *Culicini* and the *Sabethini*; but, whilst rejecting the use of the length of the palpi as a means of primarily dividing the genera, they adopt other characters which seem to have considerably less value still; namely the presence or absence of setæ on the metanotum, the presence or absence of a ventral brush on the anal segment of the larva, and the number of setæ in a microscopic structure in the form of a comb or "scraper" situated at the end of the tibia!

They, however, sink a number of the recently established genera, including several of their own, as synonymic with some of the older ones, and this fact might have been hailed with satisfaction as possibly the beginning of a return to a more rational view of the members of this family.

Thus, to deal with Oriental genera only, they absorb *Myzomyia*, Blanch., and *Cellia*, Theob., in *Anopheles*, Mg.; *Theobaldinella*, Blanch., in *Culiseta*, Felt; *Grabhamia*, Theob., in *Howardina*, Theob., and *Culicada*, Felt, in *Ædes*, Mg., *Melanoconion*, Theob., in *Culex*, *Dendromyia*, Theob., in *Wyeomyia*, Theob.

Their suggested synonymy has, however, not been adopted by subsequent authors.

---

1 "Notes on mosquito work," Can. Ent., xl, 309 (1908).

Whilst it is not proposed that the palpi are inviolable characters on which to form higher groups, they are generally considered of much taxonomic importance generically throughout the order, and are, apparently, from a systematic point of view, equal to the best other characters available in Culicidæ, if used with moderation and if the number of genera is kept within reasonable limits. The *Tipulidæ* are often divided into the *Longipalpi* and *Brevipalpi*, these divisions being considered by the late Osten Sacken (one of the soundest dipterologists and the highest authority on Tipulidæ) as of supra-sub-family rank. It is true that Loew (whom I consider actually the greatest dipterologist the world has yet seen) noted that the classification is not entirely a natural one, but even if regarded in this family as of partly artificial character it is tolerably consistent.

Moreover, the two sub-families (families, according to the recent Catalogues, with which I cannot agree) *Tipulinæ* and *Ptychopterinæ*, embraced by the *Longipalpi*, certainly *are* natural divisions; and the several sections or groups (sub-families according to some) of the *Brevipalpi*, comprising what I regard as the *Limnobiinæ* sub-family, are also tolerably well-marked divisions. An exception or two does not invalidate the use of a character, and the failure of the palpi to satisfy those desiring very distinct limits to their "genera" shows on what uncertain ground such "genera" stand.

"All the sub-families of the *Culicidæ* recognised by the Theobaldian school are untenable, including the *Anophelinæ*," say Messrs. Dyer and Knab, and to this view at least the present writer can cheerfully accord his assent.

Lutz[1] even invents terms for already established divisions, such as his *Euculicidæ* and *Culicimorphæ*, corresponding respectively to the old groups of *Culicinæ* and *Corethrinæ*.

Moreover, the adoption of a term ending in '*dæ*' is wholly inadmissible for any rank except that of a true family.

He further subdivides into *Asiphonatæ* and *Siphonatæ*[2] according to the absence or presence of a respiratory siphon in the larva; with still further sections and subsections, each with a special name, all of which seems unnecessarily encumbering the science with multitudes of new names to little purpose. Such groups and sections are sufficiently designated by mere letters or figures in a preliminary analytical table of genera.

Criticising Miss E. G. Mitchell's paper on "The classification of the *Culicidæ*" (Can. Ent., xxxix, 198) I can only repeat that she adopts the same erroneous line of thought common to all specialists in the family, that is, the over-valuation of minor characters. As a matter of personal opinion I fail to see sufficient justification for any further subdivision of the family than the *Culicinæ* and

[1] "Mosquitos do Brasil" (Bourroul).

[2] Already practically preoccupied in Lamellibranchiata by the *Asiphoniata* and *Siphoniata*.

Corethrinæ; but in my compilatory work, the *Anophelinæ* and *Ædeomyinæ* were accorded sub-family rank, merely in deference to specialists (as was distinctly stated in my reply to Messrs. Dyer and Knab's criticism of my Oriental Catalogue, Can. Ent., xli, 121).

These groups were presumably differentiated as follows: *Anophelinæ*, palpi long in ♂ and ♀; *Culicinæ*, palpi long in ♂ short in ♀; *Ædeomyinæ*, palpi short in ♂ and ♀; *Corethrinæ*, proboscis short and not formed for biting, which separates this sub-family from the other three.

No doubt the genera of intermediate nature efface the dividing lines between these sub-families, which only supports the plea that no true separation exists except between the *Culicinæ* and *Corethrinæ*. Miss Mitchell echoes writers on mosquitoes only, in asking "why should the *Corethridæ* be placed in *Culicidæ*," and in referring to both groups as "heterogeneous elements."

Replying to this it may be remarked that *Corethra, to the systematic dipterologist, has always been in Culicidæ*, where, I maintain, it must most certainly still remain, as in its natural affinity. To compare it with *Simulium* is quite wrong, the two genera having nothing in common. Most of the workers in mosquitoes forget that venation is one of the soundest characters in classification, and that *Corethra* has a venation identical with *Culex*.

The absence in the former genus of the stiff proboscis formed for piercing, characteristic of the *Culicinæ*, does not necessitate the elimination of the genus from Culicidæ.

Stomoxys and its allies have a stiff piercing proboscis, yet they have been admitted till recently merely as a group of genera in the sub-family *Muscinæ*. In Girschner's rearrangement of groups in Muscidæ *s. lato* the *Muscinæ* sub-family is suppressed but *Stomoxys*, etc., are none the less afforded generic rank only, and incidentally it may be noted that with this new sequence of genera in Muscidæ I cannot possibly agree. *Drymeia* has also a stiff proboscis, yet is merely an exceptionally structured genus of Anthomyidæ.

Other genera in other families could also be cited.

The methods of depositing the eggs, the anatomy of the stomach, the minor characters of the larvæ, and in fact, all the features emphasized by Miss Mitchell, would be regarded by systematic dipterologists as subservient to, for instance, venation, and any bodily structure in the adult of a much higher nature than the variation of organs known to be subject to the greatest differentiations.

To borrow again from Williston's article, "The three or four new families that have been proposed in recent years; all of them with more distinctive characters than the *Corethrinæ* possess, have been unanimously rejected by dipterologists."

Besides, many of the points urged by Miss Mitchell are flatly denied shortly afterwards by Mr. F. Knab, in the same Journal (Can. Ent., xxxix, 349).

Mr. Knab's reply to Miss Mitchell's article calls for little comment here as it mainly consists of refutations or doubts of

the statements made by the latter author concerning the life history of various Culicidæ as compared with species of Chironomidæ, Psychodidæ and *Dixa*. As I am personally unacquainted with the earlier stages of any of these genera, it would be presumption to decide "when doctors disagree," but I have seen no reply to Mr. Knab on the subject, and his facts appear well founded.

Regarding *Dixa*, it has always been regarded as somewhat abnormal; to me personally it appears intermediate between Tipulidæ and Culicidæ.

The excuse for the erection of such a number of new genera, and the splitting up of the Culicidæ into several sub-families, is usually the unwieldiness of the genera, which otherwise would contain such a large number of species in each.

As it is well known to be a common thing for students to determine the species first, and discover its genus afterwards, the instability of most of the genera is surely emphasized, as the present writer never heard of this method of determination being followed in any other group.

Moreover it is entirely wrong, scientifically, to consider that the presence of a large number of species in any genus is sufficient justification for dividing it into several others and according them equal value. A genus, as Prof. Williston truthfully says, should be something more than a second name for a species, or a cognomen established for convenience' sake only. "A genus is a concept" is written in the late Baron Osten Sacken's handwriting, inside the covers of his hand-copy of Aldrich's Catalogue of North American Diptera (now in the possession of the Indian Museum), and it should have a real zoological value and significance; all genera throughout the animal kingdom being theoretically more or less on the same plane of systematic value. Personally, I object to all classification which is not as nearly as possible a natural one, and purely artificial groups should at the very outside attain only the rank of subgenera.[1]

The plea of the unwieldiness of extensive genera cannot be upheld, as the systematist is quite accustomed to such genera. In the first five volumes of the Catalogue of Diptera now in process of publication by Prof. Kertesz, are to be found numerous such genera, with approximately the following number of species each: *Mycetophila* 190, *Sciara* 460, *Chironomus* 320, *Culex* 182 (up to 1920), *Cecidomyia* 180, *Dasyneura* 160, *Tipula* 310, *Odontomyia* 160, *Chrysops* 150, *Pangonia* 180, *Anthrax* 460, *Exoprosopa* 230, *Bombylius* 240, *Asilus* 260, *Promachus* 150, *Laphria* 230, in addition to nearly twenty others with a little over or a little under 100 species in each; the whole triumphantly capped by the gigantic genus

[1] An objection to "preliminary descriptions," often of a few lines or words only, may suitably be here recorded. It seems doubtful whether priority can justly be claimed in such cases, the full descriptions being often long delayed; though I recognise the awkwardness of the situation in deciding whether a "preliminary" description is of sufficient length to stand good or not.

Tabanus with 912, a genus in which over and over again abortive attempts have been made to dismember it successfully.

The real cause of the undue inflation into genera of what should be merely groups of species, and the elevation of a few of such so-called genera into sub-family rank is the general absence of knowledge of the other families in Diptera in the present-day writers on Culicidæ. Williston has already been quoted on this subject.

Therefore, in his remark that "triviality has reached its limits" (referring to the slender characters on which so many genera have in recent years been established), I cannot but entirely concur: this without any individual reproach to workers in mosquitoes, many of whom have been most courteous to me personally.

It is almost certain that a wider knowledge of the accepted zoological value of such terms as "family," "sub-family," "genus," etc., would convince them of the grossly exaggerated value attributed by them to what the systematic dipterologist would term quite secondary characters.

In short, if any culicidologist would have the patience, before making new genera and sub-families, to read up some of the systematic dipterological literature of the last 60 or 80 years, more especially the tables of genera in the various families of Diptera, contained in Schiner's Fauna Austriaca (than which no better standard work on the order has ever been issued)[1] he would find the greatest varieties of forms, not only in antennæ, palpi, genital organs, exterior covering (whether scales, hairs, bristles, spines or otherwise), proportionate parts of the body and so on, but in venation also; all this in the same family, yet in spite of the hundreds of new species erected yearly, all attempts to create new families and sub-families on slender characters meet with strenuous opposition.

It may be remarked here, although the subject will be treated more fully in the forthcoming Supplement to my Catalogue, that recent writers on this family appear to depart deliberately from biological precedence in the methods of presenting the results of their studies to others, with the result that the consultation of their writings is unnecessarily rendered materially more difficult. This is chiefly in their method of quoting from other authors; in the indices, and the undue prominence given to the ♀.

In the present paper however the only object has been to call attention to the instability of the great bulk of the generic and higher divisions recently proposed in this family.

---

[1] The examination of these tables alone forms, perhaps, the most comprehensive yet concise method of obtaining a rapid insight into the principles of classification in this order. They may be with advantage supplemented by the equivalent tables relating to North American genera, contained in Prof. Williston's admirable manual "North American Diptera," 2nd Ed.

IV. REVISION OF THE ORIENTAL BLOOD-SUCKING MUSCIDÆ (*STOMOXINÆ*, *PHILÆMATOMYIA*, Aust., AND *PRISTIRHYNCHOMYIA*, gen. nov.).

By E. Brunetti.

In the present paper, sixteen species are regarded as probably distinct, belonging to the group *Stomoxinæ*. I have also established a new genus *Pristirhynchomyia*, with one species, allied to Mr. Austen's recently created genus *Philæmatomyia*.

These latter two genera certainly belong to the group of genera immediately approximate to *Musca*, whatever this group may be called. The arrangement of genera in Muscidæ in the 3rd volume of the Palæarctic Catalogue contains several associations with which I can hardly concur; especially the placing of the genus *Musca* itself in Anthomyidæ, and the abolition of Oestridæ as a family.

Two genera not yet found in the Orient are included amongst these descriptions, that they may be recognised should they occur here.

One (*Hæmatobosca*, Bezzi) is European, and may occur in the Himalayas or in North-West India; the other (*Stygeromyia*, Aust.) is African, and might easily be imported through the agency of cattle traffic.

That the species are generally closely related to each other is easily realised by the number of synonyms even amongst the few European species. *Stomoxys calcitrans*, L., has been described seventeen or eighteen times, *Hæmatobia stimulans*, Mg., possessing six synonyms and *Lyperosia irritans*, L., a comparatively uncommon species, two.

I have little doubt of the specific distinctness of all the forms described in this paper, with the exception of the genus *Stomoxys*, of which a considerable amount of further study seems imperative.

At times it has even occurred to me that all the so-called species from the East could almost be comprised under three typical forms, which may be termed *calcitrans*, L., *indica*, Picard, and a species with a distinctively formed fore tarsus in the ♂ (the only sex known)—*pulla*, Aust.

For this reason I cannot feel satisfied with the table of species in *Stomoxys*, and in this genus the present article must be regarded as more preparatory than conclusive.

It may be noted here that some confusion may possibly arise, and erroneous deductions arrived at by a misunderstanding, as to whether the width of the frons is measured across the vertex or across the middle.

Mr. Austen, in his paper dealing with these genera measures along the vertex, but I have always adopted the second course, taking its average width, ignoring the widening at the vertex and towards the frontal triangle; or in other words I have regarded its width as the distance between two perpendicular lines drawn so as to touch the greatest length of eye margins.

My thanks are due to Prof. Bezzi for some valuable notes on *Lyperosia* and *Hæmatobosca* and especially to Mr. E. E. Austen for information, respecting *Lyperosia minuta* and *L. exigua*, enabling me to avoid describing both species again as new. The former I knew only from four specimens (African) in indifferent condition; the latter from the description only, in which, be it noted, no mention is made of the conspicuous long hairs on the hind tarsi in the ♂. As my descriptions of both species have been drawn up from a good series of both sexes of each species, I allow them to remain as redescriptions of *minuta* and *exigua*; the original descriptions of these two species not always being accessible.

In connection with studies on this group, the following papers may be consulted:—

1. E. E. Austen. A monograph of the Tsetse flies (*Glossina*). London, British Museum (1903).
2. K. Grünberg. "Uber blutsaugende Musciden," Zoologischer Anzeiger, xxx, 78 (1906).
3. M. Bezzi. "Die Gattungen der blutsaugenden Musciden," Zeits. Hymen. v. Dipt., 1907, p. 413.
4. M. Bezzi. "Mosche ematofaghe," Rend. Istit. lomb. di sci. e lett., 1907, p. 433.
5. E. E. Austen. "New genera and species of blood-sucking Muscidæ from the Ethiopian and Oriental Regions, in the British Museum," Ann. Mag. Nat. Hist. (8), iii, 285 (1909).
6. E. E. Austen. Illustrations of African blood-sucking flies, other than mosquitoes and tsetse flies. London, British Museum (1909).

Table of genera in STOMOXINÆ.

A Arista plumose above and below.

1. 1st and 3rd longitudinal veins at base bare.
   Apical part of 4th vein quite straight.
   1st posterior cell rather narrowly open.
   Body generally more slender (*Lyperosia*-like).
   Palpi comparatively less spatulute.
   Arista with comparatively fewer hairs below *Hæmatobosca*,[1] Bezzi.

[1] Not yet recorded from the Orient, but occurs in Italy.

2. 1st and 3rd longitudinal veins at base bare.
Apical part of 4th vein not straight, but less curved than in *Hæmatobia*.
1st posterior cell broadly open.
Body generally stouter (*Stomoxys*-like).
Palpi comparatively more spatulate at tips.
Arista with comparatively more hairs below, *Bdellolarynx*, Aust.

3. 1st and 3rd longitudinal veins with a few minute bristles at their bases.
Apical part of 4th vein much curved (as in *Stomoxys*).
1st posterior cell broadly open.
Body generally stouter (*Stomoxys*-like).
Palpi comparatively less spatulate at tips.
Arista with comparatively less hairs below, *Hæmatobia*, Rob. Desv.

AA Arista plumose above only.
B Palpi much shorter than proboscis.
(3rd longitudinal vein bristly at base) *Stomoxys*, Geoff.

BB Palpi always approximately as long as proboscis.
C Apical part of 4th vein quite straight.
3rd longitudinal vein with minute bristles at base.
1st posterior cell rather narrowly open.
Proboscis not tapering; palpi clavate at tips.
Body chiefly *Stomoxys*-like.
Sternopleural bristles black, *Stygeromyia*,[1] Aust.

CC Apical part of 4th vein with distinct curve, as in *Stomoxys* and *Hæmatobia*.
3rd longitudinal vein at base bare.
1st posterior cell rather broadly open.
Proboscis gently tapering from base to tip; palpi not clavate at tips.
Sternopleural bristles distinctly yellow, *Lyperosia*, Rond.

HÆMATOBOSCA, Bezzi, 1907.

Zeits. Hym. Dipt., 414.

This genus may be characterised thus: Body more slender than in *Hæmatobia*; palpi as long as proboscis; arista with some hairs below; 3rd longitudinal vein bare at base; 4th, as a whole, considerably curved (in comparison with that of *Lyperosia*); 1st posterior cell rather narrowly open.

I add a description of this genus to my paper, although it is not yet known from the East, because it may easily occur in the northern part of India.

[1] Not yet recorded from the Orient, but occurs in Arabia.

The typical (and only) species is *atripalpis*, Bezzi, Bull. So. Ent. Ital., xxvii, 60 (1895) (*Hæmatobia*), described from Italy.

Austen's recently erected genus *Bdellolarynx* is very closely allied.

BDELLOLARYNX, Austen, 1909.

Ann. Mag. Nat. Hist. (8), iii, 290.

"Small, stoutly built, thick-set flies, closely allied to *Hæmatobia*, R. D., but distinguishable as follows :—No sexual colour-dimorphism (unless it be in wings); front, facial angles, and anterior margin of buccal cavity less prominent; jowls descending considerably behind, instead of nearly horizontal, but basi-occipital region much less protuberant; bristles below facial angles small and fine, instead of relatively coarse; in ♂ front wider with upper inner margins of eyes more nearly parallel, less approximate in middle of front; arista feathered above with considerably longer hairs, and below with about six fairly long hairs; 1st and 3rd longitudinal veins entirely bare, without bristles at base." The chætotaxy is as follows: Humeral bristles 2; post-humeral 1; notopleural 2; præsutural 1; supra-alar 1; intra-alar 1; post-alar 2; dorso-central 5 (2 in front of and 3 behind suture, may be difficult to distinguish, especially in ♀); inner dorso-central 1 (sometimes 2 in ♂); scutellar 4 (1 præbasal, 1 basal, 1 discal, situated close to lateral margin, 1 apical); mesopleural about 10 or 12; sternopleural 1 : 1.

"*Bdellolarynx* is distinguished from *Hæmatobosca*, Bezzi, by the palpi being much more spatulate at the tips, by the arista having a greater number of hairs below, and, in the wing, by the shape of the 1st posterior cell and the course of the terminal portion of the 4th longitudinal vein (in *Hæmatobosca* the latter details are the same as in *Stygeromyia*, Aust.). Typical species, *B. sanguinolentus*, sp. nov."

Bdellolarynx sanguinolentus, Aust., 1909.

Loc. cit., 290.

♂ ♀. India, Ceylon, Assam. Long. ♂ $4\frac{3}{4}$-5 mm.; ♀ $3\frac{1}{2}$-$4\frac{1}{4}$ mm.

"Mouse-grey or slate-grey, clothed with short black hair, bristles also black; palpi buff; dorsum of thorax with a pair of extremely narrow, widely separated, parallel, longitudinal ad-median blackish stripes, a somewhat triangular blackish mark extending backwards from inner end of each humeral callus, and an elongate blackish streak in a line with latter mark behind transverse suture (two outer marks less distinct in ♀); dorsum of abdomen with a narrow, interrupted, longitudinal, median, clove-brown stripe, and, on 2nd and 3rd segments, paired transverse, roughly triangular, clove-brown blotches, the pair on 2nd segment especially large. Wings hyaline or tinged with tawny olive in ♂, hyaline in ♀; femora greyish clove-brown, extreme tips ochraceous

buff, one or more pairs sometimes more or less brownish except at base, tarsi dark brown."

Types in the British Museum; ♂ captured by me at Calcutta, 8-ii-09; ♀ from Mussoorie, ix-06 [*Howlett*]. Other specimens in the British Museum from Allahabad, 6-x-05 [*Howlett*]; Sylhet, 13-iv-05 [*Hall*]; and Henaratgova and Haldumulla (both Ceylon), 7-ii and 14-vi-92 respectively [*Yerbury*]. In the Indian Museum are 3 ♂♂ from Tharbani, Nepal, 27-ii-08; and from the base of the Dawna Hills, Lower Burma, 2-iii-08 [*Annandale*]; 3♂♂ from Bandra (Bombay Presidency) "hovering in slaughter house," 28-xi-09 [*Hodgart*]; and one ♀ from Maddathorai (base of Western Ghats, Travancore, 17-xi-08 [*Annandale*]. I have a ♂ in my own collection taken by me in Calcutta, 18-ii-05. Both Dr. Annandale and the Museum Collector Mr. Hodgart have noticed the apparent habit in the males of this species of hovering, an unusual practice of the members of this subfamily, although I have occasionally noticed it in *Stomoxys calcitrans*.

N.B.—Although the specimen forming the type of this genus was taken by me I was unaware of its generic difference from *Stomoxys* at the time of capture.

HÆMATOBIA, Rob. Desv., 1830.

Essai sur les Myod., 388.

Original description.—"Palpi elongati, ultra epistoma porrecti, interdum apice dilatati; apud quasdam species, tarsi postici externè serrati."

This genus was first split off from *Stomoxys* by Robineau Desvoidy for those species in which the palpi are as long as the proboscis, in contradistinction to *calcitrans* with its very short slender palpi. The author added that the palpi are sometimes a little dilated at the tip, and that in some species the hind tarsi ("tarses posterieurs") were serrated. He only included four species, all from France. Of these, two (*ferox* and *geniculata*) are synonymous with *stimulans*, Mg., and another (*serrata*) is synonymous with *irritans*, L., a species for which Rondani erected the genus *Lyperosia*. The remaining species, *tibialis*, still stands good as distinct and remains in *Hæmatobia*.

From the more restricted point of view, the characters of *Hæmatobia* are: (1) the presence of minute but distinct (though easily broken off) bristles at the base of both the 1st and 3rd longitudinal veins, this being the only genus in which these bristles appear on the 1st longitudinal vein; (2) the arista being plumose below as well as above; (3) the palpi, which are practically as long as the proboscis; (4) the well-curved apical part of the 4th longitudinal vein (as in *Stomoxys*, to which genus the present species bear considerable resemblance in size and shape); (5) the broadly open 1st posterior cell. Lesser characters may be gleaned from my table of genera.

Table of Oriental species.

Legs all black, except base of tibiæ pale	*sanguisugens*, Aust., ♂.
Posterior femora wholly pale ..	*rufipes*, sp. nov., ♀.

Hæmatobia sanguisugens, Aust., 1909.

Ann. Mag. Nat. Hist. (8), iii, 288.

♂. Himalayas. Long. 5½-6 mm.

"Olivaceous-grey, or brownish grey, with clove-brown markings; dorsum of thorax with 2 pairs of clove-brown longitudinal stripes (outer stripes broader and widely interrupted at transverse suture), and a less sharply defined median stripe; dorsum of abdomen with a clove-brown median longitudinal stripe, extending from front margin of 2nd to beyond middle of 4th segment, narrowly interrupted before hind margins of 2nd and 3rd segments, a pair of transversely elongate dusky blotches on 1st segment, a pair of large clove-brown spots on 2nd segment and a pair of similar but smaller spots on 3rd segment; wings slightly infuscated, light sepia coloured; legs clove-brown, bases of tibiæ ochraceous-buff."

The types of this species are in the British Museum taken at Kasauli, Punjab (W. Himalayas), "on cows" [*Lt.-Col. F. Wyville Thomson*]. "The flies sucked the animals, and their abdomens became distended with blood. I have never noticed them biting man." Mr. Austen compares his species to the European *H. stimulans* of Meigen, distinguishing it by "its usually somewhat smaller size (average length of 6 ♂♂, 5·75 mm.), by the median dark dorsal stripe on the abdomen being practically continuous throughout its extent instead of widely interrupted before reaching the hind margins of the 2nd and 3rd segments, by the 4th abdominal segment in the ♂ being always without a pair of dorsal spots, and by the 1st longitudinal vein being either entirely bare or having at most one or two minute bristles, instead of a row of bristles conspicuous under a strong lens when viewed at a low angle from the direction of the hind margin of the wing."

N.B.—One ♂ in the Indian Museum, taken 10-viii-09 by Mr. Paiva at Darjiling (7,000 ft.), agrees almost perfectly with Mr. Austen's description. Incidentally, I may note that, previous to reading of his species, I had marked this specimen as a variety of *stimulans*. Mr. Austen however mentions six specimens that show consistency in the markings. The lesser size I do not value as a specific character as I have noticed that Oriental specimens of very common European species appear to be generally undersized. The intrinsic value of the minute spines on the bases of the 1st and 3rd longitudinal veins, when present, is also, to my thinking, much less than some writers have considered it.

H. stimulans may quite possibly occur in Northern India; this species, if found, should be recognisable by the differences from *sanguisugens* given above.

Hæmatobia rufipes, mihi, sp. nov.

♀. Himalayas, Nepal. Long. 4-5 mm.

Head. Frons one-third width of head, yellowish grey, with a broad dull bare stripe. Ocellar triangle with two pairs of small bristles above and a pair of strong ones below.

Fronto-orbital bristles 9, the upper 4 placed rather out of the straight line, slightly irregularly, the lower 5 normal and well curved inwards.

Face whitish grey, with the usual bristles about the mouth. Antennæ blackish, arista with 7 long hairs above, and 5 below. Palpi reddish yellow, with black bristles, which are more numerous at the tip. Proboscis wholly shining black, slightly longer than palpi. Back of head grey, occipital orbit normally fringed with bristles.

Thorax. Dorsum yellowish brown, with a broad median grey stripe from anterior margin to beyond the middle; this stripe edged with a dark brown but not sharply-defined line. Towards the margin of the dorsum the colour is much browner. Humeri grey. The median grey stripe appears blackish, if viewed from behind. The whole of the sides of the thorax uniformly blackish grey, with minute sparse black pubescence. Scutellum brownish yellow, with minute pubescence, two strong spiny bristles towards each side. The two apical bristles are broken off, but appear to be strong. *Chætotaxy*. Humeral bristles 3 (one or more sometimes weaker); post-humeral 1; præsutural 1; noto-pleural 2; supra-alar 2; intra-alar 1; post-alar 1; meso-pleural 10, the uppermost placed just below the hindermost noto-pleural; sterno-pleural 1: 1. The dorso-central bristles not very conspicuous, apparently 1 before, 3 or 4 behind suture and a hindermost very strong one.

Abdomen. Yellowish grey; a narrow median black stripe; each segment mainly occupied by a pair of large blackish spots of irregular shape. Whole dorsum covered with soft hairs. Belly grey.

Legs. Reddish yellow. Fore femora (except extreme tips), tips of hind femora, and the tarsi, blackish. Fore femora with rows of long stiff hairs on outer and lower sides; middle femora with 2 curved hairs above, at tip; hind femora with a few longish hairs above at tip, one below. Middle tibiæ with 2 or 3 bristles at tip, hind tibiæ with one bristle behind, at tip. Legs minutely pubescent.

Wings clear, outer cross-vein nearly straight. Tegulæ yellowish; halteres yellow.

Described from 2 ♀♀ in the Indian Museum, Darjiling (6,000 ft.), 29-ix-08 [*Brunetti*, type]; and Noalpur, Nepal, 23-ii-08.

STOMOXYS, Geoff., 1764.

Hist. Des. Ins., ii, 538.

See also Sch. F. Aust. (Dipt.), i, 577 (1862).

The genus *Stomoxys*, Geoff., as understood by the older authors, and as described by Schiner, included both *stimulans*, Mg. (now referred to *Hæmatobia*), and *irritans*, L. (now placed in *Lyperosia*). Both these latter species were primarily split off from *Stomoxys*, under the name *Hæmatobia*, Rob. Desv., on the strength of the palpi being as long as the proboscis.

Some discussion has arisen as to whether the name *Stomoxys*, Geoff., or *Siphona*, Mg., should stand for the present genus. Two recent authorities,—Speiser (Zeits. f. wiss. Insek., i, 461) and Bezzi, both in his "Mosche ematofaghe" (Rend. Istit. lomb. (2), xl. 17) and in the 3rd volume of the new Palæarctic Catalogue,—have replaced *Stomoxys* by *Siphona*, Mg.

I am glad to see that Mr. Austen (Ann. Mag. Nat. Hist. (7), xix, 445) has deprecated the change, giving full and satisfactory reasons for supporting the continuance of the name *Stomoxys* for the present genus.

The following generic description is founded on that of Schiner, with the elimination of such characters as only apply to the more recently established genera, and the addition of other distinctive characters which appear to be, in the restricted sense of the genus, generically consistent.

STOMOXYS, Geoff.

(*Redescription.*)

Medium-sized, grey flies, one species (*calcitrans*) being one of the common "house flies."

Head semi-circular, somewhat flattened in front; epistome nearly straight, nearly bare; buccal cavity hardly prominent, with a row of strong spines each side; cheeks rather narrow, descending only a little below the eyes.

Front in ♂ narrow, in ♀ about one-third the width of the head, the exact dimensions in both sexes varying in different species, and (within narrow limits) sometimes in the same species. In both sexes a row of about 7 fronto-orbital bristles, which in the ♀ are augmented by smaller ones on the upper part of the frons placed nearer to the eyes. Eyes bare.

Antennæ recumbent, moderate in size, 1st joint very small, 2nd distinct, with a few short bristles, 3rd about three times the length of the 2nd. Arista plumose on upper side only, with about 8 to 10 long, well separated hairs of (after the first one or two) gradually decreasing length nearly to the tip, these hairs being very slightly curved, but seldom bisinuate. Proboscis horizontal, very prominent, of hard chitinous material, considerably thicker on basal part, narrowing gradually to tip; labella very small. Palpi

cylindrical, narrow, small, much shorter than proboscis, often inconspicuous through lying flat against the epistome.

Thorax a little longer than broad, of the average Muscid type, with macrochætæ,[1] and minute bristly hairs.

Abdomen ovato-conical, moderately arched, generally marked with infuscated spots, a dorsal stripe, or transverse darker bands. Legs of moderate size and length, minutely pubescent, with a few stronger bristles; inner side of middle tibiæ bare. Wings of the typical Muscid venation, resembling that of *Cyrtoneura stabulans*, F. (also a "common house fly"), except that the 4th longitudinal vein is bent upwards in a sharper curve after passing the inner transverse vein, thus leaving the 1st posterior cell rather broadly open; 3rd longitudinal vein with some distinct but minute bristles at its base.

The metamorphoses occur in decaying vegetable matter, horse-dung and similar substances. Both sexes in the adult suck blood, including, occasionally, that of man, but they are especially irritating to horses and cattle. The genus is probably world-wide, or at least wherever civilised man is found.

Table of Oriental species of STOMOXYS.

A	Fore tarsus normal.	
B	Abdominal segments without bands, but with two distinct (often ill-defined) spots on at least the 2nd and 3rd segments. Tibiæ pale at base only.	
C	Frons in ♂ $\frac{1}{4}$ width of head; in ♀ $\frac{1}{3}$.	
D	Thorax with 4 well-defined (but variable) stripes, never divided. Width of frons $\frac{1}{4}$ in ♂ $\frac{1}{3}$ in ♀	*calcitrans*, L., ♂ ♀.
DD	Thorax with 4 oblong large spots, each more or less divided. Width of frons (presumably) neither $\frac{1}{4}$ nor $\frac{1}{3}$ as sex is given as doubtful	*plurinotata*, Big.
CC	Frons in ♂ $\frac{1}{5}$ (♀ unknown). Tibiæ with basal half pale, middle pair apparently wholly so	*oblongopunctata*, sp. nov., ♂.

[1] The chætotaxy of *S. calcitrans* is fully described under the heading of that species rather than under that of *Stomoxys*, as I do not wish to suggest that that particular arrangement of bristles is necessarily generic, not being acquainted with the chætotaxy of species from other parts of the world, that is to say of species which must obviously remain in this genus. The chætotaxy of at any rate all the species I have seen is uniform.

CCC	Frons in ♂ ⅓ to ⅓ (? ♀ unknown).	
E	Frons shining white; abdominal marks as in *calcitrans* (? Oriental)	*sitiens*, Rond., ♂.
EE	Frons quite dark; 2nd, 3rd, and 4th abdominal segments each with two black marks in the shape of elongated triangles	*triangularis*, sp. nov., ♂.
BB	Abdominal segments with a distinct black band on, at least, hind margins.	
F	Frons comparatively wide, ⅓ to rather wider than ¼.	
G	Frons ⅓; tibiæ pale at base only; transverse dark band at base of 2nd and 3rd segments as well as on hind margins	*bengalensis*, Picard, ♂ ♀.
GG	Frons rather wider than ¼; anterior tibiæ and tarsi pale; no band at bases of segments; 2nd segment wholly clove-brown or nearly so (♀ unknown)	*pusilla*, Aust., ♂.
FF	Frons narrow, ⅓ to ⅓; tibiæ wholly pale brown ..	[1] *indica*, Picard, ♂ ♀.
AA	Fore tarsus in ♂ with 1st joint fringed on inside with a row of hairs of equal length (♀ unknown)	*pulla*, Aust., ♂.

N.B.—The above table of species is by no means satisfactory to me as sufficiently distinguishing them, but in the present uncertain knowledge as to the limits of each, it is the best that I can offer.

Stomoxys calcitrans, L., 1761.

Fauna Suec., Ed. ii, 467 (*Conops*).

N.B.—For the numerous descriptions of this species under the specific name *calcitrans*, see the recent Catalogue of Palæarctic Diptera, vol. iii, p. 611.

A list of the various synonyms of *calcitrans* is appended.

pungens,	DeGeer,	1776, Ins., vi, 78 (*Musca id.*).
tessellata,	F.,	1794. Ent. Sys., iv, 395.
id.,		1805. Syst. Antl., 281.

[1] As noted under the description of this species, I cannot specifically distinguish *limbata*, Austen, from *indica*, Picard.

aculeata,	Rob. Desv.,	1830,	Myod.,	386.
dira,	*id.*,		*id.*,	387.
infesta,	*id.*,		*id.*,	387.
inimica,	*id.*,		*id.*,	387.
pungens,	*id.*,		*id.*,	386.
sugillatrix,	*id.*,		*id.*,	386.
aurifacies,	*id.*,	1863. Hist. Nat. d. Dipt., ii,		607, ♀.
chrysocephala,	*id.*,		*id.*,	604.
claripennis,	*id.*,		*id.*,	604, ♂.
cunctans,	*id.*,		*id.*,	607, ♀.
flavescens,	*id.*,		*id.*,	605, ♂.
minuta,	*id.*,		*id.*,	606, ♀.
præcox,	*id.*,		*id.*,	608, ♂.
rubrifrons,	*id.*,		*id.*,	606, ♂.
vulnerans,	*id.*,		*id.*,	605, ♀.
aculeata,	Meq.,	1835, Suites à Buff.,	ii,	242.
pungens,	*id.*,		*id.*,	242.
pungens,	Mg.,	1838, Sys. Besch.,	iv,	170.
? *libatrix*,	Rob. Desv.,	1830, Myod.,	387.	

(*Redescription.*)

Head. ♂. Frons one-fourth width of head; grey, yellowish grey or slightly bluish grey. A very wide frontal stripe appearing from above almost velvet-black, thus leaving only very narrow eye-margins. Generally, this black stripe has a greyish V-shaped piece cut out of its upper end, which lighter space encloses the ocellar triangle, which latter is small, and touches the absolute vertex; and bears, just above the lower ocellus, two pairs of bristles (the lower pair the larger). There are also 4 other pairs close together (all 6 pairs forming one double row) on the upper part of the triangle, the uppermost pair being on the extreme vertex. Seen from below, the black frontal stripe is invisible, the whole frons and face appearing white, or yellowish white. Fronto-orbital bristles, about 15, the upper part of the row not always placed uniformly. Two pairs of vertical bristles as usual. Eyes black, absolutely bare. Antennæ blackish, 3rd joint more or less yellowish grey, 2nd joint with several small bristles and 1 or 2 long ones; arista with 8-9 bristles and minute pubescence on basal half above; thickened at base, where it is often yellowish. Face white or yellowish white, covered with close, microscopic tomentum. Mouth opening similar, with the usual strong bristles on each side. Palpi small, reddish yellow, with a few short black bristles. Proboscis shining black, quite bare, tapering from base to tip. Back of head generally more or less bluish grey, with very short pubescence.

In the ♀ the fronto-orbital bristles are less strong and less regular, generally rather less in number, and on the upper part of the frons there is a short extra row each side, placed nearer the eye margin, sometimes also with additional irregularly placed small bristles. In all other respects the ♀ head is similar to that of the ♂.

Thorax. Ground colour varying from yellowish grey to whitish grey. Seen from in front, a dorsal pair of moderately narrow, well separated stripes, which are normally mummy-brown, but vary sometimes to the extent of being nearly blackish. These stripes extend from the anterior margin nearly to the posterior one. On the outer side of each stripe is a similar stripe, distinctly interrupted at the suture, in front of which it becomes sometimes of a thickened cigar shape, placed diagonally, pointing to the humerus, sometimes it retains its direct direction forwards as a continuation of the portion behind the suture. It often also takes the form of an irregularly shaped spot. At the posterior ends of these dorsal stripes are two irregular black patches, immediately in front of the scutellum. Towards the side of the dorsum, just above the wing, is a concolorous brown streak, sometimes distinct enough to form a short third stripe.

Viewed from behind, the dorsal space between the two median lines appears much lighter, varying from light grey to even quite whitish. Scutellum concolorous with thoracic dorsum, generally with an irregular mummy-brown triangle at base. *Chætotaxy.* Humeral bristles 3, post-humeral 1 (weak), præsutural 1, noto-pleural 2, dorso-central with only the hindermost in each row really strong; a distinctly less strong one in front of it, whilst the remainder are barely larger than the small bristles dispersed generally over the whole dorsum, but there is usually a single moderately strong one just in front of the suture. Two moderate sized inner dorso-central bristles. Of the side bristles, there are 4 placed above the wing more or less in the shape of a diamond, all of which I should be disposed to term supra-alar, or possibly 3 supra-alar and 1 postalar.

The mesopleura bears a hinder row of about 12, diminishing in size from above downwards except that the strongest ones are generally the 2nd and 3rd, or the 3rd and 4th. Some long stiff hairs on front part of mesopleura. Sternopleura with a strong bristle on upper hind corner, a strong one on lower hind corner, in company with some shorter comparatively strong ones, but which are much longer than the very small bristles covering the whole sternopleura and, to a greater or less extent, the whole of the side of the thorax.

Scutellum with a strong basal bristle each side, near margin, with a less strong præbasal one in front, and the usual apical pair which are very strong. Occasionally a pair of bristles corresponding to dorsal macrochætæ stand out a little stronger than the microchætæ covering dorsum of thorax and scutellum, but in most specimens they are by no means obvious.

Abdomen. Normally (and generally) yellowish grey; sometimes much more yellowish, at least on the dorsum; sometimes approaching slate-grey, either wholly or towards the sides of the segments; seen from behind at a low angle, sometimes quite whitish. The markings, although following a general plan, are very variable. In what may be regarded as the typical form, there are on both the 2nd and 3rd segments, a basal mark in the shape of a moderately wide short dorsal stripe, which reaches to about the middle of the

segment, where it is sometimes cut off sharply and squarely, sometimes drawn out to a distinct point, sometimes fading away indistinctly. There is a pair of more or less circular spots of moderate size placed on the posterior margins, each midway between the middle line and the side border. On the 4th segment is a single, more or less triangular basal mark, sometimes small, or indistinct, or occasionally absent. All these marks are vandyke-brown in colour, occasionally approaching clove-brown. These principal markings can be seen most distinctly from above, or a little in front, often appearing blurred or almost invisible if viewed from behind. What I should call the secondary markings, are irregular, almost *Sarcophaga*-like reflections, often invisible when viewed from certain directions; of a pale greenish grey colour. They take the form of an irregular elongated spot each side, often connected by the colour extending along the posterior margin of the segment; and a pair of comparatively large, more or less circular spots on the 4th segment, these latter spots being present in the majority of examples.

The whole abdomen is shortly pubescent with short soft black hairs, which are little thicker on the shoulders, and a little longer and stronger on the posterior margins, and over the dorsum of the 4th segment.

When it comes to describe varieties, the difficulties as to the limits of the species are very apparent. Practically I regard as probable varieties of this species, all forms which partake of the above pattern or any reasonable variation of it, this variation being considered to be of very wide limits.

The short dorsal stripes on segments 2 and 3 occasionally form an unbroken stripe, extending to the base of the 4th segment. In one form they are very short, and the usual circular spots become quite elongated and narrow; whilst in another variety there is a pair of additional similar brown nearly circular spots in front of the main pair, and placed on the base of segments 2 and 3. There is often a pair of very narrow spots on the 1st segment, sometimes united into a transverse narrow line. In some examples the ordinary brown circular spots on segments 2 and 3 are united by the colour extending narrowly along the posterior margin; sometimes bordering the basal margin of these two segments also. In another variety, well marked in its more pronounced form, the dorsal stripe is expanded on both base and posterior margin, on which latter it is often considerably widened and joined to the two spots, thus somewhat approaching *bengalensis*, Picard.

It must be remembered that the extreme base of each segment is shining black, but that this is only visible when the segments are abnormally drawn out, and that in a normal state, the black colour is covered by the posterior margin of the preceding segment.

Belly generally concolorous, with short, somewhat sparse black pubescence, without conspicuous markings.

Legs. Blackish, minutely pubescent; femora, and sometimes tibiæ also, more or less with greyish reflections. Fore femora

with a row of bristles above from middle to tip, diminishing in size, a row on outer side on basal half, replaced towards the tip by moderately soft, rather long hairs; a row of about 16 to 18 comparatively strong bristles on under side, extending the whole length of the femur, and equal in size. Middle femora with some bristles, lying rather flat, on front side; two contiguous, moderately strong, slightly curved bristles above, near tip, and a row of bristly hairs on under side. Hind pair with a row of bristles on front side, a single curved bristle below near tip. Knees tawny, the colour extending sometimes over the whole basal half of some of the tibiæ; tips of tibiæ with 2 or 3 short spines. Tarsi blackish, under side with a little gold-yellow pubescence, which is sometimes lightly present on inner side of anterior tibiæ. Pulvilli dirty white.

Wings. Practically clear, but in the ♂ sometimes slightly tinged with brown on basal and front parts; 1st posterior cell widely open, the 4th vein forming a well rounded loop at the bend upwards; apical portion gently curved. Outer cross-vein normally with one gentle inward curve, variable, at times nearly straight, or nearly bisinuate. Tegulæ yellowish white.

Described from a long series of specimens of both sexes in the Indian Museum collection and my own, and also from European specimens. It is practically one of the world-wide species that occurs wherever civilised man is found, and in at least the East it is apparently present all the year round in every locality. Actual dates would therefore be of little significance. It is in the Indian Museum collection from Gangtok (Sikhim), Sylhet, Kurseong (Darjiling), Mussoorie, Simla, Calcutta, Port Canning, Puri, Berhampur, Bhogaon, Travancore State (S. India), Rajmahal (all India); Colombo, Rangoon, Kawkareik (Lower Burma), Mandalay, and from on board ship, at light, off Tuticorin. Personally I have met with it in many parts of the Punjab, Mussoorie, at Rangoon, Singapore, Penang, and other places further East, and have it from Java, Ceylon and the Philippines.

N.B.—The above lengthy description has appeared advisable from the variability of this very common species. Further variations and combinations of the differences (mostly in the abdominal markings) above stated, occur in individual examples, and as the species has already been described under no less than 17 different names, I hesitate to regard as distinct any form which appears to fall within its possible range of variation; especially as I have seen no distinct "variety," "race," "form," or "subspecies" peculiar to any special locality and illustrated by any number of consistently marked specimens.

"**Stomoxys libatrix,**" Rob. Des., 1830.

Ess. Myod., 387.

The author's very short description runs as follows:—

"Very near *inimica*, R. D. (*l.c.*, p. 387, from North America) · sides of the face a little more yellowish; abdominal segments

especially the 4th, bear a small transverse line at their bases; the emarginations are blacker; tegulæ brownish; wings a little clearer."

N.B.—Prof. Bezzi ("Mosche ematofaghe, Rend. Istit. lomb., 1907) says that, although admitted as distinct in Van der Wulp's catalogue, it is probably only another synonym of *calcitrans*, L., an opinion in which I cannot but concur, and, therefore, failing evidence to the contrary, I propose to sink the name as synonymous with *calcitrans*.

Stomoxys plurinotata, Big., 1887.

Bull. Zool. Soc. Fr., xii, 593.

"Long. 5½ mm. Antennis nigris; facie et fronte albescentibus, vitta frontali, bifida, nigra; palpis fulvis; thorace albido cinerascente, maculis quatuor latis, elongatis, fuscis, duplicatis, pleuris cinereis; calyptris albis, halteribus pallide flavidis; scutello cinerascente; abdomine cinereo, segmentis 1-3 superne univittatis, 2° et 3°, utrinque, in medio, punctis duobus fuscis, rotundatis, notatis, cum vitta mediana aliquoties junctis; pedibus nigris, tibiis parum fulvo tinctis; alis hyalinis. Ceylan 3 specimens."

I append a translation of Bigot's more extended French description:—

Antennæ black, tip of 2nd segment pale; vertex greyish, frons and face dirty white, frontal stripe wide, bifid above; palpi pale, proboscis black. Thorax grey, with 4 large oblong elongated spots, nearly contiguous, blackish, each divided by a not very distinct greyish line. Scutellum greyish; sides of thorax grey; sometimes the spots mentioned appear as 4 longitudinal stripes interrupted at the suture. Tegulæ white, halteres yellowish white. Abdomen grey, with a dorsal black band on segments 1 to 3, sometimes terminating at the base of the 3rd; the 2nd and 3rd having each two roundish blackish spots, which are often united to the median stripe; sometimes the 1st and 2nd segments have 2 large irregular blackish spots: also the sides of the abdomen are generally marked with elongated spots of irregular shape and of the same shade; legs black, base of tibiæ reddish, wing clear: sex ?

N.B.—No one seems to have met with this species since its original description, yet I include it as distinct, although it may quite possibly be another variation of *calcitrans*. The type is in Bigot's collection: he does not mention the width of the frons, but from his doubt as to the sex of his species I am inclined to regard it as probably distinct from *calcitrans*, of which presumably he would be quite conversant with the respective width of the frons in each sex.

Stomoxys oblongopunctata, mihi, sp. nov.

Assam. Long. 6 mm.

Differs from *calcitrans* by the wholly reddish yellow antennæ and arista, and the pair of elongo-triangulate brown spots on the 2nd and 3rd abdominal segments, placed on the hind margins.

their bases on the sides of the segments, and their apices meeting the moderately broad concolorous dorsal stripe, which does not reach the posterior border of the 2nd segment. The extreme bases of these two segments are very narrowly brown, the 4th segment has a very indistinct trace of the commonly present blackish grey spots. Thoracic dorsum lightly yellowish grey, that of the abdomen slightly bluish grey. Basal half of tibiæ pale, in certain lights the whole of the middle pair appears pale. Frons $\frac{1}{5}$ width of head; with face, whitish grey. Anterior ends of outer pair of thoracic stripes rather deeply black, enlarged into a spot of considerable size just above the shoulders.

N.B.—This specimen is evidently quite distinct from *calcitrans*, yet I can compare it for purposes of description with no other. It was sent to Mr. Austen, who returned it, marked, "? *brunnipes* Grunb. or sp. nov. closely allied." It appears to me, however, that it can hardly be *brunnipes*, Grünb. (an African species, but which, of course, may quite easily occur in the Orient as well), as that species is said by its author to have a frons only $\frac{1}{8}$ the width of the head, whereas in the present example the frons measures $\frac{1}{4}$.

From Grünberg's description I should expect a considerably larger proportion of the tibiæ and tarsi to be brown than is the case in this specimen. I therefore venture to describe it as new.

In the Indian Museum, from Sylhet, Assam, taken by Lt.-Col. Hall, 31-i-05.

For purposes of comparison, in the event of my being in error as to its specific difference from *brunnipes*, I append a translation of both sexes of Grünberg's species.

Originally described from German East Africa, only the ♂ was mentioned, but immediately following this description was that of a supposed different species, *sellata*, this being now accepted as the ♀ of *brunnipes*.

Stomoxys brunnipes, Grünb., 1906.

Zool. Anzeig., xxx, ♂, 89; ♀ (*S. sellata*, Grünb.), 90.

(*Description of ♂: translation.*)

Black, with brownish yellow, partly greyer dusted.

Frons in ♂ one-eighth width of head, with narrow velvet-black stripe; sides of frons, and the cheeks, shining yellow grey dusted. Antennæ black, with brownish yellow arista. Palpi brownish yellow.

Thorax yellowish grey dusted, grey on shoulders and between the black stripes on fore border. The black stripes converge in front of the suture, but they are sometimes separated behind it, by the presence of narrow intermediate spaces.

Abdomen brownish yellow dusted, the segments with broad blackish band on posterior borders. When viewed from behind, a black dorsal line can be distinctly seen, which is expanded on the fore borders of the segments.

Coxæ, trochanters and femora black, extreme femora tips, tibiæ and tarsi brown; wings with a little blackish tinge; tegulæ also; halteres yellow.

Long. 6-7 mm. Only the ♂. The Camaroons, German East Africa.

(*Description of* ♀ *: translation.*)

Frons in ♀ not quite one-third width of head, with broad, deep velvet-black stripe, and broad (one-half of the width of the middle stripe), whitish grey, slightly glistening side borders. Under side of head also whitish grey, slightly glistening, 1st and 2nd joints of antennæ black, 3rd dark brown, grey dusted, arista and palpi pale brown.

Thorax above grey, with broad black stripes on each side, nearly confluent and nearly reaching the scutellum.

Thorax black above, with a broad grey middle stripe: shoulders lightly slate-grey; pleuræ a little less grey; scutellum black, with greyish brown shimmer, distinctly dusted at the tip.

Abdomen black, rather shining, dark brown dusted on upper side and shimmering grey at the sides. Viewed from behind, elongated brown side spots become visible on the 2nd and 3rd segments, reaching from the fore border to the middle of each segment; last segment dark greyish brown dusted, unmarked.

Coxæ, trochanters and femora black; extreme tips of latter, also the tibiæ and tarsi, brown. Wings nearly clear, with slight brownish tinge, tegulæ white; halteres yellowish white. Long. 7½ mm. Camaroons, German East Africa. Only the ♀.

Stomoxys sitiens, Rond., 1873.

Ann. Mus. Civ. Stor. Genova, iv, 288, ♀.

This species, of which apparently the ♀ is still unknown, has not been definitely recorded from the East, but specimens in the Indian Museum collection, sent to Mr. Austen for examination being returned as possibly *sitiens*, causes me to include a description of the species in this paper and to add some comments. Rondani's original description is as follows:—

"Long. 5 mm., ♂. Similis *calcitranti* europeæ, sed minor, et distincta praesertim: Facie et orbitis albissimis, non sub-luteis, et oculis in fronte sat proximis, orbitis mediocribus vitta nigra angusta sejunctis, et sic oculorum distantia triplo circiter minor latitudine singuli oculi, non ut in mare *calcitrantis* frons lata fusca, et parum angustior singulo oculo. Praeterea in *sitiente*, abdominis grisei segmenta tria basi paulo canescentia praesertim ad latera; caetera ut in sp. europea. Keren (Abyssinia)."

(*Translation.*)

Near *S. calcitrans* of Europe, but smaller, and differing as follows: Face and eye margins extremely white, not yellowish,

and the eyes in front considerably approximate, the moderately wide eye margins separated by a narrow black stripe, and thus the distance between the eyes less by about a third than the breadth of a single eye, not as in the ♂ of *calcitrans*, frons broad, fuscous, and hardly narrower than a single eye. Moreover, in *sitiens* the pubescence of the three basal grey abdominal segments is greyer, especially towards the sides; the rest as in *calcitrans*.

The four specimens in the Indian Museum collection tentatively regarded by Mr. Austen as possibly *sitiens* were collected by me at Calcutta, 18-ii-05, Penang, 8-viii-06, and Rangoon, 23-xii-04 to 3-i-05, but they are all, unfortunately, in poor condition, and exact identification is, perhaps, impossible. Other specimens in my own collection taken by me in the same localities are in no better state of preservation.

Now, Bezzi states ("Mosche ematofaghe," Rend. Istit. lomb., 1907, p. 14) that he has seen a considerable number of specimens of *sitiens* from Eritrea and notes that the principal difference from *calcitrans* is its narrower frons; adding that he believes Rondani was in error in stating the frons to be splendid shining white, as he finds it has an even greater tendency to yellow than in *calcitrans*.

Secondly, he, in his table of species, divides *brunnipes*, Grünb., from *sitiens*, Rond., by the former having "at least the four anterior tibiæ all pale on the outside," whilst of *sitiens* he says "tibiæ at the base narrowly pale," *calcitrans* also, be it noted, falling in the same subdivision in his table. The four Museum specimens being all ♀ ♀ the test of the width of the frons does not apply. The frons is certainly more whitish than in average *calcitrans*, but not more so than in occasional specimens of it. The specimens are in too bad condition for accurate description, but it may be noted that the abdominal spots are more elongate than in normal *calcitrans*; a dorsal stripe is present on the 2nd segment, extending over part of the 3rd; all the tibiæ are dull reddish brown (much brighter in one example); the 2nd joint of the antennæ is more or less reddish.

A second specimen in the Indian Museum from Calcutta, 14-iv-08, agrees with *sitiens* with the exception of all the tibiæ being reddish brown, the middle pair lighter still, almost yellowish. The frons is glistening shining white, one-seventh in width, and the abdominal spots similar to *calcitrans*. Rondani mentions that the pubescence of the abdomen is grey toward the sides, but in the present specimen it is uniformly black.

It is possible it may be an Oriental form of the African species, but personally I have found that the wholly brownish tibiæ, when present as a character, are always consistently so.

Likewise, in *calcitrans* and those species which have only the base of the tibiæ pale, the colour rarely, if ever, extends over more than the middle of the limb.

That *sitiens* is a good species, distinct from *calcitrans* by the narrow frons, with the shining white frons as a secondary character, seems clear, but I doubt if any specimen of it has come before me.

Stomoxys triangularis, mihi, sp. nov.

♂. South India. Long. 4½ mm.

Head. Frons ⅓, dark grey; face and antennæ blackish grey; proboscis rather long; palpi pale.

Thorax. Rather deep yellowish grey. The four deep black stripes narrow and separate on anterior margin, but united soon afterwards into two broad stripes, which are continued thus to posterior margin of dorsum. A black lateral stripe in front of wing. Sides of thorax greyish anteriorly, blackish grey behind. Scutellum very dark grey. Chætotaxy apparently normal.

Abdomen blackish grey. 1st segment with posterior border somewhat darkened, 2nd with a small triangular basal spot and two large triangular spots occupying nearly all the segment, their bases almost meeting in middle of segment, their apices directed towards the posterior corners, 3rd segment with two similar irregularly triangular spots placed more obliquely; 4th segment with two sub-triangular spots, their apices pointing hindwards. Belly black.

Legs black; knees and tibiæ narrowly at base reddish yellow.

Wings and tegulæ pale brown, slightly deeper on anterior half.

Described from 2 ♂♂ in the Indian Museum collection taken by Dr. Annandale in the Travancore State, South India (Maddathorai, 17-xi-08, type, and Pallode, 16-xi-08).

N.B.—An obviously distinct and quite dark species, compared with all others I know from the East. The abdominal markings are distinct (when viewed from the side) in one of the specimens, but the abdomen of the other is best described as blackish grey with irregular blackish patches, though it is certainly of the same species.

Stomoxys indica, Picard, 1908.

Bull. Soc. Ent. Fr. 20.

? *S. limbata*, Aust.

A translation of Picard's description is appended:—

Long. 4½-5 mm. ♂. Interocular space very straight, equal to one-eighth the width of the head. Frons and face with more golden pubescence than in the ♀. Lines on thorax darker. Wings, tegulæ and halteres strongly smoky. Legs testaceous, more brownish than in ♀.

♀. Interocular space equals one-third width of head. Frons and face with silvery grey pubescence. Antennæ black, 3rd joint white dusted; arista testaceous, black at tip. Palpi testaceous, not reaching margin of epistome. Thorax grey "ternate" with two moderately wide rather dark brown stripes on each side of middle, the outer pair interrupted at the suture. Scutellum wholly grey; wings clear; veins light brown; tegulæ transparent; halteres white. Legs testaceous; coxæ black, femora brownish, anterior ones lighter on inner side, darker on outer side. Abdomen

grey, slightly bluer than rest of body; the first 3 segments furnished with a straight black dorsal line and a wide black band on posterior margins, that on the 2nd segment covering a larger space than the grey part.

N.B.—Previous to reading Mr. Austen's description of his new species *limbata*, or seeing specimens of it determined by him, I had identified a number of examples of both sexes in both the Indian Museum and my own collection, as certainly *indica*, Picard. On the Museum receiving back from Mr. Austen 2 ♂ ♂ and 1 ♀ sent to that dipterologist some time previously, I found that he had referred them to his *limbata*.

Apart from minor details, the only serious discrepancy in the descriptions of the two species appears to be in the width of the frons (which, however, I regard as one of the most valuable characters); this being quoted by Picard as one-eighth the width of the head in the ♂ and by Austen as one-fourth to one-fifth. Now, although the width at the vertex is undoubtedly wider, the width across the frons about midway between the vertex and the base of the antennæ is between $\frac{1}{7}$ and $\frac{1}{8}$ in the 2 ♂ ♂ of the Museum collection, determined by Mr. Austen as paratypes of his *limbata*; and $\frac{1}{3}$ in the ♀. All the ♂ ♂ I have seen have the frons from $\frac{1}{7}$ to $\frac{1}{8}$ in width (and, incidentally, "slightly constricted in the middle," as Austen says of *limbata*, although Picard mentions the frons of his species as being "very straight").

I therefore feel constrained to regard all these specimens examined by me as Picard's *indica*, and Mr. Austen's *limbata* as a probable synonym of it. A noteworthy feature of similarity is that both authors mention the extra width of the marginal black band on the 2nd segment, and a final coincidence is that both authors describe their species from the same three localities, India, Ceylon and Assam.

S. indica occurs in the Indian Museum collection from Calcutta, 18-vi-08 [*Annandale*]; Rajmahal, Bengal, 7-vii-09 [*Annandale*]; Bhogaon, N. Bengal, 3-x-09 [*Paiva*]; Allahabad, 15-viii-09 [*Lord*]; Maddathorai, Travancore State, 16-xi-08 [*Annandale*]; Victoria Gardens, Colombo, 26-iv-08 [*Paiva*]; Rangoon, 24—26-ii-08 [*Annandale*]; Singapore, 1-viii-06 [*Brunetti*]. In my collection I have it from Calcutta, 24-vii and 14-viii-04, and from Rangoon, 18-viii-06, taken by myself.

Stomoxys limbata, Aust., 1909.

Ann. Mag. Nat. Hist. (8), iii, 292.

♂ ♀. India, Ceylon, Assam.

♂. "Smoke-grey: face and sides of front bright yellowish-silvery, front narrow; dorsum of thorax with usual clove-brown longitudinal stripes, admedian stripes narrow and wide apart; dorsum of abdomen with deep clove-brown or blackish transverse band on hind border of each of first three segments; wings with a

brownish tinge; femora dark clove-brown, their extreme tips and base of hind tibiæ ochraceous-buff, front and middle tibiæ and tarsi mummy-brown, hind tarsi and hind tibiæ except base sepia-coloured."

♀. "Apart from usual sexual differences, agreeing essentially with ♂, except that dark markings on dorsum of thorax and abdomen are paler (olive-brown instead of clove-brown or blackish), that the wings although brownish are less noticeably infuscated, that the squamæ are paler (whitish or yellowish white), and that the front and middle tibiæ are also brighter in hue." Type in British Museum from Sylhet, 11-ii-05 [*Lt.-Col. Hall*]; also a specimen from Peradeniya, Ceylon, 22-v-92 [*Yerbury*].

"*S. limbata* is closely allied to *S. nigra*, Mcq., but is distinguished by the front in the ♂ being somewhat narrower, with the frontal stripe slightly constricted in the middle, instead of having its sides parallel; and in the ♀ by the front and middle tibiæ being mainly ochraceous instead of for the most part clove-brown or blackish."

The length of this species is from a little under 5 mm. to 5½ mm.; width of head ♂ 1·6 to 2 mm., ♀ 1·8 to 2 mm.; width of front at vertex ♂, 0·4 mm., ♀ just over 0·5 mm.

N.B.—Specimens seen by Mr. Austen and identified by him as his *limbata* are in the Indian Museum collection from Port Canning, Lower Bengal, 21-vii-07 [*Annandale*]; Calcutta, 20-viii-07; and Sylhet, 31-i-05 [*Lt.-Col. Hall*]; Mr. Austen also refers to this species a ♀ from Peradeniya, Ceylon, 22-v-92 [*Lt.-Col. Yerbury*].

N.B.—As noted under *S. indica*, Pic., I am strongly inclined to regard *limbata* as synonymous with that species.

Stomoxys bengalensis, Pic.

(*Translation.*)

♂. Interocular space one-fifth width of head. Frons and face with whitish pubescence, lightly gilded. Antennæ black, arista testaceous, tip black; palpi pale yellow.

Thorax grey, with two parallel black stripes on each side of a very indistinct median line. Scutellum rather dark grey. Wings a little smoky, veins blackish brown; tegulæ and halteres dark brown. Legs black, base of tibiæ pale brown. Abdomen light slaty brown, with black dorsal line on first three segments; each segment with a narrow basal transverse band, and a wide one on posterior margin, especially that on the 2nd segment; 4th segment wholly grey (in fresh specimens), long. 7½ mm. ♀ unknown. Sent by Col. Raymond from Calcutta.

N.B.—*S. bengalensis* should, by the description, be a good species, and I had noted three ♂ ♂ in the Indian Museum collection (from Calcutta) as being probably this species. They were, however, returned after examination by Mr. Austen as *calcitrans*, and closer study both of them and subsequently acquired specimens lead me to suppose they fall within the range of the commoner species.

If so, however, the approximation to the description of *bengalensis* is considerable, as the abdominal spots are sometimes spread out, so as to form a sort of band on the posterior margin, and there are in some examples a narrow dark band at the base of at least the 2nd and 3rd segments.

Stomoxys pusilla, Aust., 1909.

Ann. Mag. Nat. Hist. (8), iii, 293.

♂. India. Long. 4·2 to 4·5 mm.; width of front at vertex 0·4 mm.

"Dorsum of thorax mouse-grey or yellowish grey, with usual clove-brown longitudinal stripes; dorsum of abdomen olive-grey, first segment, except a small ill-defined area in centre (not reaching hind margin), second segment, either entirely or with exception of extreme front margin, and a median longitudinal stripe and fairly deep posterior transverse band on third segment, clove-brown; sides of front and sides of face, when viewed from above, light maize-yellow; wings brownish; femora clove-brown, front and middle tibiæ and tarsi and extreme tips of front and middle femora buff, hind tibiæ and tarsi light mummy-brown, base of tibiæ paler."

Type in British Museum, Allahabad, x-05 [*Howlett*].

"*S. pusilla* differs from *S. limbata* in its smaller size, in the yellower colour of the sides of the front and face, in the dorsum of the second abdominal segment being entirely clove-brown or practically so, instead of having a clove-brown posterior transverse band and median longitudinal stripe, and in the pale tibiæ and tarsi of the front and middle legs."

N.B.—This species and the next I have never seen. The present one must approximate very closely to *indica*, Pic.; *pulla* is, of course, well defined by its fore tarsus.

Stomoxys pulla, Aust., 1909.

Ann. Mag. Nat. Hist. (8), iii, 294.

♂. India. Long. 4·2 to 4·4 mm.

"Very dark species; when viewed from above, body appearing almost uniformly clove-brown, extreme front margin of thorax mouse-grey, with commencement of usual clove-brown longitudinal stripes; when abdomen is viewed from behind, at a very low angle, terminal segment appears olive-grey, while second and third segments may appear more or less mouse-grey, with clove-brown transverse blotches, and perhaps a trace of a narrow median longitudinal stripe; front narrow, occupied for most part by frontal stripe, sides of front not noticeable except anteriorly; wings brownish; legs clove-brown, tibiæ ochraceous-buff at extreme base, first joint of front tarsus fringed on inside with a row of hairs of equal length, claws black."

Type in British Museum, from Mussoorie, N. W. India, x-06 [*Howlett*].

"This is a very distinct species, which, while resembling the foregoing (*pusilla*) in size, is at once distinguishable by the dusky coloration of the body and legs, by the sides of the front being scarcely visible except anteriorly, and by the remarkable row of hairs on the inside of the first joint of the front tarsus. Owing to the latter character *S. pulla* ♂ presents some slight approximation to the ♂ of the African *S. omega*, Neust., in which, however, the row of hairs on the inside of the front tarsus extends to the end of the second joint, while the hairs themselves are much longer and conspicuously curled."

Stomoxys, sp.

A single ♂ in the Indian Museum, apparently immature, certainly belongs to a distinct species from all others given in this paper. It has a frons which narrows rapidly from the vertex (where it is about ⅓ the width of the head) downwards, being only between ⅛ and ¼ at a short distance above the antennæ, where it widens as usual. The outer side of the middle tibiæ are wholly moderately light brown, and the abdomen is apparently unmarked, but being in a somewhat crumpled state it is impossible to describe it more precisely. In other respects it resembles a slightly undersized *calcitrans*. From Calcutta, 18-vii-07.

Stomoxys dacnusa, Speis., 1908.

Zool. Anz., xxxiii, 666.

"Orichalceo griseo, vittis duabus brunneoviolaceis, pedibus luteis, coxis atque femoribus præter ultimam tertiam partem brunneo piceis, alis basi et nervatura validiora luteis squamis lutescentibus. Annam."

♀. Long. corp. 5·5 mm.; alarum 5·5 mm.

Further notes from his more lengthy description in German may be added as follows:—

Yellowish grey, with a brassy tinge. From the anterior border of the thoracic dorsum, a moderately broad brownish black, with a violet tinge, stripe towards each side.

Unfortunately the hinder part of the thorax, the pleuræ, chest, and first segments of the abdomen cannot be correctly described, owing to the blood which has exuded over them. Tip of scutellum and of abdomen uniformly grey. Legs pale brownish yellow; only the coxæ, and basal two-thirds of the femora, blackish brown or nearly black.

Head blackish brown, only the base of the antennæ paler, yellowish brown, the antennæ, with the arista, tawny brown.

Frons, almost exactly one-third width of head at vertex, widening in front. Chætotaxy normal. Palpi very little spindle-

shaped at tip, tawny. Fore femora with the brown colour nearly reaching the tip, under side with a row of longer bristles, in addition to the normal hairs. Middle femora above, towards the tips, with some small ones, hind femora with rather larger, distinct bristles, below with some preapical ones. Hind tibiæ with two bristles near the middle. Hind metatarsus with some stronger bristles below. Wing as in *calcitrans*; 1st longitudinal vein (subcosta) ends exactly above the small cross-vein; 2nd (radius) rather nearer the wing tip than in *calcitrans*.

N.B.—Being described from a single damaged specimen, the specific identity of this species must be admitted with caution; I therefore place it last of all.

Description of **STYGEROMYIA**, Aust., 1907 (non-Oriental).

Ann. Mag. Nat. Hist. (7), xix, 445.

"In some respects intermediate between *Stomoxys*, Geoff., *Hæmatobia*, Rob. Desv., and *Lyperosia*, Rond. (*sensu* Bezzi). In general appearance and form of body similar to *Stomoxys*, but in shape of proboscis and palpi resembling *Hæmatobia*, though with arista feathered only on upper side, as in *Stomoxys* and *Lyperosia*. Head somewhat flattened from front to rear, with basi-occipital region only slightly swollen; proboscis short, stout and shining, of uniform thickness throughout, not tapering to the tip, chitinous, but terminated by a pair of small fleshy labella; palpi equal to proboscis in length, large, clavate towards the tips, curving upwards, and with stout bristles on the outer side at the distal extremity.

"Bristles of thorax: Humeral 3; post-humeral 1; notopleural 2; præsutural 1; supra-alar 1; intra-alar 1; post-alar 2; dorso-central 6 (1 in front of and 5 behind the suture); inner dorso-central 1; scutellar 4 (1 præbasal, 1 basal, 1 discal, 1 apical); meso-pleural 9 or 10, wider apart than in *Stomoxys* or *Hæmatobia*; sterno-pleural 1 (posterior, as in *Stomoxys*, instead of 1 : 1, as in *Hæmatobia*).

"*Wings* with 1st posterior cell narrowly open at the tip, the width of the opening being precisely that seen in the same cell in the wing of *Musca corvina*, Fab., and less than half of that exhibited by the 1st posterior cell in the case of *Stomoxys calcitrans*, L.: *apical portion of 4th vein* beyond the bend *perfectly straight*, not bent inwards at the extremity, as in *Stomoxys* and *Hæmatobia*. Typical species, *Stygeromyia maculosa*, sp. nov."

N.B.—This is not an Oriental genus, being described from Africa, but since, owing to the traffic in cattle between one continent and another, it may easily be imported, I have thought it best to include at least the generic description to facilitate identification should it occur in the East.

LYPEROSIA, Rond., 1862.

Dipt. Hal. Prod., v, 230.

Loc. cit., i, 93 (nom. in tab.).

In splitting off this genus from *Hæmatobia*, R. Des., Rondani in a table of genera gave the following diagnosis of it: "Arista hairy only on upper side, the hairs wavy; 2nd longitudinal vein reaching the costal opposite the small cross-vein." In this genus Rondani placed two species, "*irritans*, L.," and "*serrata*, R. D."; Prof. Bezzi very kindly supplied me with notes on this genus from Rondani's work, and informs me that that author was mistaken in his identification of *irritans*, L., having another species before him at the time, and for this species my correspondent proposes the name of *titillans* (Rend. Istit. lomb. (2), xl, 24).

Moreover, Rondani's "*serrata*, R. D." was the true *irritans*, L.

LYPEROSIA, Rond.

(Revised description.)

Body more elongate than in *Stomoxys*; abdomen about twice as long as broad. Eyes bare, approximate in ♂, frons in ♀ about ⅓ width of head. Antennæ according to Rondani inserted at the middle of the eyes, with the 3rd joint a little longer than the 2nd, but I should describe them as inserted very slightly lower on the face than in *Stomoxys*. Antennæ plumose on upper side only, the hairs undulating. Proboscis as in *Stomoxys*; palpi comparatively stout and broad, as long as proboscis, less bristly than in *Hæmatobia*. Apical part of 4th longitudinal vein curved rather less than in *Stomoxys* and *Hæmatobia*, the whole vein being considerably straighter, and without the definite "elbow" so usual in the higher *Muscinæ*; 3rd longitudinal vein bare at base; 1st posterior cell comparatively broadly open; sternopleural bristles yellow.

Table of species.

Hind tarsi not dilated.

Abdomen without a dorsal stripe ..	*minuta*, Bezzi, ♂ ♀.
Abdomen with a dorsal stripe (sometimes indistinct).	
Hair on body brown ..	*exigua*, Meij., ♀.
Hair on body yellow ..	*flavohirta*, sp. nov., ♀.

Hind tarsi dilated.

Hair on body brown	*exigua*, Meij., ♂.
Hair on body yellow	*flavohirta*, sp. nov., ♂.

Lyperosia minuta, Bezzi, 1892.

Ann. Mus. Civ. Genova (2), xiii, 192.

♂ ♀. India, Ceylon (originally described from Somaliland).

"Cinerea, lutescenti-pilosa, pedibus luteis; antennarum articulo secundo rufescente; oculis etiam in mare a fronte latius cula sejunctis. Long. mm. ♂ 1·8—2·3, ♀ 3—3·8 Obbia."

(*Redescription.*)

Head. ♂. Eyes sub-contiguous; the frons for a short distance being extremely narrow, the actual width varying slightly in different specimens. Vertical triangle only moderately wider; the frons below its narrowest part, rapidly widening. Normal colour of frons dark grey or blackish grey in the middle and lighter grey along the edges of the eyes, which latter are without any distinct eye margin. For a considerable space above the base of the antennæ the frons is occasionally quite reddish or reddish brown. Lower part of the head, including oral cavity, yellowish grey, varying lighter or darker according to the individual. Ocellar triangle (isosceles) distinctly raised above the surface, concolorous, ocelli distinct. Antennæ grey, sometimes with a slight reddish brown tint, microscopically pubescent; 2nd joint sometimes much brighter, always with a short distinct bristle; 3rd joint more or less grey dusted. Arista black considerably thickened at the base, where it is normally black also. The arista bears normally at least 6 long equidistant, bisinuate hairs; with often an additional one placed just before the first, and also a very small one near the tip. There are invariably several very minute bristles at the base. Palpi elongate, black or very dark blackish brown, gradually thickened towards tip, with short stiff hairs; practically as long as the proboscis, which is dark brownish yellow, shining. Back of head moderately dark grey, with microscopic hairs.

Chætotaxy. Seven fronto-orbital bristles; mostly curved, and often pointing in different directions. Vertical triangle with 2 stronger longer bristles in front, crossing one another, and 2 smaller ones behind, which also cross each other, with 2 other similar ones practically on the vertical margin of the head, with 1 pair each side of these, of true vertical bristles.

♀. Frons at vertex, one-fourth width of head, widening only slightly, as at the level of the antennæ it is only one-third the entire width.

Fronto-orbital bristles normally arranged in two rows, an upper row of four, placed closer to the margins of the eyes, the bristles directed forwards or slightly to either side; and a lower row (these would be the lower fronto-orbital bristles of Osten Sacken), of either three or four, which is placed nearer the middle of the frons, and in which the bristles always curve inwards. The rows sometimes almost form one linear row, or occasionally overlap, and sometimes the upper row consists of three bristles only; in some individuals

the number of bristles on one side of the face is different to that on the other side, in fact this occurrence is not uncommon.

Thorax. Variable, within certain limits. Dorsum rather dark acuous grey, with a more or less distinct but nearly always obvious, broad light grey stripe beginning in the middle of the anterior border and fading away at or before the transverse suture. Humeral calli light grey; the transverse suture, and more or less of the scutellar dorsum, also. In other examples, the dorsum is best described as being yellowish grey, with two broad, well-separated, well-defined stripes from the anterior border nearly to the scutellum; with sometimes an additional narrow intermediate stripe behind the suture.

The sides of the thorax are lighter, ash-grey or yellowish grey. Metanotum dark blackish grey, practically bare.

Chætotaxy. The principal bristles are nearly always uniform in perfect specimens, but are very easily broken off. They are often smaller than their normal size, and in that case sometimes are not conspicuously larger than the small bristly hairs with which the thorax is covered. All the bristles are brownish yellow and generally reclinate. Humeral bristles 2; post-humeral 1; præsutural 1; notopleural 2; supra-alar 1; intra-alar 1; post-alar 1. A pair of inner dorso-central bristles, and a row on each side of comparatively small but distinct dorso-central bristles, the hindermost being as usual the largest; whilst outside this row is a second row of microscopic ones which only extends from the transverse suture to the posterior border. The normal row of dorso-central bristles is continued to the anterior border. Along the median line of the thoracic dorsum are numerous microscopic bristly hairs, of which those in front of the suture are arranged more or less in four rows, while those behind it are more irregularly placed.

On the scutellum there are two basal bristles, placed near the edge, a post-median row of four, of which the inner ones are less strong; and two strong long apical ones. Over the whole of the thoracic dorsum and the scutellum are microscopic bristly hairs, which are more or less irregularly placed.

On each side of the thorax there is a row of 6 (occasionally 7, or even 8) on the hinder side of the mesopleura, and 3 very distinct sternopleural ones, placed 1 : 2. Smaller bristly hairs occur irregularly, being much more numerous in some specimens than in others.

Abdomen. Rather dark grey (in some examples much lighter); with short, brownish yellow hairs, curved backwards; and a row of long bristly curved hairs towards the posterior border of each segment. Belly dark grey, sometimes reddish (probably in the case of specimens captured soon after having sucked blood); the dorsal bristly hairs continued over the sides to a considerable extent.

Genital organs in the ♂ apparently consisting of a telescopic arrangement of three pieces, brown, with blackish marks and some hairs; the tip hairy. Ovipositor in the ♀ conically elongated, concolorous, protruded, pubescent.

Legs. Coxæ, rather bluish grey dusted, reddish yellow towards tips, with a row of 5 or 6 bristles. Femora rather brownish or blue-grey dusted, reddish yellow at base and tip; with rows of short bristly hairs. Fore femora generally curved, and with a row of comparatively long bristles on outer and inner sides, the latter row being the longer; the rest of the fore femora being clothed in rows of bristly hairs. Middle femora with rows of very short bristles, and some longer ones near the base on under side, and two on upper side near tip. Hind femora, sometimes somewhat curved, with rows of small bristles and a row of long comparatively weak ones on under side, and a strong one on outer side near tip.

All the bristles on the legs brownish yellow.

Tibiæ brownish yellow or yellowish, closely pubescent, with very short stiff hairs. Tarsi yellowish, blackish towards tips, microscopically pubescent. Pulvilli greyish white.

Wings. Practically clear, iridescent in certain lights; microscopic bristles along costa to beyond end of 2nd longitudinal vein; very soft hairs on remainder of wing border. Inner cross-vein exactly opposite end of 1st longitudinal and placed above centre of discal cell. Third and 4th veins converge normally towards tips. Halteres and tegulæ yellowish grey.

Described from about 12 specimens of each sex in the Indian Museum, mostly from the Victoria Gardens, Colombo, taken by Mr. Paiva, 26-iv-08. Other specimens are from Chittagong, 27-vii-08, 8-ix-08 [*Lt.-Col. Hall*]; Mandalay, 12-iii-08 [*Annandale*]; Sukna (500 ft.), 3-vii-08 [*Annandale*], where it was abundant on cattle; Calcutta, 6—31-viii-09.

N.B.—Dr. Annandale noticed that the fly rests with its wings folded together, as contrasted with *exigua*, which when at rest, extends its wings horizontally.

Lyperosia exigua, Meijere.

(*Translation.*)

Hæmatobia exigua, Meij., in P. Schat, "Verdere Mededeelingen over Surra," Mededeel. Proefstation Oost-Java, 3e. Ser., No. 44 (1903).

Hæmatobia exigua, Meij., Bijd. tot se Dierk. Natura Artis Magistra, xviii, p. 104 (1904).

Front in ♂ very narrow, with very narrow white eye margins, between which a narrow black line is present. Frontal triangle black. In the ♀ the white eye margins separated by a black frontal stripe of uniform width. Under side of head white. Antennæ brownish yellow, especially the somewhat thickened 2nd joint, which is thereby conspicuous; the 3rd joint darkened at tip. All the joints with whitish shimmer. Palpi as long as the proboscis, brownish yellow. Proboscis brownish yellow, darker above.

Thorax dark grey, whitish dusted, in front with two narrow blackish longitudinal stripes. The sides of the dorsum, viewed sideways, broadly brownish tinged. Sides of thorax, humeral calli,

transverse suture and a cross-band on the scutellum, whitish shimmered in certain lights.

Abdomen dark grey, with a blacker (ending at the tip of the 3rd segment) dorsal stripe, which is only wholly visible when viewed from certain directions. Sometimes it appears in the form of darker spots.

Legs brownish yellow, on the outer side more or less darkened; sometimes the hind pair, with the exception of the outer basal part of the femora and tibiæ, quite dark; in the fore legs, with the femora, nearly to the tips; the middle third of the tibiæ and the tarsi tips, sometimes darker.

Veins as in *irritans*, L., the small cross-vein straight, placed beyond the tip of the 1st longitudinal vein. Halteres and tegulæ whitish.

Length of body 4 mm.; wing length 4 mm.

According to Herr Schat, this species, together with *Stomoxys calcitrans*, L., may be capable of transmitting disease.

(*Redescription.*)

Head. Frons in ♂, $\frac{1}{5}$ to $\frac{1}{6}$ width of head; in ♀ between $\frac{1}{3}$ and $\frac{1}{4}$. Ground colour almost wholly ash-grey, except the black frontal stripe, which is very narrow, yet quite distinct, in the ♂, and forms in the ♀ one-fourth of the width between the eyes at the level of the ocellar triangle, gradually widening to one-third at the level of the base of the antennæ.

The frons has in the ♂ a row, normally of nine, distinct, well-developed brownish yellow or yellow bristles, arranged practically in a single row, mostly curved inwards towards those of the opposite row, especially the lower ones.

In the ♀ they are more irregularly placed, forming normally an upper frontal row of 3 or 4, situated rather nearer the eyes, and pointing outwards or forwards; and a lower row (the lower fronto-orbital bristles of Osten Sacken) of 4, 5 or 6, situated nearer to the frontal stripe, also placed rather closer together, and always curved inwards. These two rows, the upper and the lower one, are not always placed in the same relation to each other. Those in the upper row are more liable to be placed out of line, the lowermost bristle being often on a level with, or even below, the uppermost bristle of the lower row. All the bristles are always brownish yellow or yellow.

Antennæ yellow, 3rd joint very slightly white dusted; arista often distinctly yellow at extreme base. Palpi yellow, with a few hairs. Proboscis dark brownish or brownish yellow. Bristles of cheeks yellowish, or whitish yellow; lower part of head with some pale hairs; back of head with numerous very short bristly hairs.

Thorax. Dorsum normally moderately dark grey; often with either a bluish, brownish or sub-aënous tinge; sometimes almost ash grey, especially in the median portion. There is generally a fairly distinct pair of narrow well-separated fuscous stripes, a

sub-triangular brownish spot towards each side in front of the suture, and a similar but larger and longer spot behind the suture each side. The macrochætæ of the thorax are practically the same as in *minuta*, but the very small bristles covering nearly the whole surface are relatively larger than in the previous species. The large bristles are brownish yellow, the smaller ones blackish. Sides of thorax ash-grey or with a bluish tinge, mesopleura with a row of long yellow bristles on hinder side, as in *minuta*, and smaller ones in front; sternopleura with numerous bristly hairs, and a row of curved yellow long hairs below humeral calli.

Scutellum concolorous with thorax, macrochætæ as in *minuta*, but the smaller bristly hairs more numerous and much stronger. Metanotum blackish grey, bare.

Abdomen. Rather dark grey, lighter at base, where a distinct blackish dorsal narrow stripe extends over the 1st segment to some portion of the 2nd. The whole surface of the abdomen is covered with short hairs, and there is a row of well-separated long curved ones towards the posterior border of each segment, and a fan-shaped bunch of yellow ones towards each side of the 1st segment; all the other hairs and bristles on the abdomen being distinctly brownish or brownish yellow. Belly concolorous, pubescent.

Legs. Mainly yellow, coxæ bluish ash-grey or yellowish grey, femora except base and tip often more or less lightly violet-grey tinted, sometimes almost wholly yellow. All the femora bear rows of rather long soft yellow hairs, the fore pair have a row of longer bristly hairs on upper side and a row of still longer ones on under side; middle pair with two stronger bristles on upper side, near tip; hind pair with three stronger ones below, near tip. Tibiæ, which are sometimes a little brownish, closely pubescent, with comparatively short bristly, yellow hairs, a long bristle in front at tip of fore pair, some short stiff bristles at tip of middle pair, and a long bristle on hinder side near tip of hind pair which are darker than the others. Tarsi mainly blackish, bristly, pubescent; metatarsus and bases and tips of the remaining joints more or less yellowish. Second and 3rd tarsal joints (in ♂) distinctly dilated at tip, each with 3 or 4 long curved hairs on under side, and generally all the joints with one straight hair and one longer curved one on the upper side at the tip. Pulvilli whitish, grey fringed claws black.

Wings. As in *minuta*.

Described from a good series of both sexes taken in the slaughter-house in Calcutta, 6—31-viii-00. Also from several of each sex from Travancore State, South India, captured by Dr. Annandale as follows: Nedumangad 14-xi-08; Quilon 10-xi-08; Maddathorai 17-xi-08; Pallode 15-xi-08, nearly all on cattle and buffaloes. Also from specimens from Sukna (500 ft.), 3-viii-08 [*Annandale*]; Chittagong (E. Bengal), 2-viii-08 and 3-ix-08 [*Lt.-Col. Hall*]. All the above specimens are in the Indian Museum collection. Two ♀ ♀ in the Pusa collection were taken at Bombay on cattle, 29-v and 16-x-05, and I have a considerable number of both sexes in my own collection from Calcutta and West Java.

N.B.—Dr. Annandale has noticed that this species when at rest, sits with its wings spread out horizontally.

Lyperosia flavohirta, mihi, sp. nov.

♂ ♀. Lower Burma. Long. 2½-3 mm.

This species is very near *exigua*, the differences all being minor ones, yet I believe, by taking them in the aggregate, a specific separation for this form is warranted.

1. The lighter coloured parts of the head and thorax are more *whitish* than in *exigua*.

2. The small bristly hairs covering the thorax, scutellum and abdomen are distinctly more yellow than brownish yellow.

3. The dorsal stripe on the abdomen is generally continuous almost to the tip, and is more uniformly wide; whereas in *exigua* it often terminates on the posterior border of the 2nd segment, sometimes appearing on the 1st segment only, and often (when nearly complete in length) takes the form of elongated triangles, bases uppermost.

4. The legs are paler yellow and the whole body is paler.

Described from 6 ♂♂ and 2 ♀♀ taken by Dr. Annandale on cattle at Kawkareik, Lower Burma, 1-iii-08.

N.B.—Dr. Annandale noticed this species in great abundance on cattle in the interior of the Amherst District in Tenasserim, March 1909. He remarked that when at rest it stood higher on its legs than other Indian species of the genus, thus approximating to the appearance of a Dolichopodid.

Lyperosia irritans, L.

As this palæarctic species may quite possibly be found in Northern India, a brief description is appended, drawn up from the only two specimens before me, 2 ♂♂ in my own collection, from Roumania.

Dark yellowish grey, 3½ to 4 mm. long with 4 not very well-defined thoracic blackish stripes, of which the middle pair attain the anterior margin. Abdomen with blackish dorsal stripe on 2nd segment. Palpi distinctly spatulate at tip, flattened, nearly as long as the shining black proboscis. Frontal space ⅓ width of head, mainly occupied by whitish eye margins, but leaving a very narrow black stripe. Legs black, knees pale, hind femora with a single hair below, just beyond middle, and another at tip; hind tibiæ with some comparatively long hairs on inner sides. Wing clear, 1st posterior cell very narrowly open; outer cross-vein long, nearly straight.

PHILÆMATOMYIA, Aust., 1909.

Ann. Mag. Nat. Hist. (8), iii, 295.

"Greyish flies, not unlike *Musca domestica*, Linn., in general appearance, but distinguishable at once, owing to the remarkable

proboscis. Front in ♂ narrow, its width in centre being from one-eleventh to one-fifteenth of total width of head; width of front in ♀ at vertex, one-third of total width of head; proximal portion of proboscis (mentum) a strongly swollen chitinous bulb, distal portion soft and fleshy, folded back under distal end of bulb when not in use, but when in use extended, its terminal section consisting of a 'tubular extension" which is protruded from between the labella, and is surrounded at the distal extremity with a circlet of stout chitinous teeth; venation generally as in *Musca domestica*."

Mr. Austen proceeds to give a more detailed generic description and adds the following chætotaxy:—

"Thoracic bristles: humeral 3 (in ♂ sometimes 4); post-humeral 1; notopleural 2; præsutural 1; supra-alar 1; intra-alar 1; post-alar 3; dorso-central 4 or 5 (the large and conspicuous bristles alone included—2 or 3 in front of, 2 behind suture); inner dorso-central 1; scutellar 4 (1 præbasal, 1 basal, 1 discal, 1 apical); mesopleural, normally 6 (space between uppermost two greater than that between any other two); sternopleural 1: 2."

Philæmatomyia insignis, Austen, 1909.

Loc. cit. ante, 298.

♂ ♀. India, Ceylon, Sokotra, Cyprus, Senegal and Congo Free State.

Length of 17 ♂ ♂ 3—5·8 mm.; of 25 ♀ ♀ 4—6½ mm.

"Smoke-grey to isabelline-grey, or yellowish grey; dorsum of thorax with 4 dark longitudinal stripes, broader and clove-brown or blackish in ♂, narrower and dark grey or brownish in ♀; ♂ often with an additional broad median stripe, most distinct in front and behind; dorsum of abdomen with a tranversely elongate dark blotch on 1st segment, not reaching hind margin, and a small clove-brown median triangle at base of 2nd and 3rd segments, in some specimens also with a similar but smaller and usually lighter mark at base of 4th segment; all hair and bristles on head, body and legs black; palpi ochraceous-buff; wings hyaline or with a slight ochraceous tinge, veins in proximal half buff or ochraceous-buff; legs black, femora greyish pollinose." Types of ♂ and ♀ from India in the British Museum. Mr. Austen records it from the East from Calcutta, 23-vii-07, "on draught bullocks, burrowing into the hair"; Mussoorie, ix-06; Allahabad, 11-x-05 [*Howlett*]; Bentota, Ceylon, 13-vi-91 [*Yerbury*]; Daukotuwa, Ceylon. The above data derived from specimens in the British Museum.

N.B.—This species (identified by its author in the case of some of the specimens examined) figures in the Indian Museum from Calcutta (where it is common also from May to September), 15-ii-08 [*Annandale*] and 5-iii-05 [*Brunetti*]; Chittagong, 14-vii-08 [*Lt.-Col. Hall*]; Mandalay, 13-iii-08; Kawkareik (North Tenasserim), 5-iii-08, on cattle; Rangoon, 25-ii-08; and Port Canning (30 miles south of Calcutta), 21-vii-07, and Quilon, S. India, 9-xi-08 [all

Annandale]; Puri, Bengal, 2-iii-08, Purneah, N. Bengal, 7-viii-07, Madhupur, Bengal, 15-x-09, and Victoria Gardens, Colombo, 26-iv-08 [all *Paiva*]; Cawnpore, xii-04 [*Brunetti*]; Allahabad, 12-viii-09 [*Lord*]; Purulia, Bengal, 13-x-09. I have it in my own collection from Rangoon (both sexes not uncommon), 23-xii-04 to 1-iii-05, and 18-viii-06; Calcutta, 24-vii-04 and 22-viii-04; Jubbulpore, India, 15-xi-07, and Telok-Ayer, N. Borneo, 29-vii-06, all the specimens taken by me.

PRISTIRHYNCHOMYIA, mihi, gen. nov.

With the exception of an important modification of the proboscis, identical with *Philæmatomyia*, Aust., the general characters, the venation and chætotaxy agreeing exactly.

The two parts of the proboscis, however, are structurally reversed, the wide basal part being fleshy and flexible, the second part (of about equal length) being sub-cylindrical, black and distinctly chitinized, possibly retractile to the extent of its withdrawal partly or wholly within the fleshy basal portion. At the end of the chitinous portion is a soft fleshy tip, the terminal orifice being of the shape of a triangle with a rounded base (the edges being thickened somewhat by a rim bearing the teeth). At the apex of the triangle is a single black tooth, whilst arranged around the orifice above are three pairs of similar black teeth.

Under high microscopic power the apparent "rim" of the orifice is seen to be the base of each tooth extended considerably on each side, so that the "rim" is not continuous.

The new genus is intermediate between *Philæmatomyia* and *Musca*, but the presence of the teeth suggests that it can hardly be other than a "biting fly."

Pristirhynchomyia lineata, mihi, sp. nov.

♀. Calcutta. Long. 4-5 mm.

Head. Yellowish grey, whitish grey when viewed from below. Frons at level of antennæ ⅓ width of head, slightly narrower at vertex; with a broad dull black median stripe (widest in the middle). Vertical triangle blackish, distinctly raised, with 3 pairs (rarely 4) of bristles, the upper pair small, the lower pair strong and long. Normally 7 strong fronto-orbital bristles placed along the edge of the black centre stripe, above these are two very minute ones, with a powerful one above these, this latter one being level with the centre of the ocellar triangle. The upper strong bristle, and the 7 large fronto-orbital ones are always present.

Outside this row is an irregular row of very small but distinct bristles. Two minute vertical bristles, and a pair of strong ones on vertex near the upper corner of each eye. Antennæ blackish grey, 3rd joint lighter; 2nd joint with several short stout bristles and one much stronger one. Arista considerably thickened at base;

7 or 8 nearly straight long hairs on upper side and 4 or 5 on lower side, with some very minute additional ones on basal half (both above and below). Buccal opening blackish, with a row of strong spiny bristles each side, the uppermost one being the strongest; a number of very small bristly hairs on under side of epistome. Palpi blackish grey, cylindrical, narrowed towards base, with very short irregular bristles.

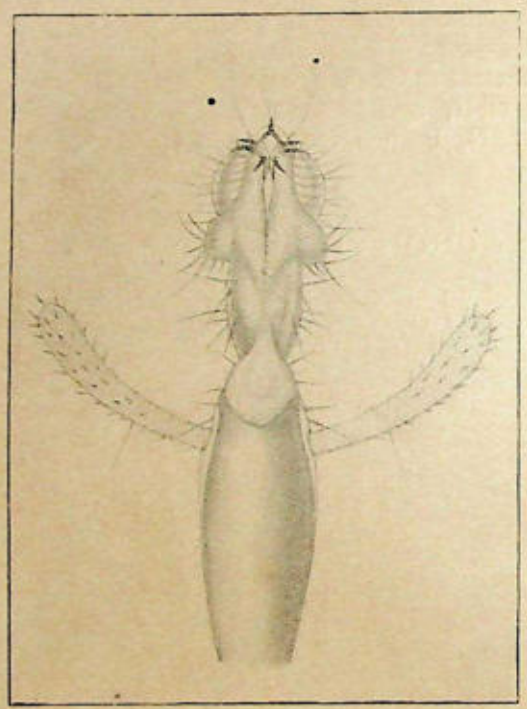


Fig. 1.—Proboscis of *Pristirhynchomyia lineata*: dorsal view of specimen mounted in canada balsam for microscopic examination.

Proboscis consisting of a sub-conical thickened fleshy basal portion, followed by a subcylindrical, chitinous black portion (both portions about equal in length); at the end of the latter a softer tip bearing 7 black teeth in accordance with the generic description.

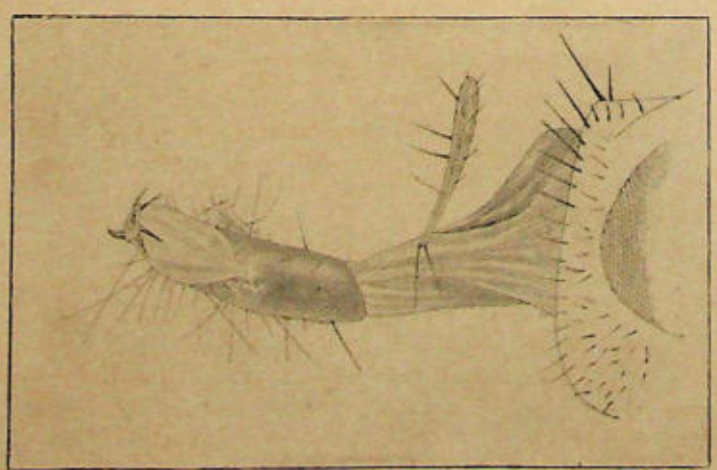


Fig. 2.—Proboscis of *Pristirhynchomyia lineata*; profile view of dried specimen.

Thorax. Varies from dark ash-grey (sometimes with a bluish tinge), to distinctly yellowish grey. Normally, the markings of the dorsum appear as four stripes, the inner pair barely interrupted at the suture but slightly widened behind it; the outer pair less regular, distinctly interrupted at the suture; in front of which the direction is changed, pointing to, and nearly reaching, the shoulders; and behind which, the stripes, seen from behind, appear widened near the bases of the wings; thence narrowing and disappearing before attaining the posterior border of the dorsum. Scutellum and sides of thorax concolorous.

Chætotaxy as in *Philæmatomyia insignis*, Aust. The whole surface of the dorsum is covered with minute bristles. Of the dorso-central rows of bristles, the intermediate smaller ones are larger in size than in that species, but 5 or 6 macrochætæ are usually evident behind the suture and 2 (with a lesser, intermediate but by no means minute one) in front of it.

Abdomen. 1st segment blackish, remainder yellowish grey; 2nd and 3rd narrowly black at the base and on posterior border. A rather narrow dorsal black line extends over both segments; 4th segment with two small elongated blackish dorsal spots.

The whole abdomen with short stiff hairs; no macrochætæ, but a row of rather stronger bristly hair near posterior border of each segment; these being somewhat stronger and longer towards the sides and on the 4th segment. Belly concolorous, with short, stiff hairs. Ovipositor capable of complete withdrawal; when protruded, a conspicuous, yellowish grey, nearly bare, cylindrical organ with a strong, black, hard apical knob.

Legs. Black, with a little greyish reflection in certain lights; minutely spinose. Fore femora with several longitudinal rows of strong bristles on outer side, a stronger spiny row on under side; middle femora with 2 or 3 short, stiff bristles on hinder side near tip; hind femora with 2 or 3 similar bristles below, near tip.

Anterior tibiæ with 2 distinct spines at tip, shorter ones on hind pair; middle tibiæ with 3 or 4 bristles on hinder side; hind tibiæ with apparently an irregular row of similar bristles on outer side.

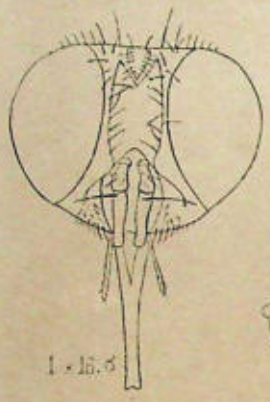
Wings. Pale grey, veins yellow on fore border and base, blackish elsewhere. Costa with a few short black bristles at base. Tegulæ yellowish grey, upper scale small, quadrangular. Halteres very small, yellow.

Described from a good series of ♀ ♀ in the Indian Museum taken in Calcutta in early December, 1907. I have seen no specimen that I can assume to be the ♂ of this species.

It may be remarked that Dr. Annandale has repeatedly observed this fly distended with blood, and actually sucking open sores on cattle. Though the proboscis itself is not sufficiently stiff to pierce the skin the toothed tip would easily enlarge a small hole, otherwise made.

EXPLANATION OF PLATE VII.

1.—*Stomoxys calcitrans*, L., head ♂, front view.
2.— *id.*, head ♂, profile.
3.— *id.*, head ♀, front view.
4.— *id.* arista.
5.— *id.*, thoracic bristles, viewed from above.
6.— *id.*, *id.*, lateral view.
7.— *id.*, wing.
8—11.— *id.*, abdomen (8, typical).
12.—*S. indica*, Picard.
13.—*S. triangularis*, Brun., sp. nov.
14.—*S. oblongopunctata*, Brun., sp. nov.
15.—*Bdellolarynx sanguinolentus*, Aust., head ♂.
16.— *id.*, head ♀.
17.— *id.*, arista.
18.— *id.*, wing.
19.— *id.*, abdomen.

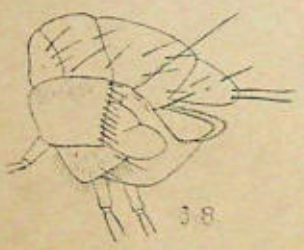

1 ×16.♂

4

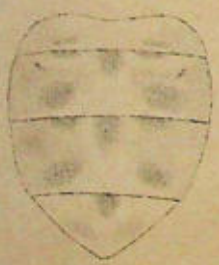
2 ×16.♂

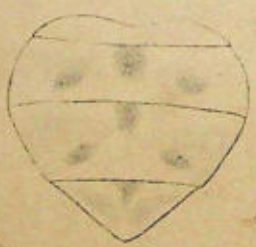
3 ×16.♀

5


6 ×8

7 ×61


8 ×8.

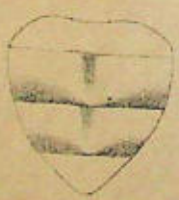

9 ×8.

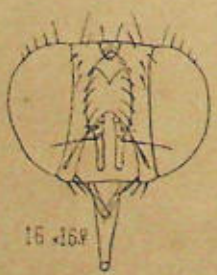
10 ×8.

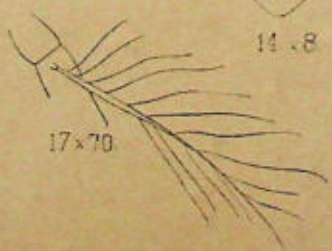
11 ×8.

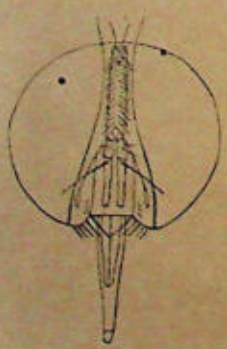
12 ×8.

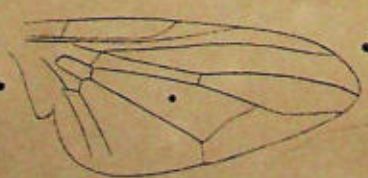
13 ×8.

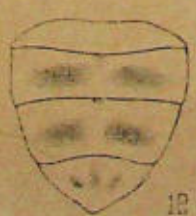

14 ×8


16 ×16♀


17×70

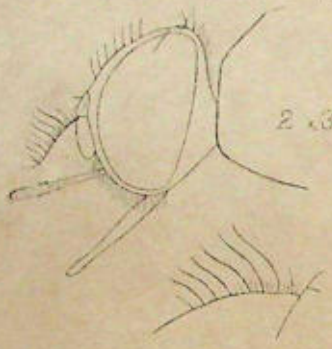

15 ×16.♂


18 ×8.


19

EXPLANATION OF PLATE VIII.

1.—*Lyperosia minuta*, Bezzi, head ♂, front view.
2.— *id.*, head ♂, profile.
3.— *id.*, head ♀, front view.
4.— *id.*, arista.
5.— *id.*, thoracic bristles, dorsal view
6.— *id.*, *id.*, side view.
7.— *id.*, wing.
8.—*L. exigua*, Meij., head ♂.
9.— *id.*, head ♀.
10.— *id.*, abdomen.
11.— *id.*, hind leg ♂.
12.—*Philæmatomyia insignis*, Austen, head, profile.
13.— *id.*, proboscis.
14.— *id.*, head ♂, profile (small variety).
15.— *id.*, head ♀, front view.
16.— *id.*, thoracic bristles.
17.— *id.*, wing.
18.—*Pristirhynchomyia lineata*, Brun., sp. nov., head ♀, front view.
19.— *id.*, head, profile.



2 ×30.

4.

3 ×30.

8 ×30.

1×30.

6×16.

11×16.

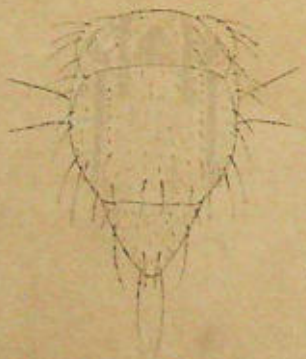
7 ×15.

5 ×8.

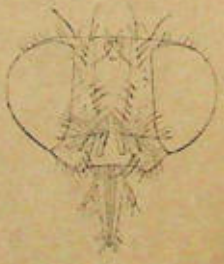
9 ×30.

10 ×16.

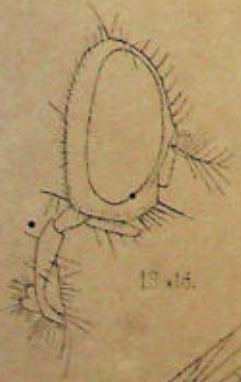
16 ×8.



14 ×16.



15 ×16



13 ×16.

17 ×8.

12.

18.

V. A NEW ARRANGEMENT OF THE INDIAN *ANOPHELINÆ*.

By S. P. JAMES, *M.D., Major, Indian Medical Service; Secretary to the Committee for the Study of Malaria in India.*

The following tabular statement shows (1) the names of the groups or genera in which the anopheline mosquitoes of India are at present arranged by Mr. Theobald, and (2) the characters by which Mr. Theobald identifies the genera and distinguishes them from one another.

Genus.	Abdominal ornamentation.	Thoracic ornamentation.	Form of wing scales.	Form of head scales.
Anopheles; Meigen.	Hair-like curved scales.	Hair like curved scales.	Large and lanceolate.	Upright forked, but no flat scales.
Myzomyia, Blanchard.	,,	,,	Mostly small, long and narrow or slightly lanceolate.	,,
Stethomyia, Theobald.	,,	,,	Lanceolate.	Median area of head with some flat scales.
Pyretophorus, Blanchard	Hairy.	Narrow curved scales.	Small and lanceolate.	Not stated.
Myzorhynchus, Blanchard.	Apical ventral tuft of scales.	Hair-like curved scales	Dense, large, lanceolate.	Not stated.
Nyssorhynchus, Blanchard.	Lateral tufts and small dorsal patches of flat scales.	Narrow curved or spindle-shaped scales.	Not stated.	Not stated.
Cellia, Theobald.	Nearly completely scaled with long irregular scales and with lateral tufts.	With scales.	Not stated.	Not stated.
Neocellia, Theobald.	Similar to *Cellia* but no lateral tufts.	With scales.	Not stated.	Not stated.
Aldrichia, Theobald.	Completely scaled with large flat scales as in *Culex*.	With scales.	Not stated	Not stated.

It has to be noted also that Mr. Theobald has stated that the common Indian species *rossi* cannot be placed in any of these genera and that a genus *Pseudomyzomyia* would be created for its

reception. So far as I am aware the characters of this genus have not yet been published.

A careful examination of the above table will convince the reader that it would be very difficult, if not impossible, correctly to arrange the Indian species generically by its aid. Those who have worked at the subject will be aware also that the defining descriptions can be criticised as being, (1) incorrect (*e.g.*, the description of the abdominal ornamentation in the genus *Nyssorhynchus*; there are no lateral scale tufts in mosquitoes of this genus), or (2) inadequate (*e.g.*, the descriptions of the genera *Cellia* and *Neocellia*), or (3) confusing and indefinite (*e.g.*, the descriptions of the forms of wing scales). The difficulties caused by these defects have led to much criticism of the system of classifying the *Anophelinæ* on a basis of scale and hair covering, but it is probable that the fault lies not so much with the system as with the inadequate and confusing nature of the generic definitions. In this revision I shall try to avoid similar defects, but limits of space prevent me from giving more than a very brief summary of my work; and for the same reason I am prevented from explaining in full why I differ from Mr. Theobald in regard to points of detail.

A consideration of the best way in which to arrange the Indian anophelines according to scale and hair ornamentation is simplified if one starts by separating all the species in two great groups, the first containing those without scales on the abdomen, and the second containing those with scales on some part or the whole of that region of the body. According to the published descriptions of species the following come in the first of these groups.

Species without scales of any kind on the abdomen.

- *aitkeni*, James.
- *immaculatus*, Theobald.
- *culiciformis*, James and Liston.
- *lindesayi*, Giles.
- *gigas*, Giles.
- *culicifacies*, Giles.
- *listoni*, Liston
- *leptomeres*, Theobald.
- *jeyporiensis*, James.
- *turkhudi*, Liston.
- *punctulata*, James and Liston.
- *elegans*, James.
- *nigrifasciatus*, Theobald.
- *nursei*, Theobald.

These 14 species are at present placed by Mr. Theobald in the following groups or genera:—

In the genus *Anopheles*: *aitkeni*, *immaculatus*, *lindesayi* and *gigas*.
In the genus *Stethomyia*: *culiciformis*.

In the genus *Myzomyia*: *culicifacies*, *listoni*, *leptomeres* and *turkhudi*.
In the genus *Pyretophorus*: *jeyporiensis*, *punctulata*, *elegans*, *nigrifasciatus* and *nursei*.

I have examined many specimens of nearly all these species and the following remarks contain the chief conclusions at which I have arrived. (1) I have carefully examined specimens of *maculipennis*, Meigen, and *bifurcatus*, Linnæus, and taking them as the types of Mr. Theobald's genus *Anopheles*, I am unable to place in this genus any Indian species at present known to me. (2) I find that the distinguishing character of the genus *Stethomyia*, namely, the presence of a few "flat scales" on the head, is not confined to the species placed by Mr. Theobald in that genus. Mr. Theobald found that the original character upon which he founded this genus (namely, the character "mammilated prothoracic lobes") was not distinctive, and now that the second character has been found to be not distinctive the genus should be sunk. Probably all the species now assigned to it would come in my new genus *Neostethopheles*. (3) The use of the shape of wing scales as a means of distinguishing between the genera of this first large group of anophelines appears to me to be open to the objection that it must always be doubtful whether, for example, the wing scales are "large and lanceolate" or whether they are "mostly small, long and narrow, or slightly lanceolate." I find, however, that this character is the only one by which the genera *Anopheles* and *Myzomyia* can be separated, and that unless it is agreed to sink the latter genus under the former we must accept it. The wing scales of *Anopheles maculipennis* are distinctly longer and broader than those of *Myzomyia culicifacies* and *Myzomyia listoni*, but they are only very slightly longer and broader than those of *Myzomyia turkhudi*. The wing scales of *Anopheles bifurcatus* are not so long nor so broad as those of *Myzomyia turkhudi*. If the character is regarded as of general application to all the genera endless confusion ensues. As I do not place any Indian species in the genus *Anopheles* and as I neglect the character of the wing scales for the grouping of the Indian species the subject need not be further considered here, but it is very desirable to find a better character for separating the genera *Anopheles* and *Myzomyia*. (4) I believe that the Indian anophelines without scales on the abdomen can be arranged in groups based on characters much more distinctive and easily recognized than those which Mr. Theobald has chosen.

For the arrangement of the species without scales on the abdomen I retain two of Mr. Theobald's groups, namely, *Myzomyia* and *Pyretophorus*, and create two new groups called respectively *Neostethopheles* and *Patagiamyia*.

The following definitions include the characters by which the four groups in which I arrange the 14 species without scales on the abdomen may be identified and distinguished from one another.

Genus 1. NEOSTETHOPHELES, *nov. gen. Abdomen with hairs but without scales of any kind. Thorax with hairs and as a rule without scales of any kind, but in one or two species a few long, exceedingly narrow,* false *scales*[1] *may be present on the anterior promontory only. Prothoracic lobes with hairs but without scales. Upright forked scales of the head very narrow in their whole length (rod shaped).*

Type of the genus: *aitkeni*, James. The distinguishing characters of the genus are shown in Plate ix, *fig.* 1.

I place the following species in this genus:—

aitkeni, James.
immaculatus, Theobald.
culiciformis, James and Liston.

Genus 2. MYZOMYIA, Blanchard. *Abdomen with hairs but without scales of any kind. Thorax with the dorsum clothed with long, very narrow, sharp-pointed, curved scales more numerous anteriorly and forming on the anterior promontory a bunch projecting over the neck. Nearly all the scales are false scales. Prothoracic lobes with hairs but without a tuft of scales. Upright forked scales of the head of the usual anopheline type, that is broadly expanding from the base to the apex.*

Type of the genus: *culicifacies*, Giles. The distinguishing characters of the genus are shown in Plate ix, *fig.* 2.

I place the following species in the genus:—

culicifacies, Giles.
listoni, Liston (= *christophersi*, Theobald).
culicifacies, variety *punjabensis*.
turkhudi, Liston.
leptomeres, Theobald.[2]*

Genus 3. PATAGIAMYIA, *nov. gen. Abdomen with hairs but without scales of any kind. Thorax with the dorsum clothed with long, narrow, curved, sharp-pointed scales which form on the anterior promontory a thick bunch projecting over the neck. Some of the scales are false scales and some are true scales. Prothoracic lobes with a conspicuous tuft of rather broad true scales projecting anteriorly. Upright forked cephalic scales of the usual broadly expanding type.*

Type of the genus: *gigas*, Giles. At present the only other

---

[1] In this revision *false scales* are defined as those without clearly marked striae. There may be an appearance of linear marking, but separate striae cannot be counted. *True scales* always have definite bars or striae passing from the base to the apex of the scale. These striae often project beyond the apex, and when the scale is examined under the microscope they can be easily counted.

[2] When a species is marked with an asterisk it means that I have not examined its scale ornamentation in detail and that it is placed in the genus only provisionally.

Indian species in the genus is *lindesayi*, Giles. The distinguishing generic characters are shown in Plate ix, *fig.* 3.

Genus 4. PYRETOPHORUS, Blanchard. *Abdomen with hairs but without scales of any kind. Thorax and scutellum with moderately broad, rather short, true scales some of which are blunt ended (ob-lanceolate). Prothoracic lobes with hairs and sometimes with two or three scales scattered irregularly, but always without a bunch or tuft of scales. Upright forked cephalic scales of the usual broadly expanding type.*

Type example of the genus: *palestinensis*, Theobald.[1] The generic characters are shown in Plate ix, *fig.* 4.

I place the following species in the genus:—

elegans, James.
jeyporiensis, James.
nigrifasciatus, Theobald.*
nursei, Theobald.*
punctulata, James and Liston.*

I now take up the arrangement of the species which have scales on some part or the whole of the abdomen. Omitting certain varieties and doubtful forms they number 19 in all. At present 17 of these species are usually classified in Mr. Theobald's genera as follows:—

In the genus *Nyssorhynchus*: *maculatus*, Theobald.
fuliginosus, Giles.
jamesi, Theobald.
theobaldi, Giles.
maculipalpis, James and Liston.
karwari, James.
stephensi, Liston.
willmori, James.

In the genus *Myzorhynchus*: *barbirostris*, Van der Wulp.
sinensis, Wiedmann.
nigerrimus, James and Liston.
nigerrimus, Giles.

In the genus *Cellia*: *pulcherrima*, Theobald.

---

[1] I name *palestinensis* as my type species because Mr. Theobald on page 71 of vol. iii of his monograph has figured the thoracic scales of this species The figure shows quite broad true scales some of which are blunt ended, and on page 74 Mr. Theobald says that these scales "of quite a different structure to the narrow hair-like scales on *turkhudi*, clearly relegate it to the genus *Pyretophorus*." According to my view a simple definition of the generic characters of *Pyretophorus* would be "with Nyssorhynchus-like thoracic scales but with no scales on the abdomen." *Costalis*, which I have not examined, is sometimes named as the type species of the genus, but if its thoracic scales do not correspond to this simple definition I should remove it.

In the genus *Neocellia* : *indica*, Theobald.
intermedia, Rothwell.
dudgeonii, Theobald.

In the genus *Aldrichia* : *error*, Theobald.

Rossi, Giles, for which Mr. Theobald proposed a genus called *Pseudomyzomyia*, and *halli*, James, which is a new species not yet assigned to a genus, are not included in the list; they will be considered separately in this account.

For the arrangement of the species in this second large group—the group in which scales are present on the abdomen—I retain the names of the groups *Nyssorhynchus*, *Myzorhynchus*, *Cellia*, and *Neocellia*, but I alter Mr. Theobald's definitions of these groups so as to make them represent clearly the scale characters of the groups. In the second place I change the position of one or two species that have been placed in wrong groups, and in the third place I create two new groups, one for *rossi*, the other for *halli*. I am unable to say anything about the genus *Aldrichia*, as I have not seen the species which represents it.

Dealing first with the group *Nyssorhynchus* I agree with Mr. Theobald in regarding the Indian species *maculatus* as a suitable type of a group of anophelines characterized by the presence of scales on only the last one, two, or three segments of the abdomen, and I find that the scale structure of this species agrees in all important respects with that of *fuliginosus*, *jamesi*, *theobaldi*, *maculipalpis* and *karwari*. My definition of the group characters is as follows :

Genus 5. NYSSORHYNCHUS, Blanchard. *Abdomen with the first five or six segments ornamented with hairs only. The last three or two segments and the genital processes carry in addition a number of rather long, blunt-ended true scales on both the dorsal and ventral surfaces. On the 8th segment and the genital processes the scales may be arranged in patches or may cover the surface more or less evenly; but they are never aggregated together to form tufts of any kind. Thorax with the dorsum covered with quite broad true scales usually arranged in more or less parallel lines. On the anterior promontory the scales are long and sharp-pointed and form a small bunch projecting over the neck on each side of the middle line; on the mid region and posteriorly they are broader and some are blunt-ended. The scutellum carries a number of similar scales. Prothoracic lobes without a tuft of scales. Head with the usual kind of upright forked scales.*

Type of the genus, *maculatus*, Theobald. The generic characters are shown in Plate x, *figs.* 1 to 6.

I place the following species in this group :—

maculatus, Theobald.
fuliginosus, Giles.
jamesi, Theobald.
theobaldi, Giles

karwari, James.
maculipalpis, James and Liston.

I have next to consider the species *rossi*, which in its scale ornamentation exhibits some of the characters of the group *Myzomyia* and some of the group *Nyssorhynchus*. An examination of a large number of specimens of this mosquito has shown that although minor differences in the degree and character of the scale ornamentation are common, the chief features, as figured in plate x, *figs.* 7 to 11, can always be made out on unrubbed specimens. I describe them thus :—

Genus 6. NYSSOMYZOMYIA, *nov. gen. Abdomen with the first seven or six segments ornamented with hairs only. The eighth segment (sometimes also the seventh) and the genital processes carry in addition a number of scales similar in character and arrangement to those of the group* Nyssorhynchus. *Thorax with the dorsum clothed with hairs and narrow, curved, sharp-pointed scales of various lengths and quite similar to those of the group* Myzomyia. *In addition there are on each side of the anterior third of the dorsum a few broader blunt-ended Nyssorhynchus-like scales. Prothoracic lobes without a tuft of scales. Head with the usual type of upright forked scales.*

The species is, therefore, representative of a group intermediate between *Myzomyia* and *Nyssorhynchus*, and is nearer to the latter than to the former group. The term NYSSOMYZOMYIA suitably indicates that it possesses the characters of both groups and I therefore apply this name to the genus instead of the name *Pseudomyzomyia* which Mr. Theobald proposed, but the characters of which he has not yet described. The characters of the genus *Nyssomyzomyia* are shown in Plate x, *figs.* 7 to 11.

I take up next the group NEOCELLIA, Theobald, several members of which have usually been wrongly placed in the genus *Nyssorhynchus*. The characters of this group are very different from those of the group *Cellia* and the name *Neocellia* is therefore quite misleading. *Neonyssorhynchus* would have been a more suitable name, but the resemblance even to that group is not close.

The type species of the group is the Indian species *indica*, Theobald. I define the group characters thus :

Genus 7. NEOCELLIA, Theobald. *Abdomen with the dorsum of each segment clothed irregularly with hairs and long, rather broad, blunt-ended scales. The scales are not aggregated together to form tufts of any kind, but they are more numerous and thickly set on the last two segments than on the others. On the ventral surface the first five segments are devoid of scales, but on this surface of the 6th, 7th, and 8th segments they are present in considerable numbers, being disposed irregularly but attached chiefly on each side of the mid line and not forming tufts of any kind. Thorax clothed with broad true*

scales. Prothoracic lobes with or without a few scales irregularly disposed, but always without a definite bunch or tuft of scales. Head with the usual type of upright forked scales.

The characters of this genus are shown in Plate xi. I place the following species in it—

indica, Theobald.
stephensi, Liston.
willmori, James.
intermedia, Theobald.* (This perhaps = *stephensi*.)
dudgeonii, Theobald.* (This perhaps = *willmori*.)

Lastly, I have to consider the arrangement of the species in which some of the abdominal scales are disposed so as to form distinct bunches or tufts projecting from the dorso-lateral or from the ventral surface of certain segments. These tufts form conspicuous objects readily seen with a hand-lens, and their presence supplies an easy means of separating the following groups from any of those described above. The Indian species provided with certain of these abdominal tufts of scales are (1) *pulcherrima*, Theobald; (2) *sinensis*, Wiedmann (= *vanus*, Walker); (3) *nigerrimus*, James and Liston (which probably = *sinensis*, Wiedmann, and *vanus*, Walker); (4) *nigerrimus*, Giles; (5) *barbirostris*, Van der Wulp; (6) *halli*, James; and they must be arranged in three quite distinct groups, the names of which are (1) *Cellia*, Theobald; (2) *Myzorhynchus*, Blanchard; and (3) *Christophersia*, *nov. gen.*

The following are my definitions of these groups:—

Genus 8. CELLIA, Theobald. *Abdomen with the dorsum of each segment clothed with very large and broad orbicular and square-ended scales which stand out somewhat from the surface and overlap one another. In addition at the postero-lateral corner of each segment from the 1st to the 7th is inserted a bunch of large scales forming a tuft which projects laterally. Six tufts on each side are plainly visible with a weak lens. The ventral surface of each segment is clothed more or less evenly with very broad scales like those of the dorsum, but the clothing is not so thick as on that surface. The postero-lateral tufts of the dorsal surface are visible on each side, but there are no ventral tufts of scales projecting downwards. Thorax clothed with very broad scales. Prothoracic lobes with a few scales projecting forwards.*

Type species of the genus, *pulcherrima*, Theobald. The generic characters are shown in Plate xi.

Genus 9. MYZORHYNCHUS, Blanchard. *Abdomen with the dorsal surface clothed with hairs only. On the ventral surface from the apex of the seventh segment in the middle line a prominent bunch or tuft of rather long, black, true scales projects downwards. On the ventral surface of the 6th, 5th, 4th and 3rd segments a few small white scales may be present; if so, they are arranged somewhat irregularly*

and do not form tufts. Thorax with the dorsum clothed with hairs and narrow, sharp-pointed scales like those in the genus MYZOMYIA. *Prothoracic lobes with a dense tuft of broad true scales projecting anteriorly. Head with short very broadly expanding upright forked scales.*

Type species of the genus, *barbirostris*, Van der Wulp. The generic characters are shown in Plate xii. The other species in the genus are *sinensis*, Wiedmann, *nigerrimus*, James and Liston, and *nigerrimus*, Giles.

Genus 10. CHRISTOPHERSIA, *nov. gen. Abdomen with the dorsum of each segment thickly clothed with hairs and lanceolate and blunt-ended scales which are not aggregated together to form tufts of any kind. The ventral surface of each segment is devoid of scales except that from the apices of six segments in the mid line prominent tufts of long, blunt-ended scales project directly downwards. These tufts resemble the single abdominal tuft present in the genus* MYZORHYNCHUS *Thorax clothed with rather narrow lanceolate and blunt-ended true scales. Prothoracic lobes with a prominent tuft of true scales. Head with the usual kind of upright forked scales.*

Type of the genus: *halli*, James. The generic characters are shown in Plate xii.

It only remains now to summarize in tabular form the essential differences between the groups I have defined, to indicate briefly how to place an anopheline in its correct genus, and to show in the form of a table the changes made in the generic position of the different Indian species.

How to ascertain the generic position of an anopheline. (1) Using a microscope with a two-thirds inch objective and a high power eyepiece (No. 8 or No. 12), examine the dorsal, lateral, and ventral surfaces of the abdomen of the mosquito. If scales are not immediately seen search carefully the last segment and the genital processes. Upon the decision whether the abdomen carries scales or not depends the accuracy of the subsequent determination. The decision is always very easily made, but especial care should be taken to examine the lateral and ventral aspects of the abdomen as well as the dorsal aspect. If no scales are present, the mosquito belongs to one of the first four genera. (2) In that case next examine the head. It will be seen at once whether the upright forked scales are of the usual broadly expanding type (all the spotted-winged anophelines have scales of this type) or whether the upright forked scales are very narrow in their whole length (linear or rod-shaped). If they are rod-shaped the mosquito belongs to the genus *Neostethopheles*. (3) If the upright forked scales are of the usual broadly expanding type, next examine the prothoracic lobes from the dorsal aspect. To see one of them clearly slant the pin so that the mosquito is turned more or less on its side. A very little practice will overcome any initial difficulty

Table of Generic Characters.

	Genus.	Abdomen.	Thorax.	Prothoracic lobes.	Upright forked scales of the head.
WITHOUT SCALES ON ABDOMEN.	NEOSTETHOPHELES, *nov. gen.*	With hairs but without scales.	With hairs but without scales. (The presence of a few long, sharp-pointed, very narrow scales on the anterior promontory does not exclude a species from this genus.)	With hairs but without scales.	Of a characteristic rod-shaped type not broadly expanding towards the apex.
	MYZOMYIA, Blanchard.	With hairs but without scales.	With long, narrow, sharp-pointed curved scales on the whole dorsal surface, but more numerous anteriorly.	Without a tuft of scales.	Of the usual broadly expanding type.
	PATAGIAMYIA, *nov. gen.*	With hairs but without scales.	With long, narrow, sharp-pointed scales more numerous anteriorly.	With a conspicuous tuft of broad scales.	Of the usual broadly expanding type.
	PYRETOPHORUS, Blanchard.	With hairs but without scales.	With quite broad true scales, many of which are blunt ended.	Without a tuft of scales.	Of the usual broadly expanding type.
WITHOUT ABDOMINAL SCALE TUFTS.	NYSSORHYNCHUS, Blanchard.	The dorsal and ventral surfaces of the last 3 or 2 segments carry true scales which are not aggregated to form tufts.	With quite broad true scales.	Without a tuft of scales.	Of the usual broadly expanding type.
	NYSSOMYZOMYIA, *nov. gen.*	With the last or the last 2 segments carrying true scales as in the genus *Nyssorhynchus*.	With long, narrow, sharp-pointed scales as in the genus *Myzomyia*, and with some broader, short scales.	Without a tuft of scales.	Of the usual broadly expanding type.

WITHOUT ABDOMINAL SCALE TUFTS.	NEOCELLIA, Theobald.	The dorsal surface of every segment carries true scales which do not form tufts. The ventral surface of the last 3 or 2 segments carries scales which do not form tufts.	With broad true scales.	Without a tuft of scales.	Of the usual broadly expanding type.
WITH ABDOMINAL SCALE TUFTS.	CELLIA, Theobald	The dorsal and ventral surfaces of every segment carry very broad scales. In addition tufts of large scales project outwards from the postero-lateral corners of the dorsal surface of each segment. No ventral tufts of scales.	With very broad true scales.	With a few scales projecting forwards.	Of the usual broadly expanding type.
	MYZORHYNCHUS, Blanchard.	The dorsal surface clothed with hairs only. The ventral surface with a conspicuous tuft of true scales projecting directly downwards from the apex of the seventh segment in the mid line.	With long, sharp-pointed scales like those of the genus *Myzomyia*.	With a dense tuft of true scales.	Of the usual broadly expanding type.
	CHRISTOPHERSIA, *nov. gen.*	The dorsal surface of each segment carries lanceolate and blunt-ended scales which do not form tufts. The ventral surface with six prominent tufts of true scales projecting directly downwards from the mid line.	With moderately broad true scales.	With a prominent tuft of scales.	Of the usual broadly expanding type.

Table of Species.

Specific name.	Genus according to Mr. Theobald's Monograph of the Culicidae.	Genus according to the arrangement described here.
aitkeni, James.	*Anopheles.*	*Neostethopheles.*
immaculatus, Theobald.	*Anopheles.*	*Neostethopheles.*
culiciformis, James and Liston.	*Stethomyia.*	*Neostethopheles.*
gigas, Giles.	*Anopheles.*	*Patagiamyia.*
lindesayi, Giles.	*Anopheles.*	*Patagiamyia.*
lindesayi, variety *maculata*, Theobald.	*Anopheles.*	*Patagiamyia.*
culicifacies, Giles.	*Myzomyia.*	*Myzomyia.*
listoni, Liston.	*Myzomyia.*	*Myzomyia.*
culicifacies, variety *punjabensis*.	——	*Myzomyia.*
leptomeres, Theobald.	*Myzomyia.*	*Myzomyia.**
turkhudi, Liston.	*Myzomyia.*	*Myzomyia.*
elegans, James.	*Myzomyia*, 1903.	
	Pyretophorus, 1907.	*Pyretophorus.*
jeyporiensis, James.	*Pyretophorus.*	*Pyretophorus.*
punctulata, James and Liston.	——	*Pyretophorus.**
nigrifasciatus, Theobald.	*Pyretophorus.*	*Pyretophorus.**
nursei, Theobald.	*Pyretophorus.*	*Pyretophorus.**
maculatus, Theobald.	*Nyssorhynchus.*	*Nyssorhynchus.*
fuliginosus, Giles.	*Nyssorhynchus.*	*Nyssorhynchus.*
fuliginosus, variety *nagpori*, J. and L.	——	*Nyssorhynchus.*
fuliginosus, variety *adiei*, James.	——	*Nyssorhynchus.*
jamesi, Theobald.	*Nyssorhynchus.*	*Nyssorhynchus.*
theobaldi, Giles.	*Nyssorhynchus.*	*Nyssorhynchus.*
maculipalpis, James and Liston.	——	*Nyssorhynchus.*
maculipalpis, variety *indiensis*, Theobald.	*Nyssorhynchus.*	*Nyssorhynchus.**
karwari, James.	*Nyssorhynchus.*	*Nyssorhynchus.*
rossi, Giles.	*Myzomyia*, 1903.	
	Pseudomyzomyia, 1907.	*Nyssomyzomyia.*
indica, Theobald.	*Neocellia.*	*Neocellia.*
intermedia, Rothwell.	*Neocellia.*	*Neocellia.**
stephensi, Liston.	*Nyssorhynchus.*	*Neocellia.*
willmori, James.	*Nyssorhynchus.*	*Neocellia.*
dudgeonii, Theobald.	*Neocellia.*	*Neocellia.**
pulcherrima, Theobald.	*Cellia.*	*Cellia.*
barbirostris, Van der Walp.	*Myzorhynchus.*	*Myzorhynchus.*
sinensis, Wiedmann.	*Myzorhynchus.*	*Myzorhynchus.*
nigerrimus, James and Liston.	*Myzorhynchus.*	*Myzorhynchus.*
nigerrimus, Giles.	*Myzorhynchus.*	*Myzorhynchus.*
halli, James.	——	*Christophersia.*
error, Theobald.	*Aldrichia.*	——*

that may be experienced in obtaining a good view of one of these bodies. It will at once be seen whether or not the lobe carries a cocade of scales projecting anteriorly. If the lobe carries such a cocade the mosquito belongs to the genus *Patagiamyia*. (4) If a tuft of scales is not present on the lobe next examine the dorsal surface of the thorax. If the scales are long, sharp-pointed, and very narrow (that is, if it is rather difficult at a first glance to say whether they are scales or hairs) the mosquito belongs to the genus *Myzomyia*. If the scales are short and moderately broad (that is, if it can at once be seen that they are true scales) the mosquito belongs to the genus *Pyretophorus*.

In the second case we shall have detected the presence of scales as well as hairs on one or more of the abdominal segments. In that case proceed as follows: (1) The first point to decide is whether or not some of the scales are aggregated to form tufts. The appearance of these tufts is shown in Plate XII; they are very definite objects and the mistake must not be made of regarding as tufts the irregularly disposed scales that in some species overhang the sides of the terminal abdominal segments. The single tuft projecting downwards from the mid line of the ventral surface of the 7th abdominal segment in anophelines of the genus *Myzorhynchus* is the least easy to detect. In specimens of that genus we usually see no scales during the examination of the dorsal surface, and even when the mosquito has been turned upside down for the examination of the ventral surface, the ventral tuft may not be recognized because its very dark scales are viewed against the equally dark background of the abdomen. It is not until the mosquito has been turned on its side that the ventral tuft is easily seen. That is why it is so important not to neglect the examination of the last abdominal segments from every direction of view. If it is found that the abdomen carries only this single ventral tuft of scales, we can say at once that the mosquito belongs to the genus *Myzorhynchus*. The determination should be confirmed by finding that the thorax carries long, sharp-pointed, myzomyia-like scales, and that the prothoracic lobes carry a cocade of scales. (2) If on examining the dorsal surface we see at once that it is clothed with very broad scales and that tufts of scales project laterally from the sides of each segment, the mosquito belongs to the genus *Cellia*. (3) If on examining the dorsal surface we see that every segment carries scales and that there are no lateral tufts, but that when the mosquito is turned on its side a number of very prominent ventral tufts come into view, the mosquito belongs to the genus *Christophersia*.

If our examination has shown that none of the abdominal scales are aggregated to form tufts, it has to be decided whether all the segments are provided with scales on their dorsal surface or whether only the terminal segments carry scales. In the first case the mosquito belongs to the genus *Neocellia*. In the second case examine the thorax; if the scales are short and broad the mosquito belongs to the genus *Nyssorhynchus*, if they are long,

sharp-pointed, and very narrow, it belongs to the genus *Nyssomyzomyia*.

Hints. (1) When beginning the study of classification by scale ornamentation always select good, *unrubbed* specimens. If mosquitoes bred from larvæ are being used do not kill them until 12 hours have elapsed from the time when they hatched out. The best specimens are those which, bred under favourable conditions from larvæ, have been allowed one meal of blood and then kept in suitable jars until the meal has been digested. (2) Do not use card-discs for mounting the mosquitoes to be used in studying this subject. Cut off the head of the fine silver pin and mount the mosquito on the pin so that an equal length of the pin projects from the dorsum and from the venter. Then stick either the point or the head end of the pin into a small block of pith or of cork. For examination, the mosquito can now be pinned with the dorsal, ventral, or lateral surface uppermost and a proper view obtained. When card-discs are used this cannot be done, because the disc is always in the way and hides the part one desires to examine. (3) A knowledge of whether the scales are false scales or true scales is not necessary for determining the genus, but if it is desired to study this matter thoroughly, the scales must be mounted flat on a slide and examined with a high power objective. It is essential to carry out the same procedure when it is desired to study thoroughly the shape of various scales. (I refer of course to a closer study than is necessary for ascertaining whether the upright forked scales of the head are rod-shaped or broadly expanding, whether the thoracic scales are sharp-pointed and very narrow or blunt-ended and broad, etc.). The following is the simplest method of obtaining the particular scales one wishes to study. Dissect out with a sharp knife the part of the mosquito that carries the scales and place it on a slide under a cover-glass. Tap and press the cover-glass slightly, then remove it and slide the part of the mosquito away with the point of a needle. Replace the cover-glass and fix it with strips of gummed paper. Many scales will have remained on the slide during these manipulations. Examine them with a $\frac{1}{12}$ inch oil immersion lens and draw them with the aid of an eyepiece camera lucida. (4) In describing the shapes of scales it would be of great advantage if all observers were to adopt the exact nomenclature used by botanists in describing the shapes of leaves. This nomenclature is given in all the elementary books on botany and is very applicable to the shapes of scales. The botanical terms acicular, linear, oblong, elliptical, rotundate, orbicular, lanceolate, ovate, oblanceolate, obovate, spatulate, etc., have a definite meaning and significance. "Lanceolate" is a botanical term commonly used by entomologists, but it is used by them indifferently for scales of very various shapes; a lanceolate leaf is broadest at the base and scales with that character are seldom or never seen, though oblanceolate scales are very common. The use of such terms as "slightly lanceolate," "long and narrow," "large and inflated," etc.,

can be criticised not only because these terms are so indefinite, but because it would be easy to find botanical terms that would describe the shape of the scale in a single word that conveys the same meaning to everyone. (5) It is particularly to be noted that no detailed arrangement by scale ornamentation can be made that will apply to both females and males. The scale ornamentation (especially on the last segments of the abdomen and genital process) of male anophelines often differs considerably from that of female anophelines. The arrangement described in this paper applies throughout to the female insect only.

26-5-10.

ADDENDUM.

The issue of vol. v of Mr. Theobald's Monograph while this paper was passing through the Press has made it necessary to add in the form of an appendix the characters of a new genus, NEOMYZOMYIA, described by him. He has created the genus for the reception of *elegans*, James, a species that I have not seen for some years. The generic characters are shown in the following statement :—

Abdomen.	Thorax.	Head.	Prothoracic lobes.
Only the last segment carries scales. They are arranged as in the genus *Nyssorhynchus*.	The anterior promontory carries a group of sharp-pointed curved scales which project over the neck. The remainder of the dorsum is clothed with hairs.	With the usual type of broadly expanding upright forked scales which form dense tufts at the postero-lateral corners.	With a tuft of long out-standing scales.

It will be seen that the genus is distinct from any of those described above. It comes near to the genus *Patagiamyia*, but the presence of scales on the last segment of the abdomen separates it very distinctly and makes us place it in the second of the two great groups. Mr. Theobald says that the scales of the wing are *Myzorhynchus*-like and that the palpi are densely scaled, so that the chief difference between the new genus and the genus *Myzorhynchus* must be that in *Myzorhynchus* the scales of the last abdominal segments are arranged as a ventral tuft while in *Neomyzomyia* they are not aggregated to form a tuft but are disposed irregularly as in the genus *Nyssorhynchus*. The name *Neomyzomyia* is rather misleading.

S. P. J.

5-9-10.

EXPLANATION OF PLATE IX.

The figures show from left to right the upright forked scales of the head, the hairs or scales on the dorsum of the thorax, and the hairs or scales on the prothoracic lobes. The drawings of these structures relate respectively to

The genus	NEOSTETHOPHELES	(Fig. 1.)
,, ,,	MYZOMYIA	(Fig. 2.)
,, ,,	PATAGIAMYIA	(Fig. 3.)
,, ,,	PYRETOPHORUS	(Fig. 4.)

In Fig. 2 the three thoracic scales shown are false scales; in Fig. 3 one scale is a false scale and two are true scales; in Fig. 4 all are true scales.

D. Bagchi, lith.

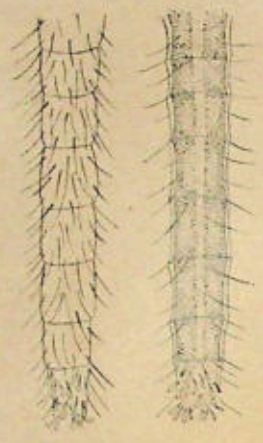
EXPLANATION OF PLATE X.

The upper half of the plate (Figs. 1 to 6) relates to the genus .. .. NYSSORHYNCHUS.

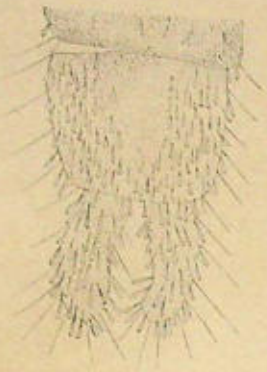
The lower half of the plate (Figs. 7 to 11) relates to the genus .. .. NYSSOMYZOMYIA.

Details of the upper half of the plate.—From left to right the drawings are, (1) abdomen from the dorsal aspect, (2) abdomen from the ventral aspect, (3) last segment of abdomen and genitalia, (4) thorax. Fig. 5 shows three of the abdominal scales as drawn with the aid of a camera lucida under a $\frac{1}{12}$-inch oil immersion objective and low eyepiece. Fig. 6 shows some of the thoracic scales drawn by the same method. The three thoracic scales to the left are from *fuliginosus* and the three to the right are from *maculatus*.

Details of the lower half of the plate.—Genus *Nyssomyzomyia*. The thoracic and abdominal scale ornamentation of *rossi* is shown. Fig. 8 shows the ventral surface of the last abdominal segments. The long pointed false scales and the hair on the right of the plate are from the anterior promontory and mid region of the dorsum of the thorax; and the two true scales below the short black line. (Fig. 11) are from the ventral surface of the last abdominal segment.

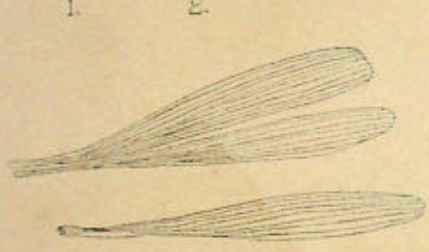


1. 2.

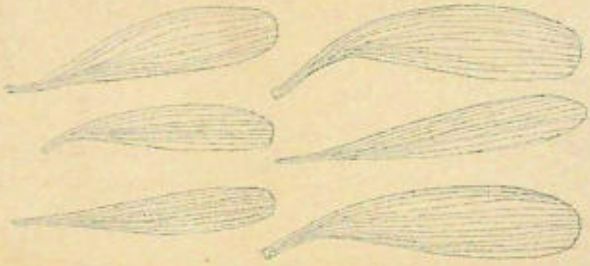


3.

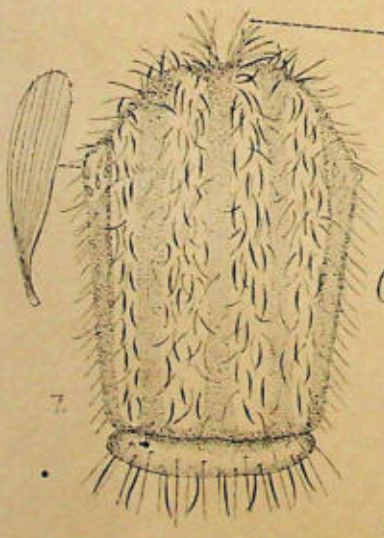
4.



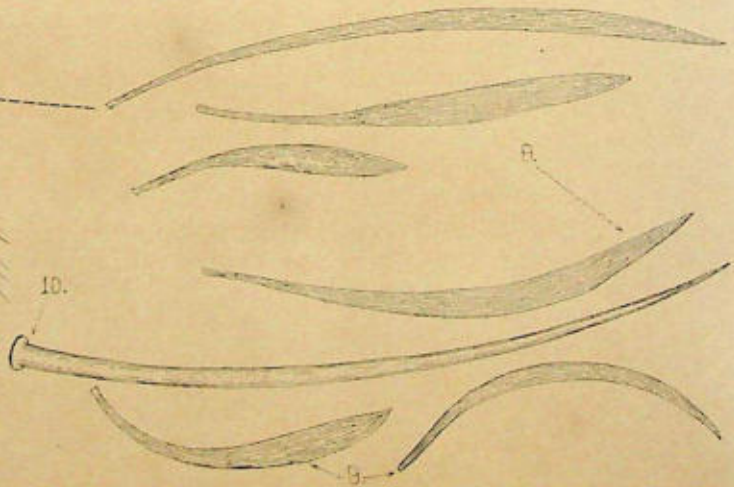
5.



6.



7.



8. 9. 10.

11.

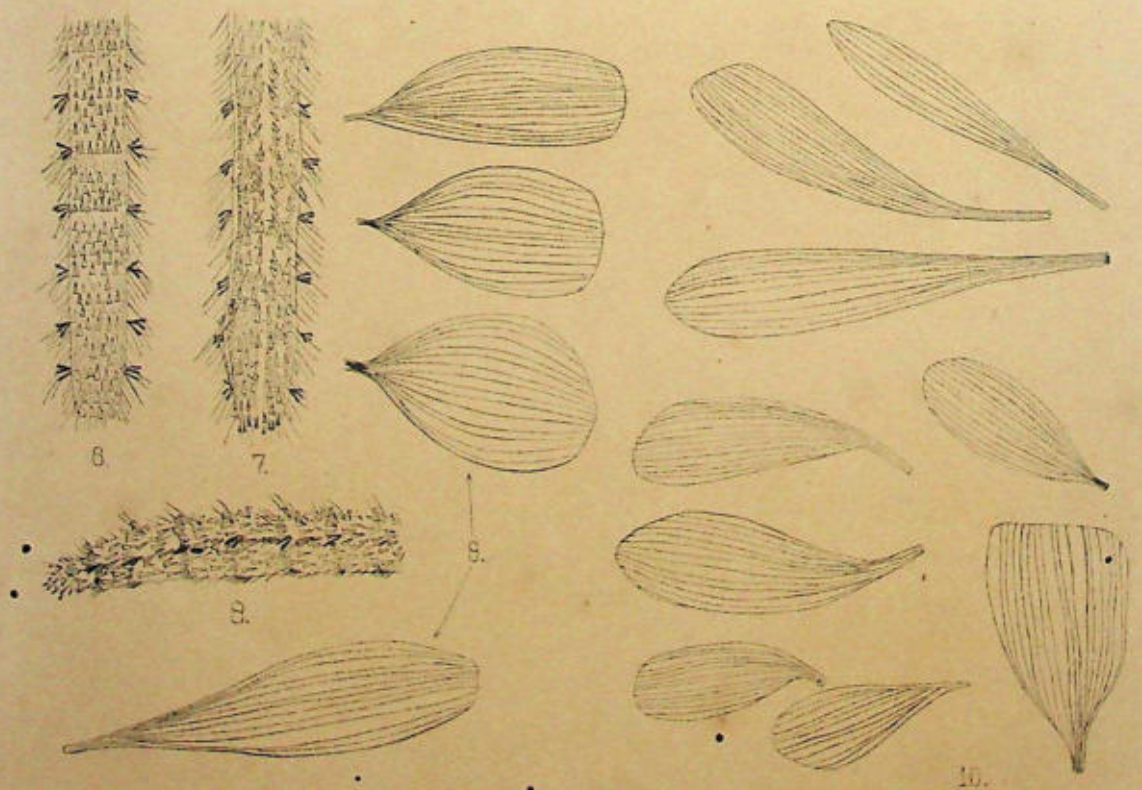
S. P. James, del. D. Bagchi, lith.

EXPLANATION OF PLATE XI.

The upper half of the plate (Figs. 1 to 5) relates to the genus .. .. NEOCELLIA.

The lower half of the plate (Figs. 6 to 10) relates to the genus .. .. CELLIA.

In both cases the following structures are shown: (1 and 6) abdomen from the dorsal aspect, (2 and 7) abdomen from the ventral aspect, (3 and 8) abdomen from the side; (4 and 9) abdominal scales and (5 and 10) thoracic scales. As regards the genus *Neocellia* some of the scales (the larger ones) are from *willmori* and others (the smaller) from *stephensi*. As regards the genus *Cellia* all the scales are from *pulcherrima*.



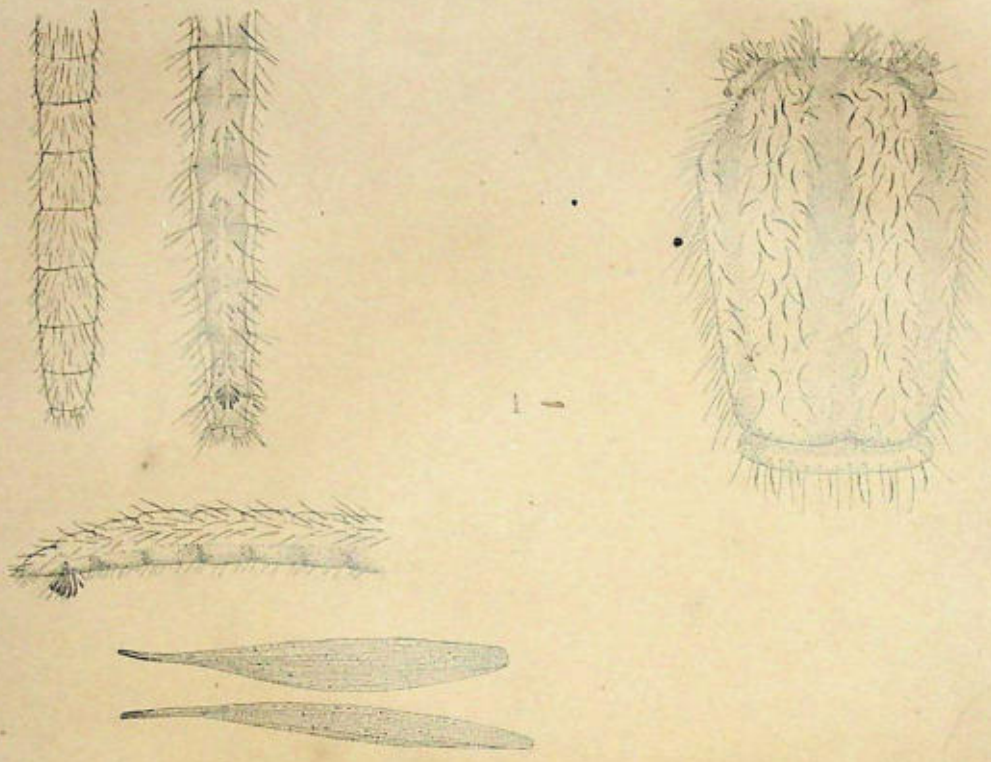
S. P. James, del. D. Bagchi, lith.

EXPLANATION OF PLATE XII.

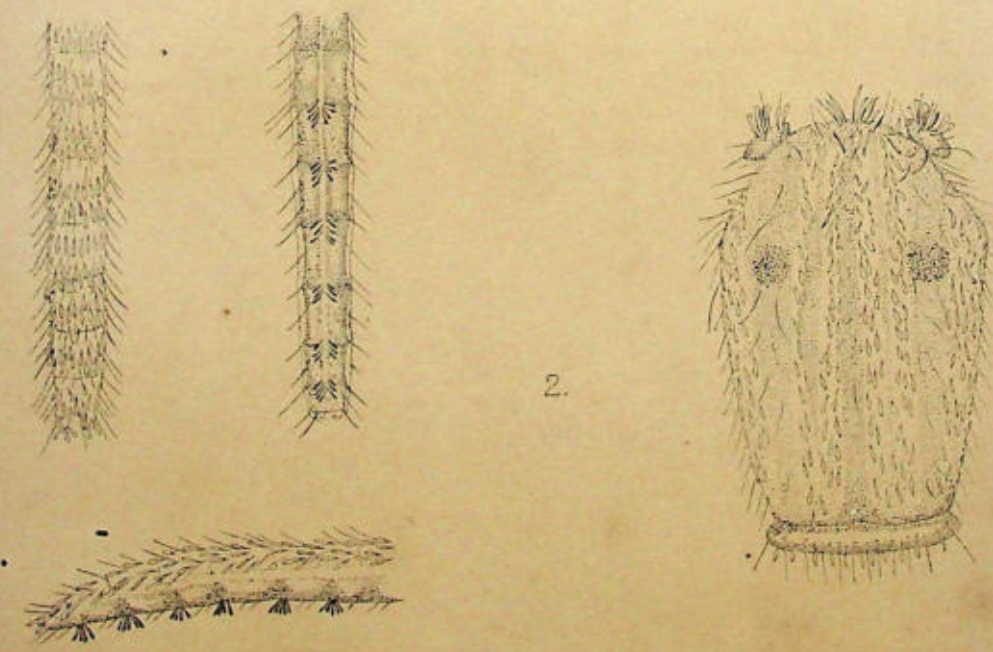
The upper half of the plate (1.) relates to the genus .. .. MYZORHYNCHUS.

The lower half of the plate (2.) relates to the genus .. .. CHRISTOPHERSIA.

In both cases the scale ornamentation of the abdomen, thorax, and prothoracic lobes is shown. The two scales below the lateral view of the abdomen in 1. are from the ventral abdominal tuft.



1.



2.

VI. A REVISION OF THE SPECIES OF *TABANUS* FROM THE ORIENTAL REGION, INCLUDING NOTES ON SPECIES FROM SURROUNDING COUNTRIES.

By GERTRUDE RICARDO.

The Oriental Region in this paper includes India, Burma, Federated Malay States, Siam, Annam, Sumatra, Borneo, Java, and other islands, the Philippines, Formosa, and the southern part of China, as defined by Wallace and others, but Celebes is not included, following the eastern dividing line adopted by Sclater, so that, as a rule, the species from Celebes are not included here, but relegated to the Austro-Malay Region; judging from the Bigot and Walker types I have seen from Celebes, they certainly (with one or two exceptions included here) appear to have little affinity to the Indo-Malay, Borneo and Java species.

The material on the examination of which this paper is based, includes the British Museum collection, a collection sent me by Dr. Annandale from the Indian Museum for identification, a smaller collection from Mr. F. M. Howlett, from the Pusa Agricultural Research Institute, Bengal; besides species sent by Dr. Kertesz from the Budapest Museum. To Dr. A. T. Stanton I am indebted for an interesting series of species collected in the Federated Malay States. From Col. Alcock I have had a small collection to identify belonging to the London School of Tropical Medicine. Through the courtesy of the Director and of M. Jacques Surcouf of the Paris Museum, I have been able to examine most of the Macquart and Bigot types in their possession. Through the courtesy of the authorities of the Natural History Museum at Genoa, I was able to examine Rondani's types in their collection. I am indebted to Mr. G. H. Verrall for his loan of the majority of the Bigot types, which, as a rule, would be very difficult to recognize from the descriptions, based in many cases on single specimens, and now at any rate in a very denuded condition. Bigot labelled many of the specimens in the Indian Museum collections, but most of them are merely MS. names, where he made a new species and published the description, he evidently interchanged the specimens with the Museum and his own collection, so that some of Mr. Verrall's Bigot types have co-types from the same series of specimens in the Indian Museum collection. His specification of localities is very vague,

"India" alone frequently being given for Assam; Dr. Annandale informs me in a letter that M. Bigot destroyed most of the original labels and substituted others in which only "Inde" was written. Owing to denudation it is frequently difficult to identify species of *Tabanus*, and probably with the advent of fresh material much rectification may be necessary, especially as regards the identification of the older species. The synonyms given here are very numerous, but have been chiefly determined from the more important plastic characters, such as breadth of forehead, its greater or less narrowness anteriorly above the eyes, and the shape of the frontal callus; both these characters vary, but to a small extent only; the shape of the palpi is also a valuable character if not relied upon too minutely; the absence or presence of an appendix on the wing is a very variable, uncertain, character; the closed or extremely narrow first posterior cell at border of wing appears fairly reliable, but males and females probably vary in this character. Rondani formed the genus *Bellardia* for species possessing this character (Archiv. Canestr., iii, p. 81, 1863), but it does not appear a good generic character and has not been adopted by other authors. The design and colouring of the abdomen must naturally be largely made use of, though owing to the easy denudation of the tomentose dust which usually forms the spots and stripes, it is often difficult to identify species; the colouring of the hairs on body and legs is useful, but it appears to vary in specimens of the same species to some extent, especially as regards the legs; the shining polished subcallus in some species appears a reliable distinct character, though here again denudation must be borne in mind. The subgenus *Therioplectes*, Zeller, formed for species with pubescent eyes and with an ocelligerous tubercle on vertex of forehead, appears applicable to the species of the Oriental Region, though their number is very small; but it is otherwise with the subgenus *Atylotus*, Osten Sacken, formed for species with pubescent eyes but no ocelligerous tubercle, some species such as the widely distributed *Tabanus taeniatus*, Macq., and other species from this Region have an *Atylotus*-like appearance, that is to say, they resemble the group containing *fulvus*, *rusticus*, and others, of a mealy coloured appearance, Brauer placed black and other species in this group, in his work on European Tabanidae; but the eyes are practically bare in both sexes, so that this subgenus as in the South African fauna is not here applicable. The grouping of the species has been again attempted as in those of the South African Region, but where it is based upon the presence or absence of spots on the abdomen it will probably need correction in the future, the group represented by *Tabanus fumifer*, Walker, being one of the most difficult in this fauna. The table of species has been drawn up for the females, only males are included in a few instances where specified; as is always the case, the males in the collections are very few in number. The measurement of the length of the forehead is based on the width anteriorly above the eyes. In the references

here to Macquart's Dipt. Exot. volumes the original pagination is used, unfortunately in some of the reprints of the work from Mem. Sci. Agri. et Arts de Lille, 1838—1854, in which publication the work first appeared, the original pagination has not been adhered to, and in this incorrect form has been in general use. As the descriptions by Walker and Bigot are, as a rule, too poor for identification of the species, it appears justifiable to delete from the list of species of *Tabanus* any types of either of these authors which are now lost or destroyed. All types, except those of Bigot and Macquart which are either in Mr. Verrall's possession, or in the Paris Museum, or as in the case of Macquart in the Lille Museum, are in the British Museum collection unless otherwise specified.

There were about 119 described species of *Tabanus* from the Oriental Region, now reduced by synonyms, deletion from list or not belonging to the Oriental Region to about 73 species, which with the addition of 40 new species described here (4 were published first in the Annals) brings the total to 117 species, including one species from Celebes, and 3 species from other Regions occurring here. The table for species does not include those species of which I have no knowledge, except in a few instances where the descriptions allow of their being included with some certainty.

The drawings in the two plates have been executed by Miss Grace Edwards.

TABLE FOR GROUPS.

I. Eyes bare		II.
Eyes hairy (*Therioplectes*)	GROUP XI.	91.
II. Forehead with two separate calli, the first one usually transverse, the second irregular in shape, smaller. Forehead four to six times as long as it is broad. Small species 9—14 mm. in length ..		III.
III. Thorax and scutellum same colour. Abdomen with no bands	GROUP I.	1.
Scutellum white or yellow-haired. Abdomen with white or yellow-haired bands ..	GROUP II.	4.
IV. Forehead with two small round spot-like calli, one above the other, never united ..	GROUP III.	7.
V. Forehead with no callus	GROUP IV.	9.
VI. Forehead with one square, narrow, or oblong callus, which is always prolonged towards the vertex by a more or less narrow line..		VII.
VII. Wings with spots or bands	GROUP V.	10.
Wings distinctly marked with brown or yellow colouring, but not in the form of bands. Large species 18—23 mm. in length ..	GROUP VI.	13.

Species with one or more stripes usually continuous on abdomen. Forehead five to nine times as long as it is broad .. GROUP VII. 17.

Species with median or lateral spots or both on abdomen, not usually forming a continuous stripe. Forehead four to ten times as long as it is broad .. .. GROUP VIII. 39.

Species with paler bands and sometimes spots on abdomen. Forehead four to ten times as long as it is broad .. .. GROUP IX. 53.

Species with the abdomen unicolorous or almost so, sometimes darker at apex. Forehead five to ten times as long as it is broad .. .. .. GROUP X. 65.

VIII. Species with eyes pubescent and an ocelligerous tubercle on forehead at vertex .. .. .. GROUP XI.

TABLE FOR SPECIES.

GROUP I.

1. Subcallus shining. Eyes with no cross-bands .. .. 2.
   Subcallus not shining. Eyes with cross-bands .. .. 3.
2. Frontal callus reaching eyes. Abdomen grey, covered with long white pubescence. Tibiae whitish with long fringes of white hairs .. .. .. *rarus*, n. sp.
   Frontal callus not reaching eyes. Abdomen black, shining. Tibiae whitish, but with no long fringes of white hairs .. .. *hirtipalpis*, n. sp.
3. Frontal callus reaching eyes. Black species with three grey stripes on abdomen .. .. *bicallosus*, Ricardo.

GROUP II.

4. Dark brown or yellowish brown species with yellow-haired scutellum and yellow-haired bands on abdomen .. .. 5.
   Black species with white-haired scutellum and white-haired bands on abdomen .. .. 6.
5. Abdomen reddish brown or yellow with six narrow yellow bands.

Palpi pale yellow with black and yellow pubescence. Fore tibiae pale on basal two-thirds only .. *flavicinctus*, n. sp.

Abdomen dark reddish brown or blackish with two broad yellow bands. Palpi black with grey tomentum and white and black hairs. Fore tibiae pale to apices.. *leucocnematus*, Bigot.

6. Abdomen black with two white bands. Frontal callus almost reaching eyes. Fore tibiae pale on basal two-thirds only. Wings tinged brown on fore border .. *bicinctus*, n. sp.

Abdomen with six white bands. Frontal callus not reaching eyes. Fore tibiae pale to apices. Wings clear .. .. .. *sexcinctus*, n. sp.

GROUP III.

7. Forehead slightly narrower anteriorly, three and a half to four times as long as it is broad .. 8.

8. Abdomen blackish covered with golden yellow tomentum and appressed yellow pubescence .. *fulvus*, Meig.

Abdomen yellowish with median and lateral blackish or brownish stripes .. .. .. *ditaeniatus*, Macq.

GROUP IV.

9. Abdomen brown, reddish at base, covered with grey tomentum and with two small round greyish spots on the segments. Wings with no appendix. Length 7½ to 11 mm. *virgo*, Wied.

Abdomen blackish brown with median and lateral greyish tomentose spots. Wings with an appendix. Length 13 mm. .. .. *nemocallosus*, Ricardo.

Abdomen covered with greyish yellow tomentum and with thick short yellow pubescence, ♀ : abdomen the same but a black median stripe often appears, ♂. Wings with no appendix. Length 11½-12½ mm. .. .. .. *negativus*, n. sp.

GROUP V.

10. Wings with four dark spots. Abdomen reddish brown, with white spots *javanus*, Fabr.

Wings with one cross-band, the first posterior cell open		11.
Wings with two cross-bands, the first posterior cell closed or very narrow		12.
11. Forehead narrowest at vertex. Abdomen reddish, darker at apex, with small white median spots ..	*optatus*, Wlk.	
Forehead narrowest anteriorly. Abdomen yellowish, darker at apex, with larger white spots ..	*non-optatus*, n. sp.	
12. Abdomen brownish yellow, with broad yellow posterior bands on each segment, under side yellowish. Antennae reddish yellow. ♂ with equal facets to eyes ..	*flexilis*, Wlk.	
Abdomen brownish red with narrower yellow bands, under side darker. Antennae reddish yellow, black at apex. ♂ with unequal facets to eyes	*vanderwulpi*, O. S.	

Group VI.

13. Wings dark rich brown, the discal cell clear. Large black species with orange-red pubescence on face and breast. Antennae red ..	*pratti*, n. sp.	
Smaller species similar in colouring. Antennae black	*fuscicornis*, n. sp.	
Wings yellowish or brownish, very distinctly tinged with brown at apex and on posterior border. Scutellum yellow or greyish ..		14.
14. First posterior cell of wings closed or very narrow		15.
First posterior cell open, not very narrow		16.
15. Abdomen reddish brown, narrow, with grey tomentose bands and median spots. Palpi slender. First posterior cell closed ..	*nephodes*, Bigot.	
Abdomen brown with narrow grey tomentose bands but no median spots. Palpi large, broad. The first posterior cell very narrow at border	*albofasciatus*, n. sp.	
Abdomen black, livid at base. Smaller species. First posterior cell closed	*basalis*, Macq.	

16. Large yellowish species with blackish bands on the abdomen .. *auriflamma*, Wlk.

GROUP VII.

17. First posterior cell closed. Yellowish species with indistinct median black stripe on abdomen .. *annamitus*, ♂, Bigot.
First posterior cell open .. 18.

18. Frontal callus oblong or narrow with lineal extension. Forehead at least five times as long as it is broad .. .. .. 19.
Frontal callus large, somewhat protuberant, almost square, with short lineal extension. Forehead three or four times as long as it is broad .. .. .. 36.

19. Abdomen with a median stripe and lateral stripes or spots .. 20.
Abdomen with one median continuous stripe only, no lateral spots, or only isolated ones on the second segment .. .. .. 27.
Abdomen with lateral stripes only .. 35.

20. Frontal callus with a spindle-shaped lineal extension .. .. 21.
Frontal callus with the lineal extension not spindle-shaped .. 22.

21. Abdomen blackish or reddish brown with grey median and lateral stripes, almost all the same length .. .. .. *striatus*, Fabr.
Abdomen with the grey median stripe beginning only on the third segment, and with lateral stripes ending on the third or fourth segment .. .. .. *hilaris*, Wlk.

22. Abdomen with a median stripe, the side spots small and indistinct .. 23.
Abdomen with a median stripe, the side spots large and distinct .. 24.

23. Smaller species. Abdomen reddish yellow, darker at apex. Thorax blackish. Forehead eight times as long as it is broad .. *abbreviatus*, Bigot.

24. The median abdominal stripe composed of almost equal sized spots, not very large .. .. 25.

The median abdominal stripe composed of spots of unequal size, those on the third and fourth segments very large and conspicuous .. .. .. 26.

25. Abdomen and thorax lilac or blackish brown, femora blackish. Forehead about five times as long as it is broad .. .. *rubidus*, Wied.

Abdomen and thorax obscurely reddish brown, femora reddish brown. Forehead five to six times as long as it is broad .. .. *albimedius*, Wlk.

26. Abdomen and thorax reddish brown, femora blackish. Forehead about seven times as long as it is broad *speciosus*, n. sp.

27. Median stripe of abdomen grey tomentose or white or yellow haired .. .. .. 28.

Median stripe of abdomen black .. 31.

Median stripe of abdomen golden haired .. .. .. 32.

28. Forehead barely half as wide anteriorly as it is at vertex .. 29.

Forehead parallel or nearly so .. 30.

29. Small brown species. Femora brownish. Wings clear, brown on fore border .. .. .. *hirtistriatus*, n. sp.

30. Large black or reddish brown species, medium abdominal stripe narrow. Femora black. Wings tinged brown .. .. .. *monotaeniatus*, Bigot.

Brown species, the median abdominal stripe broad, and two round spots on second segment. Femora reddish. Wings brown on fore border .. .. .. *brunnipennis*, n. sp.

31. Abdomen reddish, black at apex, a narrow grey stripe often apparent on the median black stripe .. *abscondens*, Wlk.

32. Forehead parallel .. .. 33.

Forehead narrower anteriorly .. 34.

33. Abdomen yellowish brown, darker at apex, the median stripe dull golden haired indistinct .. *auristriatus*, n. sp.

34. Abdomen yellowish brown or dark brown, the median stripe broad. Fore femora yellowish. Wings brown, especially on fore border .. *hybridus*, Wied.

Abdomen covered with yellowish tomentum, median stripe very broad. Fore femora black. Wings clear .. .. .. *aurotestaceus*, Wlk.

35. Black species. Abdomen with ferruginous lateral stripes on the first four segments. Legs blackish brown .. .. .. *tristis*, v. d. Wulp.

36. Forehead narrowest anteriorly .. 37.
Forehead narrowest at vertex .. 38.

37. Small black species. Abdomen with a median grey stripe beginning on the third segment only, the lateral stripes terminate on the second segment .. .. .. *jucundus*, Wlk.

38. Small brown species. Abdomen with a median grey stripe .. *puteus*, n. sp.

GROUP VIII.

39. Wings with first posterior cell closed or at least very much narrower at border. Forehead six to seven times as long as it is broad .. 40.
Wings with first posterior cell open, never very narrow at border .. 41.

40. Abdomen with three series grey spots on abdomen, reddish brown in male, blackish in female .. *amaenus*, Wlk.
Abdomen with three grey spots on the first two or three segments only, a larger, broader bodied, blackish species .. .. *mandarinus*, Schiner.

41. Forehead narrow, six to ten times as long as it is wide anteriorly, with a long narrow frontal callus .. 42.
Forehead broader, four to five times as long as it is wide anteriorly, with a larger nearly square, or pear-shaped frontal callus .. 52.

42. Brown, reddish brown, or reddish yellow, medium sized or large species, the triangular greyish or yellowish spots not usually forming a continuous stripe .. 43.
Large unicolorous reddish species with small median indistinct white spots .. .. .. 49.
Reddish brown or brown species with large prominent median whitish

spots on the third and fourth segments only .. .. 50.
Reddish species with black spots .. 51.
Small species with a narrow yellow abdomen irregularly marked with black and with three series irregular shaped grey median and lateral spots .. .. *varicolor*, Ricardo.

43. Medium sized species, 17-18 mm. in length. Abdomen reddish yellow with small median white spots. Forehead almost parallel or barely a third narrower anteriorly, six times as long as it is broad. Frontal callus oblong not reaching the eyes. Wings clear, faintly tinged yellowish brown .. .. *rubicundus*, Macq.
Large brown or reddish brown species usually 18-25 mm. in length, with abdominal median spots. Forehead from one-third to half narrower anteriorly, frontal callus long and narrow .. .. 44.

44. Forehead eight to nine times as long as it is broad, about one-third narrower anteriorly .. .. 45.
Forehead very narrow, eight to ten times as long as it is broad, only half as wide anteriorly as at vertex .. .. .. 46.

45. Abdomen reddish, or reddish yellow, large, broad, with median short triangular yellow spots often indistinct. Fore tibiae reddish yellow on basal half, with black pubescence. Wings large, tinged yellowish brown or almost clear. Forehead almost parallel .. *stantoni*, n. sp.
Abdomen reddish brown, long, narrow, with median long triangular, distinct whitish spots, usually joining each other. Fore tibiae white on basal half with white pubescence. Wings long, faintly tinged yellowish brown. Forehead about a third narrower anteriorly .. .. .. *indianus*, n. sp.
Abdomen blackish brown with almost hemispherical white median

spots. Fore tibiae blackish. Legs and palpi blackish. Wings clear, tinged brown. Forehead about a third narrower anteriorly .. .. *brunneus*, Macq.

46. Forehead eight times longer than it is broad, the frontal callus not reaching eyes .. .. .. 47.

Forehead ten times as long as it is broad, the frontal callus reaching eyes .. .. .. 48.

47. Abdomen dark reddish brown or reddish yellow, with indistinct small greyish or yellow-haired median spots, often absent: Thorax blackish with some yellowish grey tomentum. Fore tibiae pale on basal half. Wings slightly tinged with brown. Male with unequal facets on eyes .. .. *fumifer*, Wlk.

Smaller species. Abdomen reddish brown with distinct bright yellow-haired median spots and similar lateral spots on the 2-5th segments. Thorax blackish with greyish yellow tomentum .. *malayensis*, n. sp.

Larger species. Abdomen broad, reddish brown with indistinct median spots and some lighter segmentations. Thorax reddish with some grey tomentum. Wings nearly clear. Fore tibiae pale on basal two-thirds. Male with equal facets to eyes .. .. *factiosus*, Wlk.

48. Abdomen reddish brown, median spots indistinct, small, whitish. Thorax reddish, thickly covered with ashy grey tomentum. Wings clear .. .. .. *dissimilis*, n. sp.

49. Abdomen and thorax reddish, shining, nearly devoid of pubescence. Wings clear. Palpi ending in an acute point .. .. *ignobilis*, Rondani.

Abdomen and thorax reddish. Wings tinged yellowish brown. Palpi ending in an obtuse point .. *nexus*, Wlk.

50. Red-brown species with the large median white spots on third and fourth segments of abdomen, and white spots on the lateral borders

of the first four segments. Tibiae reddish .. .. .. *signifer*, ♂, Wlk.

Brown species with the same median spots, but with lateral white spots on the first two segments only. Tibiae white .. .. *significans*, n. sp.

51. Abdomen reddish, the apex dull black with large black median spots on the second and third segments .. .. .. *fuscomaculatus*, n. sp.

52. Frontal callus square. Small black species with white-haired median abdominal spots. Legs blackish, tibiae yellowish .. .. *leucopogon*, Bigot.

Frontal callus pear-shaped. Large reddish brown species, abdomen with median triangular spots. Legs reddish brown .. .. *discrepans*, n. sp.

Group IX.

53. First posterior cell closed .. 54.

First posterior cell not closed .. 55.

54. Large blackish species with narrow fulvous bands on abdomen .. *servillei*, Macq.

55. Abdomen blackish brown, the first two segments covered with grey tomentum .. .. *crassus*, ♂, Wlk.

56. Forehead narrow, seven or eight times as long as it is broad. Frontal callus narrow with a lineal extension. Black or brown species 57.

Forehead broader, four or five times as long as it is broad. Frontal callus large with a stout, broad, or spindle-shaped extension .. 62.

57. Large black or brown species 21 mm. in length, with very narrow pale bands on abdomen .. .. 58.

Smaller blackish species, 15-17 mm. in length, with whitish bands on abdomen .. .. .59.

58. Brown species. Scutellum and sides of thorax with pale tomentum. Legs blackish, tibiae obscurely reddish .. .. .. *albosculatus*, Bigot.

Black species. Scutellum and sides with no such pale tomentum. Legs black, tibiae yellowish white .. *explicatus*, Wlk.

59. Forehead narrower anteriorly .. 60

Forehead hardly narrower anteriorly, but parallel .. .. 61.

60. Frontal callus large, reaching the eyes. Antennae, legs, and palpi wholly black. Wings clear or tinged smoky brown .. *nicobarensis*, Schiner.
Frontal callus narrow. Antennae and legs blackish. Palpi yellow. Wings brownish .. .. *justorius*, Rondani.

61. Frontal callus narrow, not reaching eyes. Antennae and legs black. Palpi black, paler on insides. Wings faintly tinged brown .. *khasiensis*, n. sp.

62. Brown or black species with whitish bands and spots on abdomen .. 63.
Reddish yellow species with whitish bands and spots on abdomen .. 64.

63. Abdomen reddish brown or blackish brown with broad white bands and large triangular median spots. Palpi short and stout .. *sanguineus*, Wlk.
Smaller species. Abdomen black with narrow white-haired segmentations and small triangular spots. Palpi slender .. *oxyceratus*, Bigot.

64. Abdomen reddish yellow, darker at apex, with narrow yellowish white segmentations and median spots. Legs black, tibiae yellowish .. *orientis*, Wlk.
Abdomen similar, but the last four segments are black .. .. *fulvimedius*, Wlk.
Smaller species. Abdomen similar to that of *orientis*. Legs wholly yellow .. .. .. *consanguineus*, Macq.

GROUP X.

65. Black or brown species. Forehead narrower anteriorly, seven to ten times as long as it is broad .. 66.
Large reddish yellow species from 20-24 mm. in length. Forehead six to ten times as long as it is broad .. .. .. 72.
Dark reddish brown species from 18-22 mm. in length. Forehead seven to ten times as long as it is broad .. .. .. 75.
Reddish or reddish yellow species

from 16-19 mm. in length. Forehead six to ten times as long as it is broad .. .. .. 76.

Small species reddish, yellowish, brownish or blackish, from 12-16 mm. in length Forehead five to ten times as long as it is broad .. 79.

66. Thorax paler than abdomen with yellowish tomentum and pubescence .. .. .. 67.

Thorax not paler than abdomen .. 68.

67. Dark brown or blackish species with yellowish brown thorax. Legs black, tibiae white. Wings tinged yellowish brown .. .. *birmanicus*, Bigot.

Reddish brown species with light yellow or greyish thorax. Legs black, tibiae white, middle and posterior femora yellowish. Wings brownish, clear at apex .. *flavothorax*, n. sp.

68. Wings yellowish brown, yellow on fore border. Black species. Thorax with short red pubescence .. *tinctothorax*, n. sp

Wings brownish or black. Brown or black species .. .. 69.

69. First posterior cell of wings closed. Abdomen deep black .. *nigrotectus*, Bigot.

First posterior cell not closed .. 70.

70. Blue-black species. Thorax red at base. Antennae reddish brown. Posterior tibiae red at base .. *caerulescens*, Macq.

Forehead almost parallel. Abdomen dull reddish brown with greyish blue tomentum. Antennae reddish yellow, black at apex. Tibiae dull red or blackish. Beard and palpi black .. .. *tenebrosus*, Wlk.

Forehead narrower, not parallel .. 71.

71. Abdomen blackish. Antennae reddish yellow. Tibiae dull reddish. Beard white and black. Palpi yellowish .. .. *perakiensis*, n. sp.

Abdomen dull blackish, conical. Antennae black. Tibiae black. Beard and palpi black .. *inobservatus*, n. sp.

72. Forehead parallel, six times as long as it is broad .. .. 73.

Forehead narrower anteriorly, eight to ten times as long as it is broad .. 74.

73. Broad-bodied reddish-yellow species. Antennae yellow. Legs reddish brown .. .. .. *fulvissimus*, Rondani.

74. Thorax brownish. Antennae reddish, the third joint black. Femora reddish brown .. .. *univentris*, Wlk.

Thorax yellowish. Antennae, palpi and legs yellow .. .. *flavissimus*, n. sp.

75. Abdomen reddish brown, covered posteriorly with yellowish brown tomentum, and yellowish pubescence. Forehead seven times as long as it is broad. Beard white.. *pauper*, Rondani.

Abdomen dull reddish brown with black pubescence. Forehead seven times as long as it is broad. Beard brownish, scanty. Fore coxae with white hairs .. .. *leucohirtus*, n. sp.

Abdomen dull reddish brown with black pubescence. Forehead ten times as long as it is broad. Beard brown, thick. Fore coxae with black hairs .. .. *atrohirtus*, n. sp.

76. Forehead ten times as long as it is broad. Frontal callus long and narrow. Abdomen reddish yellow, darker at apex. Legs black, tibiae whitish at base .. .. *pallidepectoratus*, Bigot.

Forehead six to seven times as long as it is broad .. .. 77.

77. Forehead narrowest at the vertex, abdomen reddish. Legs wholly red *nigropictus*, Macq.

Forehead narrowest anteriorly .. 78.

78. Abdomen narrow, reddish brown, under side with bands. Thorax reddish. Legs black, tibiae white at base .. .. *joidus*, Bigot.

Abdomen conical, reddish yellow, the apex black, under side the same. Thorax blackish. Legs black, fore tibiae dull reddish yellow on basal half, others wholly so .. *siamensis*, n. sp.

79. Forehead five times as long as it is broad, narrower anteriorly. Frontal callus club-shaped. Small reddish brown species. Palpi slender, hairy .. .. .. *palpalis*, Ricardo.

Forehead five to six times as long as it is broad, parallel or nearly so.

Frontal callus oblong or club-shaped .. .. .. 80.

Forehead seven to ten times as long as it is broad, narrower anteriorly. Frontal callus long and narrow or oblong .. .. .. 83.

80. Yellow species. Thorax and scutellum covered with grey tomentum and yellow pubescence. Legs and antennae yellow. Palpi stout, ending in a long fine point. Frontal callus yellowish, often indistinct.. *flaviventris*, Bigot.

Reddish brown species. Frontal callus reddish brown, always distinct .. .. .. 81.

81. Thorax and scutellum blackish. Palpi slender, long. Antennae black at tip. Legs black, tibiae reddish yellow .. .. *diversifrons*, n. sp.

Thorax and scutellum usually reddish. Palpi stouter. Antennae not black at tip .. .. 82.

82. Abdomen reddish brown, unicolorous. Legs reddish yellow, femora often darker .. .. *subcinerascens*, n. sp.

Abdomen marked with grey tomentum, giving it the appearance of having zigzag indistinct bands. Legs blackish, tibiae yellowish .. *obconicus*, Wlk.

83. Subcallus not bare, shining or tuberculous .. .. .. 84.

Subcallus bare, shining, tuberculous .. .. .. 88.

84. Palpi stout. Femora black or reddish brown .. .. .. 85.

Palpi slender. Femora yellowish .. 87.

85. Forehead two-thirds narrower anteriorly than at vertex. Abdomen yellow, anteriorly rather transparent. Legs yellowish, fore legs darker .. .. .. *borniensis*, Ricardo.

Forehead one-third narrower anteriorly than at vertex. Reddish brown or reddish yellow species .. 86.

86. Abdomen reddish brown. Thorax blackish. Legs black, tibiae yellowish. Wings clear or slightly tinged .. .. .. *fuscicauda*, Bigot.

Thorax reddish yellow, almost same colour as abdomen. Legs yellowish,

fore femora darker. Wings tinged yellow on fore border .. *uniformis*, n. sp.

87. Abdomen dusky reddish brown or reddish yellow. Forehead about a third narrower anteriorly than at vertex, frontal callus pear-shaped .. .. .. *subhirtus*, Ricardo.

Abdomen olive-coloured. Forehead about half as narrow anteriorly as it is broad at vertex, frontal callus very narrow .. .. *formosiensis*, n. sp.

88. Medium sized species. Abdomen yellowish with darker apex. Palpi yellow. Legs reddish yellow, the fore tarsi darker. Forehead seven times as long as it is broad .. *tuberculatus*, n. sp.

89. Small species. Legs black, tibiae white. Eyes with cross-bands .. 90.

90. Reddish brown or yellowish species. Beard white or yellow. Palpi usually pale. Forehead ten times as long as it is broad .. *simplissimus*, Wlk.

Black, sometimes reddish brown species. Beard black. Palpi blackish. Forehead eight times as long as it is broad .. .. *ceylonicus*, Schiner.

GROUP XI. THERIOPLECTES.

91. Forehead with two transverse calli. Subcallus bare and shining. Abdomen black with white-haired bands .. .. .. *subcallosus*, n. sp.

Forehead with one callus. Subcallus not bare or shining .. 92.

92. Frontal callus black, club-shaped, with spindle-shaped extension. Abdomen black, reddish yellow at sides of first two or three segments. Palpi stout with short apex. Appendix usually present. Legs black and reddish yellow .. *hirtus*, Wlk.

Frontal callus small, indistinct. Abdomen blackish, only reddish on second segment. Palpi slender with long acute apex. No appendix to wing .. .. 93.

93. Smaller species. Legs black and reddish yellow .. .. *wyvillei*, n. sp.

Frontal callus broad, yellow. Abdomen black, reddish yellow at sides. Palpi slender. No appendix to wing. Legs yellow .. .. *albilateralis*, Macq.

Group I.

Forehead with two callosities, the first one usually transverse, the second one smaller, irregular shaped, separated from each other, forehead broad, four to six times as long as it is broad. Small species 9—14 mm. Scutellum same colour as thorax. Abdomen not banded.

Tabanus rarus, ♀, n. sp.

(Pl. xiii, fig. 1.)

Type ♀ from Kuala Lumpur, Federated Malay States, (H. C. Pratt), from London School of Tropical Medicine.

A small species of unusual appearance, the abdomen being covered with grey tomentum and with long white pubescence. Subcallus shining. Legs black, all tibiae whitish with fringes of long white hairs, which are also present on the femora. Wings clear. Length 12 mm.

Face covered with grey tomentum, and with long white pubescence. Beard white. *Palpi* yellow with white pubescence which is long below and short above. *Antennae* reddish yellow, the first two joints pale yellow with black pubescence, the third narrow at base with only an obtuse angle representing the tooth. Subcallus shining, reddish yellow, furrowed in the middle. *Forehead* five times as long as it is broad, very slightly narrower anteriorly, covered with greyish yellow tomentum; the frontal callus reddish yellow, reaching eyes, transverse, the median one black, irregularly heart-shaped, on the vertex appears another reddish brown small callus; some black hairs on forehead. Hind part of head with long white hairs. *Thorax* and *abdomen* black but appearing grey, being covered with dense grey tomentum, the *thorax* with whitish pubescence, shoulders reddish with grey tomentum and white hairs; breast and sides the same. *Scutellum* identical with thorax, fringed on its outer border with long white hairs. *Abdomen* has the white pubescence thickest on the last five segments; under side the same, but the pubescence slighter. *Legs* black, the coxae and femora with some grey tomentum, the fore tibiae white, black at their extreme apex, the other tibiae straight, slender, yellowish, the long white pubescence is thickest on the fore legs, on the tarsi the pubescence is black and short. *Wings* clear, stigma yellow, veins pale brown.

Tabanus hirtipalpis, ♀, n. sp.

(Pl. xiii, figs. 2, 3.)

Type from Bichiakoh, Nepal; sent in Indian Museum collection.

A small black species allied to *Tabanus ceylonicus*, Schiner, but at once distinguished from it by the wide forehead with two callosities and the hairy palpi, and by the metatarsi being black. Length 9 mm.

Face black covered with ashy grey tomentum and with long white hairs. *Palpi* stout ending in a fine but short point, pale yellowish covered with grey tomentum, and with long white hairs at base and below, some few black hairs visible on dorsum. *Antennae* reddish yellow, black at apex, the first two joints with black hairs, the third joint rather short with small tooth. *Forehead* about four times as long as it is broad, slightly narrower anteriorly. Subcallus shining yellow, convex, divided by a narrow interval from the frontal callus which is black, transverse, not reaching the eyes, furrowed laterally; beyond it appears, separated from it however, a small indistinct black callus; the forehead dark with brownish tomentum. *Thorax* and *abdomen* black, shining, the latter with very narrow yellowish red segmentations, some white hairs at sides and on under side. *Legs* black, the fore tibiae to apex, and the others wholly, yellowish white, fore coxae and all femora with some white hairs. *Wings* hyaline, veins and stigma brownish yellow.

Tabanus bicallosus, ♂ ♀, Ricardo.

(Pl. xiii, fig. 4.)

Ann. Mag. Nat. Hist. (8), iii, p. 489 (1909).

Type (♂) from Pusa, Bengal.

Type (♀) and three other females from the same place.

These specimens were sent to me for identification by Mr. F. M. Howlett from India.

This small species might at first sight be taken for a small specimen of *Tabanus striatus*, Fabr., but is at once distinguished from it by the two separate calli of the forehead. It is very nearly allied to *Tabanus gratus*, Loew, which is distributed over South, Central, and West Africa, reaching up to Egypt, as I had a specimen sent me from the Suez Canal. The wholly yellow legs, narrower median stripe of abdomen the same width throughout (in the African species it is wider on the third and fourth segments), and the prolongation of the thoracic stripes on to the scutellum, seem the only differences between the Indian and the African specimens.

Black, with five grey stripes on the thorax and three on the abdomen. Legs and antennae yellowish. Wings clear. Length 10 mm.

♀. *Face* covered with grey tomentum and with white pubescence. Beard white. *Palpi* greyish, with some white hairs at base, and black hairs elsewhere, but these last are not very numerous.

Antennae: the first joint yellow, the second and third red, tooth at base small. *Forehead* broad, quite a third narrower anteriorly, and four times as long as it is wide, covered with yellowish brown tomentum and with some black pubescence; the frontal callus yellowish brown, nearly square, and almost reaching the eyes; beyond it and sometimes connected by a very fine line is an irregular-shaped black or brownish callus isolated in the middle of the forehead. Eyes with three cross-bands. *Thorax*: the median stripe is linear, the other ones broad, sides of thorax greyish, with black pubescence. *Scutellum*: the lateral stripes are continued here, leaving the centre blackish. *Abdomen* narrow, all three stripes reaching from the first to the sixth segment; sides grey, with white pubescence; under side covered with grey tomentum. *Legs* uniformly reddish yellow, only the tarsi a little darker; the femora with grey tomentum and white pubescence. *Wings* clear, the stigma and veins yellow.

♂. The male is identical. Eyes with large facets above; the small ones on the lower third of eyes are continued round the head as a very narrow border.

Group II.

Forehead with two callosities, the first one usually transverse, the second one smaller, oblong, or irregular shaped, separated from each other; forehead broad, four to six times as long as it is broad. Small species. 9—14 mm. Scutellum white or yellow haired. Abdomen with white or yellow-haired bands. Tibiae white, fore tibiae curved, and sometimes slightly incrassate.

The species as yet described in this group are conferred to India, Assam, Burma and Federated Malay States.

Tabanus flavicinctus, ♀, n. sp.

Type ♀ from Shillong, Assam, in Howlett collection; 2 other females from N. Khasi Hills, Lower Ranges (Chennell collection), in the British Museum collection; and another female from the Nilgiris in Howlett collection.

A species nearly allied to *Tabanus leucocnemalus*, Bigot, but distinguished from it by the presence of narrow yellow-haired bands on every segment of abdomen except the first one. The subcallus and palpi are yellowish, the latter with the long-haired pubescence yellow, the tibiae are yellowish, with the apices of the fore pair more widely black, and the white pubescence on them

and the coxae replaced by yellow. The *antennae* are dark at the apices. The *abdomen* is a lighter reddish brown or reddish yellow. The *wings* are clear, with no appendix. The *forehead* is almost the same width throughout, and a little shorter, hardly more than four times as long as it is narrow. Length 9-10 mm.

There is a female in the British Museum collection from N. Kanara, India (Bell), which appears to be the same species, but the middle callus of forehead is much narrower, and the forehead itself slightly narrower and anteriorly narrower. The bands on the third and fourth segments are a little produced in the middle, but this is the case in some of the other specimens.

Tabanus leucocnematus, ♀, Bigot.

Mem. Soc. Zool. de France, vii, p. 656 (1892).

Type (now headless) ♀, from India, is a faded denuded specimen which was evidently described by Bigot in this condition; it would be impossible for anyone to verify the species from his description in which he makes no mention of the pubescence on scutellum and on thorax so characteristic of this species and others in the group. Fortunately fresh specimens from Lushai Hills, Burma, in Dr. Kertesz's collection and from Khasi Hills, Assam, in Mr. Howlett's collection serve to clearly identify the species, and the following description is based on them.

A small species dark brown in colour with two yellow pubescent bands on the abdomen, scutellum entirely covered with yellow pubescence, all tibiae white, wings tinged brown on the fore border. Length 10-11 mm.

Face covered with grey tomentum, a dark brown band is present on each side of the antennae, pubescence white, consisting of long hairs, beard white. *Palpi* stout, ending in a point, pubescent, appearing black but covered with dense grey tomentum, on the inside they are yellowish, the pubescence is white and long on the first joint, on the second short and black, with a few white hairs below and on apex. *Antennae* reddish yellow with a small tooth on third joint, the first two joints with black pubescence. Subcallus shining, brown or reddish brown, convex, furrowed in the middle, produced between the antennae, divided from the frontal callus by a narrow interval. *Forehead* about five times as long as it is narrow, and about a third narrower anteriorly, covered with grey tomentum and with two separate calli, the frontal callus almost square, furrowed in the middle, almost touching the eyes, the middle callus distinct from it in fresh specimens, is narrower and oblong, sometimes with a short linear extension, both blackish brown in colour. *Thorax* dark brown, on the anterior half covered with grey tomentum and with yellow appressed pubescence, on posterior half with black pubescence bordered with a fringe of yellow hairs; sides of thorax with long white hairs; breast covered with grey tomentum, and with long white pubescence. *Scutellum*

chestnut-brown when denuded, but in fresh specimens covered with grey tomentum and with dense golden yellow pubescence of the same shade as that on the posterior border of thorax. *Abdomen* reddish brown, appearing darker with dense short black pubescence, on the third and fourth segments are wide bands of bright golden yellow pubescence, which also appears on the sides of the first two segments, and often as a narrow fringe on the posterior border of the sixth; under side with the yellow bands narrower but present on most of the segments, the second segment with white pubescence. *Legs* black, the knees, fore tibiae except at their apices, and the middle and posterior tibiae wholly, whitish, with white hairs, the fore coxae covered with grey tomentum and with white hairs, the others less distinctly so, the pubescence on femora thick, black; the fore tibiae are curved but hardly incrassate. *Wings* tinged with brown on the fore border as far as the third or fourth longitudinal vein, clearer at the apex, veins, stigma and costal border yellowish, short appendix present.

Tabanus bicinctus, ♀, n. sp.

(Pl. xiii, fig. 5.)

Type ♀ and another from N. Kanara, S. W. India (Bell); others from Pahang, Perak and Kuala Lumpur, Federated Malay States (Pratt, Durham).

A handsome black species with white-haired scutellum, white-haired bands on the third and fourth segments, whitish tibiae, and wings tinged brown on the fore border, distinguished from *Tabanus leucocnematus*, Bigot, by its colouring and by its more heavily fringed black femora. Length: type 18 mm., others 10—18 mm.

Face covered with whitish tomentum and with long white hairs. A dark brown band extends between the eyes and the base of the antennae, with dark pubescence. Beard white; thick. *Palpi* stout, ending in a point, yellowish but appearing grey on the outside, being thickly covered with grey tomentum and with short black pubescence, a few white hairs are visible chiefly at the base, and longer ones below. *Antennae* reddish yellow, the first two joints with black pubescence, the third joint with very small tooth crowned with a few black hairs, apex of joint darker. Subcallus shining, dark brown. *Forehead* about six times as long as it is broad, about one-third narrower anteriorly, covered with grey tomentum, the two calli the same colour as the subcallus, the frontal callus irregularly square, separated from the subcallus by a narrow interval, convex, furrowed in the middle, almost reaching the eyes; the median callus is oblong and narrower, on each side of it and at the vertex the forehead is brownish.

Thorax black, covered with an anterior band of grey tomentum and short whitish pubescence, and with a heavy white fringe of hairs on its posterior border; on the posterior dark part of dorsum the pubescence is black and dense. *Scutellum* covered with whitish

grey tomentum and dense white pubescence. Breast with long white pubescence.

Abdomen black, type with only the two white-haired bands, but on some of the other specimens narrow fringes of white hairs appear on the fifth and sixth segments, the rest of the dorsum with dense black pubescence, sides of first two segments with white hairs, black on the others; under side similar, but the second segment is covered with white pubescence.

Legs black, tibiae white, but black at their apices, fore coxae with some long white hairs, and tibiae with white pubescence, elsewhere black, the femora with thick black fringes on each side. *Wings* tinged brown on the fore border as far as the third vein, less so on some specimens, veins and stigma brown, costal border yellow.

Tabanus sexcinctus, ♀, n. sp.

Type, a female from Lushai Hills, Burma (Capt. E. C. Macleod), sent by Dr. Kertesz for identification.

A species nearly allied to *Tabanus bicinctus*, n. sp., but distinguished by white bands on every abdominal segment except the first, and the under side is almost entirely covered with white pubescence. The *wings* are quite clear. The femora with grey tomentum, and some white hairs which are long and numerous on the fore pair, the thick black fringes not present. The *palpi* are more white haired. The *forehead* is almost the same width throughout, and a little broader, the frontal callus not reaching the eyes. The *thorax* appears less black, with no anterior white-haired band, but with some grey tomentum on the dorsum and black pubescence. Length 11 mm.

GROUP III.

Species with the callosities on forehead represented by two small calli separated from each other, both about the same size, usually round, small spots; distinguished by their *Atylotus*-like appearance (*fulvus* group only) though the pubescence on eyes is often practically non-existent. So far the only species in this group from the Oriental Region are also common to the Palaearctic Region, and are represented by the typical *Tabanus ditaeniatus*, Macq., a South African species whose distribution is very wide, and *Tabanus fulvus*, Mg. (*Atylotus*).

The identity of *Tabanus agricola*, Wied., recorded by Schiner as occurring at Hongkong, seems very doubtful; the species is not included in the table.

Tabanus fulvus, ♂ ♀ (*Atylotus*), Meigen.

Syst. Beschreib., ii, 61, 40 (1820) (see Kertesz Cat. Dipt. iii, 1908, for authorities).

Atylotus bituberculatus, Bigot, Mem. Soc. Zool. de France, v, 659 (1892).

Bigot gives China with a query as the locality for his type, which is identical with Meigen's species.

In British Museum collection are two females from Chinkiang, Yangtze River, China (B. G. Tours); and another from China is in the Kertesz collection, so that the range of the species to the east coast of China and within the line of the Oriental Region is well established.

The type of *Tabanus hoang*, ♀, Macq., Dipt. exot., Suppl. v, p. 46 (1855), is apparently lost as, though the label is existent among the Bigot types lent me by Mr. Verrall, there are no specimens which answer to the description given by Macquart, in which he says it is related to *Tabanus fulvus*, Mg.; it was possibly identical with this latter, judging from the description. In any event it may now be deleted from the list of *Tabanus*.

Tabanus ditaeniatus, ♂ ♀, Macquart.

Dipt. exot., i (1), p. 130 (1838); Walker, List Dipt., v, pp. 236, 355 (1854); Bezzi, Ann. Mus. Civ. Genova (2), xii (xxxii), p. 184 (1892); Austen, Report Gordon Memorial College (1906), p. 57, fig. 22; *id.*, African Blood-Sucking Flies, p. 118, pl. xi, fig. 82 (1909).

Tabanus pyrrhus, Walker, Dipt. Saund., i, p. 47, pl. ii, figs. 4, 5 (1850).

Tabanus bipunctatus, v. d. Wulp, Notes Leyden Museum, vii, p. 75, pl. v, fig. 5 (1885).

Atylotus nigromaculatus, Ricardo, Ann. Mag. Nat. Hist. (7), vi, p. 165 (1900); Newstead, Ann. Tropical Medicine, 1907, p. 44.

The type was recorded by Macquart from Mauritius; it is a common species in South Africa; Coquillet records it from Japan as *Tabanus pyrrhus*,—see Proc. U. States Mus., xxi, p. 311 (1898); as may be seen from the localities given below, it has a wide distribution ranging from Africa to India, China and Japan.

In Indian Museum coll. and Howlett coll. are specimens from Perso-Baluchistan Frontier; Pusa; Belgatchia, Calcutta, in Bengal; Madras Coast; Umballa, N. W. India; Balighai in Orissa, S. E. Bengal. In Brit. Mus. coll. specimens from Wei Hai Wei, China; "biting cows" (Muat).

A greyish yellow species, the abdomen yellowish with a blackish brown broad median, and narrow lateral stripes, on the median one appear greyish yellow tomentose triangular spots, the lateral stripes do not reach the sides of abdomen and at apex coalesce with the median stripe; the abdomen often varies in appearance,

the yellowish ground colour not always being very apparent. Antennae and legs yellowish. Length 11—14 mm.

Tabanus agricola, ♀, Wied.

Auss. Zweifl. Ins., i, p. 556 (1828); Schiner, Reise Novara Dipt., p. 82 (1868).

Ashy grey: sides and segmentations of abdomen, antennae and legs luteous. Length 6 lines, ♀. From Red Sea.

It is somewhat similar to *Tabanus rusticus*, Fabr. Antennae yellow (the last joint wanting). Palpi very pale yellow. Beard yellowish white. Face and forehead mouldy grey. Thorax appears as if covered with ashy grey tomentum because it has whitish pubescence on the black-grey ground colour. Abdomen clay-yellow on the sides, and more narrowly so on the hind borders of the segments, so that not much remains of the black-grey ground colour on each segment. Under side almost yellow. Dorsum and under side with white pubescence. Wings colourless with yellow veins. Legs clay-yellow; the anterior tibiae at the base inside, all tarsi, but the posterior tarsi only at the apex, brownish black. (Rüppel in the Frankfort Museum.) Wied., Auss. Zweifl. Ins., i, p. 556.

Wiedemann's description fits a male and two females from Hongkong so well that I am induced to refer them to this species, and add the following particulars to complete the description:— The antennae are pale red-yellow, the first and second joint short, not produced above and with few hairs, the third somewhat deeper in colour, slightly incised above, so that the angle projects but little. The femora have tolerably thick but extremely short whitish pubescence; the fore tibiae brownish black at the apex (Wiedemann says, no doubt by mistake, brownish black at the base, which is contrary to the usual colouring of species of *Tabanus*). Wings quite clear, the first posterior cell wide open, an appendix present. Eyes of male very large and convex; they join completely on the forehead. Everything else as described by Wiedemann; the correctness of the identification is chiefly corroborated by the allusion to the similarity of the species with *Tabanus rusticus*, Fabr. (Schiner, Reise Novara Dipt., p. 82).

From the comparison with *Tabanus rusticus*, L., *nec* Fabr. (*Atylotus*), it is to be presumed this species has two small calli on forehead. *Tabanus rusticus* has not yet been recorded from Asia. It seems probable that the specimens Schiner identified from Hongkong as *Tabanus agricola*, Wied., belonged to *Tabanus ditaeniatus*, Macq.

GROUP IV.

A small group of species, at once distinguished by the absence of callosities on the forehead, which is broad, from four to five times

as long as it is wide. In old or denuded specimens it occasionally appears as if a frontal callus were present. Species from 7½ to 13 mm. in length.

Tabanus erythrocephalus, Wulp, from Halmaheira Island, and *Tabanus leucopterus*, Wulp, from Aru Island, in the Australian Region, appear to belong to this group.

Tabanus virgo, ♀ ♂, Wiedemann.

Anal. Entomol., 22 (1824); *id.*, Auss. Zweifl. Ins., i, p. 184 (1828).

Tabanus albulus, ♀ ♂, Walker, Dipt. Saund., i, p. 46 (1850).

Tabanus puella, ♂, Walker, *l. c.*, p. 53.

Types of *Tabanus albulus*, male and female, from India (Saunders coll.).

Type of *Tabanus puella*, male, from India (Saunders coll.). A male from Mysore (H. K. Slater). In Indian Museum coll. Specimens from Calcutta and Pusa, Bengal. The Wiedemann type came from East India. Slaty grey with red-yellow antennae and a twofold white spotted abdomen. Length 4—4½ lines, ♂ ♀.

Antennae bright rusty yellow; face rather grey haired. Palpi very light yellow. Beard white. Forehead light yellowish green without a callus or line. In the male it is ochre-yellow behind the antennae. Thorax slaty grey, very faintly white striped, the median line extremely narrow. The shoulders and posterior sides of thorax almost chamois-leather colour. Breast sides whitish. Abdomen slaty grey with narrow yellowish white-haired segmentations; on each segment two white-haired roundish spots. Wings very hyaline with ochre-yellow veins and halteres. Legs ochre-yellow with almost chamois-leather coloured femora. In the Royal Museum. Wiedemann, Auss. Zweifl. Ins., i, p. 184.

This small species is easily recognized by the unmarked forehead and very pale wings, yellow antennae and legs and spotted abdomen. The female specimens above mentioned vary from 9—11 mm. One male only measures 7½ mm.

The description given by Wiedemann of the colour of the *abdomen* only applies to very fresh specimens, the grey colour being caused by the grey tomentum covering the abdomen, viewed best from behind; the ground colour of the abdomen is greyish brown, rusty coloured at the sides of the first three or four segments, the pubescence black, but white on the spots and segmentations; under side lighter with white pubescence, darker at the apex. The *thorax* is blackish brown covered with grey tomentum and with some appressed fulvous hairs, the stripes hardly visible. The *forehead* is about five times as long as it is wide, and a third narrower anteriorly, yellowish, showing no callus when fresh, if denuded one is sometimes visible. *Antennae* reddish yellow, the first two joints pale yellow. *Face* ashy grey with white

pubescence. Beard white. The *palpi* very pale yellow, stout at base, ending in a point.

The male has the abdomen more reddish in colour, darkening at the apex. Large facets of the eyes very distinctly divided from the small ones, which take up barely a third of the eye and reach the vertex as a very narrow border.

Tabanus nemocallosus, ♀, Ricardo.

(Pl. xiii, fig. 6.)

Ann. Mag. Nat. Hist. (8), iii, p. 490 (1909).

Type ♀ and another female from Pusa, Bengal, in Howlett coll.

A medium-sized species, distinguished by the rather broad forehead, not narrower anteriorly, and with no callus or spots. Abdomen blackish brown marked with greyish yellow median and lateral spots. Length 13 mm.

Face and *forehead* covered with greyish tomentum, the former with white pubescence. Beard scanty, white. *Palpi* yellowish white with white pubescence, stout ending in a short point.

Antennae reddish yellow, the first two joints pale yellow, the third with hardly any tooth. *Forehead* barely three times as long as it is broad. *Thorax*, *scutellum* and *abdomen* blackish brown, the former with five distinct greyish yellow stripes, the dorsum with some grey tomentum and with appressed pale fulvous pubescence; scutellum with the same and with grey tomentum. *Abdomen* with an almost continuous median stripe formed of grey tomentose narrow, triangular spots, and with irregular-shaped, roundish, grey tomentose spots on the sides, the pubescence on these, short, pale fulvous, some black pubescence on the dark parts, the sides of the first two or three segments pale reddish, under side lighter, covered with grey tomentum. *Legs* pale yellowish red, the tarsi brown, the pubescence white on femora and tibiae, black on the tarsi. *Wings* hyaline with brown veins and yellow stigma, a long appendix on branch of third vein.

Tabanus negativus, ♂ ♀, n. sp.

Type ♂, type ♀, from Formosa, in Dr. Kertesz's coll.

In Brit. Mus. coll. one female from Hongkong very much mutilated.

A species allied to *Tabanus nemocallosus*, Ricardo, but distinguished from it by the absence of spots on the abdomen and of stripes on the thorax. Wings with no appendix, veins pale yellow. Length of female type 13 mm.; of male specimens 11½-12½ mm.

♀. *Face*, beard, and *antennae* the same as in the above-mentioned species. *Palpi* pale yellow, the same shape, but with

black pubescence. *Forehead* with no callus, almost parallel, about four times as long as it is broad. *Thorax* and *abdomen* uniformly covered with greyish yellow tomentum, through which the dark ground colour hardly appears, and with thick short pale yellow pubescence on the dorsum of abdomen, on the thorax it is less thick and replaced chiefly by black pubescence anteriorly, shoulders the same colour. Breast rather greyer with white pubescence. Under side of abdomen similar but almost devoid of pubescence. *Legs* pale reddish yellow, the apices of fore tibiae and the tarsi blackish, the other tarsi more or less brown, pubescence pale yellow on the coxae and femora, chiefly black elsewhere. *Wings* clear, the veins very pale yellow and stigma hardly noticeable, no appendix.

♂. Similar but in some of the specimens, owing probably to denudation, black median markings or a black median stripe appear. *Abdomen* with very little yellow pubescence, almost bare. Eyes large, convex, the large facets occupying fully two-thirds of the surface of eyes, the small ones reaching to the vertex as a narrow border. *Palpi* pale yellow with yellow pubescence and black pubescence on apex. Frontal triangle and subcallus coloured alike.

Group V.

Species with wings spotted or banded. Forehead with one square, narrow, or oblong callus, always prolonged towards the vertex as a more or less narrow line; five to ten times as long as it is broad. Species from 9—21 mm. in length.

Tabanus javanus, ♀, Fabr.

Syst. Antl., 103, 46 (1805); Wied., Dipt. exot., p. 93 (1821); *id.*, Auss. Zweifl. Ins., i, p. 183 (1828).

Thorax striped; abdomen with white triangular dorsal spots, wings spotted. Smaller than the preceding species (*Tabanus vittatus* and *longicornis*). Head white haired. Thorax brown, with white stripes. Abdomen brown, with a large triangular spot on the dorsum of each segment. Body pale, darker at the apex. Wings hyaline, with five black spots. Legs testaceous. From Java, Fabr., Syst. Antl., p. 103.

The species is unknown to me. Wiedemann redescribed it in Auss. Zweifl. Ins., i, p. 183, as follows: Thorax black, white striped, the sides rusty yellow, abdomen brown, ferruginous at the sides, with triangular white median spots; wings spotted with brown, 4½ lines ♀, from Java.

The whole head reddish white. Beard white. Forehead with a chestnut-brown smooth stripe, widening below into a broad callus. Dorsum of thorax with three whitish lines, the sides almost

chamois-leather coloured behind the usual seam, with a small black stripe; breast sides almost chamois-leather coloured; scutellum black. Abdomen on the first segment brown, rusty brown on the sides, the second one at the base with an interrupted whitish band and another more wavy one at the apex; from the middle of it the triangular spot proceeds, the third to the sixth each with the same shaped whitish band at the apex and larger triangular spots; on the seventh the border is hardly whitish; the three last segments are not at all rusty yellowish; under side almost chamois-leather coloured, brownish towards the apex, with whitish segmentations. Wings almost hyaline, stigma and four spots brown. Legs reddish; tarsi gradually brown. The fore legs are wanting in the single specimen in Fabricius's collection. A very denuded specimen in the Leyden Museum is of a deep pure brown colour, with no trace of the stripe and spots of abdomen, only the segmentations are yellowish white.

Tabanus optatus, ♀, Walker.

Proc. Linn. Soc., i. p. 111, 33 (1856).

Tabanus alboscutatus, ♀, Rondani, Ann. Mus. Civ. Genova, vii, p. 456 (1875).

Tabanus equestris, ♂ ♀, v. d. Wulp, Notes Leyden Museum, vii, p. 77, 31, pl. v. fig. 6 (1885).

Walker's type, ♀, came from Sarawak, Borneo (Saunders coll.); another female in Brit. Mus. coll. from Kajoe-Tanan, Sumatra (Dr. Hagen), and a male from India (Saunders coll.). In Indian Museum coll. a female from Belgatchia, Bengal.

On comparison of one of the Brit. Mus. coll. specimens with the type of *Tabanus alboscutatus*, the identity of the two species was at once established. Rondani's type also came from Borneo.

From van der Wulp's description and figure of wing there is no doubt he was describing the same species, and his description, as being the best one, is given below.

Reddish, face and palpi pale yellow; eyes naked; antennae with the third joint darker; abdomen with triangular dorsal white spots; the anterior legs and all femora brownish; wings at the base and a median band brownish, ♂, ♀. Length 15·5—17 mm.

Face yellowish white; beard of the same colour; palpi pale ochraceous; front rufous, in the ♀ moderately broad, with a brown cordiform spot extending upwards in a line. Eyes bare, in the ♂ reddish bronze above, with large facets; below for a third part and on the outward borders blackish, with much smaller facets, even after having been moistened no trace of cross-bands is to be seen. Antennae ochraceous; third joint infuscated, rather slender and on its upper side with a triangular tooth. Thorax, scutellum and abdomen rufous, the thoracic dorsum a little infuscated, with indistinct stripes; hind margin of the scutellum

greyish; last segments of the abdomen darker; their hind margins yellowish, with small triangular, white, dorsal spots; on the under surface the pale margins of the segments are broader. Legs and halteres fulvous; the femora and the whole front legs fuscous. Wings at the base brownish yellow, in the middle with a rather broad brownish cross-band, which issues on the stigma and embraces the discal cell, but does not quite reach the hind margin; the costal cell is yellow. This species seems to be not uncommon in the Sunda Islands; it is represented in the Leyden Museum by a ♂ from Sumatra (v. Lansberge), 2 ♀ from Java (Blume and Ludeking) and 4 ♀ from Borneo (Müller); it was a long time ago designated in the collection by the late Mr. Snellen van Vollenhoven under the name *equestris*, n. sp., without having been described. The species is related to my species *Tabanus pictipennis* (Tijd. v. Ent., xi, p. 100, 1868), the name of which having been used before, is changed by Osten Sacken into *Tabanus vanderwulpi* (Berlin Ent. Zeit., xxvi, p. 97, 1882); it differs, however, by its fulvous posterior legs, its more slender antennae, the third joint of which is darker, and by the pattern of the wings, showing instead of two cross-bands, but a single one which passes over the discal cell. Notes Leyden Museum, vii, p. 77, 31, pl. v, fig. 6, 1885.

Tabanus pictipennis is the same as *Tabanus flexilis*, Walker, a species from Celebes, but *not* the same as *Tabanus vanderwulpi*. The *forehead* against the general rule is slightly wider anteriorly, about a third, and is five and a half times as long as it is wide, the frontal callus small, pear-shaped, with a linear extension. The *legs* have the fore tibiae obscurely reddish yellow on their basal half, the extreme apices of other tibiae and all tarsi blackish. The cross-band of *wing* in the description, said not to reach the hind border of discal cell, does so in the figure and in these specimens.

Tabanus non-optatus, ♀, n. sp.

Type ♂ from Purneah District, in Indian Museum coll.

Type ♀ from unknown locality and two males in Brit. Mus. coll. from unknown locality.

This species is very nearly allied to *Tabanus optatus*, Walker. The female type is so similar to the male type, and the two males identical with latter, that I think it is safe to assume that the specimens with no locality specified came from India or an adjacent region, especially as the species with banded wings are not very numerous in the African or Oriental Region, and probably not in any fauna.

This species is distinguished from the Walker species by the almost wholly yellowish abdomen, only becoming darker on the last two or three segments, and the pale spots are larger, more triangular in shape, the abdomen is longer and more conical in shape, and the forehead in the female is *not* narrower at the

vertex. Length of male type 14 mm., of female type 19 mm., the other males 17—19 mm.

♀. *Face* covered with greyish tomentum, pubescence and beard whitish. *Palpi* yellow with longer slender point, and a few black hairs. *Antennae* reddish yellow, the first two joints with some black hairs, the third broad at base, deeply incised, with a distinct tooth. Subcallus and *forehead* same colour as face, the latter with some black pubescence, almost parallel, about five times as long as it is broad; the frontal callus reddish brown, almost square, not reaching the eyes, posteriorly narrower with a short lineal extension. *Thorax* dull chamois-leather coloured, with some greyish tomentum, no stripes visible, a few yellowish and black hairs visible on dorsum, shoulders pale reddish with black pubescence; breast covered with grey tomentum and with greyish white pubescence, tufts of white hairs round base of wing; *scutellum* same colour as thorax, but with whitish grey tomentum on its posterior border. *Abdomen* reddish yellow, black at apex, the spots most distinct in the second, third and fourth segments, pubescence black but very scanty and short, the segmentations somewhat lighter; under side similar with more distinct white segmentations. *Legs* blackish, the tibiae reddish with black pubescence, the pubescence on femora white and on coxae, which latter are covered with grey tomentum, tarsi reddish brown with black pubescence. *Wings* with a dark band across the middle of wing, similar to that of *Tabanus optatus*.

♂. Similar, the *thorax* rather darker in colour. The eyes with large facets on upper part, the small ones attaining the vertex as a narrow border.

Tabanus flexilis, ♂ ♀, Walker.

Proc. Linn. Soc., iv, p. 104 (1860); v, p. 104 (1861).

Tabanus pictipennis, ♀, v. d. Wulp, Tijd. v. Entom., xi, p. 100, pl. iii, figs. 1, 2 (1868); *nec vanderwulpi*, Osten Sacken.

Type ♂ from Celebes.

Type ♀ from Macassar, Celebes (A. R. Wallace), and others from Manado, Celebes, all in Brit. Mus. coll.

This species, though as yet only recorded from Celebes, is included here owing to the great similarity to it of *Tabanus vanderwulpi*, Osten Sacken, from the Philippines.

From the figure and the description of van der Wulp's there is no doubt he was redescribing a specimen identical with Walker's species, both from the same locality. His description is given, as it is sufficient for identification, of the female only however, as he did not know the male.

♀. Ochraceous. Forehead very narrow with a blackish median line; eyes naked; antennae testaceous; the anterior margins of the abdominal segments brown; legs blackish; wings with two

brown bands; costal border testaceous. ♀ 8¾ lines. Pl. iii, figs. 1 and 2.

Head ochre-yellow, below with some coloured pubescence; the forehead very narrow, stripe shaped, with a black median line hardly broader below. Eyes naked, bronze coloured, without markings. Antennae cinnamon-brown, the first joint ending in a point, above the second very short, prolonged above in a thorn-like point, the third moderately incised above. Palpi ochre-yellow. Thorax and scutellum blackish with ochre-yellow tomentum and on the breast sides with conspicuous ochre-yellow pubescence. Abdomen black-brown, with thick pale ochre-yellow almost golden yellow tomentum, which leaves the fore borders of the segments tolerably wide, so that cross-bands more or less darker are formed, somewhat broader at the sides. Legs black, the coxae the same colour as the abdomen, and the ground colour of the femora becomes more or less modified owing to the rather thick ochre-yellow pubescence. Halteres yellow. Wings with greyish ground colour and black-brown veins; the base and the marginal cell brown-yellow; a brown shadow lies across the transverse veins, which forms a narrow half zigzag band in the middle of the wing, and on the last third of the wing appears a broad brown cross-band, which stretches from the fore border at the ending of the first vein to the upper branch of the third longitudinal vein; this band, which becomes paler on the posterior border, is rounded on the inside and outside towards the apex of wing notched triangularly, the angle of the third vein has no appendix; the first posterior cell is closed at the border with a short stalk. Celebes (Rosenberg). v. d. Wulp, Tijd. v. Entom., xi, p. 100.

In Walker's type the *abdomen* is brownish black, but the yellow bands are covered with yellow pubescence, besides tomentum; the under side is more yellow with whitish segmentations, blackish at the apex. *Legs* black, the fore tibiae at the base obscurely yellowish, the hind tibiae obscurely reddish yellow, the pubescence on coxae and femora yellow with grey tomentum, black on the tibiae and tarsi, the hind tibiae with black fringes. *Forehead* is barely more than half as wide anteriorly as it is at vertex and about ten times as long as it is broad, the frontal callus very narrow, pear-shaped, with lineal extension. Length of female type 19 mm., the other 16 mm.

♂. Eyes with equal facets. *Face* and subcallus with yellowish grey tomentum and yellowish white hairs. Beard the same. *Palpi* yellow with yellow hairs and a few black ones at the apex. *Antennae* reddish yellow, the first two joints pale yellow, with black hairs, the third long and slender with a small tooth, slightly dusky at tip. *Abdomen* more yellow than in female, the darker bands only beginning on the fifth segment, the segmentations narrowly whitish, the under side identical. *Wings* with the first posterior cell narrowed at opening. Length of type 16 mm., of others 19 mm.

Tabanus vanderwulpi, ♀ ♂, Osten Sacken.

Berlin. Ent. Zeit., xxvi, p. 97 (1882); *nec pictipennis*, V. d. Wulp.

One female in Brit. Mus. coll. from the Philippines.

This species is very nearly related to *Tabanus flexilis*, Wlk. Osten Sacken thought it identical with *Tabanus pictipennis*, v. d. Wulp (which is undoubtedly the same as the Walker species), and renamed it as above, the first name being preoccupied. His reproduction of van der Wulp's description is not given here as he made additions to it to suit his specimens from the Philippines, 1 ♂ and 4 ♀. Judging from the specimen in the Brit. Mus. coll. the female differs from *Tabanus flexilis*, Wlk., in the following particulars:—

Antennæ black at apex. *Forehead* about half as wide anteriorly as it is at the vertex and fully ten times longer than it is broad, the frontal callus longer and narrower, very little wider than its lineal extension. *Abdomen* brownish red with the yellow posterior bands narrower, produced in the middle as triangular spots, but the under side is darker with black and yellow bands. *Legs* black or dark brown with black pile as Osten Sacken describes, but in this specimen the femora have some yellow hairs, the fore coxae same colour as breast. Length 21 mm.

♂. According to Osten Sacken's description the eyes have large and small facets very sharply divided.

GROUP VI.

Forehead with one square or narrow or oblong callus, always prolonged towards the vertex as a more or less narrow line, usually nine to ten times as long as it is broad (in *Tabanus auriflamma* Wlk., however, it is much broader). Large species, 18--23 mm. in length, with the wings coloured brown or yellow or both, usually clear at extreme apex and sometimes in the discal cell, never forming regular bands.

Tabanus speculum, Wlk., from Celebes will belong to this group.

Tabanus pratti, ♀, n. sp.

Type ♀ in Brit. Mus. coll. from Kelanton, Malacca (purchased from H. Rolle, 1904); and another female from Sarawak (A. R. Willington, 1908). Presented London School Tropical Medicine coll. In the latter collection is one female from Batu Tiga, Selangor (Pratt). This very handsome black species is distinguished by the bright orange-red pubescence on face and sides of breast; the beard is also the same colour. Abdomen black with white-haired bands at sides. Wings dark brown. Tibiae white at base. Length of type 24 mm., the other female 23 mm.

Face thickly covered with bright orange-red pubescence, the hairs in middle of face and a tuft at sides rather more golden yellow, a few brown hairs are visible on cheeks bordering the eyes, and a tuft-like fringe between the antennae and the eyes. Beard orange-red, thick. *Palpi* dull reddish, appearing black by reason of the thick black pubescence, stout, almost the same width throughout. *Antennae* red, the first two joints covered with black hairs, the third large, broad, the last four divisions forming hardly a fourth of the whole length; the tooth is represented only by a very slight angle indeed. Subcallus blackish, covered with reddish brown tomentum. *Forehead* darker, narrow, about nine times as long as it is broad, and a third narrower anteriorly; frontal callus black, shining, long and narrow, almost reaching the eyes with a long stout linear extension. *Thorax*, *scutellum* and *abdomen* dull blackish brown, covered with close black pubescence, on the shoulders and sides of thorax it is longer; breast with dense orange-red long pubescence; in the centre it is nearly bare, covered with reddish brown tomentum. *Abdomen* with white-haired segmentations on all the segments but the first, thickest at the sides, hardly ever reaching the centre but usually represented on the median line by a few scattered white hairs; the type itself is denuded and only shows the white bands on the second and third, the segmentations under the white pubescence at sides only, appear golden yellow, sides of abdomen with thick tuft-like black pubescence; under side black with white-haired segmentations. *Legs* black with black pubescence, the tibiae white on the basal half with white pubescence, but black at the extreme base. *Wings* a dark rich brown, a clear streak is visible in the costal cell below stigma, another in the marginal cell, the discal cell is wholly clear, the extreme apex, the basal cells and posterior border much paler if not quite clear, veins and stigma blackish brown, first posterior cell a little narrowed at opening. Squamae brown. Halteres brown, the club at apex yellow. It is named after the gentleman who has enriched the London School of Tropical Medicine and Brit. Mus. coll. with a considerable number of specimens from the Malay Archipelago.

Tabanus fuscicornis, ♀, n. sp.

Type ♀ in Brit. Mus. coll. from Punkio, Formosa (A. E. Wileman, 1909).

This species is nearly allied to *Tabanus pratti*, n. sp., in colouring, but is at once distinguished by the black antennae and black palpi and by the more hyaline wings, quite clear at apex. Length 17 mm.

Face brownish yellow, paler at base, with a few black hairs, the bright orange-red pubescence is here confined to the beard. *Palpi* blackish with black pubescence more pointed than in *T. pratti*. *Antennae* wholly black, the first two joints with black pubescence, the third broad at base with a perceptible

tooth. Subcallus brown. *Forehead* ashy grey, narrow, the same width throughout and about seven times as long as it is broad, the frontal callus black, almost the same width throughout, to within a short distance of the vertex, very similar to that of *T. pratti*. *Thorax* and *scutellum* in this species bluish black, with ashy grey tomentum, devoid of pubescence on dorsum, sides with long black hairs; breast with similar orange-red pubescence to that of *T. pratti*. *Abdomen* black with median white-haired spots, the segmentations white-haired at the sides only, pubescence on dorsum black; under side black with white segmentations. *Legs* black with black pubescence, some yellow hairs on the fore coxae and yellow tomentum on the others. *Wings* marked with dark rich brown colouring, most intense on fore border and across middle of wing, leaving the discal cell however clear, and not extending beyond the base of fork of third vein, so that the apex is wholly clear, posterior border almost wholly clear, veins and stigma blackish, no appendix present. Halteres brown.

Tabanus nephodes, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 656 (1892). [*Atylotus.*]

Type (female) recorded from India; a label is affixed to it with "Naga Hills," which are on the Burma-Assam boundary. There is another female in the Indian Mus. coll. from Sibsagar, Assam, so that the habitat of this species is probably in these regions.

A dark reddish brown species with indistinct grey tomentose bands and median spots on the abdomen. Legs reddish brown. Wings deeply tinged yellowish brown, with the first posterior cell closed.

Antennae yellow. Forehead very narrow. Length of type 21 mm., the other female is 19 mm.

Face red, covered with grey tomentum, above near the antennae and the subcallus with more yellowish brown tomentum, the pubescence brown, on the lower part of the face the pubescence is white. Beard of long white hairs. *Palpi* yellow with black pubescence, long, slender, not much stouter at base, ending in an obtuse point. *Antennae* reddish yellow, the first two joints with black pubescence, the third blackish at its apex with a few hairs, at the base broad, with a small tooth crowned with some black hairs. *Forehead* reddish, covered with grey tomentum, about ten times as long as it is broad, almost reduced to half its width anteriorly, the frontal callus reddish, very narrow, cylindrical, with long, raised lineal extension; the callus is hardly wider than this last. *Thorax* and *abdomen* reddish brown, the former with grey tomentum, sides reddish yellow, shoulders with black hairs; breast blackish, covered with greyish white tomentum, pubescence probably white. *Scutellum* similar to the thorax. *Abdomen* with grey tomentose bands on the first four segments about a third of the width of segment; on the

last three the segmentations are very narrowly lighter, hardly perceptible; there are traces of median white-haired spots with a ground-work of grey tomentum on the second to fifth segments; pubescence otherwise seems black, but on the sides of the first four segments there are white hairs; under side similar with white hairs on the segmentations. All the specimens are more or less denuded. *Legs* reddish brown, the fore tibiae at extreme base and the middle pair appear reddish yellow, fore coxae with grey tomentum and some white hairs, femora also with a few, otherwise the pubescence is black. *Wings* with almost a dark band, the dark brown colouring extending from the upper end of the stigma to the apex on fore border, but not reaching much beyond the branch of third vein, leaving the apex clear, extending across the wing towards posterior border over the upper border of discal cell, shading the veins proceeding from the cell and gradually fading away; costal border and stigma yellow, base of wing with a faint yellow tinge, veins yellow, brown on upper half, the first posterior cell closed, appendix present.

Tabanus albofasciatus, ♀, n. sp.

Type ♀ from Shillong, Assam, sent in Indian Mus. coll.

A large brown species, distinguished by the pale greyish basal band on scutellum, in this respect allied to *Tabanus albocostatus*, Bigot, but with the posterior cell very much narrowed at its opening on border. The abdomen has narrow white tomentose bands. Wings yellowish on basal half, brown on apical half. Legs black. Length 21 mm.

Face covered with yellowish tomentum and with some pale yellowish hairs. Beard yellow. *Palpi* yellow with black pubescence, large, ending in a fairly acute point, antennae bright red, dusky at apex, the first two joints pale yellow with black pubescence, the third wide at the base with a prominent tooth. *Forehead* with tomentum a little darker than that of the face, about nine times as long as it is broad and barely half as wide anteriorly as it is at vertex. Frontal callus long and narrow with lineal extension. *Thorax* brown, reddish yellow at the sides with golden yellow hairs at base of wings, black hairs on the shoulders, dorsum of thorax with traces of short golden yellow pubescence anteriorly; breast covered with greyish yellow tomentum and with yellow pubescence, some black hairs intermixed. *Scutellum* brown but the basal two-thirds covered with grey tomentum. *Abdomen* blackish brown with greyish white narrow tomentose bands on the first five segments, the first one does not extend beyond the sides, traces of white pubescence on them, otherwise the pubescence on dorsum where present is black; under side identical. *Legs* blackish brown, the femora with some yellowish brown tomentum below, pubescence black. *Wings* yellowish as far as the apex of discal cell, more intensely so on fore border, apex brown extending to

the fourth posterior cell but the second submarginal cell is almost wholly clear. The type is not in very good preservation but is too distinct a species to be confused with others, though it is allied to *Tabanus foidus*, Bigot, in colour of wings and shape of antennae and forehead; the palpi are however larger and broader, and the wings have no appendix, the posterior cell open at border though very narrow.

Tabanus basalis, ♀, Macquart.

Dipt. exot., i (1), p. 130 (1838); Van der Wulp, Notes Leyden Museum, vii, p. 72, 26 (1885).

Black. Scutellum and basal segments of the abdomen ferruginous. Wings yellow at the base, brown at the apex. Length 8 lines. From East India. M. Marc. Museum.

Face and forehead brown, this latter narrow, especially anteriorly, with a raised line and a small anterior callus, blackish. Antennae brownish testaceous, the third joint elongated, with a very short tooth, the last divisions brown. Thorax brown; sides, outer border and scutellum pale ferruginous. Abdomen with the first two segments pale ferruginous, transparent, with light whitish reflections; the others shining black. Legs blackish; tibiae yellowish black at the apex. Wings on anterior half yellowish and posteriorly of a light brown. Macq., Dipt. exot., i (1), p. 130.

Two females from Sumatra (V. Lansberge). In the most essential points they agree with the description. There are however some disagreements to be mentioned.

1st. According to the description the third and following segments of abdomen ought to be shining black; in my specimens the colour of these segments is fuscous and rather dull; moreover the livid margins of segments show remains of a white hair-fringe; the under surface is wholly fuscous and there the white fringe is complete, even on the second segment.

2nd. According to Macquart the legs are blackish, the tibiae yellow with black tips; this may be the truth in regard to the front legs; in the posterior ones, however, I find the tibiae brown and not darker at the end.

This species may be easily recognised by the light brownish yellow colour of the first two abdominal segments, on account of which it resembles more or less the N. American *Tabanus cinctus*, Fabr. The eyes are bare, reddish bronze, without cross-bands, even after having been moistened, and with very small facets all over. V. der Wulp, Notes Leyden Museum, vii, p. 72.

Type in Paris Museum seen by me, has the first posterior cell of the wing closed, a fact not mentioned by Macquart or V. der Wulp.

The abdomen is elongated, the first two segments livid, the remaining ones brownish black. Scutellum livid. Thorax brown, livid at base. Wings tinged brown, clear at the extreme apex,

yellowish at the base. Only the fore pair of legs are remaining; these are brown, the tibiae pale. Forehead about ten times as long as it is broad, narrowed anteriorly. Frontal callus oblong, no linear extension apparent. Palpi large, broad, ending in a point, reddish, flat. Antennae reddish with hardly any tooth. Length 18 mm. A specimen in Brit. Mus. coll. from Chantabun, Siam, which I believe to belong to this species—though owing to its bad preservation it is not possible to be certain—has the *scutellum* covered with grey tomentum, the *legs* as Schiner describes, and measures 15 mm. The beard is brown.

The female of *Tabanus crassus*, Walker, has not yet been discovered; it is just possible this may prove to be it, though it is a very differently shaped insect. The closing of the first posterior cell is not always present in both sexes.

Tabanus auriflamma, ♀, Walker.

List Dipt. Brit. Mus., i, p. 155 (1848).

Type (female) and two others from Sylhet, Assam, in Brit. Mus. coll.

In Indian Mus. coll. one female from Sibsagar, Assam, another from Naga Hills and another from Cachar, both localities on the border of Burma and Assam.

In Kertesz coll. one female from Sylhet, Assam. A handsome yellow-and-black species with yellowish wings, brown at apex and on posterior border, abdomen yellowish with black bands. Legs yellowish. Antennae yellow. Length of type 22 mm., others from 20—24 mm.

Face, subcallus and *forehead* covered with bright golden yellow tomentum; hairs on face and beard yellow or yellowish brown. *Palpi* reddish yellow with brown pubescence, stout, ending in an obtuse point. Antennae reddish, the first two joints covered with greyish tomentum and with brown hairs, the third joint slender, with no tooth and hardly a perceptible angle. *Forehead* parallel, about four times as long as it is broad, the frontal callus red-brown, shining, almost square, not reaching eyes, with hardly any lineal extension in fresh specimens; in denuded ones it appears. *Thorax* and *abdomen* yellowish, the former with some greyish brown tomentum and browner on the dorsum; pubescence scanty, consisting of short yellow hairs, shoulders with longer soft yellowish brown hairs. Breast the same colour. Scutellum yellow. *Abdomen* with broad blackish brown bands on the second, third and fourth segments, and a very narrow one on the fifth, all situated on the anterior half of segments, taking up half the width of segment on the second, rather narrower on the third and fourth, and on the fifth hardly noticeable; in some specimens the bands are reddish brown, the pubescence on the yellow parts golden yellow, thick, on the bands black; under side similar. *Legs* wholly reddish yellow, in the type the fore tarsi and tibiae are darker, owing to discoloration, pubescence reddish yellow. *Wings* large, deeply tinged with

yellowish at the base. Only the fore pair of legs are remaining; these are brown, the tibiae pale. Forehead about ten times as long as it is broad, narrowed anteriorly. Frontal callus oblong, no linear extension apparent. Palpi large, broad, ending in a point, reddish, flat. Antennae reddish with hardly any tooth. Length 18 mm. A specimen in Brit. Mus. coll. from Chantabun, Siam, which I believe to belong to this species—though owing to its bad preservation it is not possible to be certain—has the *scutellum* covered with grey tomentum, the *legs* as Schiner describes, and measures 15 mm. The beard is brown.

The female of *Tabanus crassus*, Walker, has not yet been discovered; it is just possible this may prove to be it, though it is a very differently shaped insect. The closing of the first posterior cell is not always present in both sexes.

Tabanus auriflamma, ♀, Walker.

List Dipt. Brit. Mus., i, p. 155 (1848).

Type (female) and two others from Sylhet, Assam, in Brit. Mus. coll.

In Indian Mus. coll. one female from Sibsagar, Assam, another from Naga Hills and another from Cachar, both localities on the border of Burma and Assam.

In Kertesz coll. one female from Sylhet, Assam. A handsome yellow-and-black species with yellowish wings, brown at apex and on posterior border, abdomen yellowish with black bands. Legs yellowish. Antennae yellow. Length of type 22 mm., others from 20—24 mm.

Face, subcallus and *forehead* covered with bright golden yellow tomentum; hairs on face and beard yellow or yellowish brown. *Palpi* reddish yellow with brown pubescence, stout, ending in an obtuse point. Antennae reddish, the first two joints covered with greyish tomentum and with brown hairs, the third joint slender, with no tooth and hardly a perceptible angle. *Forehead* parallel, about four times as long as it is broad, the frontal callus red-brown, shining, almost square, not reaching eyes, with hardly any lineal extension in fresh specimens; in denuded ones it appears. *Thorax* and *abdomen* yellowish, the former with some greyish brown tomentum and browner on the dorsum; pubescence scanty, consisting of short yellow hairs, shoulders with longer soft yellowish brown hairs. Breast the same colour. Scutellum yellow. *Abdomen* with broad blackish brown bands on the second, third and fourth segments, and a very narrow one on the fifth, all situated on the anterior half of segments, taking up half the width of segment on the second, rather narrower on the third and fourth, and on the fifth hardly noticeable; in some specimens the bands are reddish brown, the pubescence on the yellow parts golden yellow, thick, on the bands black; under side similar. *Legs* wholly reddish yellow, in the type the fore tarsi and tibiae are darker, owing to discoloration, pubescence reddish yellow. *Wings* large, deeply tinged with

yellow, brown on the apex, beginning from the base of the fork of third vein and extending along the posterior border, gradually becoming narrower as it approaches the base of wing, the coloration very distinct and the two colours sharply divided, veins yellow, brown on the brown part, stigma yellow, no appendix, all posterior cells widely open.

GROUP VII.

Forehead with one square or narrow or oblong callus always prolonged towards the vertex as a more or less narrow line, from five to nine times as long as it is broad.

Species of medium size or small, with one or more stripes on abdomen, usually continuous, the median stripe always so.

Tabanus striatus, Fabr., is the typical species of this group. *Tabanus auristriatus*, n sp., *hybridus*, Wied., and *aurotestaceus*, Wlk., form almost a subgroup. *Tabanus immanis*, Wied., is not known to me and is not included in the table; neither is *Tabanus bubali*, Doleschall, which will prove hard to identify from its very meagre description.

Tabanus annamitus, ♂, Bigot.

Mem. Soc. Zool. France, v, p. 630 (1892) (*Bellardia*).

Type, male, from Saigon, Cochin China.

A species with a fulvous abdomen on which appears an indistinct blackish median stripe, the apex blackish. Wings clear. Legs yellowish. Length 15 mm.

Eyes large, with the large facets very distinct, taking up fully two-thirds of the eye, the small facets on lower part continued to vertex as a narrow border, no appearance of hairs on eyes. Frontal triangle chestnut-brown. Subcallus and *face* covered greyish tomentum and a few white hairs. *Antennae* now incomplete, described as yellow, black at apex; the first two joints with black pubescence. *Palpi* yellow, with paler pubescence. *Thorax* blackish with grey tomentum. *Abdomen* reddish yellow, with some grey tomentum, especially visible on the black narrow median stripe which becomes broader towards apex; under side reddish yellow, apex blackish. *Legs* yellowish, the fore femora darker, covered with grey tomentum and with black pubescence, the posterior pair with chiefly white pubescence, elsewhere it is mostly black. *Wings* quite clear, veins and stigma yellow, the first posterior cell closed at border.

I have seen no specimens identical with this species.

Tabanus striatus, ♂ ♀, Fabr.

(Pl. xiii, fig. 7.)

Ent. Syst., iv, p. 371 (1794); *id.*, Syst. Antl., p. 103 (1805); Wied., Dipt. exot., p. 79 (1821); *id.*, Auss. Zweifl. Ins., i, p. 155

(1828); V. d. Wulp, Sumatra Exped. Dipt., p. 16 (1881); *id.*, Notes Leyden Museum, vii, p. 71 (1885).

Tabanus dorsilinea, ♂, Wied., Anal. Entom., p. 22 (1824); *id.*, Auss. Zweifl. Ins., i, p. 184 (1828).

Tabanus sinicus, ♂, Wlk., List Dipt., i, p. 163 (1848).

Tabanus tenens, ♀, Wlk., Ins. Saund. Dipt., i, p. 49 (1850).

Tabanus megalops, ♂, Wlk., List Dipt., v, Suppl. i, pp. 247, 407 (1854).

Tabanus partitus, ♀, Wlk., Proc. Linn. Soc. London, i, p. 9 (1856).

? *Tabanus manilensis*, ♀, Schiner, Reise Novara Dipt., p. 84 (1868).

Atylotus macer, ♂, Bigot, Mem. Soc. Zool. France, v, p. 649 (1892).

Tabanus rufocallosus, ♀, Bigot, *l. c.*, p. 679.

Reddish brown; thorax with white stripes, abdomen with three wide white stripes. Length 5-6 lines, ♂ ♀. From China and Java. Fabr., Ent. Syst., iv, 371, 39 (1794).

Ashy grey, abdomen brown with three abbreviated white lines. Fabr., Syst. Antl., 103, 47 (1805).

Antennae rusty yellow. Face grey-haired. Beard whitish. Forehead yellowish with a smooth band widened above and below into a square callus. Thorax in certain lights appearing white, with four broad whitish stripes and a line in the middle always apparent. Sides of breast white-haired. Abdomen in unrubbed specimens with three broad white unabbreviated stripes; the side borders also white so that really five stripes are present. Wings hyaline. Halteres brownish with white knob. Femora reddish rusty brown, tibiae paler. Tarsi blackish brown. Wied., Auss. Zweifl. Ins., i, 155, 69 (1828).

Van der Wulp records a male from Soerian Sumatra, in Sumatra Exped. Dipt., 16, 3 (1881), and gives the following details :—

"♂. Eyes are naked, flatter above than in other species, with a coarse network and a purple transverse band, below which the network becomes very fine. The white stripes on the thorax are indistinct, as are the two side stripes on the dorsum of abdomen, which latter ends in a point. The wings are quite clear, but have a pale grey tinge, the costal cell is yellow, the stripe-like stigma yellow-brown."

In Notes Leyden Museum, vii, 71, 24 (1885), he records ♂ and ♀ from Java and Sumatra and adds—

"Eyes bare, in ♂ reddish bronze above with large facets, the lower third and the borders blackish with small facets; the two parts distinctly separated; in the ♀ the eyes are uniform bronze with small facets."

This species has a wide distribution, being found from India to Sumatra.

In the Brit. Mus. coll. are ♂ ♀ specimens from N. India, Pusa Bengal, Bassein Bombay, Calcutta; Trincomalee, Tamblegam, Kandy and other places in Ceylon; Upper Burma; Kuala Lumpur, Federated Malay States; Cavité, Philippines; and from Kajoe-Tanan, Sumatra (Hagen).

In Indian Mus. coll. from Bunkutwa, Gonda District, U. P.; Calcutta; Murshidabad, Purneah District; Port Canning; Bengal; Madras Coast; and Balighai, near Port Orissa E. India.

In Howlett coll. from Belgatchia and Pusa, Bengal; others identified from Sylhet, Assam; and Manipur, Burma.

The only species likely to be confused with this species are *Tabanus albimedius*, Walker, and *Tabanus rubidus*, Wied., from both of which it may be distinguished by the *spindle-shaped continuation of the frontal callus*, by the almost straight median stripe, narrow almost continuous lateral stripes and by the slender more or less pointed abdomen. Length from 12—20 mm. A female specimen in the Paris Museum placed under this species and supposed to be the original type is a specimen of *Tabanus albimedius*, Walker, from Java, but as the original description very clearly states there are three stripes, the type has probably been lost or confused; there is a specimen side by side with this supposed type, determined by Macquart as *Tabanus striatus*, with the usual striped narrow abdomen.

Some small specimens, females, from Mohmand Pass, N. W. Frontier, in the Howlett coll., which I took at first to be a new species, only measure 11 mm. but I can find no other specific character to divide them from *Tabanus striatus*.

♀. *Face* greyish, with white pubescence. Beard white. *Palpi* very pale yellow with white pubescence and some black hairs, curved on upper side, with a rather long apex. *Antennae* reddish yellow, darker at apex. *Forehead* rather narrow, slightly narrower anteriorly, about six times as long as it is wide, covered with yellowish grey tomentum, some short white pubescence is visible, on the vertex are some black hairs. Frontal callus shining reddish brown, oblong, hardly reaching the eyes anteriorly, posteriorly receding from them and continued in a fine line for a very short distance, then becoming broad, at least half as wide as the callus itself, often starting direct from the callus as a broad stripe. Pubescence on hind part of head short and white. *Thorax* reddish brown, or brown with four fairly distinct greyish white tomentose stripes with white pubescence, elsewhere on the dorsum the pubescence is black, sides of thorax with black hairs, breast grey with white pubescence. *Scutellum* same colour as thorax, with black pubescence and white hairs round the posterior border.

Abdomen usually long and slender, ranging from reddish brown to blackish brown, the median stripe continuous, reaching the sixth segment, composed of oblong grey tomentose spots slightly narrower at their apices on the second and third segment, the side stripes

usually prolonged very distinctly to the fourth segment, appearing on the fifth as an indistinct spot, the sides of abdomen white with white hairs, the pubescence on dorsum black, white on the stripes. Under side reddish yellow or darker, covered with grey tomentum.

Legs reddish yellow, the femora more rusty reddish, often appearing darker owing to the black hairs situated chiefly on the upper sides, in some specimens the middle and posterior pair are blackish covered with grey tomentum, the pubescence is always predominantly whitish; on the coxae it is white and on the tibiae with black hairs on the upper sides, the tarsi reddish brown with black pubescence. *Wings* hyaline, stigma yellow, veins reddish. Halteres yellow or brown with lighter knob.

In a specimen from Malacca the fore coxae and femora are shining black with grey tomentum and wholly white pubescence.

♂. These are all reddish brown in colour of abdomen; in *Tabanus sinicus* ♂ type and another specimen from Calcutta, the femora and the greater part of the fore tibiae are blackish. The eyes are as Van der Wulp describes them, but the large facets are yellowish green in colour with a large brown band across the centre, only in the type of *Tabanus sinicus*, is this not apparent. The males vary from 12—20 mm. in size.

Tabanus dorsilinea, ♂, said to be nearly related to *Tabanus striatus* in the description but much smaller and different, has been long placed as a synonym and apparently correctly, though I have never seen a specimen of *Tabanus striatus* with "segmentations of abdomen widely ochre-yellow," as Wiedemann describes. His type came from E. India.

Tabanus sinicus, ♂, from Hongkong, has rather darker legs than usual, measuring 20 mm. length.

Tabanus tenens, ♀, from India, has legs rather paler than usual.

Tabanus megalops, ♂, from Java, is more reddish in colour than usual.

Tabanus partitus, ♀, from Singapore, has the femora rather darker than usual.

Atylotus macer, ♂, from India is labelled as *Atylotus microloma*, but from the description it is evidently the type of *A. macer*; it is a small specimen in very bad condition, as remarked by Bigot in his description; it appears to be a small specimen of *Tabanus striatus*, the three stripes clearly visible though Bigot speaks of two only. The type of *Tabanus rufocallosus* is from Java, nearly all the legs were wanting when described, the abdomen is partly destroyed which accounts for Bigot describing the median stripe as ending on the third segment; in reality it appears to end on the fourth segment, as the fifth is incomplete; the fore femora are rather darker than is usual.

Tabanus manilensis, ♀, is apparently from the description a specimen of *Tabanus striatus*, with the side stripes indistinct and the legs rather darker than usual; it is described as from Manila. Length 13 mm. one specimen only. *Tabanus chinensis*, Thunberg

(N. Acta. Reg. Soc. Upsaliensis, ix, 53—62, 1827), recorded as from China and Cape of Good Hope, was probably a specimen of *Tabanus striatus*, or of *Tabanus taeniola*, P. B., from the Cape, or Thunberg may have had specimens of both species before him, the African and Indian species being very nearly related, but distinct; the frontal callus alone would divide them, but his description is not full enough to make it possible to decide; the species may well be deleted from the list of *Tabanus* species. See Bezzi, "Nomenklatorisches über Dipteren" in Wien. Ent. Zeit., xxvii, vol. ii and iii (Feb. 1908).

Tabanus costalis, Lichtenstein, Catalogus, p. 213, Hamburg (1796); Austen, Ann. Mag. Nat. Hist. (8), i, p. 346 (1908); from Coromandel. This species, described in under a dozen words and absolutely indeterminable but apparently thought by the author to be near *Tabanus striatus*, should be deleted from the list of species of *Tabanus*.

Tabanus hilaris, ♂ ♀, Walker.

Ins. Saund. Dipt., p. 49, pl. ii, fig. 3 (1850).

In Brit. Mus. coll.; the type ♂ from India, others from the Punjab and N. W. India.

In Indian Museum coll. ♂ and ♀ specimens from Bhogaon, Purneah district, N. Bengal, "resting in numbers on tree trunks during the day, common in the evening on the stomachs of cows" (C. A. Paiva). In Howlett coll. ♂ and ♀ specimens from Belgatchia and Pusa, Bengal, others sent for determination came from Sylhet, Assam.

A species distinguished from *T. striatus*, F., by the short median stripe of abdomen which does not begin till the *third* segment and by the shorter lateral stripes which usually terminate on the third or fourth segment. The frontal callus is very similar in shape, shining red-brown, rather protuberant with a spindle-shaped extension, the forehead almost the same width throughout. The *palpi* shorter and stouter. *Legs* darker, the femora being all blackish or reddish brown. In colouring the abdomen is blackish brown with the stripes grey. The *thorax* with two stripes which fade away on the anterior border. The males are similar, in the type the abdomen is more reddish brown than black. Eyes in males with a broad band of very large facets, leaving the lower half of eyes and a narrow border continued to the vertex composed of small facets; across the yellowish large facets is a well-marked broad brown band.

Length of male specimens 11½ mm., of females 14 mm.

Tabanus abbreviatus, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 670 (1892). [*Atylotus.*] ? *Atylotus conicus*, ♂, Bigot, *l. c.*, p. 650.

Type ♀ and another from Java, in bad preservation. In Brit. Mus. coll. a female from Singapore (Falshaw), "Biting horses and cattle, more frequently seen in the last six months than in former years;" a female from Selangor (Butler), "Common, bites men and horses." In Howlett coll. females from Calcutta and from Belgatchia, Bengal.

In Kertesz coll. four females from Formosa. The type had the antennae incomplete when described and is now in a dirty denuded condition; the description given below is based largely on the modern specimens.

A reddish yellow species with the thorax blackish, abdomen with a narrow grey median, and fainter lateral stripes. Antennae and legs reddish brown. Length type 16 mm., other specimens from 14—17 mm.

This species is distinguished from *Tabanus albimedius*, Wlk., by its smaller size, narrower forehead especially above antennae, more slender palpi, covered with black pubescence, darker legs and thorax, abdomen reddish yellow, blackish at apex. *Face* covered with grey tomentum and with silvery white pubescence. Beard the same colour. *Palpi* pale yellow thickly beset on their outer side with black hairs, long and slender, the apical part as long as the stouter basal part. *Antennae* red-brown, blackish on the last half of the third joint which is broad at its base with a prominent tooth, the first two joints with black hairs. *Forehead* narrower anteriorly, covered with yellowish brown tomentum and with black hairs about eight times as long as it is wide anteriorly, the frontal callus oblong, not reaching the eyes, diminishing to a long narrow line, reddish brown or brown in colour. *Thorax* blackish covered with yellow brown and grey tomentum and with white and black hairs on dorsum, the grey stripes indistinct, sides with black hairs, but tufts of whitish or yellowish hairs round base of wings; breast grey with white pubescence. *Scutellum* as thorax. *Abdomen* reddish yellow, on each side of the median stripe it is usually brown, the last three segments largely black, the median stripe is narrow, usually continuous, covered with grey tomentum and with black hairs, some yellow hairs are often present, the side stripes are faint, indicated by grey tomentum and by yellow hairs, the pubescence on the dorsum is otherwise black, thicker at the apex: under side lighter. *Legs* reddish, femora darker, especially the anterior pair, with grey tomentum and largely yellowish pubescence, fore tibiae at apex and fore tarsi blackish, other tarsi brown. *Wings* clear, costal border yellow, veins brown, stigma yellow.

In one of the specimens from Formosa the median stripe is broken up into narrow triangular spots which however join; in fresh specimens the side stripes appear more distinct as oblong narrow spots forming more or less continuous stripes.

Atylotus conicus ♂, Bigot, from India is probably the ♂ of this species. Type is in fair condition; eyes with large facets above.

Tabanus rubidus, ♀, Wied.

Dipt. exot., 69, 14 (1821).

♀. Lilac brownish. Thorax with whitish stripes. Abdomen with three whitish stripes composed of spots. 8 lines. From Bengal, Wied., Dipt. exot., 69, 14 (1821).

Related to *Tabanus autumnalis*. Antennae rather reddish, the end joint almost wholly blackish. Face and beard white. Palpi very pale yellowish. Forehead grey. Frontal stripe narrow ending below in a narrow egg-shaped reddish callus. Thorax lilac reddish brown, with grey tomentum and five whitish, in certain lights, grey-haired stripes; breast sides rather hoary white with white tomentum. Abdomen lilac reddish brown, median stripe composed of narrow triangular side stripes of nearly square spots: side borders yellowish white, in certain lights the abdomen appears a little grey haired. Wings in the middle rather yellowish; halteres rather reddish. Femora very light lilac reddish, above with a blackish stripe, tibiae more yellowish, both with white pubescence, tarsi brown. Wied., Auss. Zweifl. Ins., i, 127, 25 (1828).

Van der Wulp in Notes Leyden Museum, vii, 71, 23 (1885), records females from Java and Sumatra. Eyes with no cross-bands.

In Brit. Mus. coll. ♀ specimens from Moulmein, Burma; Bombay; Kuala Lumpur and Singapore, Federated Malay States; Siam (Woolley). On the female from Singapore is the following note: "Biting horses and cattle, more frequently seen during the past six months than in former years." (Falshaw.)

In Howlett coll. from Pusa and Belgatchia. In Indian Mus. coll. from Sibsagar, Assam; Bhogaon and Purneah District, N. Bengal: "Resting in numbers on tree-trunks during the day, common in the evening on the stomach of cows;" from Khasi Hills, Assam; from Partabgarh, U. P.

This species is distinguished from *Tabanus striatus*, Fabr., in general by its broader, larger *abdomen*; the frontal callus is not prolonged in a spindle-shaped thick line but as a narrow short line; the median stripe of *abdomen* is not so straight, the sides are serrated, the spots composing it being more triangular in shape, the side stripes do not appear so regular and continuous, being composed of very similar spots, but their apices as a rule are turned inwards so that the stripe appears irregular. The *legs* as a rule are darker, especially the femora, and the apices of the fore tibiae, which are blackish, their basal part yellowish white. The *palpi* are pale yellow or whitish with mostly black pubescence, stout and large. The *face* is covered with grey tomentum and with white hairs. *Forehead* slightly narrower anteriorly, about five times as long as it is broad. In the specimen from Assam the wings are tinged with brown. Length of specimens 17—20 mm. The males of this species if they do not retain the dark colour of the females will be difficult to distinguish from those of *Tabanus albimedius*, Wlk., only the darker femora serving to divide them.

I have not yet seen any males which appear to belong to this species.

Tabanus albimedius, ♀ ♂, Walker.

(Pl. xiii, fig. 8.)

Dipt. Saund., p. 48 (1850).

Tabanus vagus, ♀, Walker, Dipt. Saund., p. 50.

Tabanus umbrosus, ♀, Walker, Dipt. Saund., p. 52.

Tabanus priscus, ♀, Walker, List Dipt., i, p. 176 (1848).

? *Tabanus calidus*, ♀, Walker, Dipt. Saund., p. 57.

Atylotus lachrymans, ♀, Bigot, Mem. Soc. Zool. France, v, p. 669 (1892).

In Brit. Mus. coll. the type (♀) of *albimedius* from E. India (Saunders coll.), other specimens from Nepal; India; and a long series of males and females from Ceylon (Verbury coll.); these latter are said to be common on the road from Trincomalee to Kanthalla.

In Howlett coll. females from Umballa, 900 ft., "lying close on tree trunk;" males from Calcutta; and males and females from Pusa, Bengal.

This species is very nearly allied to *Tabanus rubidus*, Wied., being chiefly distinguished from it by the lighter colour of *abdomen* which is not uniformly blackish brown or lilac-brown, as is the case in typical specimens of the Wiedemann species, but is reddish brown, usually darker brown each side of the median stripe, which latter varies from narrow to wider triangular spots forming a more or less continuous stripe. Under side reddish yellow. *Thorax* reddish brown with grey tomentum and indistinct grey stripes. *Legs* are lighter in colour, the femora reddish brown, the tibiae yellowish but the apices of the fore tibiae blackish, the tarsi reddish brown. ♀. *Forehead* five to six times as long as it is broad, slightly narrower anteriorly, frontal callus reddish brown, not quite reaching the eyes, with a narrow linear extension, which at once distinguishes it from *Tabanus striatus*. *Palpi*, very pale yellow with few or no black hairs. *Antennae* red, darker at the apex. Length 13½—18½ mm. The male is difficult to distinguish from the males of *Tabanus striatus*, but the shape of median stripe is different, being not so straight or continuous. The males of the three species *striatus*, *albimedius* and *rubidus* are all somewhat difficult to distinguish from each other.

The species is very nearly allied to *Tabanus rubidus*, Wied., and may perhaps eventually be regarded as only a form of the above, as many of the specimens of both species are variable in the colouring of the abdomen and of the legs and therefore difficult to divide from each other.

The series from Ceylon have the forehead rather narrower anteriorly and the abdomen is rather more reddish yellow.

Tabanus vagus, type, ♀, is from E. India (Saunders coll.), another female from same locality and one from Java were identified by Walker as this species, but I find no difference in the specimens from those of *Tabanus albimedius*.

Tabanus umbrosus, type, ♀, from E. India (Saunders coll.), has the legs somewhat darker than usual, and the median stripe is straighter and narrow.

Tabanus priscus, type, ♀, from an unknown locality, appears to be identical with *T. albimedius*, but priority is not given to it owing to the doubt as to locality.

? *Tabanus calidus*, type, ♀, from Asia, but in the description a query accompanies the locality; this is presumably a specimen of *Tabanus albimedius*, very similar to the series of specimens from Ceylon.

Atylotus lachrymans, ♀, Bigot, from Java, appears identical with the Walker species.

Tabanus speciosus, ♀, n. sp.

Type ♂ from Travancore.

Type ♀ from India (Wroughton), and another female from Tamblegum, Ceylon (Yerbury), in Brit. Mus. coll. In Indian Museum coll. female from Travancore, S. India.

A distinctly marked conspicuous species with a superficial resemblance to *Tabanus reducens*, Wlk., from Celebes, but distinguished from it by the presence of side spots. It is allied to *Tabanus rubidus*, Wied., but the conspicuous spots on the third and fourth segments of abdomen with wide bases will distinguish it; on the second segment the spot is very narrow so that the stripe has a much more unequal appearance; and it is larger in size.

A black species, with three series of white spots on abdomen, legs blackish with yellow tibiae, antennae red, wings almost clear. Length 19 mm.

♀. *Face* covered with greyish white tomentum, with silvery white pubescence and beard. *Palpi* pale yellow with some black pubescence, stout, ending in a short acute point. *Antennae* red, duskier at the apices, the first two joints pale yellow with black pubescence, tooth of third joint small but distinct. Subcallus same colour as face. *Forehead* with rather darker tomentum and with some white pubescence, about seven times as long as it is wide, only slightly narrower anteriorly, the frontal callus reddish brown, large, oblong, not reaching the eyes, the short linear extension not always visible. *Thorax* reddish brown in type, probably blackish brown when not denuded, with five distinct grey tomentose stripes, with yellowish white pubescence on them, sides with black hairs, round the base of the wings with white ones; breast covered with grey tomentum and with white pubescence. *Scutellum* same colour as thorax, with white pubescence at sides and on posterior border. *Abdomen* blackish brown, the median stripe

composed of four whitish tomentose spots, the one on the second segment narrow triangular, on the two following segments broad triangular, on the fifth the same but a little narrower, all with their apices reaching the border of the next segment, the spots on the sides distinct and large but less defined in shape and only present on the second, third, and fourth segments, oblique, inclining inwards from the outer border, the one on the fourth segment smaller; all these spots are white haired, pubescence otherwise on dorsum short, thick, black, sides yellowish with white pubescence; under side reddish brown with an indistinct median black stripe, pubescence white. *Legs* blackish, the coxae and femora covered with dense grey tomentum and with white pubescence, tibiae reddish yellow, the fore pair only so on their basal half, with white pubescence, which is also present but less thick on the other tibiae; pubescence on apices of fore tibiae, the extreme apices of the others and on the tarsi black. *Wings* hyaline, a hardly noticeable brownish tinge on the fore border, veins brown, stigma reddish yellow. Male identical with female, more reddish in colour. Eyes very large, the large facets occupy fully two-thirds of the eyes, the lower third composed of small facets which reach to the vertex as a narrow border, a dark brown band crosses the coppery coloured large facets.

Tabanus hirtistriatus, ♀, n. sp.

Type (♀) and five other females, the type from Perak, the others from Durien Tipus, Negui Sembilan, Federated Malay States, in collection sent me by Dr. Stanton. A small brownish species, with a very narrow forehead, anteriorly barely half as wide as it is at the base, the abdomen with a grey tomentose median stripe clothed with yellowish or whitish hairs, this stripe often seems almost obsolete in rubbed specimens. Wings tinged with brown on the fore border. Length of type 11½ mm., others from 12—14 mm.

Face covered with grey tomentum and some white hairs, sides of cheeks and subcallus with yellowish brown tomentum. Beard white. *Palpi* small, a little stout at base, ending in a point, pale yellowish with black pubescence. *Antennae* slender with an acute but very short tooth at base of third joint, bright red, black at apex, the first two joints with black pubescence. *Forehead* covered with same coloured tomentum as subcallus, the frontal callus very narrow, oblong or cylindrical with a fine linear extension, not reaching the eyes, brown in colour, about nine times as long as it is wide. *Thorax* blackish brown with fine greyish yellow short pubescence, at sides with black pubescence. *Scutellum* is similar.

Abdomen blackish brown, more yellow-brown on the first two segments, sometimes reddish brown and black at apex, the pubescent stripe continuous with straight sides; under side yellowish brown covered with grey tomentum, and with white-haired segmentations. *Legs* brownish, the tibiae yellow, black at apices. *Wings* hyaline, tinged with brown on the fore border reaching the apex, a short appendix usually present.

There are a series of males in the Indian Museum coll. from the base of the Dawna Hills, Lower Burma (*Annandale*), which may possibly prove to be the male of this species; the abdomen and legs are yellower; all the facets of the eyes almost the same in size. A note is attached to them, *viz.*, "Hovering over cart track in the bright sun."

Tabanus monotaeniatus, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 655 (1892). [*Atylotus.*]

Type (♀) and four others from India (only three specimens are mentioned by Bigot in his description) and one other (♀) from N. Khasi which was placed under his species *Tabanus monilifer*.

In Indian Museum coll. three para-types from India, one of them from Sibsagar, and another from N. Khasi, Assam. In Howlett coll. seven ♀ from Nangpoh, Assam, "caught on animal." In Brit. Mus. coll. ♀ specimens from Dibia and Sadia, Khasi Hills District; and N. Khasi Hills, lower ranges (Chennell); and Nangpoh, Assam. A blackish brown or reddish brown species, the abdomen with a narrow distinct grey tomentose median stripe reaching to the sixth segment, the sides straight: the thorax blackish with indistinct stripes. Legs blackish, with red tibiae, antennae and palpi.

Length of the type 18 mm., other specimens range from 14—19½ mm.

Face covered with greyish tomentum and with white pubescence, a few black hairs on cheeks. *Palpi* large, reddish or yellow, covered with black hairs, the inside bare, ending in rather an obtuse point. Beard white. *Antennae* reddish, the third joint dusky, and blackish at apex, only red at base, the tooth obtuse, the first joint with grey tomentum and with black pubescence, the second with black pubescence on its outer border. *Forehead* covered with yellowish tomentum, with some short black pubescence, very nearly the same width throughout, very slightly narrower anteriorly, quite six times as long as it is wide, the frontal callus club-shaped, the line proceeding from it being thick; the callus does not reach the eyes and is dark brown in colour. Hind part of head with short white pubescence, some black hairs at vertex. *Thorax* black with yellowish brown tomentum and with traces of four indistinct grey stripes, the shoulders and sides of thorax in some of the specimens reddish brown, the pubescence of dorsum short, black, hairs at sides black. *Scutellum* black with grey tomentum and black pubescence; breast and sides covered with greyish tomentum and with white hairs. *Abdomen* blackish brown, or reddish brown, with some yellowish brown or greyish tomentum which in some specimens appears as indistinct roundish spots, the dorsum rather thickly covered with short black pubescence, with the exception of the median stripe on which a few white hairs are visible, the hairs on sides of first three segments are black, afterwards white, the segmentations very narrowly lighter; under side blackish brown or reddish brown

covered with grey tomentum, the segmentations yellowish, the pubescence chiefly black. *Legs*: the coxae and femora black with grey tomentum and with white pubescence, the tibiae reddish, darker at extreme apex, with chiefly black pubescence, the tarsi the same colour but appearing darker on account of the thicker black pubescence. *Wings* grey, tinged with brown on fore border, and round veins. Halteres reddish brown, knobs pale yellowish red.

The two females from N. Khasi are rather paler in colouring, the abdomen more reddish, the thorax with sides and shoulders reddish, the legs slightly redder, the wings clear with stigma and veins yellow.

The type and the majority of the specimens have a blackish brown abdomen, but some are reddish brown.

Tabanus brunnipennis, ♀, n. sp.

(Pl. xiii, fig. 9.)

Type (♀) and two other females from Basi, N. Kanara, S. W. India (T. R. Bell), 1908; one ♀ from Bangkok, Siam (S. S. Flower), 1908.

In Howlett coll. one ♀ from Gorakhpur, U. P., India.

A well-marked brown species with a rather broad very distinct grey median stripe on abdomen, and two grey spots on the second segment. Legs and antennae reddish. Wings grey, tinged brown on fore border as far as the second longitudinal vein. Length of type 16 mm., other specimens from 13—15 mm. It is distinguished from *T. monotaeniatus*, Bigot, by its smaller size, and the wings have not the cross-veins shaded, but the tinged fore border sharply defined.

Face covered with whitish grey tomentum and a few scattered white hairs. Beard white. *Palpi* yellow with rather numerous black hairs, stout at base ending in a long obtuse apex. *Antennae* reddish, the first joint appearing paler with whitish tomentum and some very fine black pubescence, the third slender with a very slight tooth, brown at apex. *Forehead* covered with yellowish brown tomentum and with a few black hairs, the same width throughout, about six times as long as it is wide, the frontal callus shining reddish brown, not reaching the eyes, club-shaped, the linear extension thick ending in a point beyond the middle of the forehead, in some of the specimens the callus appears larger, apparently owing to denudation, a slight furrow appears each side of the apex of callus converging towards the vertex. *Thorax* blackish (when denuded reddish), covered with greyish tomentum and black pubescence, two indistinct grey stripes apparent, with traces of yellowish pubescence anteriorly, sides grey with white hairs, shoulders reddish with black hairs, breast covered with grey tomentum and white pubescence. *Scutellum* reddish with grey tomentum and black hairs, white hairs on borders. *Abdomen* dark reddish brown, usually redder on the anterior

segments, covered with dense but short black pubescence, on the stripe and spots with short white hairs; the spots are situated one on each side of the second segment, small and round, indications of one on the third segment are present, the stripe measuring nearly 1 mm. at its broadest from the first to sixth segment, sides straight; under side paler, reddish, with white and yellowish pubescence. *Legs* reddish, apices of fore tibiae and tarsi darker, femora with grey tomentum and chiefly white pubescence, tibiae and tarsi with chiefly black pubescence. *Wings* with the dark colouring very noticeable reaching to the apex, veins and stigma brown.

Tabanus abscondens, ♀, Walker.

Trans. Entom. Soc. London, v, p. 275 (1860).

Type ♀ from Burma; one ♀ from N. Chin Hills, Burma (Watson); one ♀ from Dawna Range, Tenasserim, Lower Burma, 500—1,500 feet (Bingham); one ♀ from China in Dr. Kertesz's collection.

Type and specimens are all in a denuded faded condition, so that the redescription given below is imperfect. The species appears to be nearly related to *Tabanus glaber*, Bigot, but is distinguished from it by the frontal callus. Abdomen reddish, with a broad black median stripe. Length 16 mm., one specimen 17 mm.

Face greyish with thick short white pubescence. Beard white. *Palpi* reddish yellow with black pubescence, long with a not very pointed apex.

Antennae gone in type. Walker describes them as small, with the tooth very small; in the specimens from Tenasserim and China they are long and slender, the tooth prominent, reddish, the third joint darker. *Forehead* considerably narrower anteriorly, about six times as long as it is wide, the frontal callus oblong, narrow, nearly reaching the eyes with a short linear extension. *Thorax* blackish, red at sides, *scutellum* blackish, red on its outer border. *Abdomen* appears to be reddish with a broad black stripe on which appear traces of a narrow grey stripe, the sides of segments black and the three last segments wholly blackish. *Legs* reddish, the fore femora, apices of fore tibiae, and tarsi blackish. *Wings* clear, stigma yellowish, veins brown.

Tabanus auristriatus, ♀, n. sp.

Type ♀ and three others from Gersoppa, N. Kanara, S. W. India (Bell), 1908.

A dark brown species with golden hairs on thorax and abdomen, forming a stripe on the latter. Antennae yellowish. Legs brownish. Wings pale brown, deeper brown on the fore border. Length of type 14 mm., other specimens from 11—13½ mm.

Face covered with pale greyish white tomentum on lower part; a narrow band stretching across just below the antennae, subcallus and the forehead covered with rich yellowish brown tomentum, pubescence on face scanty, black. Beard sparse, white. *Palpi* long, narrow, yellowish brown with black pubescence. *Antennae* long, slender, the first two joints pale yellow with black hairs, the third red, black at apex, with a small tooth. *Forehead* narrow, the same width throughout, about six times as long as it is wide anteriorly, the frontal callus long, narrow, not reaching the eyes, prolonged in a thick line just beyond the middle of forehead. *Thorax* and *scutellum* thickly covered with very short yellow pubescence, sides with black hairs, breast grey with white hairs. *Abdomen* yellowish brown anteriorly, darker at apex, with black pubescence, the median stripe is indistinct, chiefly marked by the golden yellow hairs which also border the segmentations; under side brown with white-haired segmentations.

Legs brown or yellowish brown, fore tibiae a little paler at base. *Wings* tinged brown, paler on the posterior border, stigma dark brown, veins brown.

This species is distinguished from *Tabanus hybridus*, Wied., by the forehead not becoming narrower anteriorly, by the darker legs and indistinct narrower median stripe.

Tabanus hybridus, ♀ ♂, Wied.

Auss. Zweifl. Ins., i, p. 557, 31 (1828); Walker, Proc. Linn. Soc., i, p. 110 (1857) (recording the species from Macao).

Oak-brownish with a brown-yellow striped abdomen. Wings brownish on the fore border, 5½ lines, ♀ from Macao.

Of a slender form. Antennae rusty yellowish, the last joint with a hardly perceptible tooth at base; palpi brownish; face yellow; beard whitish; forehead yellow with a linear like callus gradually somewhat thicker below. Thorax oak-brown with two hardly perceptible lighter stripes; breast sides greyish. Abdomen brown with a broad yellow stripe and quite narrow yellow side borders, the last segment black-brown; on the under side the three last segments are blackish with yellow side borders. Wings on the fore border brownish. Legs brownish yellow with black-brown tarsi. In my collection. Wied., Auss. Zweifl. Ins., i, p. 557.

Van der Wulp in his Cat. Dipt. S. Asia also gives Borneo, the type being recorded from Macao, S. China.

In Brit. Mus. coll. are ♀ specimens from Kuala Lumpur and Sunghai, S. Perak, Federated Malay States; also specimens sent to me by Dr. Kertesz for identification from Perak, and from Sylhet, Assam, others from Batu Tisa, Federated Malay States, Stanton coll. A very pale faded specimen determined by Walker as this species from Sarawak, Borneo, is probably correctly identified.

♀. An easily recognised species with the median yellow stripe on the yellowish brown sometimes darker brown *abdomen*,

the stripe in well-preserved specimens is covered with golden yellow hairs and is continuous and straight at sides; the *thorax* is covered with short golden yellow pubescence and some black hairs intermixed. The *forehead* is narrow, quite seven times as long as it is wide anteriorly, where it is almost a third narrower than at vertex. The frontal callus is very narrow with a fine linear extension. The *palpi* are yellowish covered with black pubescence, rather stout, ending in an obtuse point. The *legs* are brownish yellow, but the anterior and middle pair paler yellow, the fore tibiae often appearing white owing to white pubescence; in some specimens however the pubescence is black. The *wings* have the costal border shaded brown extending to the apex, in some specimens it reaches to the hind border, stigma yellow.

♂. Similar, the large facets of eyes occupy the greater portion of eye, the small facets on the lower part occupying about a third of the surface of eye, continued as a narrow border to the vertex.

Length of specimens from 11½ to 15 mm.

Tabanus aurotestaceus, ♂, Walker.

List Dipt., v, Suppl. i, pp. 214, 253 (1854).

Type from Shanghai, and a ♀ from China (Walker coll.).

A species near *Tabanus hybridus*, Wied., but distinguished by the wholly clear wing and black fore femora.

The ♂ has a very large head, *Atylotus*-like, flat above, the small facets occupying the lower third of the eyes and continued as a narrow border to vertex. *Thorax* and *abdomen* covered with yellowish tomentum and with black and some yellow hairs. *Legs* pale yellow, fore femora black, tarsi blackish. The yellow stripe on abdomen is very broad, about a third of the width of abdomen. Length 17 mm.

♀. A poor specimen. The forehead very narrow anteriorly, about nine times as wide as it is broad, with a long narrow frontal callus. Length 16½ mm.

Tabanus tristis, Van der Wulp.

Sumatra Exped. Dipt., 17, 5, pl. i, fig. 9 (1881).

One female from Datar, Sumatra, in May.

Black. Abdomen with lateral stripes and antennae ferruginous, the lateral borders of thorax and posterior border of scutellum pale haired. Wings ashy grey, the costa darkened. ♀. Length 11 mm.

Eyes naked, divided by a narrow, posteriorly somewhat enlarged, frontal band, on which a stripe-shaped, below a little enlarged, black line appears; the remaining triangular forehead, besides the face and the cheeks, with grey-brown tomentum; the beard pale grey. Antennae rust-coloured; the first joint triangular, the second projecting above spine-like; the third above at the base

with a small tooth and at the apex darkened (see plate). Abdomen black; the borders of the thorax and the posterior border of the scutellum with pale pubescence: on the fore breast and the fore coxae a very long dirty white pubescence; breast sides with ashy grey tomentum; the first four segments of abdomen with a rusty coloured stripe on each side, which is broadest at the base, but posteriorly narrower, a pale pubescence is visible on them; on the dorsum are some traces of reddish segmentation; on the under side they are distinct and light grey. Legs black-brown, somewhat shining; the femora by their pubescence greyish. Halteres brown. Wings with a grey-brown tinge, darkest on the fore border; stigma dark brown; veins black-brown, neuration normal. V. d. Wulp, Sumatra Exped. Dipt., p. 17.

This species is unknown to me.

Tabanus jucundus, ♂ ♀, Walker.

(Pl. xiii, fig. 10.)

List Dipt., i, p. 187 (1848).

Type ♂ and another specimen with no head, from Hongkong; male and female from Pundaluoya, Ceylon (Green); females from Kohat, Punjab, and India; all in Brit. Mus. coll.

In Howlett coll. females from Igatpuri, W. Ghats, Bombay Presidency; from Mussoorie, N. India, about 7,000 ft. high.

Walker described the male only.

A well-marked small black species with two very distinct lateral grey stripes on the thorax and with a grey median stripe on the abdomen, starting from the third segment and continued to the sixth segment, two lateral stripes commence on the first segment but terminate abruptly on the second segment. Wings clear. Legs reddish yellow. Antennae red. The large protuberant frontal callus with the short linear extension distinguishes this species. It differs from *Tabanus hilaris*, Wlk., by the presence of the lateral stripes confined to the first two segments, by the more distinctly striped thorax, and by the shorter linear extension of the frontal callus which is darker and larger, and by the narrower forehead anteriorly.

Length males 13 mm., females 10-11 mm.

♀. *Face* covered with whitish tomentum and with white pubescence. Beard white. *Palpi* stout, ending in a short apex, pale yellow in colour covered with white hairs, a few black hairs are also visible. *Antennae*: the first joint pale with white pubescence, black at the upper edge, the second very small, pale red, the third red with very obtuse tooth, apex reddish brown. *Forehead* broad, narrower anteriorly, about four times as long as it is broad at narrowest end, covered with greyish tomentum and with some patches of black pubescence; the frontal callus is large, almost square, entirely filling up the space between eyes, tuberculous, rising above the plane of the head, dark blackish brown, shining,

with a short fine line proceeding from it. Eyes with three cross-bands.

Thorax with dark pubescence except on the broad grey stripes where it is whitish, sides grey, so that the thorax might be called four-striped, pubescence below black, breast covered with long white hairs. *Scutellum*: the two grey stripes are continued and end on its posterior border.

Abdomen blackish, reddish brown anteriorly, the pubescence black, white on the stripes; sides grey, covered with white pubescence; under side with white-haired segmentations. *Legs* reddish yellow, the fore femora darker, all with grey tomentum, the fore pair with black, the others with white pubescence, the fore tibiae with thick white pubescence on basal half, elsewhere black, apices of fore tibiae and tarsi black. In the specimen from Bombay all the femora are darker.

Wings clear with small yellow stigma, veins dark.

♂. Identical. The eyes with large facets, the lower third consisting of small ones continued as a very narrow border to back of head; the cross-bands are visible in the type.

Tabanus puteus, ♂ ♀, n. sp.

(Pl. xiii, fig. 11.)

Type ♂ from Velverry, Ceylon, and another from Trincomalee.

Type ♀ and another from Hot Wells, Trincomalee, one ♀ from Colombo, all from Yerbury coll.; "not uncommon" [note by donor].

A small brown species with a dusky mahogany-brown abdomen which has a straight median grey stripe. Antennae yellow. Legs brownish. Wings tinged with brown on the fore border reaching the third longitudinal vein. *Forehead of ♀ narrowest on the vertex.* Length 11 mm.

♀. *Face* covered with yellow-brown tomentum and with a few dusky hairs. Beard scanty, brown. *Palpi* small, stout, the same colour as face, with black pubescence. *Antennae*: the first two joints pale yellow with some black hairs, the third bright yellowish red, narrow, with no tooth, only a small angle marking its usual position, the second joint half as long as the first one. *Forehead* broad, *narrower at the vertex*, about three times as long as it is broad anteriorly, the same colour as the face, frontal callus large, almost square, reaching the eyes with a thick short line proceeding from it, in all the specimens there is a deep depression on the posterior part of the rather prominent callus which is yellowish brown in colour. *Thorax* blackish brown with the sides reddish, dorsum with thick short pale yellow hairs (in type rubbed off), on sides with yellowish brown pubescence. *Scutellum* appears rather lighter in colour, with the same very short pubescence. *Abdomen* narrow, no spots, the anterior segments more yellow-brown, the apex darker, the short yellowish hairs appear on the grey

stripe and on sides, but short black pubescence covers the dorsum. *Legs* dull brown or yellowish brown.

Wings grey, the yellowish brown shading extending in a fainter shade along the veins but most intense on the fore border, stigma brown, veins yellowish.

♂. Similar, the eyes with large facets, only the lower part bordering cheeks with small facets which do *not* extend to the vertex. The figure of head is taken from a badly preserved specimen, two ♀ specimens lately added to Brit. Mus. coll. have the whole forehead shining brown.

Tabanus immanis, ♀, Wiedemann.

Auss. Zweifl. Ins., i, p. 123, 17 (1828); V. d. Wulp, Sumatra Exped. Dipt., 16, 1 (1881); *id.*, Notes Leyden Museum, vii, p. 71, 22 (1885).

Olive-green. Abdomen rusty brown with an indistinct paler stripe; legs black; ♀ 8½ lines. From Java.

Antennae black. Palpi grey brownish. Face mouldy greyish coloured; forehead grey, with a brown shining stripe, very little wider below. Thorax olive-green, yellowish in certain lights. Breast sides mouldy greyish white. Abdomen in certain lights with a paler median stripe and almost square side spots; side borders themselves yellow; under side brownish, side borders broadly, the segmentations narrowly, yellowish. Wings a little tinged, fore border and border of veins, and apex yellowish. Halteres yellowish. Femora mouldy greyish, knees and base of fore tibiae rusty brown. In the Leyden Museum. Wiedemann, Auss. Zweifl. Ins., i, p. 123.

A female from Silago (Middle Sumatra) in June. This is 20 mm. long. The eyes are naked, and with very fine network; the frontal band is narrow, posteriorly a little broader, in the middle with a shining black-brown, below broader, stripe. The third joint of antennae has a distinct tooth. Palpi with light ashy grey tomentum, ending in a point. Beard as well as the pubescence of fore breast and fore coxae light grey. The pale median stripe of the abdomen consists of triangular spots; under side red-yellow, with a black-brown apex. The neuration of wings is normal, the first posterior cell at its opening a little narrowed. Perhaps *Tabanus rubicundus*, Macq., Dipt. exot., Suppl. i, p. 32, 64, Suppl. iii, 10, and Suppl. v, 27, is only a somewhat paler variety of this species. Van der Wulp, Sumatra Exped. Diptera, p. 16.

Several specimens, females, all from Sumatra. The eyes are bare, bronze-coloured, and after being moistened, without cross-bands. *Id.*, Notes Leyden Museum, vii, p. 71.

This species is unknown to me.

Tabanus bubali, Doleschall.

Natuurkund. Tijd. Nederl. Ind., x, p. 407, pl. iii, fig. 3 (1856).

A reddish brown *Tabanus*, eyes very black, antennae black,

forehead like mouth of a horse (*sic*), greyish white, the abdominal dorsal stripe white. Wings hyaline. Length 12 lines. Habitat in Java, hostile to cattle. Doleschall, *l.c.*, p. 407.

It is doubtful whether it will ever be possible to identify the species from this description; the figure proves the description was from a female, but otherwise is of little use.

GROUP VIII.

Forehead with one square, narrow, or oblong callus always prolonged towards the vertex as a more or less narrow line; four to ten times as long as it is broad.

Species with median or lateral spots or both on abdomen, not usually forming a continuous stripe. The subgroup represented by *Tabanus fumifer*, Wlk., contains species distinguished by very narrow foreheads and frontal calli, usually reddish brown or reddish yellow in colour: this is the most difficult group in the Oriental Region, the species being very nearly allied, and apparently distinguished by small, often variable characteristics; they are rather large or medium-sized species. *Tabanus signifer*, Wlk., is the type of a small subgroup easily distinguished by their prominent large abdominal pale spots.

Tabanus rufiventris, Fabr., *felderi*, V. d. Wulp, and *leucosparsus*, Bigot, are not included in the table being unknown to me.

Tabanus triangularis, V. d. Wulp, in the Austro-Malay Fauna, must be nearly related to *Tabanus brunneus*, Macq., but the legs must be lighter judging from the description.

Tabanus amaenus, ♂, Walker.

List Dipt., i, p. 163 (1848).

Tabanus clausacella, ♂, Macquart, Dipt. exot., Suppl. v, p. 45 (1855).

Tabanus administrans, ♂, Schiner, Reise der Novara Dipt., p. 83 (1868).

Tabanus signatipennis, ♀, Portschinsky, Horae Soc. Entom. Ross., xxi, p. 180 (1887).

Bellardia sinicus, ♀, Bigot, Mem. Soc. Zool. France, v, p. 629 (1892).

The description of *Tabanus clausacella* is as follows:—Black. Thorax with ashy grey pubescence. Abdomen with red segmentations, the second segment testaceous at the sides. Antennae with the third joint testaceous at the base. Tibiae white, with the apex black. Wings with first posterior cell closed.

Length 6 lines, ♂. Palpi of a yellowish white. Face, beard and forehead white. Antennae: the two first joints and the small

divisions of the third, black, first division of the third yellow, tooth moderate. Thorax with tomentum of a rather yellowish grey; sides of a whitish grey. Abdomen with fawn-coloured incisions, terminated by yellow; second segment with a testaceous lateral spot reaching the two borders; under side with tomentum and segmentations whitish. Legs black; tibiae of a yellowish white, black at the apex. Wings clear, stigma brown, first posterior cell closed near the border. From N. China (M. Bigot). Macquart, Dipt. exot., v. p. 45.

This description by Macquart of his species is unusually incorrect as he overlooked the grey triangular spots of the abdomen, yet there is no doubt of the identity of the type, which is however a very faded dirty specimen, a male measuring 15 mm. Schiner could hardly identify his male specimen from the above-mentioned description, and gave it a new name. His description is as follows:—

♂, type, from Hongkong. Closely related to *Tabanus mandarinus*, and identical in many respects with it; the differences are as follows.

Abdomen at bottom dark brown, the two basal rings as in the above-mentioned species, the following three rings with white tomentum, leaving four almost triangular spots of the ground colour free on the anterior border; or these segments might be described as brown, each with an anteriorly indented, posterior band; under the white tomentum, in some lights less distinct, the ground colour is reddish yellow, the sixth segment on the under side blackish, at the sides reddish yellow, the tomentum as in *Tabanus mandarinus*. Antennae rusty yellow, the third joint at the apex black-brown, the middle and posterior tibiae are almost wholly red-yellow. In every other respect identical with *Tabanus mandarinus*. 6 lines. One male.

Though this species is so closely allied to *Tabanus mandarinus* I do not think it possible to consider it as merely a variety of it.

I have before me also, from the same locality, a female specimen that possibly may be the female of *T. administrans*, the identity of all plastic characters at least encourages this opinion, but the abdomen is differently marked (and besides is not well preserved), and the first posterior cell is narrowed but not closed. The forehead is fairly broad, whitish grey above the antennae, the callus black, broad at the base, then becoming narrower and continued to the vertex as a line, ocelligerous spot present, but no ocelli visible. Schiner, Reise der Novara, Diptera, p. 83.

Portschinsky described his type from Chinese Mongolia thus—

This species is similar to *Tabanus autumnalis*, from which it is quite distinct, *the first posterior cell of wing being closed* with a long petiole, the size of body is less and it is much narrower in shape.

Black with cinereous or grey tomentum, sub-naked or very shortly pubescent.

Head wholly white and white haired, frontal callus narrow, oblong, ovate, continued in a black line. Eyes naked, not banded. Palpi white. Antennae reddish, at apex more or less widely black, the third joint at base with distinct tooth. Thorax with three wide stripes (anterior half divided by a narrow ashy grey line) in middle with very short black hairs, at sides with yellow hairs. Abdomen black with three grey or white rows or spots, the middle spot triangular as in *Tabanus autumnalis*, rather wider at apex; under side grey with middle stripe brown less conspicuous, each segment at apex narrowly margined with yellow. Squamae dark. Halteres white, at base black. Length 7½ lines. Portsch., Horae Soc. Entom. Ross., xxi, 180 (1887).

♀. The abdomen is blackish marked as in the male, with grey tomentose triangular median distinct spots and with lateral less distinctly defined ones, the segmentations very narrowly lighter. Thorax similar. Tibiae all yellowish with apices black. Palpi reddish yellow, long ending in an acute point, with black pubescence. Antennae with black pubescence on first two joints, third long rather slender with obtuse tooth. Forehead narrow, very slightly narrower anteriorly, about seven times as long as it is broad, covered with yellowish brown tomentum and some scattered pubescence. Frontal callus oblong, not touching eyes, reddish brown or brown with a short spindle-shaped extension. Length of specimens from 15—18 mm.

Three females from Wei Hai Wei have the first posterior cell not closed but very much narrowed at the border, but are in all respects similar, with the exception of the greater size of the lateral spots which take up nearly the whole width of the segments.

♂. The colour of the *abdomen* is yellowish brown or darker brown, the lateral white tomentose spots often yellowish, ill defined, the second segment sometimes almost wholly yellowish brown with three grey spots; the median triangular grey spots always well marked. *Thorax* dark with grey tomentum and stripes, these last often with short scattered yellowish pubescence. The fore tibiae are usually red-yellow as well as the others, but sometimes obscurely so, and always on only the basal half.

Head large, the facets sharply divided, the small ones reaching half-way up the frontal triangle anteriorly and continued posteriorly as a narrow band to the ocelligerous tubercle. Length from 15—18 mm.

The Macquart type came from China (on the label is "China boreal"); the Walker type from Hongkong; the Portschinsky type from Chinese Mongolia; and Schiner's type from Hongkong. In Bull. Ent. France, 1887, p. lxxvii. *Tabanus amaenus* is recorded from near Yeso, N. Japan, by Bigot.

In Brit. Mus. coll. are specimens from Foo Chow and Swatow, and Shanghai (Walker); Formosa; and Japan (Dr. Myajima, 1909). In the Kertesz coll. a long series of males and females from Formosa.

The species probably belongs to the northern part of the Oriental Region and the southern part of the Palæarctic Region.

Bellardia sinicus, described by Bigot from one specimen from China, is from the description no doubt this species described by Walker and others, the type is probably now lost.

This species has certainly a great resemblance to *Tabanus autumnalis*, L., but may be distinguished from it by the closed first posterior cell, and even in these specimens with this cell not closed but very narrow, the narrower abdomen and smaller size of insect, the narrower forehead seven times as long as it is wide (in *T. autumnalis* it is only five times) and the frontal callus nearly reaching the eyes will serve to distinguish it.

Tabanus mandarinus, ♂, Schiner.

Reise der Novara, Dipt., 83, 8 (1868).

Tabanus trigeminus, ♀, Coq., Proc. U. States Nat. Mus., xxi, 310 (1898).

Brown reddish; thorax at bottom very dark with white tomentum which makes it in certain lights appear quite white, and with five stripes, the middle one narrow, rather yellowish, divided by a shining brown line, in certain lights very indistinct, the outer ones situated quite on the sides of thorax, and uniting pair-like with the inner ones before the scutellum. Breast sides nearly red-yellow, the shoulders red-yellow. Scutellum brown, in certain lights whitish, the posterior border red-yellow, the pubescence chiefly dark, on the breast sides white, and in certain places tuft-like. Abdomen black, the first and second segment thickly whitish tomentose, leaving of the ground colour only four spots apparent, on each of the 3—5 segments a whitish yellow triangular median spot which (?) takes up the whole hind border with its broad base, and reaches the fore border with its apex, the side borders also whitish extending on each segment a little inwards, the segmentations narrowly red-yellow; under side blackish with yellow sides and segmentations, in certain lights it appears wholly white with the exception of a broad middle stripe. Head very large, the eyes very convex, the facets below and at the side very small, the upper ones large. Face very concave in the middle, whitish, proboscis short, black, projecting horizontally, palpi white-yellow, the end joint mussel-shaped. Antennae brown, the first joint appearing grey, the second rusty yellow, both quite bare, the first above projecting triangularly, the second with an upper thorn-like point, the third above with a shallow indentation and an obtuse angle. Legs black-brown, coxae and femora appearing white in certain lights and white haired, tibiae red-yellow on their basal half, more so on their outer than their inner side, tarsi black. Wings hyaline, the longish stigma brown, the first posterior cell closed, no appendix. Length 9 lines; one ♂ from Hongkong.

A magnificent species. Schiner, Reise der Novara, Dipt., p. 83.

Schiner thinks it is nearly related to *Tabanus spoliatus*, Walker, but not the same. It has in fact no kind of resemblance to the Walker species.

Brauer in Denkschr. Akad Wien, xlii, p. 191 (1880), remarks that this species is very similar to *Tabanus rectus*, Loew, from Spain and Marseilles, but that the large facets of the eyes reach to behind the ocelligerous tubercle, and the zone of small facets above is narrow and not so broad as in Loew's species.

This species and *Tabanus administrans*, Schiner (now equal to *Tabanus clausacella*, Macq.), are related to *Tabanus autumnalis*, L., and *Tabanus rectus*, Loew, but the closed first or very much narrowed posterior cell will serve to distinguish both species. This species is distinguished from *Tabanus clausacella* by the absence of spots on the sides of the posterior segments and by its larger broader abdomen, and forehead not so narrow anteriorly.

In Brit. Mus. coll. specimens ♂ and ♀ from Tientsin; ♀ specimens from Wei Hai Wei ("biting cows"); from Chinkiang, Yangtze River, Foo Chow, Shanghai; Formosa and Japan.

Tabanus trigeminus is recorded from Japan, six ♀ specimens measuring 17-18 mm., the first posterior cell narrowed at opening. A long series from Dr. Miyajima from Japan have this same peculiarity. The species belongs to both zoological Regions. It is rather a blackish than a reddish brown species, with well-marked grey triangular median spot and lateral spots on the first two or three segments. The first posterior cell of wings usually closed, but occasionally only narrowed at opening. *Face* greyish tomentose with yellowish white pubescence. *Palpi* large, not very stout at base, ending in an obtuse point, reddish yellow with black pubescence. *Forehead* in ♀ narrower anteriorly, nearly six times as long as it is broad, frontal callus oblong, reddish brown, not reaching the eyes, with a thick linear extension, the forehead covered with grey or yellowish grey tomentum and grey hairs, in many specimens a dark patch is present in the middle with black hairs. *Thorax* brownish black with three white stripes on dorsum and sides white, breast sides covered with greyish tomentum. *Scutellum* blackish brown with grey tomentum bordered posteriorly with grey hairs, on dorsum of thorax the pubescence is white and black, at sides black, below white. *Abdomen* black, the first two segments might be described as black, the first with three spots and the sides grey tomentose, the second with a large median and two lateral grey spots, on the third segment in some specimens there appear traces of a third spot, the segmentations usually narrower than as described by Schiner but in the specimens from Japan they are broader, grey tomentose slightly reddish yellow below. *Wings* with first posterior cell closed with a short petiole, or very narrow at the opening, the specimens from Japan have it open, not closed, but very narrow; the ♂ from Tientsin the same.

Length of specimens 15—21 mm.

Tabanus varicolor, Ricardo.

Tabanus variegatus, Rondani, Ann. Mus. Civ Genova, vii, p. 458 (1875) (*nomen bis lectum*).

Length 14 mm. Antennae with the first two joints and the base of the third reddish yellow, the apex blackish. Forehead greyish yellow, anteriorly paler, the lineal callus red, shining; head above and below white and white haired; palpi very pale, black-haired. Thorax on dorsum dark brown, the sides, posterior corners and margin of scutellum reddish; pleurae greyish and white haired.

Abdomen with the first two segments reddish yellow luteous; the following ones streaked blackish brown and ferruginous; the apex black, a pale dorsal stripe present on the four segments before the last one; under side with the basal segments blackish, or black spotted, posteriorly luteous, with white tomentum, and short white hairs. Wings sub-limpid, the costal border luteous. Legs: anterior ones black, the tibiae at the base widely luteous, the posterior tibiae and knees luteous reddish yellow, femora and tarsi more or less blackish. Calyptera ferruginous. Halteres with club outside whitish, inside and the stalk brown-red. Rondani, Ann. Mus. Civ. Genova, vii, p. 458.

The name of *variegatus* being preoccupied by a Fabrician species from N. America, I propose the substitution of *varicolor* for this species, the type of which came from Sarawak, Borneo, and was seen by me at Genoa.

It is a narrow-bodied specimen measuring 17 mm., with a yellowish shining *abdomen* irregularly marked with black on all the segments except the first one, and has besides three series irregular shaped greyish spots median and lateral, indistinct; the blackish markings are situated between the anterior and posterior borders of segments, the seventh segment is blackest, with black hairs on the outer border; the dorsum appears finely punctuated all over, pubescence black, thickest on the apical segments; under side similar but darker. *Thorax* blackish with grey tomentum, reddish at sides, with black hairs at the sides; *scutellum* blackish, red round the outer border. *Legs* yellow, with black pubescence, the femora reddish brown with white pubescence, the tarsi reddish brown. *Face* with grey tomentum and whitish hairs. *Palpi* yellow, thickly covered with black hairs, slender, ending in an obtuse point. *Antennae* reddish, dusky on the third joint, the tooth distinct, the first two joints with black hairs. *Forehead* with yellow-brown tomentum, narrow, anteriorly barely half as wide, about eight times as long as it is broad, the frontal callus yellow mahogany, narrow, oblong, not reaching the eyes.

I have not seen any specimens identical with this isolated type.

Tabanus rubicundus, ♂ ♀, Macquart.

(Pl. xiii, fig. 12.)

Dipt. exot., Suppl. i, p. 160 (1846); *id.*, Suppl. iii, p. 170 (1847); *id.*, Suppl. v, p. 47 (1855).

Tabanus internus, Walker, ♀, List Dipt., i, p. 164 (1848).

Tabanus monilifer, ♀, Bigot, Mem. Soc. Zool. France, v, p. 654 (1892). [*Atylotus.*]

♀. Testaceous, abdomen with dorsal white spots. Legs testaceous; anterior tibiae white at base. Length 7½ lines.

Palpi of a pale yellow. Beard and face yellowish white. Forehead yellowish with a testaceous callus prolonged as a line. Antennae: the first two joints are testaceous, the third is wanting. Thorax and abdomen testaceous (denuded), with traces of a yellowish down; an abdominal stripe of triangular whitish spots; under side with whitish down. Anterior tibiae whitish in front, brown at apex. Wings yellowish, veins normal.

From India, Macq., Dipt. exot., Suppl. i, p. 160.

♂. We have since describing the female observed the male which differs in the dark colour of the thorax and abdomen. Macq., *l.c.*, Suppl. iii, p. 170. From Java. Length 6 lines. Palpi yellowish. Beard white. Forehead and face white, a little yellowish. Antennae testaceous, third joint with the usual tooth and the last divisions black. Eyes: upper part brown, lower part black. Thorax with a yellowish grey tomentum, a testaceous stripe with greyish tomentum, passing above the insertion of the wings; sides with ashy grey tomentum. Abdomen testaceous; segmentations a little yellow (seen sideways), seventh segment brown; under side the same. Legs fawn-coloured, femora blackish, a little fawn-coloured at apex; tarsi brownish. Wings clear, exterior border and stigma yellow: veins normal. From Java. Macq., *l.c.*, Suppl. v, p. 47.

Macquart's types are in Mr. Verrall's coll.

Walker's type from Sylhet, Assam.

Bigot s type from N. Khasi, in a very dirty condition, two other females with it are from Sibsagar, Assam, and India.

In Brit Mus. coll. specimens (females) from Sylhet; Chargola Valley, Sylhet; Dibia, Khasi Hills District (Chennell), and Khasi Hills (Godwin-Austen, Sladen). In Indian Museum coll. females from N. Khasi and Assam.

This species is distinguished from the species in *Tabanus fumifer* subgroup by its smaller size, broader, almost parallel forehead and reddish yellow colour.

A medium-sized reddish yellow species, the median triangular spots on abdomen small and often indistinct, the pubescence on dorsum scanty. Antennae reddish, rather wide at their base. Legs reddish brown. Length 17-18 mm.

Face covered with yellowish brown tomentum and with white pubescence. Beard yellowish white. *Palpi* reddish yellow with some grey tomentum and rather thick black pubescence, in shape long and slender, ending in a long apex. *Antennae* deep red, darker at the apex, the first two joints with some black pubescence, the tooth of third joint prominent. *Forehead* rather narrow, about six times as long as it is wide, very slightly narrower anteriorly,

the same colour as the face; frontal callus oblong, brownish, not reaching the eyes, the linear extension narrow. *Thorax* obscurely reddish brown, sometimes blackish, stripes indistinct, covered with some yellowish brown tomentum and a few hairs of the same colour and with scattered black pubescence, sides redder with black hairs: breast black with grey tomentum and obscure yellow pubescence. *Abdomen* reddish yellow, the last three segments slightly darker, the small triangular grey tomentose spots with yellowish pubescence are present from the first to the fifth, sometimes reaching the sixth segment, most conspicuous on the third, fourth and fifth; the dorsum with rather dense but inconspicuous black pubescence; under side with lighter segmentations, and yellowish white pubescence. *Legs*: femora reddish brown with grey tomentum below and with yellowish pubescence, tibiae reddish yellow, the fore pair darker at apex with yellowish hairs on the paler part, the tarsi reddish brown with black pubescence. *Wings* grey, tinged with brown on fore border and round veins, veins yellowish brown, an appendix is present only in the Bigot type and in a female from Khasi Hills.

The male type (Macquart) has no sign of median grey spots on abdomen, and may possibly prove not to belong to this species, which seems otherwise confined to India and Assam.

Tabanus stantoni, ♀, n. sp.

(Pl. xiv, fig. 13.)

In Brit. Mus. coll. a long series from Batu Tisa, Labuan Padang, Federated Malay States (Pratt, Stanton), others from Selangor, and Kuala Lumpur, Federated Malay States.

A large reddish yellow broad-bodied species, distinguished from *Tabanus fumifer*, Wlk., by the greater width of the forehead, anteriorly never more than one-third narrower than it is at vertex, in *T. fumifer* the forehead begins to get narrower half-way from the vertex, in this species it is hardly perceptibly narrower and only begins to be so just before it terminates. Thorax has a paler appearance. Abdomen more reddish yellow. Length 19½—25 mm.

Face with yellowish hairs. *Palpi* yellow with black pubescence, not very stout at base, ending in an acute point. *Forehead* eight to nine times as long as it is broad and barely a third narrower anteriorly, nearly parallel, frontal callus long and narrow, not touching the eyes, slightly club-shaped. *Antennae* reddish, with the third joint black. *Thorax* brownish with indistinct stripes, covered with brownish yellow tomentum, appressed fulvous hairs and some black pubescence. *Abdomen* appearing reddish brown, more strictly reddish yellow, but the close black pubescence gives it the darker appearance and with some brownish yellow tomentum makes it appear not uniform in colour, the median spots often indistinct, are yellow haired, short,

triangular; under side with thick yellow pubescence at the sides and on segmentations, leaving a broad dark median stripe. *Legs*: femora blackish with grey tomentum, the tibiae obscurely yellowish or reddish brown, apices and all tarsi black; the pubescence on coxae and femora yellowish, elsewhere black. *Wings* large, tinged yellowish brown or almost clear with no appendix, veins blackish on fore border, thin brown, the first posterior cell widely open.

Tabanus indianus, ♂ ♀, n. sp.

? *Tabanus mentitus*, ♂, Wlk., List Dipt., i, p. 162 (1848).

In Brit. Mus. coll.

Type ♀ and a series from Kadra, N. Kanara, S. W. India (Bell). Others from Formosa in Dr. Kertesz's coll. Type ♂ and a series from Formosa in Dr. Kertesz's coll.

A reddish brown species with a long narrow abdomen, distinguished from others of the *fumifer* subgroup by the distinct pale yellow fore tibiae with white hairs of the female, and by the longer narrow white-haired triangular median spots of abdomen. Femora with black pubescence. Length of type ♀ 20 mm., others from 17—22 mm.

♀. Head wider than thorax. *Face* covered with greyish tomentum, with a few white hairs. Beard white. *Palpi* very similar to those of *Tabanus malayensis*, n. sp., with long obtuse apex, only slightly stouter at base, yellow with thick black pubescence. *Antennae* reddish brown, darker at apex, the first two joints and apex of tooth with black pubescence. *Forehead* covered with yellowish brown tomentum and with some black hairs, about eight times as long as it is wide, only slightly narrower anteriorly (barely a third) than at vertex: frontal callus reddish brown, long, narrow, not reaching the eyes, with long linear extension. *Thorax* blackish with some grey tomentum and with black pubescence and fulvous appressed hairs, sides with black hairs; breast with reddish white pubescence. *Abdomen* reddish brown, the median triangular white-haired spots are present from the 2-5th segments, with traces of one on the first and sixth segments, their apices almost reach the anterior border of each segment; pubescence on dorsum black, thicker at apex; under side lighter reddish brown with white pubescence, which is also present on sides of abdomen except at the apex where it is black. *Legs* dark reddish brown or blackish brown, coxae with long white hairs, the femora with grey tomentum and black pubescence, white on the under side of the middle and posterior pairs, tibiae pale yellow, black at their apices, the fore tibiae appear whiter on account of their white hairs; the middle and posterior pairs have some white pubescence below, otherwise it is black, and on all the tarsi. *Wings* long, faintly tinged yellow-brown on fore border and along veins, stigma yellowish brown, veins brown, first posterior cell slightly narrowed at opening.

The specimens from Formosa have the abdomen in females more reddish yellow, the segmentations paler with yellow hairs. Frontal callus a little broader and more pear-shaped.

♂. Redder in colour than the female, the spots on *abdomen* are smaller and the fore tibiae dull yellowish or obscurely red at base with only a few lighter hairs. Eyes large, the large facets occupy the upper half but do not reach the anterior border of the frontal triangle, nor the vertex where the small facets extend as a narrow border. *Palpi* yellow, with yellow pubescence and a few black hairs at apex. Length of males 17—20½ mm.

The type of *Tabanus mentitus*, Walker, a male from Foochow, China (G. T. Lay), is probably identical, judging from its similarity to the male from Formosa, but owing to its bad condition and the fact of its being a male, its identity must remain doubtful till the advent of more material.

The blackish colouring sometimes surrounding the median abdominal spots is more distinct than usual, as oblong black spots on the second, third and fourth segments, and only on the third and fourth segments is a median grey spot visible, probably owing to denudation, the apex of the abdomen is blackish.

Tabanus brunneus, Macq.

Suites à Buffon, i, p. 203 (1834); *id.*, Dipt. exot., i, p. 132 (1838).

In Brit. Mus. coll. one female from Timor and one male from Java.

In Indian Mus. coll. one female from Semangho, Selangor, "on cattle."

Length 8 lines.

Blackish brown. Palpi brownish. Face and forehead yellowish grey; the latter narrower than usual, velvety brown; elevation near the antennae longitudinal, and the usual line black. Antennae black, inserted a little lower than in other species. Thorax covered with a short thick, brown tomentum; two brown stripes on the outer border; sides with yellowish hairs; a yellowish space with black hairs under the base of the wings, abdomen with dorsal triangular white spots, the three first segments brown, the four others black; a small yellowish spot on each side of the posterior border of the segments; under side yellowish, a hemispherical black spot on each segment. Legs black. Wings brownish, ♀.

From Java, in my cabinet. Macquart, Suites à Buffon, i, p. 203.

Brown. Antennae black. Abdomen with triangular white spots. Legs black. Wings brown. Length 6 lines.

♀. Palpi brownish. Face and forehead greyish yellow, frontal callus narrow and little distinct from the line proceeding from it. Antennae black. Thorax black, with brown tomentum. Abdomen black; a dorsal triangular yellowish white spot as well as a spot

on the exterior border of each segment. Legs black, with yellowish tomentum. From East India (M. Marc) Museum. An identical specimen in my collection came from Java. Macquart, Dipt. exot., i, p. 132.

Type ♀ (the one from India I believe) seen by me in Paris Museum. A medium-sized species distinguished from *Tabanus internus*, Wlk., with which I compared it, by the narrower *forehead* and frontal callus and by the spots on *abdomen* which are almost hemispherical in shape, on the second to fifth segments, small and oblong on the sixth, abdomen dark brown in colour, the segmentations very narrowly yellowish, and the lateral margins more widely so, forming the spots mentioned by Macquart; under side brown with yellowish segmentations and yellow pubescence on them.

Wings clear, tinged brown. *Legs* brownish, tibiae appearing obscurely reddish on middle and posterior legs. *Forehead* narrow, eight or more times as long as it is broad, narrower anteriorly, with a long narrow frontal callus and lineal extension. *Antennae* reddish brown, *palpi* rather broad, brownish yellow with black pubescence. *Face* with yellowish white pubescence. Beard the same colour.

This is apparently a distinct species, distinguished by the almost wholly black legs, dark palpi and antennae and by the hemispherical spots of the dark blackish brown abdomen.

Tabanus fumifer, ♂ ♀, Walker.

(Pl. xiv, fig. 14.)

Proc. Linn. Soc., i, p. iii (1857).

Types ♂ and ♀ from Sarawak, Borneo (Saunders coll.).

In Brit. Mus. coll. specimens from Darien Tipus, Negui Sembilan, Federated Malay States (Stanton coll.); from Sungei, Bessi, Selangor (Durham); from Batu Tiga, Selangor (Stanton coll.); Singapore (Ridley), Sumatra (Forbes).

A somewhat variable species, in colouring, but distinguished by the extreme narrowness of forehead, becoming anteriorly only half the width of what it is at vertex. The abdomen varies from reddish yellow anteriorly, becoming darker at apex (type), to dark reddish brown with small median indistinct spots, sometimes not apparent, the black pubescence on dorsum always rather thick, sides with yellow hairs anteriorly (type), but some specimens have black hairs entirely. Legs blackish, the fore tibiae usually obscurely reddish, on their basal third or half with some yellow hairs occasionally reddish yellow on basal half, the middle and posterior pair obscurely reddish or reddish yellow, only black at their apices. Wings tinged brown all along the veins, but in some specimens only tinged very slightly. Length from 15—21 mm. The female type 21 mm.

♀. *Face* covered with yellowish brown or grey tomentum and with some whitish yellow hairs. Beard pale yellow. *Palpi* large

with obtuse apex, almost the same width throughout, yellowish red but densely clothed with black pubescence. *Antennae* reddish brown, the first two joints with black pubescence, tooth of third joint distinct. *Forehead* narrow, covered with yellowish brown tomentum, nearly eight times as long as it is broad, barely half as wide anteriorly as it is at vertex; frontal callus brownish, long, narrow, not reaching the eyes with a rather long linear extension. Thorax reddish brown or blackish with stripes hardly apparent, some greyish yellow tomentum on dorsum, the pubescence black, with some short appressed yellowish hairs, shoulders more red, sides with black hairs; breast covered with grey tomentum and with yellowish hairs. *Scutellum* identical with thorax. *Abdomen* reddish brown, often more yellow-red anteriorly and darker at apex, spots usually present on each segment but often indistinct and indicated by a few yellow hairs only, usually small with short triangles; under side reddish brown, the segmentations bordered with yellowish hairs; sides of abdomen with black hairs and a few yellow hairs below or with almost wholly yellow hairs. *Legs*: femora black covered with grey tomentum below, the pubescence black and short above, yellow and longer below, coxae black covered with grey tomentum and with thick whitish pubescence on the fore pair, the pubescence on the dark red tibiae black and rather thick, some yellow or white hairs on the fore tibiae at base which alone is reddish. *Wings* in type very distinctly tinged brown on all the veins, but this is fainter in many specimens and sometimes almost confined to fore border; veins brown, stigma yellow.

♂. The male type has now lost part of abdomen, but other males in the Brit. Mus. coll. from Singapore and Sumatra appear identical.

Beard and hairs on face in type brownish, in the other males whitish. The *palpi* yellowish red, with black pubescence. The frontal triangle reddish brown. Eyes with large facets on the upper part, not extending beyond the apex of the frontal triangle, reaching the vertex but gradually sloping away from it towards the centre of eye. *Abdomen* on its anterior half yellowish red, the apex darker, the sides bordered with a short fringe of black hairs, but on the posterior lateral angles of the segments are some yellow hairs; under side reddish brown with yellow-haired segmentations. *Wings* in type deeply tinged yellowish brown, in other males yellow on fore border only, between the costal border and the first vein.

Tabanus malayensis, ♀, n. sp.

In Brit. Mus. coll. type ♀ and a long series from Darien Tipus, Negui Sembilan, Federated Malay States, collected by Dr. A. T. Stanton on a new road running through jungle in February and March, 1908, and others in 1909 by him at Batu Tiga, others from Kuala Lumpur, Selangor, Federated Malay States (Durham), and from Singapore (Ridley).

A species nearly allied to *Tabanus fumifer*, Wlk., distinguished only by its colouring and usually smaller size (16½—21 mm.), differing in the bright yellow-haired median spots of abdomen which are larger and very distinct, with longer apices, *and by the presence of lateral yellow-haired spots on sides of segments in form of isosceles triangles*, usually present from the second to the fifth segments; under side more yellow with yellow pubescence on the sides. The *thorax* and *scutellum* have a paler appearance with greyish yellow tomentum and more numerous appressed fulvous hairs. The tomentum on the femora is more yellowish grey. *Forehead* seven to eight times as long as it is broad, very narrow anteriorly as in *Tabanus fumifer* with the same long narrow frontal callus. *Antennae* blackish brown, in some specimens reddish at base of third joint, the first two joints with some grey tomentum and black hairs. *Palpi* large, ending in an obtuse point, yellowish with dense black pubescence. *Abdomen* reddish brown, redder on the anterior segments, the whole dorsum covered with thick short black pubescence, on the posterior borders of segments appear a few yellow hairs, the spots consist of a small almost square one on the first segment, on the following four they are triangular in shape with short apices which do not reach the fore border of segment, those on the third and fourth segments usually with the widest bases, on the fifth appear traces of a small triangular spot, all have a yellowish or greyish ground colour covered with bright yellow hairs, sides of segments with spots as described above; under side covered with yellowish pubescence leaving a broad central black stripe apparent. *Legs* similar to those of *Tabanus fumifer*, Wlk. *Wings* grey, very slightly tinged brown, chiefly on the fore border, stigma yellowish, veins brown, the first posterior cell slightly narrower at opening.

Tabanus factiosus, ♂ ♀, Walker.

Proc. Linn. Soc. London, iv, p. 102 (1859).

Type ♂ from Celebes. Type ♀ from Makessar, Celebes, both from Saunders coll.

Two females from Negros, Philippines (Whitehead).

♀. This large reddish brown species is very nearly allied to *Tabanus fumifer*, Wlk., indeed the female seems only distinguished from the latter species by its larger size and by the fore tibiae being more largely yellowish or white, for quite two-thirds of their length, and by the *wings* being nearly clear, even the space between costa and first longitudinal vein being only faintly yellow. The *thorax* appears lighter, having more grey tomentum and a few appressed yellow hairs. *Abdomen* large, broad, with grey triangular spots on every segment except the first and last ones, on the fourth, fifth and sixth the segmentations are lighter, colour of abdomen reddish brown. Length 23 mm.

♂. Male type is not mentioned in Walker's description, but bears a label "factious" in his handwriting. It is immediately distinguished by the eyes, which have the facets almost the same size, those where the eyes join hardly perceptibly larger; this character at once distinguishes it from *Tabanus fumifer*. Beard blackish, with the same coloured hairs on face. Fore tibiae black. *Wings* deeply tinged yellowish brown. Till further material is available, it is impossible to define this species more accurately.

Tabanus dissimilis, ♀, n. sp.

(Pl. xiv, fig. 15.)

Type ♀ from Selangor (Butler), a series from Singapore (Butler, Ridley), two ♀ from Silam, N. Borneo and Borneo.

A species very nearly allied to *Tabanus fumifer*, Wlk., but distinguished from it in general appearance by the redder thorax, covered thickly with ashy grey tomentum, and with black pubescence so that it appears darker than in the Walker species, with no yellowish interspersed hairs, and by the clear wings, only the space between the costa and the first longitudinal vein being yellowish brown. In the less width of the forehead anteriorly with the frontal callus practically reaching the eyes lies the chief plastic difference.

Length of type 21 mm., other specimens 19½—22 mm.

Head large, wider than thorax. *Palpi* with a rather longer apex than in *Tabanus fumifer*. *Forehead* about ten times as long as it is wide, hardly more than half the width of the vertex anteriorly. Breast reddish with grey tomentum, and with black above and white pubescence below. *Scutellum* identical with thorax. *Abdomen* very similar but anteriorly with traces of yellowish brown or grey tomentum, the spots indistinct, often absent, usually white haired; under side reddish with grey tomentum and white pubescence: the lighter hairs on sides of abdomen below the black ones are white. *Legs*: the fore femora are reddish brown or black with grey tomentum, but with wholly *black* pubescence, only the middle and posterior pairs with white hairs below in some specimens, in the type they are black. No white hairs are visible on the fore tibiae, but a few on the hind tibiae below.

Tabanus ignobilis, ♀, Rondani.

Ann. Mus. Civ. Genova, vii, p. 457 (1875).

Length 15—20 mm.

Antennae brown-red. Forehead fulvous, the linear callus reddish. Face white, with white hairs. Palpi very palely luteous, black haired. Thorax with the dorsum obscurely red and with darker stripes, the pleurae and breast whitish and white haired. Abdomen brown-reddish, on the dorsum with black spots, chiefly scattered posteriorly: the posterior margins of the segments narrowly pale; the median whitish stripe of spots; under side

brown-red the margins of the segments posteriorly with pale margins and very short white hairs.

Wings sub-limpid, the costal border brown yellowish, the stigma browner. Calyptera ferruginous. Halteres with the knob yellow, the stem red. Legs brown-red; the apices of femora and tibiae and all tarsi blackish. Rondani, Ann. Mus. Civ. Genova, vii, p. 457. From Sarawak Province.

Type ♀ in Nat. Hist. Museum, Genoa. A specimen ♀ in Brit. Mus. coll. from Sandakan, N. Borneo, compared with type, is identical.

The type in good preservation, measures 20 mm., the black spots mentioned in original description seem accidental stains or marks, the median spots only commence from the third segment, the thorax and scutellum are covered with grey tomentum, being reddish in colour.

A species nearly allied to *Tabanus dissimilis*, n. sp., distinguished from it by its lighter redder thorax, abdomen and legs. The *abdomen* is shining, uniformly reddish with grey median spots from the second to the sixth segments, and with greyish narrow segmentations, the little pubescence present, chiefly black. *Forehead*, frontal callus and palpi similar to those of *Tabanus dissimilis*. *Legs* reddish brown, the tarsi and apices of tibiae darker, the fore femora on under side and hind tibiae at base with some white hairs, the pubescence otherwise black. The specimen from Sandakan measures 22 mm. This species is not unlike *Tabanus rubicundus*, Macq., but is distinguished from it by the greater narrowness of the forehead anteriorly.

Tabanus nexus, ♀, Walker.

Proc. Linn. Soc., i, p. 110 (1875).

Type ♀ from Sarawak, Borneo (Saunders coll.).

A large species very nearly similar to *Tabanus ignobilis*, Rondani, from which it is only distinguished by the *wings* being not quite clear, but deeply tinged with yellowish brown on the fore border along the veins, and in the discal cell, reaching beyond its borders. The *palpi* are stouter, almost the same width throughout, so that their apices are obtuse. There are no white hairs on the hind tibiae, but the white pubescence on all the femora is distinct, thickest on the fore pair.

Forehead about nine times as long as it is broad, and hardly more than a third narrower anteriorly, frontal callus not reaching eyes; owing to its great similarity to *Tabanus ignobilis*, Rondani this species is placed next to it though strictly speaking it should go under the heading of foreheads one-third narrower anteriorly in the table.

Tabanus signifer, ♂, Walker.

Ins. Saund. Dipt., i, p. 452 (1856).

Type ♂ from China.

A red-brown species easily distinguished by the prominent whitish tomentose triangular spots on the third and fourth abdominal segments, and with the same coloured spots on the lateral borders of the first four segments. Wings clear. Legs blackish. Tibiae reddish. Length 21 mm.

Head large. Eyes with the large facets distinct, reaching the apex of frontal triangle, and the vertex, the small facets extending behind as a narrow border but not reaching the vertex apparently (eyes discoloured). *Face* covered with grey tomentum and with white hairs. *Palpi* yellow with black hairs. Beard white. *Antennae* incomplete, Walker does not describe them; the first two joints reddish with black hairs. *Thorax* reddish brown with three grey stripes, sides with black hairs. *Scutellum* reddish brown. *Abdomen* conical, reddish brown, becoming darker towards the apex, the two triangular median spots have very short apices, and broad bases, the spots on lateral borders do not join them, a small whitish tomentose median spot is visible on the second segment at its base, pubescence black, but white on the spots; under side the same but with no median spots visible. *Legs* (incomplete) blackish with black pubescence, the tibiae reddish. *Wings* yellow on costal border, stigma yellow, veins yellowish brown, appendix present.

The species first named by Walker *Tabanus apicalis*, List Dipt., i, p. 176, and later changed by him to *Tabanus finalis* (the first name being preoccupied), List Dipt., v, p. 258, is allied to this species, and is also a male, but differs in having three large white spots on the third, fourth and fifth segments and the cross-veins of wings are shaded; it is a badly preserved specimen from unknown locality; it may possibly belong to the American fauna.

Tabanus significans, ♀, n. sp.

Type ♀ and another female from Kuala Lumpur, Federated Malay States (H. C. Pratt), in London School Tropical Medicine coll. and another female from Darien Tipus, Malay States, in Stanton coll.

This well-marked species allied to *Tabanus signifer*, Walker, from China, is distinguished by the two well-marked grey tomentose median spots on the brown abdomen, by the white tibiae and wings slightly shaded on the cross-veins. Antennae red, forehead narrow. Length 18 mm.

Face covered with whitish tomentum and with long white hairs, a band across the base of antennae and the subcallus on its outer borders with yellowish brown tomentum, between the antennae and the eyes the band bears some long brown hairs; centre of subcallus covered with greyish tomentum. Beard white. *Palpi* pale yellow with black pubescence, stout, ending in a point. *Antennae* red, the first two joints paler and yellowish with black pubescence, the third joint broad but with a very slight tooth indeed. *Forehead* very narrow, about ten times as long as it is

broad, and a third narrower anteriorly, covered with greyish tomentum, the frontal callus reddish yellow, very narrow, almost cylindrical with a somewhat raised long lineal extension. *Thorax* reddish brown with short black pubescence, shoulders and sides covered with greyish tomentum which extends round the thorax as a narrow border posteriorly, pubescence on the shoulders black, on the sides white and long, extending round the *scutellum* which is the same colour as thorax but with grey tomentum, this with the white pubescence gives it a pale appearance, at least on its posterior half. *Abdomen* brown or red-brown, clothed with short black pubescence the grey tomentose spots are clothed with white pubescence and are situated on the third and fourth segments, the one on the latter is the largest, with a wide base and short apex, almost half moon in shape, not reaching the anterior border of segment, the other one is smaller, oblong, placed on the posterior border of segment, on the sides of the first and second segments are lateral similar spots, and on the fourth segment at side on posterior margin a small tuft of white hairs, traces of a few white hairs are visible in the middle of the second segment; under side brownish yellow with some whitish tomentum at sides and anteriorly. *Legs*: coxae and femora reddish with white pubescence on the former, and black on the latter, the middle and posterior femora are darker reddish brown, the tibiae white, black at their apices, with the pubescence to correspond, tarsi all deep black. *Wings* slightly tinged with brown on the fore border and round transverse veins, stigma and veins brown. Halteres black

Tabanus fuscomaculatus, ♀, n. sp.

Type female and four others from Sima, Myitkyina District, Upper Burma (Capt. Whitmore, I.M.S.), in Brit. Mus. coll., and another female from Sikhim in Indian Museum coll.

A handsome stout dark reddish species, the abdomen with two large black spots on the second and third segments and the apex black. Antennae and palpi blackish. Legs blackish. Wings tinged with brown and with an appendix. Length of type 20 mm., others 19—21½ mm.

Face covered with greyish yellow tomentum, light yellow on the cheeks, some dark short hairs in middle of face and long soft pale yellowish hairs on cheeks. Beard pale yellowish. *Palpi* stout, much the same width throughout, ending in an obtuse point appearing black, but dark reddish, covered with greyish brown tomentum and with thick black pubescence, brighter red on the inside. Antennae black, the first two joints red with black pubescence, the third joint broad at base with a distinct tooth. *Forehead* narrow, about eight times as long as it is broad, slightly narrower anteriorly, about one third, forehead and subcallus covered with brownish yellow tomentum, the frontal callus black, narrow, club-shaped, not reaching the eyes anteriorly, with a long linear extension.

Thorax blackish, with brownish yellow tomentum, some appressed yellow hairs chiefly along the lateral sides of dorsum and short black hairs scattered over dorsum; sides with yellow hairs, shoulders reddish with black hairs, no sign of stripes on dorsum. *Scutellum* similar to thorax, on posterior border with some long yellow hairs. *Abdomen* reddish, the last three segments wholly dull black, the median black spots very distinct, the one on the second segment largest, bluntly triangular, neither base nor apex reaching the border, the second one on third segment smaller and more irregular in shape, the segmentations on the first four red segments paler, yellowish; pubescence on dorsum black, golden yellow hairs are visible on the lighter segmentations, chiefly at the sides, where they extend upwards, long and thick; under side reddish yellow with a broad median stripe and the apex black, pubescence the same but the golden yellow is more prominent.

Legs appearing blackish, the coxae covered with yellowish tomentum and with long yellow hairs, the femora with some grey tomentum and yellow hairs on the upper and under side, otherwise the pubescence is black, tibiae obscurely reddish with thick black pubescence, tarsi with black pubescence but on the under side of the posterior tarsi it is deep red. *Wings* tinged on fore border and along the veins brownish, appendix short, not always present, all posterior cells widely open, stigma brownish yellow, veins brown.

Tabanus leucopogon, ♀, Bigot.

(Pl. xiv, fig. 16.)

Mem. Soc. Zool. France, v, p. 651 (1892). [*Atylotus.*]

Type ♀ from India and another ♀ from Sikhim, in Indian Museum coll. A small species allied to *Tabanus oxyceratus*, Bigot, but distinguished from it by the large oval frontal callus with hardly any linear extension, and by the wings which are shaded round the veins and have an appendix. Length 15 mm.

The type is a very faded poor specimen.

Face with white tomentum and white hairs. Beard white. *Palpi* slender, long, not very stout at base, ending in a point, dull reddish appearing dark by reason of the thick black short pubescence. Antennae reddish brown. Subcallus and forehead covered with yellowish brown tomentum. *Forehead* short, wide, very slightly narrower anteriorly, practically parallel, about four times as long as it is wide, the frontal callus blackish, not reaching the eyes, oval or nearly square with hardly any prolongation, in the type with a fine short line about the length of the callus itself.

Thorax brownish. Abdomen blackish brown, with white-haired median spots on each segment except the last two. *Legs* blackish, tibiae yellowish. *Wings* hyaline with brown shading round the veins, fore border and stigma yellow, veins brown.

Tabanus discrepans, ♀, n. sp.

(Pl. xiv. fig. 17.)

Type ♀ and another from Ceylon (Yerbury coll.)

A long narrow species in general appearance allied to the species of the *fumifer* subgroup and more especially to *Tabanus indianus*, n. sp., but distinguished from them by the wider forehead, parallel in this species, and by the larger less narrow frontal callus. Abdomen reddish brown with small median whitish spots. Legs and antennae reddish. Palpi yellow. Wings tinged yellowish brown. Length of type 20 mm. the other female 18 mm.

Face covered with yellowish grey tomentum, and with some pale yellow short hairs, browner on cheeks. Beard whitish yellow. *Palpi* stout, ending in a point, yellow with black pubescence and a few white hairs intermixed. Antennae reddish, duskier at the tip, the first joint pale yellow with black pubescence, third joint of antennae with very slight tooth. Subcallus and *forehead* covered with darker yellowish brown tomentum, the latter with some black pubescence, parallel, about five times as long as it is broad, the frontal callus red-brown, oblong, not reaching eyes with a short but stout lineal extension. *Thorax* dusky brown, pale reddish brown at sides and on shoulders, dorsum with appressed short yellow hairs, sides with long black pubescence; breast covered with greyish yellow tomentum and with pale yellow pubescence. *Scutellum* same colour as thorax with some of the appressed yellow hairs on sides, in the centre with black hairs. *Abdomen* reddish brown with short black pubescence, on the paler segmentations some yellowish white hairs extending to the sides and up the lateral borders of segments, the grey tomentose median spots present from second to fifth segment, more or less triangular in shape; under side with wider whitish-haired segmentations, and with the black pubescence. *Legs* reddish, the coxae covered with greyish tomentum and with whitish pubescence, the fore and hind femora darker, the apices of fore tibiae and all tarsi blackish brown, femora and basal half of hind tibiae with yellow pubescence, elsewhere it is black.

Wings tinged yellowish brown, the centres of the cells at apex and on posterior border lighter in type, not discernible in the other female, stigma and veins of fore border brown, other veins yellowish brown, type alone with rudiment of an appendix.

Tabanus rufiventris, ♀, Fabr. (*nec* Macq.).

Syst. Antl., 96 (1805); Wied., Dipt. exot., p. 66 (1821); *id.*, Auss. Zweifl. Ins., i, p. 118 (1828).

Thorax dark, abdomen reddish, wings with a black costal border. Of the size of *Tabanus bovinus*. Head ashy grey haired, antennae black. Eyes golden; thorax dark, hardly ashy grey striped. Abdomen reddish, with a dorsal stripe of white spots.

Wings white, costal border black. Legs black; tibiae red. East India. Mus. Dom. Lund. Fabr., Syst. Antl., 96, 13.

Thorax brown, white pruinose; abdomen red, white spotted, wings with black costal border. 9½ lines. From East India.

Antennae brown, black at the base and apex. Head yellow haired. Forehead reddish with the usual shining stripe hardly wider below. Thorax with hardly perceptible linear-shaped greyish white stripes. Breast sides reddish. The white abdominal spots are situated on the posterior border of each segment; the side borders of these segments and the ventral segmentations are also white. Wings almost hyaline, brownish black on the border. Squamae brown. Halteres white. In the Royal Museum. Wied., Auss. Zweifl. Ins., i, p. 118.

This species judging from the description may be identical with *Tabanus fumifer*, Wlk., but it is impossible to identify it with any other species in this group where the species are only divided from each other by very small differences, unless the type or the specimen determined by Wiedemann is seen.

Tabanus dives, ♀, in parte, Rondani.

Ann. Mus. Civ. Genova, vii, p. 457 (1875).

? = *Tabanus stantoni*, n. sp.

Type ♀ in Genoa Museum seen by me, is the smaller species of two specimens belonging to different species, the larger one I believe to be the same as *Tabanus univentris*, Wlk., and this one is either the same as *Tabanus stantoni*, n. sp., or very nearly allied to it, only differing in the reddish brown *abdomen* having yellowish segmentations, the under side uniformly yellowish. *Wings* with lighter veins, yellow in colour, stigma the same, slightly tinged with yellow, no appendix. *Face* yellowish with yellowish grey hairs. *Palpi* large, stout, pale yellow with thick black pubescence, and thick yellow pubescence above. *Forehead* as in *Tabanus stantoni*, n. sp., the frontal callus yellowish mahogany and more pear-shaped, narrower anteriorly, about ten times as long as it is wide, the forehead with yellowish brown tomentum and black pubescence. Antennae incomplete, the first two joints yellow. Length 18 mm. From Sarawak, Borneo.

Tabanus felderi, ♂ ♀, Van der Wulp.

Notes Leyden Museum, vii, 78, 32; pl. v, fig. 7 (1885).

? *Tabanus bucolicus*, ♂, Schiner, Reise Novara Dipt., 81, 4 (1868).

Blackish; antennae, palpi, three first segments of abdomen (except the dorsal spots on segments 2 and 3), the posterior border of the following ones and the legs red; eyes naked; wings greyish red, with the angle of the third longitudinal vein omitting an appendix. ♂ ♀, length 22-23 mm.

Head greyish white; face of the ♂ ochraceous; on the front of the ♀ a raised line, which is broader below. Antennae and palpi reddish yellow; third joint of the antennae on the upper part with a rather sharp tooth, slender towards the end, the tip brown. Palpi in the female as long as the rostrum, in the male much shorter. Eyes bare, bronze-coloured, even after having been moistened without cross-bands; in the male the facets of the upper portion large. Thorax and scutellum greyish black, with hardly any indication of longitudinal bands; pleurae cinereous with a yellow pile. Abdomen in the male pointed, in the female a little narrower towards the end, in both sexes reddish yellow; the first segment blackish below the margin of the scutellum, on the second and third segments a dark grey dorsal spot: the following segments fuscous, with pale reddish yellow hind margin; under surface of abdomen testaceous, with yellow hind margins of the segments. Legs reddish yellow; the tarsi a little darker; front coxae with a long pale yellow pile; hind tibiae in the male fringed with short hairs, the hairs of the outside black. Wings with a reddish grey tinge; the upper branch of the furcated cell angular at its base and with a recurrent vein. A single pair from Ningpo (near Shanghai) presented to Leyden Museum by Dr. Felder. V. d. Wulp, Notes Leyden Museum, vii, p. 78.

Tabanus bucolicus was described by Schiner from one male specimen taken at Hongkong, and from the description and the comparison of one male specimen in the Brit. Mus. coll. with no locality specified, it is possible that Wulp and Schiner described the same species, but as there are no females in any of the collections, the matter must be left doubtful for the present. I append all that Schiner says regarding his species.

"Is exactly the same as *Tabanus intermedius*, Egger, which, as the name *T. intermedius* was used earlier by Walker for a North American species, I shall in future name *Tabanus eggeri*. [Brauer however retains the original name as he says Walker's species is doubtful; Kertesz in his last Cat. 1906 follows Schiner.] It will suffice to give the differences. The middle of the face in *Tabanus bucolicus* as well as the frontal triangle are snow-white, the remainder bright yellow, the beard is golden yellow, the legs are entirely bright reddish yellow, the tarsi hardly a little darker. In all other respects similar to *Tabanus eggeri*. 11 lines."

Brauer remarks at the end of his description of *Tabanus intermedius* that *Tabanus bucolicus* has much larger facets of the eye (♂) and these extend above to the ocelligerous tubercle, and thence almost entirely to hind border.

Tabanus leucosparsus, ♀, Bigot.

Nouv. Archiv. Mus. Hist. Nat. Paris (3), ii, p. 203 (1890).

Length 18 mm.

Antennae incomplete, the first two joints brown; palpi, beard, face and forehead whitish grey, frontal callus and tubercle of

vertex chestnut-coloured (ocelli indistinct), the former at the base wider and square, very much restricted in the middle, narrow, oval, prolonged above. Thorax of a pinkish or flesh-coloured grey, sides whitish. Abdomen black, with a median series of triangular spots, wide towards the bases, smaller and smaller towards the extremity, and on each side another series formed of narrow spots, all these spots are whitish; squamae brown; halteres pale fawn-coloured. Legs black, femora with a whitish tomentum below, base of tibiae widely whitish. Wings clear, no appendix. Eyes naked.

Laos (Siam), one specimen, Bigot, Nouv. Archiv. Mus. Hist. Nat. Paris (3), ii, p. 203.

This species with black abdomen marked with spots may possibly be allied to *Tabanus leucopogon*, Bigot, from the description of the frontal callus, but is a larger insect.

Group IX.

Forehead with one square, narrow, or oblong callus, always prolonged towards the vertex as a more or less narrow line, four to ten times as long as it is broad. Species with paler bands on the abdomen, spots are also sometimes present, large, medium-sized, or small species.

Tabanus orientalis, Wied., *Tabanus geniculatus* and *incultus*, V. d. Wulp, are not included in the table, being unknown to me. *Tabanus geniculatus* has a very narrow parallel forehead and narrow callus, *Tabanus incultus* the same but narrower anteriorly.

Tabanus servillei, ♀, Macq.

Dipt. exot., i, p. 132, 13 (1838); Walker, List Dipt. Brit. Mus., v, p. 246 (1854).

Tabanus pyrausta, ♀, Walker, Zoologist, viii, Appendix lxv (1850); *id.*, List Dipt. Brit. Mus., v, p. 246 (1854).

Antennae black. Thorax fulvous. Abdomen black; with white segmentations. Wings red; the first posterior cell closed. Length 11 lines.

Palpi black, wide at the base. Face and forehead greyish yellow; the latter narrow with a black line, a little raised anteriorly. Thorax with greyish yellow tomentum. Abdomen black; the four first segments with a narrow yellowish white posterior band. Calyptera blackish, bordered with white. From E. India. M. Marc. Museum. One specimen from Java occurs in M. Serville's collection. Macquart, Dipt. exot., i, p. 132, 13.

The specimen mentioned as from Java, is apparently the one with another female now in Mr. Verrall's coll. in very bad condition, but from the description and comparison of these with Walker's types there is no doubt they are identical. Walker placed the two

species one after the other in his List Diptera, v, without discovering their identity.

His type (female) from Mr. Argent's coll. and another male from Hon. E. India Company's Coll. are both from Java and well preserved, and from these the following notes are taken.

♀. A large easily distinguished insect, the first posterior cell of the wing closed with a rather long petiole reaching the border; blackish, the thorax covered with fulvous tomentum and the segmentations of the abdomen fulvous. Length 25 mm., the Macquart specimens 22 mm.

Face covered with fulvous tomentum and with brownish pubescence. Beard brown, in one of the Macquart specimens it appears to be mostly golden yellow. *Palpi* large, stout, black, with black pubescence. *Antennae* black, stout, the first two joints with black hairs, the third joint with a large tooth, and broad at base. *Forehead* and subcallus the same colour as face, the former very narrow anteriorly, at the vertex quite double the width, about ten times as long as it is wide, the frontal callus reddish brown, very long and narrow, almost reaching the eyes with a long stout lineal extension. Eyes as remarked by Walker with the facets a little larger above. The bright coloured *thorax* with some scattered yellow hairs, the sides with black hairs; breast same colour as thorax with long yellow pubescence and some brown hairs. *Scutellum* similar to thorax. *Abdomen* broad, the lighter segmentation most apparent on the first four segments; under side with whitish segmentations. *Legs* wholly black, fore tibiae with some greyish tomentum, pubescence black. *Wings* tinged deeply reddish yellow, stigma yellowish, veins yellow.

♂ identical. Eyes with the large facets hardly reaching beyond the apex of the frontal triangle, and the small facets not reaching the vertex. Length 21 mm.

Tabanus crassus, ♂, Walker.

Dipt. Saund., i, p. 50 (1850).

Type male from E. India (Saunders coll.), and other males from Karwan, N. Kanara, India (Bell) ("in bungalow"), Hongkong (Walker), in Brit. Mus. coll.

In Howlett coll. two males from Pusa, Bengal ("in bungalow"). In Kertesz coll. males from Formosa.

This species, of which curiously enough no females appear to have been collected, is an easily recognized blackish species, the first two segments of the abdomen covered with a hoary tomentum; wings clear, the first posterior cell narrower at opening. Antennae reddish. Palpi and legs blackish. Length of type 19 mm., others 15—20 mm.

Face and subcallus covered with yellowish brown tomentum, the former with blackish brown hairs. Beard the same colour, thick. *Palpi* black with grey tomentum and black hairs. *Antennae* dull reddish yellow, black on apex, the first two joints with black

pubescence, the third joint narrow, slender, with a small tooth. Eyes large, the large facets very distinct, the small facets hardly reaching the vertex. *Thorax* reddish brown or blackish brown, with yellowish brown tomentum and blackish pubescence. *Scutellum* the same. *Abdomen* blackish brown or reddish brown, the first two segments reddish, densely covered with ashy grey tomentum, the segmentations very indistinctly paler, the pubescence on dorsum close, black, at sides black ; under side more reddish brown. *Legs* appearing black, but often dull reddish covered with thick close black pubescence, the femora and hind tibiae with longer black fringes. *Wings* quite clear, stigma hardly apparent, pale yellow, veins on fore border sometimes blackish, otherwise yellow, the first posterior cell in type slightly narrowed, in some others more distinctly so, no appendix.

It is just possible that *Tabanus basalis*, ♀ , Macquart, may prove to be the female, but it is a very much narrower bodied insect with dark wings.

Tabanus albocostatus, ♀ , Bigot.

Mem. Soc. Zool. France, v, p. 649 (1892). [*Atylotus.*]

Type ♀ from India.

No specimens of this species are in the collections mentioned in this paper. It is a medium-sized specimen distinguished by the lighter colour of the sides of thorax and of scutellum, the abdomen being a dull brown with very narrow pale segmentations, antennæ (incomplete), palpi and beard dark, legs brown. Forehead rather narrow. Length 21 mm.

Face and subcallus brown with yellowish brown tomentum, pubescence dark brown. Beard brown. *Palpi* dull reddish, covered with grey tomentum and with close black pubescence, long, not very stout at base, ending in an obtuse point. *Antennae* with the first two joints same colour as palpi, with black pubescence. *Forehead* brown with grey tomentum, raised, about eight times as long as it is broad, anteriorly reduced to almost half the width it is at vertex, frontal callus black, long, not reaching the eyes, its lineal extension stout, broad, ending in a finer point, not much longer than the callus itself which is oblong. *Thorax* reddish brown on dorsum, its sides redder, covered together with the shoulders with greyish tomentum which extends narrowly round the posterior border, scutellum covered with it also, pubescence of thorax now almost *nil*, a few white hairs present, on shoulders brown ; breast brown with yellowish brown tomentum and brown pubescence. *Abdomen* dull brown, the segmentations very narrowly reddish yellow, with traces of a few white hairs in the middle, and white hairs are distinct on the sides of the first five segments, pubescence otherwise black; under side identical. *Legs* blackish with black pubescence, the tibiae more dull reddish brown. *Wings* tinged brown on fore border, veins and stigma brown, no appendix.

Tabanus explicatus, ♀, Walker.

List Dipt., v. p. 328 (1854).

Types, two females from Sikhim, E. Himalayas (Hooker); another female from Khasi Hills (Chennell coll.); two females from Coonoor, Central India. One male from Khasi Hills (Chennell coll.).

A black species with narrow fulvous segmentations on the abdomen, yellowish white tibiae and hyaline wings with yellow veins and stigma. Length 21 mm.

Face covered with greyish yellow tomentum and a few white hairs. Beard pale yellowish. Palpi reddish with thick black pubescence, almost the same width throughout, the apices obtuse. Antennae reddish, the third joint dusky, broad at base with a prominent tooth, the first two joints with black pubescence.

Forehead and subcallus same colour as face, the former nearly seven times as long as it is broad and a third narrower anteriorly, the frontal callus blackish brown, shining, oblong, not reaching the eyes with a rather thick lineal extension. *Thorax* with some grey tomentum, reddish at sides, hairs on sides yellowish. *Abdomen* blackish with narrow reddish segmentations on every segment, which in fresh specimens are covered with whitish hairs, often extending in the middle to almost a triangular spot, dorsum otherwise appears devoid of pubescence; under side similar. *Legs* black, tibiae pale yellowish, black at apices, fore coxae densely covered with yellowish grey tomentum, femora and tibiae with white, apices of tibiae and tarsi with black pubescence. *Wings* very slightly tinged yellow on second and third longitudinal veins. The specimens from Coonoor probably discoloured have more reddish brown colouring on the abdomen which has yellowish pubescence. The male is identical with the female, the large facets occupy two-thirds of the eye, the small facets extending as a narrow border to the vertex.

Tabanus nicobarensis, ♀, Schiner.

Reise Novara Dipt., p. 81 (1866).

Black: thorax with some grey tomentum and with three paler stripes, only distinct in certain lights and then especially so anteriorly, sides also paler, the shoulders with white tomentum; breast sides and scutellum ashy grey; the short pubescence on the dorsum of thorax chiefly black or at least dark, but whitish on the sides of breast, with a black-haired stripe from the base of wings to the shoulders. Abdomen black-brown, the first segment whitish at the sides, all segmentations clothed with snow-white short hairs which are extended in the middle to small, blunt, triangular spots; under sides identical; viewed from behind towards the light a dark cinnamon-brown tomentum spreads over the whole abdomen which, in comparison with the thorax viewed in the same light and appearing very light grey, stands out in strong contrast. Head black, with whitish tomentum and shining white pubescence; the

forehead anteriorly likewise whitish, but with a bright brassy yellow glimmer; the shining black callus situated rather far from the antennae, oblong, filling up the entire width of forehead, its posterior border with two incisions so that points appear at each side, but from the middle a shining black line proceeds towards the vertex, which is at first wider and from behind to the middle deeply incised fork-like; in the place where usually the ocelli are situated appear two shining black raised little lines near each other; the remaining surface of the forehead is grey tomentose, as is the rather distinctly concave hind part of head; proboscis black and short, the labella long. Palpi black-brown, with paler tomentum, broad at the base then gradually ending in a point, curved, a little shorter than the proboscis. Antennae black, the first projecting above; the second very short with a thorny point, the third on the upper side with a shallow incision, the angle only slightly projecting. Eyes naked. Legs black, the tibiae by reason of the paler thick tomentum at the base, appearing whitish, the fore tarsi unusually broad and short. Wings tinged deep smoky brown, the centres of cells rather paler, fore border darker, the first posterior cell widely open, no appendix. Length 7 lines. Four females from Nicobar Islands, one from Nankauri, the others from Sambelong. The species could only be compared with *Tabanus brunneus*, Macq., but there is no trace of black spots on the abdomen, neither of median spots, and the sides are not whitish yellow. *Tabanus brunneus* is also larger—8 lines. Schiner, Reise Novara Dipt., p. 81.

Two females from Nicobar Islands, 1904 (Bingham coll.; collected by G. Rogers, Esq., Deputy Surveyor of Forests), in British Museum coll.

In these specimens the *wings* are clear, veins brown. The *forehead* is about eight times as long as it is broad, and a third narrower anteriorly. The frontal callus large, a little protuberant, reaching the eyes, with a lineal extension. Length 16-16½ mm. The comparison with *Tabanus brunneus* appears to me misleading, but no doubt Schiner had not had the advantage of seeing the type.

Tabanus justorius, Rondani.

Ann. Mus. Civ. Genova, vii, p. 455 (1875).

From Province Sarawak, Borneo.

Length 15—17 mm.

♀. Body black; forehead brown-grey, callus linear, black, shining; face white.

Antennae black. Palpi obscurely brown. Thorax, particularly at the pleurae, white, pruinose.

Wings blackish, the two basal cells in the middle, and a stripe under the third longitudinal vein almost hyaline: costal border blacker; stigma black, appendix present. Halteres blackish, with the knob largely whitish.

Abdomen black, the posterior segments with white bands, which are a little dilated in the middle of dorsum; under side with four white bands. Legs wholly black. Rondani, Ann. Mus. Civ. Genova, vii, p. 455.

Type female and another from Sarawak seen by me in Nat. Hist. Museum, Genoa. No specimens are present in the collections named in this paper, but an easily identified species.

Blackish with white-haired bands on abdomen, legs and antennae black. Length 17 mm.

Face grey with white pubescence. *Palpi* yellow, with thick black pubescence. *Antennae* now incomplete, the first joint with black pubescence. The frontal callus long on the narrow forehead, with a short linear extension. *Forehead* quite seven times as long as it is wide and nearly two-thirds narrower anteriorly. Subcallus with grey tomentum. *Thorax* blackish brown with grey tomentum, and very indistinct stripes. *Scutellum* brown with grey tomentum. *Abdomen* rather long and narrow, the first segment broadly whitish grey tomentose, second, third, fourth with whitish grey haired narrow bands enlarged in the middle, the fifth and sixth with white-haired median spots, colour of abdomen blackish brown with black pubescence; under side similar. *Legs* brownish black, the pubescence black. *Wings* deeply tinged with brown, the discal, second basal cell and apex almost clear, appendix present.

Tabanus khasiensis, ♀, Ricardo.

Ann. Mag. Nat. Hist. (8), iii, p. 487 (1909).

Type ♀ and two other females from Khasi Hills, Assam, 1,000—3,000 ft. One female from Meerut (Indian Museum coll.).

A black medium-sized species with white bands on the abdomen. Antennae, palpi and legs blackish. Wings hyaline, tinged with brown. Length 15-16 mm.

Nearly allied to *Tabanus justorius*, Rondani, from Borneo but distinguished by the more hyaline wings, by the forehead being the same width throughout, and by the darker palpi.

Face covered with greyish tomentum in the middle, on the cheeks and subcallus with yellowish brown tomentum, the pubescence black. Beard black. *Palpi* on outside appearing blackish covered with grey tomentum and with black pubescence, on the inside obscure reddish yellow, long and pointed, stouter at base. *Antennae* dull reddish black or black, the first two joints with grey tomentum and black pubescence, the tooth of third joint small. *Forehead* same colour as subcallus, the same width throughout, with a few black hairs, nearly seven times as long as it is broad; the frontal callus oblong, narrow, brown, not reaching the eyes, furrowed in the middle, with a long narrow linear extension. *Thorax*, *scutellum* and *abdomen* brownish black, the former with grey tomentum and traces of two stripes, the pubescence black, a few appressed white hairs anteriorly; sides with black hairs, a tuft of white hairs behind the base of wings; breast black with grey

tomentum and black and white hairs. *Scutellum* on outer border covered with grey tomentum, pubescence black, white on the outer grey border. *Abdomen* with distinct white-haired bands on every segment except the seventh, enlarging slightly in the middle to half-moon spots and wider at the sides; under side similar. *Legs* black or brownish black, with black pubescence, coxae with white pubescence, and a few white hairs on hind femora below, the tibiae are sometimes obscurely reddish brown at base. *Wings* clear, tinged faintly with brown, in one specimen it is more distinct and borders the longitudinal veins.

Tabanus sanguineus, ♀, Walker.

Dipt. Saund., i, p. 54 (1850).

Tabanus assamensis, ♀, Bigot, Mem. Soc. Zool. France, v, p. 653 (1892). [*Atylotus.*]

Walker type ♀ from Java (Saunders coll.).

Bigot type ♀, faded, from Assam.

In Brit. Mus. coll. females from Kelantan, Malacca; and Hongkong.

In Howlett coll. from Pusa, Bengal; and Khasi Hills, 1,000—3,000 ft. high.

Others sent for identification from Darien Tipus and Negui Sembilan, Federated Malay States; Kuala Lumpur and Jelebu, Federated Malay States; Lushai Hills, Burma; and Formosa.

In Kertesz coll. two females from Sumatra.

This species has a wide distribution and is a handsome, easily recognised species, but very liable to vary in appearance owing to denudation on abdomen. In well-preserved specimens the abdomen appears blackish or reddish brown, with well-marked whitish-haired triangular spots on each segment, and with white-haired posterior borders, widest at sides. Forehead wide with large club-shaped callus. All the tibiae white. Length of type 17½ mm., others 18—21 mm.

Face covered with light greyish tomentum and with rather thick silvery white pubescence. *Palpi* yellow or light reddish with white pubescence and some black hairs at apex, short, stout, ending in a point. Beard silvery white. *Antennae* reddish brown with distinct tooth, the first two joints with black pubescence, the third joint long and slender. *Forehead* broad, short, rather more than four times as long as it is wide, almost the same width throughout, darker than the face with chiefly black pubescence, the frontal callus red-brown, large, oblong, almost reaching the eyes with a stout spindle-shaped extension. *Thorax* reddish brown or blackish brown, with grey tomentum on dorsum and chiefly black pubescence, stripes on well-preserved specimens distinct, sides with black hairs, round root of wings tufts of white hairs. *Scutellum* same as thorax, bordered with a short fringe of white hairs. *Abdomen* reddish brown, often blackish brown, with white

haired segmentations on a grey tomentose border, enlarged in the middle as broad, triangular spots, and at the sides wider and more distinct; under side blackish with the sides broadly white haired. *Legs* black, all tibiae with the exception of the apices pale yellow or white, the pubescence on coxae, femora, pale part of tibiae white, elsewhere black. *Wings* clear, stigma very pale yellow, veins brown, all posterior cells widely open.

Tabanus oxyceratus, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 652 (1892). [*Atylotus.*]

Type ♀ from India.

In Brit. Mus. coll. females from Cheena Forest, Himalayas, and N. Chin Hills, Burma.

In Indian Museum coll. from Mussoorie, India. A small black species with grey segmentations and grey median spots on the abdomen. Frontal callus large, protuberant, prolonged in a short, very thick line ending in a point. Forehead wide. Legs black, tibiae yellowish. Length of type 13 mm., others 11-12½ mm.

Face covered with grey tomentum and with whitish or yellowish hairs. *Palpi* long, not very stout at base, ending in an obtuse point, reddish yellow densely covered with black hairs. *Antennae* dull reddish, darker at apex, the first two joints with black pubescence, the second very small, the third wide at base with very slight angle. Subcallus and forehead covered with brownish yellow tomentum. *Forehead* wide, slightly narrower anteriorly, about four times as long as it is broad, the frontal callus blackish, not quite reaching the eyes, the forehead with dark markings beyond the apex of callus and on vertex. Thorax with two distinct grey stripes, grey at the sides, breast with white pubescence. *Scutellum* in well-preserved specimen with a grey tomentose posterior border covered with white hairs. *Abdomen* short, the broad but shortened triangular grey-haired spots are present from 2—5 segments, the segmentations reddish yellow but covered with grey hairs and grey tomentum; under side with reddish yellow segmentations, pubescence on dorsum of abdomen black. *Legs* black, the tibiae on basal two-thirds reddish yellow with whitish hairs on the lighter part, the fore coxae and hind femora with white pubescence, elsewhere it is black. *Wings* hyaline, stigma yellow, veins reddish yellow, appendix present.

In the two specimens from Burma the hairs on the segmentations are yellowish.

Tabanus orientis, ♀, Walker.

(Pl. xiv, fig. 18.)

List Dipt., i, p. 152 (1848).

Tabanus consocius, ♀, Walker, Dipt. Saund., i, p. 56 (1850).

Tabanus perlinea, ♀, Walker, *l.c.*

The type of *Tabanus orientis* is from Nepal, the types of *Tabanus consocius* and *perlinea* from India, Saunders coll.

In Brit. Mus. coll. specimens from N. W. Province; Naini Tal and Thandiani, Himalayas; N. India; W. Bhutan.

In Indian Mus. coll from Mussoorie, N. India, about 7,000 feet; in Brunetti coll. from Naini Tal, Kumaon, 6—7,000 feet (Lloyd); Minda, Nepal, and from Dongagali, Murree district, W. Himalayas. It appears to be a Northern Indian species in distribution.

A medium-sized species with almost clear wings and a reddish yellow abdomen which, when not denuded, is clothed with yellowish or whitish triangular median spots and segmentations. Forehead moderately broad with a large callus, its linear extension almost the same width as itself. Legs black, the tibiae yellowish. Eyes with three bands. Length 15—17 mm.

Face covered with yellowish or greyish tomentum. Beard and pubescence of face yellowish white. *Palpi* long, slender, only slightly stouter at base, ending in a rather obtuse apex, with scanty black pubescence and few white hairs below. *Antennae* red, often darker at apex, the first two joints and the apex of tooth with black hairs. *Forehead* slightly narrower anteriorly, about five times as long as it is wide, covered with yellowish or white tomentum and with some black pubescence, the frontal callus blackish or reddish brown, oblong, not reaching the eyes, its linear extension quite two-thirds its own width, though sometimes narrower at its lower end where it joins the callus. Eyes with three bands. *Thorax* black, when undenuded covered with yellowish tomentum and with appressed pale yellow hairs, the pubescence black, no stripes visible; the hairs at sides black: breast covered with yellowish white tomentum and with white pubescence; scutellum same as thorax. *Abdomen* reddish yellow on the three first segments with the exception of a large black median spot on the second and third, very distinct when insect is denuded, the fourth segment is very largely the same colour but often blackish on its posterior border, the remaining segments appear blackish but in the fresh insect the posterior segments are widely yellow, on all the segments appear yellow-haired triangular spots, and the segmentations are all yellow tomentose with yellow pubescence, elsewhere on the dorsum the pubescence is black, under side reddish yellow, only the extreme apex black, with yellow short pubescence. In some specimens the abdomen is darker with blackish markings on each segment, but the large callus of forehead distinguishes the species without difficulty. *Legs* black, the tibiae a rather transparent yellow, the fore pair black at the apex, the femora with yellowish white tomentum and pubescence, the tibiae and tarsi with chiefly black pubescence. *Wings* usually clear, sometimes slightly tinged, usually without an appendix. The eyes in life are described as greenish with three violet-green bands.

Tabanus orientalis, Wied., Auss. Zweifl. Ins., i, p. 145, from E. India, must be very nearly allied to this species, but Wiedemann

states the legs are ochre-brown, and calls the thorax yellowish with broad reddish brown stripes. It may possibly be identical with *Tabanus consanguineus*, Macquart, which has however yellowish legs.

Tabanus fulvimedius, ♀, Walker.

List Dipt., i, p. 152 (1848).

Tabanus melanopygatus, ♀, Bigot, Mem. Soc. Zool. France, p. 651 (1892). [*Atylotus.*]

Tabanus pagodinus, ♀, Bigot, *l.c.*, p. 654 (1892). [*Atylotus.*]

The type of *Tabanus fulvimedius* is a ♀ from Nepal (Hardwicke Bequest), in bad condition, in the description the locality is given as doubtful: there is another ♀ in the Brit. Mus. coll. from N. Chin Hill, Burma.

There is no doubt that both the Bigot species are identical, though the frontal callus in *pagodinus* varies slightly, having a narrower prolongation, described by Bigot as "fortement retrecie au milieu," he also mentions another callosity on the vertex—which, however, only appears owing to denudation—and the presence of black pubescence. The three bands on the eyes are just discernible.

In Dr. Kertesz's collection there is a long series of females from Formosa, in very good preservation, with the pubescence on the abdomen perfect.

The species is very nearly allied to *Tabanus orientis*, Walker, the only apparent difference being in the more widely black apex, the last four segments being dark in this species. The wings are tinged with brown.

A medium-sized reddish brown species, with a rather broad *forehead* about six times as long as it is broad, only slightly narrower at the vertex, with a large oblong callus prolonged as a thick linear extension. *Antennae* red, palpi slender, reddish yellow with black pubescence. *Abdomen* reddish brown on the first three segments, black on the remaining ones with narrow yellow segmentations, when undenuded with large greyish yellow haired more or less triangular-shaped median spots on each segment, forming a continuous stripe. *Legs* black, the tibiae reddish yellow. *Wings* usually with a short appendix and slightly tinged brown. Length 15-16 mm.

The series from Formosa have the *abdomen* blacker, often only the first two segments being reddish yellow and not always entirely so. The *wings* are very distinctly tinged brown often without an appendix.

Tabanus consanguineus, ♀, Macq.

Dipt. exot., i (1), p. 127 (1838).

Black. Abdomen with three white stripes, the lateral ones not reaching the apex. Legs red. Length 5½ lines.

Palpi yellowish white, terminating in an acute point. Face and forehead of a pale yellowish grey; the latter with an elongated brown callus, continued as a rather wide band. Antennae; the first two joints ferruginous; the third wanting. Thorax brown, with whitish stripes and tomentum; sides ashy grey. Abdomen black; a dorsal narrow stripe of a rather yellowish white, very distinct, extends to the end of the sixth segment and is prolonged on the seventh by a greyish line; a similar stripe on each side only extends to the third segment, being faintly prolonged on the fourth by an oblong little spot; lateral borders whitish; under side pale fawn with white tomentum. Legs with white tomentum. Halteres ferruginous. Alulae and wings clear; stigma yellow.

From the coast of Malabar. Collected by Mons. Dussumier. Museum.

This species resembles *Tabanus guineensis*, *indicus*, *trilineatus*, *lineola*, *occidentalis*, *trivittatus*, *dorsiger*, *quinquevittatus*, *costalis*, *obsoletus*, but appears to us distinct from all. Macq., Dipt. exot., i (1), p. 127.

From the above description I concluded the species was the same as *Tabanus striatus*, Fabr., but on seeing the type in the Paris Museum I find it is not so, but is nearly related to *Tabanus orientis*, and *fulvimedius*, Walker, from which it seems only distinguished by its smaller size, and the legs being wholly yellow.

The type is in a dirty condition, labelled from Malabar. *Forehead* broad, with the same shaped callus as in *Tabanus orientis*, reddish brown, extending almost as a straight stripe to the vertex. *Palpi* yellow, small and pointed. *Thorax* with grey tomentum. *Abdomen* blackish with pale white-haired segmentations, red-yellow on the first two segments and on the sides of the third; no stripes or spots now visible; under side pale yellowish. *Wings* clear, veins and stigma yellow. Length 12 mm.

Comparing it with a specimen of *Tabanus orientis* from the Brit. Mus. coll. it appeared similar allowing for denudation, with the exception of the lighter coloured legs and smaller size, so that for the present it seems best to keep it distinct from the Walker species.

Tabanus orientalis, ♂, Wiedemann.

Anal. Ent., 21, 8 (1824); *id.*, Auss. Zweifl. Ins., i, p. 145 (1828).

Yellow; thorax with brown stripes; abdomen posteriorly almost with bands, with a stripe of white spots. 6½ lines; ♂ from East India.

Antennae rusty yellow. Face mouldy grey; palpi colour of chamois-leather; beard grey. Thorax yellowish with broad reddish brown stripes, the median one broadest, cut short behind, divided longitudinally by a pale yellowish line; scutellum clear brown with a paler border; pleurae chamois-leather-colour. (Wiedemann, in Auss. Zweifl. Ins., i, p. 145, where he repeats this description,

substitutes breast sides for pleurae.) Abdomen inclining to rusty yellow; on the posterior segments the base is clear brown, which appears as an indistinctly defined band; on the posterior border of each segment a triangular spot appears, and the border itself has whitish hairs. Wings more or less tinged yellowish, with almost leather-yellow veins. Halteres yellowish. Legs ochre-brown. In the Royal Museum. Wied., Anal. Entom., 21, 8.

Tabanus incultus, ♀, Van der Wulp.

Sumatra Exped. Dipt., 17, 4, pl. i, fig. 8 (1881).

Two females in Lebong, Sumatra, in May.

Brown. Antennae ferruginous. Abdomen with ochraceous segmentations; anterior legs black, tibiae at the base yellow. ♀. Length 14-15·5 mm.

Face yellowish, with ashy grey tomentum, towards the borders of the eyes lighter; forehead more rust-coloured; frontal band very narrow, gradually widening towards the vertex; the black stripe lineal; pubescence of the face brownish. Beard tawny yellow. Eyes naked, with fine network.

Antennae red-yellow, the first joint triangular, the second above with a little bristle, the third at the base with a sharp tooth, the apex of which is brown, the curved end of the joint black-brown (see plate). Palpi grey-brown; proboscis black. Thorax and scutellum grey-brown with partly yellow, partly black-brown pubescence, which is longer on the sides of the breast; on the thorax some traces of lighter stripes. Abdomen above black-brown, with ochre yellow segmentations which are distinctly marked, especially in the middle, by a short white pubescence; under side red-brown with very broad yellow bands on the segments. Fore legs black, the tibiae for wholly two-thirds at the base pale yellow; middle legs brown-yellow, the coxae and femora at their base blackish, the tarsi with the exception of the base, black-brown; hind legs black-brown with the knees besides the inner border and apex of tibiae yellowish; the pubescence of legs pale and appressed, except on the outer side of the hind tibiae where it is very dark brown and upstanding. Halteres yellow. Wings tinged yellow-grey, more brown-yellow along the fore border; the stripe-shaped stigma tobacco-brown, the neuration normal. Although the above specimens have too much conformity with each other, for me to have the least doubt of their belonging to the same species, yet I must refer to single differences. The description is taken from the largest specimen; in the other the forehead and face are uniformly ochre-yellow, also the pubescence of the face, of the beard, and of the segmentations of the abdomen, which are broadened out in the middle into triangular spots; the under side is darker; the hind tibiae are except at the apex wholly yellow, yet they have nevertheless black-brown pubescence on the outsides. V. d. Wulp, Sumatra Exped. Dipt., p. 17.

Tabanus geniculatus, ♀, Van der Wulp.

Sumatra Exped. Diptera, 16, 2, pl. i, figs. 7, 7*a* (1881).

From Lebong (Sumatra) in May.

Thorax dark ashy grey, substriated; abdomen brownish red, the fore borders of segments brown; antennae and palpi brown; legs black, knees reddish yellow. Length 21 mm.

Related to the former species (*Tabanus immanis*, Wied.) but somewhat larger and distinguished by the black legs, of which alone the knees are red-yellow, by the darker borders of the abdominal segments and by the darker beard. Frontal band very narrow, posteriorly not wider, in the middle with a shining black stripe-shaped line. Eyes naked, with very fine network, forehead, face and cheeks with reddish grey tomentum; face with red coloured pubescence; beard black-brown. Antennae, proboscis and palpi black-brown; the antennae on the inner side with grey tomentum, the first joint triangular, the second very short, above with a bristle; the third with an acute tooth and in consequence deeply indented. Thorax and scutellum with dark ashy grey tomentum; the thorax with indistinct stripes, between which in some lights appear pale brown-yellow stripes; breast sides dark grey-brown; the fore breast and fore coxae with darker pubescence. Abdomen brown-red, a little metallic, with dark brown fore borders to the segments; under side black-brown with reddish segmentations. Legs black with red-yellow knees. Wings of a grey-brown tinge, along the border distinctly yellow-brown, stigma as a brown shadow at the end of the subcostal vein. V. d. Wulp, Sumatra Exped. Dipt., 16, 2, pl. i, fig. 7.

Group X.

Forehead with one square, narrow or oblong callus, always prolonged towards the vertex as a more or less narrow line, five to ten times as long as it is broad. Species with the abdomen unicolorous or nearly so, sometimes darker at apex, but with no spots or bands, large, medium-sized or small species.

The following species are not included in the table, being unknown to me, but probably belong to this group.

Tabanus ardens, Wied.; Macquart described the male, the type of which is probably lost.

Tabanus laotianus, ♀, and *melanognathus*, ♂, Bigot, the latter described as having a yellow abdomen and black legs, the former with legs greyish black, the tibiae greyish at base.

Tabanus ixion, ♂, Osten Sacken, from Philippines.

Tabanus fumipennis, Van der Wulp, must be nearly related to *Tabanus caerulescens*, Macq.

Tabanus birmanicus, Bigot.

Mem. Soc. Zool. France, v, p. 653 (1892). [*Atylotus.*]

Type the only specimen, a female, from Burma.

In Brit. Mus. coll. are females from Ningpoh, India (H. M. Lefroy). In Kertesz coll. one from Lushai Hills, Burma; and another from Kuala Lumpur, Malay, London School Tropical Medicine coll.

A medium-sized dark brown species with lighter thorax, wings tinged brown, legs black, with white tibiae and a narrow forehead. Length of type 18 mm., others 16—19 mm.

Face covered with bright yellowish brown tomentum and with brownish yellow hairs. Beard same colour as face. *Antennae* bright reddish, darker at apex, first two joints with black hairs, the third long and slender and narrow, with a small tooth at base. *Palpi* yellow with black pubescence, stout ending in an obtuse point. Subcallus same colour as face. *Forehead* a little darker, with black pubescence, about seven times as long as it is narrow, and a third narrower anteriorly, the frontal callus long, narrow, not reaching the eyes with a linear extension, red-brown in colour. *Thorax* covered with nearly the same coloured tomentum as the face but slightly darker, and with short appressed fulvous hairs and pubescence, shoulders and sides with black hairs; breast the same colour, with black pubescence. *Scutellum* same as thorax. *Abdomen* brown, yellowish brown on the sides of the first two segments, with black pubescence and some yellow hairs, which appear chiefly on the segmentations and as a median line which is, however, not always to be discerned; under side dark brown with black pubescence. *Legs* blackish, the knees yellowish brown, the fore tibiae to their extreme apex, and the others wholly yellowish white, the fore coxae covered with yellowish brown tomentum, the pubescence on them, femora and tarsi black, on the tibiae white, some yellow hairs on hind femora. *Wings* tinged yellowish brown, lighter on posterior border.

Tabanus flavothorax, ♀, n. sp.

Type and another female from Perak, Federated Malay States (Pratt), London School Tropical Medicine coll. In Brit. Mus. coll one female from Singapore (Ridley); one from Johore (Flower); one from Sungie Krudda, Sungie Siput, Perak (Pratt); others from Batu Tiga, Federated Malay States (Stanton coll.).

A species nearly allied to *Tabanus birmanicus*, Bigot, but at once distinguished from it by the yellow middle and posterior femora, rather narrower forehead, and by the darker brown wings, with a distinctly marked clear apex; in the Bigot species it becomes merely paler on the posterior part of apex. Length 16 mm.

The *forehead* is quite eight times as long as it is narrow, and barely half as wide anteriorly, the frontal callus very narrow, reaching the eyes. *Thorax* more thickly covered with short yellowish pubescence over the yellowish brown tomentum, so that the dorsum appears yellower, the *scutellum* similar, no black pubescence on the shoulders, hairs at sides yellowish. *Abdomen* reddish brown

with black pubescence, long and narrow like the Bigot species; under side yellowish with a black median stripe, being densely covered with yellowish pubescence. *Legs* as in Bigot species but more largely yellow as specified above.

Wings tinged dark brown, on the fore border not reaching the apex and extending almost as a band across the wing to posterior border, becoming smoky brown in colour, costal border yellow, stigma dark brown, veins brown.

Tabanus tinctothorax, ♀, n. sp.

Type ♀ and another female from Malay States, the type from Bukit Katu, Selangor, 3,500 ft (Robinson), and the other from Kinta Valley, S. Perak, Sept.-Oct. (Ridley).

A blackish species with the thorax and scutellum reddish brown, covered with appressed red pubescence, under side of abdomen with white-haired segmentations. Wings pale brown, yellowish on fore border and at base. Length 20 mm.

Face black, with brownish tomentum, pubescence in middle of face brownish, on cheeks thick, black. Beard black. *Palpi* dull reddish, appearing black by reason of the thick black pubescence. *Antennae* dull black, the first two with thick black pubescence, the third long, the last four divisions short, not a third of the length of the whole joint, which is broad at base with a short tooth. Subcallus covered with yellowish brown tomentum. *Forehead* a little darker with some black pubescence, about nine times as long as it is broad, almost half as narrow again at the vertex: frontal callus narrow, long, with a not very long linear extension, reddish brown, shining, furrowed in the type only. The *thorax* and *scutellum* give the insect a distinctive appearance, some black hairs intermixed with the appressed red pubescence, sides of thorax with long black hairs; breast blackish brown with black pubescence. *Abdomen* oval, blackish brown with close black pubescence, in the middle of the first segment some hairs similar to those on the scutellum; under side similar, but with narrow white-haired segmentations on the second, third and fourth segments.

Legs black with black pubescence, femora and tibiae with some yellowish brown tomentum, hind tarsi with red hairs below. *Wings* with costal border, extreme base and stigma yellow, on apical half and posterior border as far as anal cell tinged pale brown, the basal and anal cell and axillary angle almost clear, veins yellow, brown on apical half. Squamae pale brown. Halteres yellow.

Tabanus nigrotectus, ♀, Bigot.

Nouv. Archives Mus. Hist. Nat. de Paris (3), ii, p. 204 (1890). [*Bellardia.*]

Length 20 mm.

Antennae (incomplete) with first two joints reddish; face and forehead of a reddish grey; frontal callus and vertex black, the

former lineal, very narrow, very slightly dilated below; beard short and scanty, black, as are the palpi; the whole body dark black, abdomen a little shining. Wings black, with a long appendix, the first posterior cell closed with a long stalk. Eyes naked. One specimen from Laos, Bigot, *l.c.*, p. 204.

From Siam, not Island Laos as given in Kertesz Catalogue. Not known to me.

Tabanus caerulescens, ♀, Macq.

Dipt. exot., i (1), p. 132 (1838).

Black. Antennae testaceous. Thorax with lateral testaceous stripes. Abdomen bluish black. Legs black. Wings brown. Length 8 lines: ♀.

Palpi and face black with scanty grey tomentum. Forehead at the base transversely furrowed, reddish grey, then blackish with a shining black spot club-shaped. Antennae brownish testaceous. Thorax black, with scanty grey tomentum: a lateral dull testaceous stripe above and in front of the wings. Abdomen black with blue reflections. Legs black; anterior femora hairy above; anterior and intermediate tibiae blackish brown, with scanty whitish tomentum. Squamae and halteres brown. Wings brown, less dark on the anterior border, the centre of the largest cells hyaline. Neuration normal. From Java Museum, Macq., Dipt. exot., i (1), p. 132.

Type in Paris Museum seen by me. A black species with the *wings* tinged brown. *Forehead* very narrow anteriorly, a little wider at the vertex, the frontal callus narrow, with linear extension. *Palpi* stout, ending in a point with thick black pubescence. Antennae (incomplete) reddish. *Thorax* black, red on the basal part. *Abdomen* black. *Legs* blackish, the posterior tibiae reddish. Length 18 mm. No specimens of this species occur in the collections mentioned in this paper.

Tabanus tenebrosus, ♀, Walker.

List Dipt., v, Suppl. i, pp. 242, 389 (1854).

Type ♀ from Kanara, Malabar, and another female with the name on it but no locality.

Tabanus obscuratus, Walker, from Celebes is nearly related to this species, but has a longer narrower frontal callus, and the abdomen with no sign of the greyish blue tomentum.

From *Tabanus caerulescens*, Macq., it may be distinguished by the dull obscure colour of its abdomen, face not black, legs with no white pubescence.

A dull reddish brown species with a narrow abdomen, narrow forehead and frontal callus, blackish palpi; reddish yellow antennae and blackish legs. Wings brown, paler on posterior border and at extreme apex. Length 18 mm.

Face and subcallus covered with yellowish brown tomentum, the former with rather long blackish brownish hairs in the middle and on the cheeks. Beard blackish brown. *Palpi* appearing black by reason of their very close black pubescence on yellowish brown tomentum, the insides yellowish, stout, ending in a point. *Antennae* reddish yellow, the first two joints with black pubescence, the third with the apex in the other specimen blackish, in the type partly broken off, the tooth at base acute, distinct. *Forehead* about eight times as long as it is broad, and a third narrower anteriorly, frontal callus dark brown, club-shaped, not reaching eyes, with a lineal extension. *Thorax* (damaged) covered when fresh probably with the same plum-coloured tomentum as abdomen, in the type it is discoloured, in the other blackish; shoulders reddish, sides with black hairs. *Scutellum* same colour as *abdomen* which is an obscure reddish brown, covered with greyish blue or plum-coloured tomentum, pubescence apparently black, under side the same. *Legs* blackish, the tibiae in type dull reddish, in the other female black, pubescence entirely black. *Wings* brown, upper half of submarginal cell clearer and posterior border, in the other female many of the cells have clear middles or streaks.

Tabanus perakiensis, ♀, n. sp.

Type ♀ from Kuala Lumpur, Federated Malay States, Stanton coll., 1909, and another female from Perak (Pratt), London School Tropical Medicine coll.

A black species nearly allied to *Tabanus inobservatus*, a new species from Sumatra, but distinct from it, having the face paler, the beard largely white, the antennae reddish yellow, the palpi paler, yellowish inside and on the outside yellowish but covered with grey tomentum, and the black pubescence is thick. Tibiae dull reddish. Length 15 mm.

Face covered with grey tomentum and with some short black hairs. Beard whitish with some black hairs. *Palpi* obscurely yellow, with some grey tomentum and with black pubescence, slender, a little stouter at base, ending in a point, base of first joint with long black hairs. *Antennae* reddish yellow, darker at apex, the first two joints paler with black pubescence, the tooth of third joint very small. Frontal triangle covered with reddish brown tomentum. *Forehead* narrow, a little greyer, with some black hairs, about eight times as long as it is broad and quite a third narrower anteriorly, the frontal callus reddish brown, long and narrow, not reaching the eyes, with a lineal prolongation. Eyes apparently with two or more cross-bands. *Thorax* brownish black, with some greyish tomentum and traces of appressed pale hairs, pubescence black, *scutellum* same as thorax. *Abdomen* narrow, blackish or brownish black, with close-lying black pubescence, sides with black hairs; under side black with grey tomentum and white-haired segmentations. *Legs* blackish, the femora with grey tomentum, the fore tibiae on basal half and

the other tibiae wholly reddish yellow, the pubescence on legs black. *Wings* dark brown, paler on posterior border and at extreme apex, the centres of cells somewhat paler, veins and stigma blackish brown.

Tabanus inobservatus, ♀, n. sp.

Type ♀ and another from Kajoe-Tanan, Sumatra (Dr. Hagen), in Brit. Mus. coll.

A dull blackish species. Antennae, palpi and legs black. Wings brownish. Forehead very narrow, distinguished from *Tabanus caerulescens*, Macq., by its dull black not blue-black colour and its wholly black colouring, from *Tabanus obscuratus*, Wlk., from Ceram by its dark wings, and the forehead is narrower anteriorly. The thorax also is black, not reddish brown as in the Walker species which has reddish antennae. Length 16½ mm.

Face blackish with some yellowish tomentum, its pubescence and beard brownish black. *Palpi* blackish, on inner border reddish yellow, with black pubescence, fairly stout ending in a point. *Antennae* blackish, the first two joints with black pubescence, the third slender with some grey tomentum, the tooth small. Subcallus covered with yellowish brown tomentum. *Forehead* nearly ten times as long as it is broad, anteriorly about half as broad as it is at the vertex, blackish with a little yellow-brown tomentum and some black hairs; frontal callus reddish brown, shining, long, narrow, almost reaching the eyes with a long lineal extension. *Thorax*, *scutellum* and *abdomen* brownish black, the former with a few golden brown hairs scattered over dorsum, pubescence otherwise black as it is on the abdomen and breast; *abdomen* conical in shape; under side similar to the dorsum. *Legs* black with black pubescence, the tibiae with some greyish tomentum. *Wings* deeply tinged with brown, paler at extreme apex and on the posterior border, where however all the veins are shaded, the discal cell paler in the centre; rudiment of an appendix in the type, none on the other female, veins brownish black, stigma black, all posterior cells widely open.

Tabanus fulvissimus, ♀, Rondani.

Ann. Mus. Civ. Genova, vii, p. 458 (1875).

Length 20 mm. From Borneo.

Body fulvous-reddish, unicoloured. Forehead brown fulvous, with the linear-shaped callus reddish, shining; face paler. Antennae and palpi red.

Thorax on dorsum reddish brown, the pleurae and breast fulvous haired. Abdomen on dorsum with the posterior borders of segments margined with short fulvous hairs; the ventral segments at the base obscurely red, with the apices more or less paler. Wings pale brown-yellow, base and costal border fulvous. Calyptera brown-red. Halteres reddish with the knob paler. Legs

ferruginous, the coxae reddish yellow, the tarsi pitchy black. Rondani, Ann. Mus. Civ. Genova, vii, p. 458.

Type seen in the Museum at Genoa. Only the one specimen, from which I made the following notes:—

A very large broad-bodied species. Abdomen reddish yellow, very broad. Antennae yellow. Legs reddish brown. Wings large, hyaline, tinged yellow. Length 22 mm.

Face covered with yellowish grey tomentum and a few scattered grey hairs. *Palpi* reddish yellow, long, and a little stout at base ending in a long point, with black hairs, darker at the extreme apex. *Antennae* the same colour, darker at apex the first two joints with black hairs, the third with a distinct tooth. *Forehead* the same width throughout, about six times as long as it is broad, the frontal callus mahogany-coloured, oblong with a linear extension, not touching the eyes, the forehead and subcallus are covered with yellow-brown tomentum, some black hairs on the former. *Thorax* and *scutellum* the same colour as the abdomen with some grey tomentum, most noticeable on the anterior part of thorax. *Abdomen* with narrow yellow-haired segmentations; on the under side these are wider and whiter and the red-yellow colour is darker. *Legs* uniform reddish brown, the pubescence black.

Four specimens sent me by Dr. Kertesz for identification from Borneo and Sumatra, agree with these descriptions with the exception of the wings which appear more brown than yellow, but the specimens are faded and dirty; and the palpi have yellow hairs.

Tabanus univentris. ♀, Walker.

List Dipt., i, p. 151 (1848); *id.*, Proc. Linn. Soc. London, i, p. 9 (1857).

Tabanus dives, in parte, ♀. Rondani, Ann. Mus. Civ. Genova, vii, p. 457 (1875).

Type ♀ from Borneo. (Presented by the Admiralty.)

In the Proceedings Linn. Soc. Walker refers to two varieties of the species from Mt. Ophir, Malaysia, which are not to be found in the Brit. Mus. coll.

A large species easily recognised by the uniform yellow abdomen, the colour of *Tabanus par*, Wlk., the small African species. Length 20 mm.

The Rondani type measures 22 mm.

Face with yellowish grey tomentum and hairs. *Palpi* large, stout, ending in a point, yellow with black pubescence, some yellow hairs at base. *Forehead* and subcallus with yellowish tomentum and some black hairs on the former, which is narrow, about eight times as long as it is broad, only slightly narrower anteriorly; frontal callus red-brown, oblong, with a linear extension. *Antennae* with the first two joints reddish with black hairs, the third blackish with a prominent tooth. *Thorax* brownish but covered with dense

yellowish grey tomentum, and with two very indistinct grey stripes. Under side of *abdomen* yellow with blackish median stripe. *Legs* yellowish red, femora reddish brown, covered on the under side with dense yellow-grey tomentum, and chiefly whitish pubescence, the apices of tibiae, and tarsi reddish brown, some white hairs on the tibiae, otherwise the pubescence on tibiae and tarsi is black. *Wings* hyaline, tinged faintly with yellow, stigma yellow, veins yellow-brown. In Walker's type the abdomen has segmentations and a faint median stripe, paler.

Rondani labelled two specimens (females) from Sarawak as *Tabanus dives*, but on examining these specimens it was clearly evident they belonged to two different species, the one measuring 22 mm. with a uniformly coloured yellowish abdomen marked with no spots is identical with *Tabanus univentris*, Wlk. The description was evidently drawn up from an examination of both specimens. The smaller specimen is probably nearly allied to or identical with *Tabanus stantoni*, see page 174.

Tabanus flavissimus, ♀, n. sp.

Type ♀ from Pundaluoya, Ceylon (Green), and another ♀ likewise from Ceylon.

A large bright yellow-bodied species nearly allied to *Tabanus fulvissimus*, Rondani, but distinguished from it by the narrower forehead, not parallel, and by the smaller narrower frontal callus. It is a larger species than *Tabanus univentris*, Walker, to which it is related in the shape of the forehead and frontal callus, but has wholly yellow legs and antennae, and the thorax is yellowish. Length of type 24 mm., the other is 20 mm.

Face, *palpi*, *antennae*, *forehead*, whole *body*, and *legs* uniformly fulvous, the colour of *Tabanus par*, Wlk., a South African species. *Abdomen* a brighter yellow. The pubescence of *palpi* black, they are long, rather slender, ending in a point. Beard brownish yellow, long. *Antennae* long and slender, the third joint narrow at base with hardly any tooth, its apex with some hairs, the first two joints with yellow pubescence. *Forehead* about seven times as long as it is broad, and barely a third narrower anteriorly, the frontal callus yellow, narrow, not reaching the eyes, with a lineal extension. *Thorax* (denuded) with whitish yellow hairs at sides and some white pubescence. *Abdomen* with yellow pubescence, thicker on the apical half; under side similar. *Legs* with chiefly short black pubescence. *Wings* yellow on costal border, tinged narrowly yellow on all the longitudinal veins, appendix present, stigma yellow, veins yellow.

Tabanus pauper, Rondani.

Ann. Mus. Civ. Genova, vii, p. 456 (1875).

Length 20 mm.

♀. Dull brown; the forehead subluteous, the linear callus pitchy red. Antennae brown-red, the apex, and the first two joints

partly, blackish. Head above and below white with white pubescence; palpi pale with very short black hairs. Thorax and scutellum subcoriaceous, with brown stripes; pleurae and breast greyish. Abdomen dull brown, with a dorsal intermediate series of whitish spots, but obsolete; the segmentations with short pale yellow hairs, on the under side with more distinct white hairs. Wings palely brownish, the veins bordered brown yellowish, the costal border browner, the stigma ferruginous. Legs, the anterior femora black, the anterior tibiae at the base widely reddish; posterior femora pitchy black, the tibiae red, the anterior tarsi wholly black, the posterior ones reddish at the base. Halteres reddish, with the club pale subluteous. Rondani, Ann. Mus. Civ. Genova, vii, p. 456.

Type ♀ seen in the Museum at Genoa. This large reddish brown species, length 23 mm., from Sarawak, is nearly allied to *Tabanus stantoni*, n. sp., but is distinguished from it by the absence of any median spots on the *abdomen* (the type is not in very good condition, but does not appear much denuded) which appears reddish brown, from the third segment onwards it is covered with yellowish brown tomentum, and with some short yellow pubescence, under side the same but with black pubescence. *Thorax* reddish brown covered with the same tomentum, and some greyish tomentum on the shoulders, the pubescence appears to have been chiefly black, the *scutellum* reddish with tomentum yellowish brown. *Wings* hyaline, tinged pale yellowish brown along all the longitudinal veins, no appendix, veins yellow. *Face* with grey tomentum and white hairs. *Palpi* pale yellow, long, slightly stout at base, ending in an obtuse point. *Forehead* narrow and about seven times as long as it is wide, and two-thirds narrower anteriorly, the frontal callus pear-shaped with a rather short linear extension. *Antennae* reddish, duskier at the tips, with a prominent tooth, pubescence black on the first two joints.

No specimens of this species are in any of the collections mentioned in this paper.

Tabanus leucohirtus, ♀, Ricardo.

Ann. Mag. Nat. Hist. (8), iii, p. 488 (1909).

Type ♀ and two other females from Kanara, Bombay, in Howlett coll.

A medium-sized dull reddish brown species, not unlike *Tabanus fumifer*, Walker, in appearance, but distinguished from it by the absence of spots on the abdomen and by the dark beard and hairs on face. Wings tinged with brown. Legs blackish brown, tibiae obscurely red. Length 20—22 mm.

Face covered with grey tomentum, pubescence brown, but some white hairs are visible on sides of face, beard is similar but very scanty. *Palpi* dull reddish, thickly covered with black hairs, large, stout ending in an obtuse point. Subcallus, forehead and sides of cheeks covered with yellowish brown tomentum. *Antennae* bright reddish, the apex black, and the first two joints with

black pubescence, the third joint long, slender, the tooth near the base distinct, crowned with a few black hairs. *Forehead* narrow, about seven times as long as it is narrow, very slightly narrower anteriorly, the frontal callus dark reddish brown, narrow, oblong, not reaching the eyes, prolonged as a narrow raised line towards the vertex, hairs on forehead black. *Thorax* brown with yellowish brown tomentum and scattered black pubescence, a few appressed pale yellow hairs are visible, chiefly on the anterior half of dorsum and at sides. *Scutellum* similar. *Abdomen* dull reddish, appearing darker owing to the close short black pubescence, segmentations obscurely yellowish or lighter, a few white hairs at the sides of abdomen; under side brown, but with grey tomentum on the sides and the segmentations, which latter are wider and more distinct, the pubescence black. *Legs* with black pubescence, but the fore coxae with long white pubescence, the fore tibiae reddish at base, the others reddish brown. *Wings* with brown veins and stigma, tinged with brown on the fore border becoming paler on the posterior border.

Tabanus atrohirtus, ♀, n. sp.

In Brit. Mus. coll.

Type ♀ and three other females from Ceylon (Yerbury coll.).

This species is very nearly related to *Tabanus leucohirtus*, n. sp., but appears a distinct species differing in the following particulars.

The *face* is covered with yellow-brown tomentum similar to the forehead and subcallus. The beard is wholly brown and thicker, and no white hairs visible on the face. The *forehead* narrower, being about ten times as long as it is narrow, and narrower anteriorly, the frontal callus longer and narrower.

The *thorax* is more thickly covered with the short appressed yellow hairs, as is the *scutellum*. The *abdomen* appears darker, in the type almost black, owing to the thicker short black pubescence lying all over the dorsum, in the other specimens this pubescence is not quite so thick and shows the red-brown ground colour of the abdomen, the same colour as *Tabanus leucohirtus*; under side has no light tomentum or pubescence but is similar to the dorsum. The fore coxae have black pubescence. Length 18—20 mm.

Tabanus pallidepectoratus, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 658 (1892). [*Atylotus.*]

Type female from Saigon, Cochin China.

No other specimens of this species identified in the collections mentioned in this paper.

Type in fairly good preservation is a robust reddish yellow fly, with a very narrow forehead and frontal callus, reddish antennae, yellow palpi, black legs, only the tibiae whitish at the base, and clear wings tinged yellowish brown. Length 19 mm.

It is nearly allied to *Tabanus joidus*, Bigot, from Assam, but

is distinguished from it by the narrower, longer frontal callus, and narrower forehead, by the broader base of third antennal joint, and wings less deeply tinged. The tibiae are less widely whitish at base. The abdomen is broader and shorter with no golden yellow pubescence on the segmentations, only a little appears at the sides of the segments. The thorax is a little lighter in colour.

Face covered with greyish tomentum which becomes yellowish brown on the upper parts of cheeks, on subcallus and forehead, pubescence on face of white hairs, with darker ones on the cheeks. Beard white. *Palpi* yellow with thick black pubescence, large, stout, ending in an obtuse point *Antennae* long, slender, the first two joints pale yellow with thick black pubescence, the first joint with the upper angle produced, the third joint reddish with a small tooth, dusky at its extreme apex. *Forehead* about ten times as long as it is broad, and a third narrower anteriorly, the frontal callus reddish brown, long, narrow, not reaching the eyes, with a rather thick lineal extension. *Thorax* brown covered with yellowish brown tomentum, denuded, pubescence remaining is chiefly yellowish, on shoulders and at sides chiefly black; breast covered with greyish tomentum. *Scutellum* similar to thorax. *Abdomen* fulvous, a little browner on the anterior borders of third, fourth and fifth, and almost wholly blackish brown on the last two segments, pubescence short, golden yellow, scanty, thickest on the segmentations, black on the last two segments; under side darker, reddish brown with paler under segmentations, appearing banded on anterior segments, at apex wholly dark, pubescence golden yellow only on segmentations, black elsewhere. *Legs* black, knees and basal third of all the tibiae whitish with some yellow hairs, fore coxae with pale hairs, elsewhere the pubescence is black. *Wings* tinged yellow-brown on fore border, veins and stigma yellow.

Tabanus nigropictus, ♀, Macquart.

Dipt. exot., Suppl. v, p. 44 (1855).

Testaceous (denuded). Thorax with black stripes, breast black. Wings hyaline, the veins margined with brown. Length 8 lines, ♀. Palpi yellow, long. Beard yellowish. Face and forehead testaceous, frontal callus the same colour, prolonged in a line. Antennae; the first two joints testaceous, the third missing. Eyes naked. Thorax (denuded) testaceous with three wide black stripes; sides with traces of yellowish tomentum; breast black. Scutellum testaceous. Abdomen (denuded) testaceous; under side testaceous with the segmentations less dark, those of the fifth and sixth segments yellow. Legs testaceous, the last two joints of the tarsi brown. Wings brownish on the outer border, veins normal, bordered brownish, stigma reddish brown. From India. M. Bigot. Macquart, Dipt. exot., Suppl. v, p. 44.

This type is much denuded as stated by Macquart, no other specimens yet met with by me. The species is distinguished by the uniform colour of the abdomen, which is however darker at

the apex, and *legs*, and by the long narrow *palpi* only slightly stouter at the base with a long obtuse point. *Forehead* almost parallel but anteriorly a little *broader*, about six times as long as it is broad, the frontal callus large, oblong, not reaching the eyes, yellow, shining, with a long lineal extension. Breast only black below legs, is probably reddish in fresh specimens and the same may be said of the thorax. *Abdomen* with short black pubescence on the dorsum. *Legs* with some white pubescence on the fore coxae and on the femora, otherwise black. *Wings* with all the veins tinged with a brown border, veins and stigma yellow. Length 18 mm.

Tabanus joidus, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 657 (1892). [*Atylotus.*]

Type ♀ from India and another female from Sibsagar, Assam, this is the second specimen included in the original description.

In Indian Museum coll. females with no locality specified, with the exception of one labelled Sibsagar; two have MS. names in Bigot's handwriting.

A narrow-bodied species with a reddish brown abdomen and a darker apex, sometimes the third and fourth segments are darker. Wings deeply tinged yellowish brown, paler on posterior border. Legs black, tibiae white. Forehead narrow with an oblong narrow callus. Antennae slender, reddish. Length of type 17½ mm., others from 16—20 mm.

Face reddish brown with brownish yellow tomentum, pubescence appears brownish. Beard brown or yellowish brown. *Palpi* yellow with thick black pubescence, stout ending in a point. *Antennae* pale red, the first two joints yellowish red with black pubescence, the third joint longer, slender, not very wide at base, with a distinct but small tooth. *Forehead* about six times as long as it is broad, and a third narrower anteriorly, covered with brownish yellow tomentum and some black pubescence, the frontal callus yellowish brown, narrow, oblong, furrowed in the middle, not reaching the eyes, with a lineal extension. *Thorax* brown with some short yellow or reddish yellow pubescence and greyish yellow tomentum, shoulders with long brownish hairs; breast covered with greyish yellow tomentum and with yellow hairs; *scutellum* same as thorax. *Abdomen* long and narrow, reddish brown, the last three segments in type black, segmentations fringed with golden yellow hairs, on the black part they only appear in the middle, pubescence on apex, and elsewhere black, but in one specimen it is almost entirely golden yellow on the anterior segments, on one specimen the blackish colour extends on to the third and fourth segments; under side reddish brown with black bands commencing from the second segment and lighter segmentations, the extreme apex wholly black, pubescence black. *Legs* blackish, the coxae covered with greyish yellow tomentum, the fore pair with long yellow hairs at base, and at apex with shorter black ones, femora with black pubescence, the fore tibiae pale yellowish on their basal half

with white hairs, the others also pale yellow at base with white hairs extending only a third of length, then becoming a rusty dirty yellowish with thick short black pubescence; in the specimens in Kertesz coll. the bases of tibiae are same colour as the rest, with no white hairs, all the tarsi blackish. *Wings* with no appendix, veins yellowish brown, first posterior cell not narrowed at opening.

Tabanus siamensis, ♀, n. sp.

Type ♀ and another from Siam, June 1906 (W. Palmer). Received from T. R. Bell, Bombay, per H. E. Andrews, in Brit. Mus. coll.

A species allied to *Tabanus joidus*, Bigot, but distinguished from it by the shining black thorax, and reddish yellow abdomen with black apex, the under side identical. In shape of forehead and frontal callus, colour of antennae, palpi and legs and of wings it is very similar to the Bigot species. From *Tabanus laotianus*, Bigot, from Siam, it will differ in the colour of thorax, abdomen and legs. Length 17½ mm., the other female 16 mm.

Face, subcallus and forehead covered with yellowish tomentum, the former with some yellow hairs, and a few brown ones on the cheeks. Beard scanty, brownish. *Palpi* pale yellow with black hairs, some yellow ones towards the apex, stout, ending in an obtuse point. *Antennae* reddish yellow, the first two joints paler with black pubescence, the third one broader at base than in *Tabanus joidus*, with a distinct but small tooth. *Forehead* about seven times longer than it is broad and a third narrower anteriorly; frontal callus oblong, not reaching the eyes with a long linear extension, reddish brown, a large spot of the same colour on the vertex, probably owing to denudation. *Thorax* shining black, with traces of yellowish brown tomentum anteriorly and at the sides, and on the dorsum as stripes, shoulders reddish and breast black, both with the same coloured tomentum. *Scutellum* similar to thorax. *Abdomen* reddish yellow, somewhat shining, the fifth partly, and the last two segments wholly, black, dorsum devoid of pubescence; under side identical but the black segments fifth and sixth have distinct yellowish segmentations, hardly visible above, some yellow and black pubescence on the under side. *Legs* black, the tibiae reddish yellow on their basal half, pubescence black, the coxae covered with the yellow-brown tomentum. *Wings* tinged brown, yellowish on the fore border, stigma yellowish brown, veins brown.

Tabanus palpalis, ♀, Ricardo.

(Pl. xiv, figs. 19, 20.)

Tabanus angustus, ♀, Bigot (*nomen bis lectum*), Mem. Soc. Zool. France, v, p. 652 (1892). [*Atylotus.*]

Type ♀ and another female from India, in the description *one specimen* only is mentioned.

The name is preoccupied by a Macquart species from S. America.

A small narrow-bodied species, of which no specimens are present in the various collections dealt with in this paper, the type and other specimen are both in a faded dirty condition, but the species seems distinguished from any I have yet seen by its very narrow hairy palpi; the frontal callus is club-shaped with a short rather stout lineal extension; Bigot gives the colour of the abdomen as light chestnut with a yellowish tomentum, which appears fairly correct. Legs uniformly dull yellow. Wings tinged yellow.

Length of female specimen 13 mm., the type has the abdomen broken off and gummed on to the label, it appears about the same length.

Face covered with grey tomentum which becomes on the upper part on cheeks near the eyes, and on subcallus yellowish brown, cheeks with some brown hairs. Beard brownish with some yellow hairs. *Palpi* narrow, almost the same width throughout, dull yellow, the first joint with long brownish hairs, which continue not quite so long on the lower border of second joint, which above is covered with the usual short black pubescence. *Antennae* reddish yellow, the first two joints with black pubescence, the third narrow but with a very prominent short tooth, at apex it is dusky in colour with hairs at the joints, apex of tooth also with a few black hairs. *Forehead* about five times as long as it is broad, and slightly narrower anteriorly, the frontal callus reddish brown, pear-shaped, with a short lineal extension, not reaching the eyes. *Thorax* brownish. *Abdomen* apparently chestnut-brown the segmentations lighter with traces of golden yellow hairs, which are distinct on the sides and scattered on the dorsum; under side the same. *Legs* chestnut-brown, the tibiae yellowish, fore coxae covered with grey tomentum and with pale hairs, femora with some long soft pale hairs, pubescence otherwise black.

Tabanus flaviventris, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 657 (1892).

Type ♀ and two others from Sibsagar, Assam.

In the description India only is mentioned, but the specimens are all labelled with the locality; the fourth specimen included by Bigot under this species does not belong to it but is a new species now named *Tabanus diversifrons*.

In Indian Museum coll. other females evidently of the original typical series from Sibsagar. In Brit. Mus. coll one male and two females from Ceylon (Yerbury), one of the females is marked as "not common." None of the specimens are in very good condition.

A small yellow species easily recognised by its yellow abdomen, legs and antennae, clear wings and parallel forehead with a small indistinct yellow frontal callus. Length type 13 mm.: others 11—14 mm.

♀. *Face* covered with yellowish tomentum and with some yellowish hairs. Beard pale yellow. *Palpi* pale yellow with sparse black pubescence and some longer yellow hairs below, stout, swollen, tapering suddenly to a slender point, so that the upper side is curved, the lower side straight. *Antennae* slender, reddish yellow, the first two joints paler, with a few yellow hairs, the tooth of third joint distinct. *Forehead* parallel, about six times as long as it is broad, same colour as face, the frontal callus small, not reaching eyes, yellow, shining, often very indistinct, with usually no linear extension visible. *Thorax* covered with greyish yellow tomentum and with fulvous appressed hairs, sides with yellowish hairs. *Scutellum* similar. *Abdomen* yellow, slightly darker at extreme apex, pubescence fulvous, and fairly thick, in well-preserved specimens; under side similar. *Legs* wholly yellow, apices of tarsal joints a little browner, pubescence chiefly yellow. *Wings* hyaline, veins and stigma yellow, appendix usually present.

♂. Similar, but the small facets of eye do not reach the vertex.

There are males and females in the Indian Museum coll. from Calcutta and Tenasserim with the apices of fore tibiae, the fore tarsi wholly and the others partly brown, which may perhaps justify their being divided from this species, but the material is too poor for decision on this point at present.

Tabanus diversifrons, ♀, n. sp.

[*Atylotus flaviventris*, Bigot, *in parte*.]

Type ♀ and seven others from Shillong, Assam (H. M. Lefroy, Entomologist to Govt. of India), in Brit. Mus. coll. and Howlett coll., three females from North Khasi Hills, Lower Ranges (Chennell coll.), one female from N. Khasi Hills, in Bigot coll., which was placed under *Tabanus flaviventris*, Bigot, and others from Buxar Duars, Bengal and Sylhet, Assam.

A species very nearly allied to *Tabanus fuscicauda*, Bigot, but distinguished from it by the broader forehead nearly parallel, by the larger frontal callus, by the third joint of antennae being bright reddish yellow, black at apex, and rather wider at the base, by the more slender palpi and by the rather lighter coloured abdomen. Length 11—15 mm.

Face with hardly any brown hairs above. *Palpi* yellow with black pubescence, only slightly stouter at base. *Antennae*: the first two joints yellow with black hairs. The subcallus in some specimens is almost bare owing to denudation. *Forehead* about six times as long as it is narrow, almost parallel, the frontal callus reddish brown, darker posteriorly and on linear extension, callus not reaching the eyes but oblong or pear-shaped with a rather stout linear extension. *Thorax* blackish with fewer appressed fulvous hairs, and the shoulders are not reddish. *Abdomen* reddish yellow, darker at apex, the black pubescence on dorsum not so thick, some grey tomentum on dorsum, segmentations narrowly paler with some yellow hairs; under side is similar. *Legs* black, tibiae reddish, fore tibiae black at apex. *Wings* very slightly tinged brown.

It is distinguished from *Tabanus subcinerascens*, n. sp., by the reddish yellow abdomen with black apex, and no grey tomentum, and by the antennae being black at apex.

Tabanus subcinerascens, ♀, n. sp.

(Pl. xiv, fig. 21.)

In Brit. Mus. coll.

Type and three other females from N. Chin Hills, Burma (Watson), 1894.

This species is very nearly related to *Tabanus cinerascens*, Bigot, but appears a distinct species, shape of the antennae, forehead and *frontal callus* being different.

The third joint of the *antennae* is wider at the base and the whole joint shorter, the *palpi* a little stouter. The *forehead* is broader, almost the same width throughout, barely six times as long as it is broad, the frontal callus is larger, practically reaching the eyes, and is prolonged as a thick spindle-shaped line, reddish brown in colour.

Thorax and *scutellum* reddish brown with black pubescence and some yellowish white hairs. *Abdomen* more uniformly reddish brown, a pale median stripe appears in some lights formed of greyish tomentum with a few scattered yellow hairs which also appear on the segmentations, sometimes forming a narrow fringe chiefly on the apical segments. *Legs* reddish yellow, femora frequently darker. Length 12-13 mm.

Tabanus obconicus, Walker.

Dipt. Saund., i, p. 54 (1850).

Type ♂ from Central India.

One female from India (Wroughton) in Brit. Mus. coll. One female from Bombay and one from Belgatchia, Bengal, in Howlett coll. ♂. A specimen with a yellowish brown conical *abdomen*, posterior borders of segments covered with grey tomentum, which in the middle reaches the anterior border of segment on the third and fourth segments at least, so that the anterior yellowish brown part of segment has a zig-zag posterior border, the last two segments blackish, the pubescence on dorsum black, longer at the apex, and on sides black; under side yellowish brown covered with grey tomentum, and with scanty black pubescence. The *legs* are reddish brown, the middle and posterior tibiae more yellowish brown, the fore coxae with grey tomentum and whitish pubescence. The *thorax* is reddish brown. The *wings* hyaline tinged brown on the veins, the cross-veins included. The eyes have the large facets on the upper part, reaching just beyond the beginning of the frontal triangle, and small ones occupy the lower portion, attaining the vertex as a narrow border. The *antennae* are yellowish on the first two joints with black hairs, the third joint is wholly of an obscure black (whether this is owing to the bad state of preservation of the

specimen, or is peculiar to it, is doubtful), tooth distinct but small, *Face* appears yellowish with chiefly yellow pubescence. The *palpi* the same colour. Length 15 mm.

♀. Similar. *Face* with grey tomentum and white hairs, the subcallus and forehead with similar tomentum. *Palpi* yellow, stout at base, ending in a point. *Forehead* almost parallel, about five times as long as it is broad. Frontal callus large, oblong, not reaching the eyes, reddish brown with almost a spindle-shaped extension. *Antennae* wholly yellow. *Thorax* with some white hairs anteriorly and at the sides, otherwise the pubescence is black on dorsum and on shoulders; breast with grey tomentum and white hairs. *Abdomen* in like manner has some white hairs on dorsum and at sides, the pubescence otherwise black as in ♂. *Legs* blacker, the fore tibiae at base obscurely yellow, the middle and posterior tibiae yellowish.

Tabanus borniensis, ♀, Ricardo.

Tabanus apicalis, ♀, Rondani, Ann. Mus. Civ. Genova, vii, p. 459 (1875). Name preoccupied by a species from Brazil described by Wiedemann in 1828.

In Brit. Mus. coll. one female from Sarawak. (Purchased Stevens 1857.)

Length 12 mm. ♀. Body fulvous, with the apex of the abdomen blackish. Antennae widely red. Palpi reddish. Forehead between the eyes dull brown, the lineal callus pitchy black, the exterior part behind the antennae fulvous. Head before and below pale grey yellowish and pale haired. Thorax with scutellum brown reddish, pleurae and breast grey yellowish. Abdomen with the three basal segments above and below fulvous, the two following especially at the base, streaked with black; the two apical ones black-brown and brown haired; the preceding ones posteriorly shortly ciliated with pale yellow hairs. Wings subhyaline, the costal border brown yellowish, towards the apex brownish. Legs: the anterior pair dull piceous, the posterior ones yellowish red, all the tarsi blackish brown. Calyptera blackish. Halteres red, the club pale yellowish, its apex paler. Rondani, Ann. Mus. Civ. Genova, vii, p. 459.

Type ♀ seen by me in the Museum at Genoa. A small species from Sarawak, with a pale yellow abdomen, apically darker. Antennae yellow with hardly any tooth. Legs yellowish. Wings clear. Length 12 mm.

Face yellowish grey with scattered white hairs. *Palpi* yellow with black pubescence, slender. *Antennae* wholly yellow with yellow hairs on the first two joints. *Forehead* narrow, about eight times as long as it is broad, and nearly two-thirds narrower anteriorly, apparently dark coloured, with the frontal callus narrow not reaching the eyes, brownish, the lineal extension short, some yellow hairs on the vertex. Eyes bronze-coloured, spotted black. *Thorax* yellowish somewhat shining, with grey tomentum, the *scutellum* yellowish, shining. *Abdomen* transparent yellow on the first three segments,

the remaining segments blackish and reddish brown, with thick yellow-haired segmentations on third, fourth and fifth segment, less distinct on the second, the fifth is almost covered with yellow pubescence, the sixth and seventh with almost wholly black pubescence; under side similar, the segmentations lighter coloured with no pubescence. *Legs* yellow, fore pair and all tarsi reddish brown. *Wings* slightly tinged yellow on the fore border and apex; veins and stigma yellow.

The specimen in Brit. Mus. coll. has a few black hairs on the first joints of antennae. Beard scanty, pale yellow. *Forehead* one-third narrower anteriorly, brown, covered with grey tomentum, the lineal extension of callus reaches more than half way to the vertex, which is reddish brown. Sides of *thorax* with yellowish white hairs. *Legs* yellow, the fore femora reddish brown, the posterior ones paler.

Another specimen from Sarawak has a label in Walker's handwriting "hybridus" but I believe it to be a specimen of this species; the fore femora and tibiae are wholly yellow.

Tabanus fuscicauda, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 658 (1892). [*Atylotus.*]
? *Tabanus andamanicus*, ♀, Bigot, *l.c.*, p. 668. [*Atylotus.*]

Type ♀ from Ceylon; and 3 other females from Pundaluoya, Ceylon (Green); and another from Peradeniya, Ceylon (Green); others from Kajoe-Tanan, Sumatra, June 1907 (Dr. Hagen).

This species described by Bigot from a single specimen is a reddish brown medium-sized species with clear wings, blackish, legs and tibiae yellowish, with a very narrow forehead and long narrow frontal callus. Abdomen with no spots except an indistinct black median mark on the second segment, the segmentations narrowly paler. Length of type 15 mm., others from 14-15 mm.

This species might possibly be confounded with small specimens of *Tabanus fumifer*, Wlk., but may be distinguished by the absence of any median pale spots on abdomen, by the lighter reddish yellow tibiae and by the paler segmentations of abdomen with white or yellow hairs.

Face covered with grey tomentum, on cheeks and near antennae with yellowish brown tomentum, pubescence white. Beard white. A few brown hairs are present on the upper part of face and at sides of antennae. *Palpi* stout, ending in a fairly long point, yellow with black pubescence, a few white hairs visible at the base. *Antennae* dull red, duskier at the apex, the first two joints and apex of tooth which is distinct, with black hairs. Subcallus and forehead yellowish brown with grey tomentum. *Forehead* very narrow, about nine times as long as it is broad, a third narrower anteriorly, the frontal callus very narrow, long, brown, not reaching the eyes, with a linear extension, the pubescence on forehead black. *Thorax* blackish brown, no stripes visible, covered with grey tomentum

and with scattered short appressed yellowish pubescence and longer black hairs, shoulders reddish, sides with black hairs, a tuft of white hairs behind at base of wings. Breast covered with grey tomentum and with white hairs. *Scutellum* similar to the thorax. *Abdomen* reddish brown, blackish towards the apex, and with a faint black median mark on the second segment, the segmentations yellowish, with yellow pubescence which is scattered and on some of the specimens is hardly visible, on the type it appears on the median line, the pubescence of dorsum thick, black; under side very similar but appearing darker in the middle with grey tomentose sides. *Legs* black, the fore tibiae at their base, the others wholly, reddish yellow, pubescence on fore coxae and on posterior femora white or yellowish white, on the others a few whitish hairs appear, otherwise the pubescence on them and elsewhere is black. *Wings* clear, veins yellowish brown, stigma yellow. In the specimens from Sumatra the black mark on the second segment is often not visible.

Atylotus andamanicus is a very badly preserved female specimen from the Andaman Islands, it appears to me to be identical with the above, the only difference appearing to be the presence of a round grey tomentose spot on each side of the second and third segments.

Tabanus uniformis, ♀, n. sp.

Type ♀ and a long series from Darien Tipus, Negui Sembilan, Federated Malay States, collected February and March 1908 by Dr. A. T. Stanton, who informs me that the locality is a new road running through jungle country.

A species with a uniformly coloured abdomen, reddish, with brighter reddish yellow haired narrow segmentations. Antennae and legs reddish yellow, the femora darker. Forehead narrow with a long narrow callus. Wings clear, tinged yellow on the fore border. Length of type 16 mm., others 14—16 mm.

Face covered with yellowish grey tomentum, the upper part of cheeks bordering eyes, the subcallus and forehead with darker reddish brown tomentum, pubescence on face scanty yellow, on the cheeks browner and longer, beard dark yellowish with brown hairs intermixed. *Palpi* yellow, thickly covered with black hairs, stout, ending in an obtuse point. *Antennae* reddish, the first two joints yellow with black pubescence, the third moderately broad at base with a distinct tooth. *Forehead* about eight times as long as it is broad, and a third narrower anteriorly, frontal callus shining yellowish brown, very narrow, long not reaching the eyes, furrowed in the middle with a fine lineal extension, pubescence of forehead black. *Thorax* reddish brown as abdomen but with some greyish brown tomentum anteriorly and at sides, the pubescence on dorsum very largely of short fulvous hairs, but black hairs are intermixed especially in the middle of dorsum, hairs at sides blackish. *Scutellum* is similar.

Abdomen reddish brown with bright reddish yellow short pubescence, always present on segmentations and in type and well-preserved specimens on the whole dorsum, black hairs intermixed, all pubescence is short but thick; under side the same but with paler segmentations, the black pubescence predominates. *Legs* reddish yellow, the coxae and femora reddish brown, on the middle and posterior pairs however this colour appears only in streaks, the fore coxae with grey tomentum and whitish hairs, the femora with short black pubescence, some yellow hairs intermixed at knees, and on outer border of the middle femora, in the tibiae it is black, largely yellow at the base, on the tarsi it is black. *Wings* clear, distinctly tinged yellow on the costal border, and more faintly so on the fore border, stigma yellow, veins yellow, a pale white streak is visible below the stigma.

Tabanus subhirtus, ♀, Ricardo.

Tabanus cinerascens, ♀, Bigot, Mem. Soc. Zool. France, v, p. 669 (1892). [*Atylotus.*] (*Nomen bis lectum.*) The name is preoccupied by a species from Australia named by King in 1827.

Type ♀ from Java.

In Howlett coll. females from Belgatchia, Bengal, and from Bombay.

A small olive-coloured or reddish brown species, the abdomen appearing dusky with yellowish brown tomentum and black and white pubescence, the thorax olive-brown with white hairs intermixed with the black pubescence. Antennae light red, palpi pale yellow with black and white pubescence, slender. Legs pale reddish yellow. Wings clear. Length 12 mm.

Face covered with whitish grey tomentum and with white pubescence. Beard white. *Palpi* with a long pointed apex. *Forehead* covered with yellowish brown tomentum and with black pubescence, narrow, anteriorly one-third narrower than at vertex, about seven times as long as it is wide, frontal callus yellowish brown, long not reaching eyes, extended as a fine line beyond the middle of the forehead. *Antennae* long and slender, the first two joints with grey tomentum and some black hairs, the apex of third joint dark brown. *Thorax*: shoulders red with black hairs, white hairs round base of wings, breast covered with whitish grey tomentum and with white hairs. *Scutellum* same as thorax. *Abdomen*: segmentations very narrowly pale yellow, the apex appears darker, dorsum sprinkled with white hairs; under side ashy grey with short white pubescence. *Legs* almost unicolorous, the femora and tarsi a little browner, pubescence black, on femora some white tomentum and on tibiae some few yellow hairs. *Wings* clear, veins yellowish and brown, stigma yellow.

The specimens from Bengal have the abdomen rather redder in colour, and the very short white hairs are yellowish in colour and not so numerous.

Tabanus formosiensis, ♀ , n. sp.

Type ♀ and another from Formosa in Dr. Kertesz's coll.

A small species nearly allied to *Tabanus cinerascens*, Bigot, distinguished from it by the narrower shining black frontal callus and narrower forehead, and by its olive-coloured abdomen with short yellow pubescence scattered over the dorsum. Antennae and legs yellow. Wings clear. Length 11 mm.

Face covered with whitish tomentum and white hairs, the upper cheeks, subcallus and forehead with yellowish brown tomentum, the former with black hairs. Beard white. *Palpi* pale yellow, with black pubescence, slender, not very stout at base, with a long slender apex. *Antennae* reddish yellow, the first two joints pale yellow with black hairs, the third with a very small but distinct tooth crowned with a few black hairs, narrow, not very wide at base. *Forehead* nearly ten times as long as it is broad, being only half as wide anteriorly as it is at vertex, frontal callus cylindrical, with narrow lineal extension, not reaching the eyes, black; some black hairs on forehead. *Thorax* blackish with some grey tomentum anteriorly, the dorsum with scattered short yellow pubescence, shoulders reddish with black hairs ; sides and breast ashy grey with white pubescence. *Scutellum* similar to thorax. *Abdomen* olive-brown, covered with yellowish brown tomentum and with black pubescence, short appressed yellow hairs are scattered over the dorsum ; under side black covered with ashy grey tomentum. *Legs* yellow, the coxae covered with ashy grey tomentum and with white pubescence, the femora with the same tomentum chiefly on their lower sides and with some white hairs below, fore tibiae on their basal half with yellowish pubescence, and the others with some on their lower sides, elsewhere the pubescence is black, fore tarsi black, the others more or less brownish. *Wings* clear, veins and stigma pale yellow.

Tabanus tuberculatus, ♀ , n. sp.

From Indian Museum coll.

Type ♀ and another from Companiganj, Sylhet district, Assam (B. Warren); and another female from Belgatchia, Bengal, in Howlett coll., and type ♂ from Pusa, Bengal.

A small yellowish species allied to *Tabanus diversifrons*, n. sp., but distinguished from it by the shining bare subcallus, forehead narrower anteriorly. Thorax covered with yellowish tomentum. Abdomen more red-yellow and narrower. Legs almost wholly yellowish. Length, male and female types 13 mm., others 12 mm.

♀ . *Face* covered with greyish tomentum and with some short yellow hairs. Beard yellow. *Palpi* bright yellow, a little stout at base ending in a long point, pubescence of yellow and black hairs intermixed. *Antennae* (incomplete): the first two joints yellow. Subcallus shining, mahogany-yellow, rather protuberant. *Forehead* covered with greyish yellow tomentum, about seven times

as long as it is broad, slightly narrower anteriorly, the frontal callus large, oblong, nearly reaching the eyes, red-brown, with a short rather stout lineal extension. *Thorax* black, but covered with greyish yellow tomentum and with yellow appressed hairs, sides and shoulders reddish yellow with pale yellow hairs; breast black, covered with greyish tomentum and with pale yellow pubescence. *Scutellum* same as thorax. *Abdomen* narrow, reddish yellow, the last three segments blackish with some grey tomentum, the pubescence on dorsum short, black, with bright yellow hairs intermixed which become thick at sides, on apical segments the black hairs are longer; under side the same, but the yellow pubescence predominates. *Legs* bright reddish yellow, the tibiae and tarsi pale yellow, the fore tibiae at apex and the fore tarsi black, the other tarsi brown on their apical joints, the fore femora with black short pubescence which is also present on apices of fore tibiae and on fore tarsi and apical joints of others, the pubescence elsewhere yellow. *Wings* hyaline with pale yellow fore border, stigma and veins.

♂. The males are similar. Eyes with the large facets distinct, occupying two-thirds of the eye, the small facets extending to the vertex as a narrow border. *Face*, subcallus and frontal triangle covered with greyish white tomentum, the pubescence of former and the beard white. *Palpi* pale yellow with yellow hairs and a few black ones at apex.

Antennae light reddish yellow, the first two joints pale yellow, the third joint slender with a very slight tooth. *Thorax* blackish covered with greyish yellow tomentum, the pubescence consisting of long pale yellow hairs, sides and breast covered with grey tomentum and white pubescence. *Scutellum* the same with a fringe of long yellow hairs on its basal border. *Abdomen* the same as in female, conical, the blackish colouring begins on the fourth segment. *Legs* the same, but the tibiae have chiefly black pubescence. *Wings* clear, the stigma and veins pale yellow, the rudiment of an appendix present.

Tabanus simplissimus, ♀ ♂, Walker.

Proc. Linn. Soc., i, p. 111 (1857).

Tabanus minimus, ♀, Van der Wulp, Sumatra Exped. Dipt., 18, pl. i, fig. 11 (1892); *id.*, Notes Leyden Museum, vii, p. 71 (1885).

Walker's types male and female from Sarawak (Saunders coll.); and others in Brit. Mus. coll. from Perak (Pratt), Kuala Lumpur, Selangor (Durham); Railway, Sungei Bessi, Selangor (Durham), and Selangor (Meade Waldo); Bidor, S. Perak (Robinson and Annandale coll.); one male from Singapore (Ridley). V. d. Wulp described his species as follows:—

"A female from Soeroelangoen (Sumatra) in August. Piceous; antennae, tibiae and posterior tarsi at the base red; frontal callus black, shining; wings subhyaline. ♀, length 10 mm.

Face and cheeks dark grey; beard white; subcallus above the antennae wholly taken up by a shining black tubercle, which has

a longitudinal furrow in the middle, and is prolonged above as a stripe-shaped line on the grey narrow frontal band. Eyes naked with very fine network. Antennae red-yellow, the two first joints projecting above tooth-like; the third at the base with a small tooth; at the apex brownish. Palpi grey-brown ending in a point, proboscis black-brown. Thorax, scutellum and abdomen brown-black, slightly shining. Thorax with short pale pubescence, the shoulders and the triangle at base of wings brown; breast sides black-grey with whitish pubescence; abdomen with some trace of reddish segmentations; under side with distinct grey segmentations. Coxae and femora black, the fore coxae with whitish grey tomentum and pubescence of same colour; knees and tibiae pale red-yellow; on the fore legs the apex of tibiae as well as the whole tarsi black, on the hind legs the first tarsal joint red-yellow with the apex and following joints black-brown. Halteres yellow. Wings hardly a little greyish; the stigma marked by an almost unnoticeable brown-yellow shadow; veins normal. This species seems related to *Tabanus pusillus*, Macq. (Dipt. exot., i (1), 127, 12), from China, which has also a black subcallus, but the palpi are described as pale yellow and the legs as uniformly red-yellow." V. d. Wulp, Sumatra Exped. Dipt., p. 18.

"I need only add to my original description that the eyes are bare and of a bronze colour, with small facets; even after having been moistened they show no trace of cross-bands. In these Javan specimens the yellow colour of the legs is so pale that it may be called whitish. Two females from Ambarawa in Java (Ludeking)." V. d. Wulp, Notes Leyden Museum, vii, p. 71 (1885).

Van der Wulp evidently re-described the same species as Walker had described years before, but the colour of the *abdomen* as stated by him hardly applies to the specimens in Brit. Mus. coll. and in London School Tropical Medicine coll., which range from yellowish at the base becoming darker towards the apex, to reddish brown becoming blackish at the apex, the pubescence on dorsum black but not very thick, the segmentations in fresh specimens fringed with yellow hairs. The tibiae whitish or very pale yellow. The *wings* hyaline but very faintly tinged yellowish on fore border, the costal border yellow.

The *forehead* is narrow nearly ten times as long as it is broad, about a third narrower anteriorly, the frontal callus narrow, long, blackish, reaching the eyes with a linear extension, forehead covered with grey tomentum. The *palpi* vary from usually yellow with black pubescence to almost black with grey tomentum, swollen at base, ending in a rather fine point. Length from 9—12 mm. The male type (now headless) has the abdomen almost wholly yellow, underneath dark at the apex.

The male from Singapore has the large facets of the eyes distinct, reaching across almost as far as the posterior border of the subcallus, the small ones are continued as a narrow border to the vertex.

This species may usually be distinguished from those specimens of *Tabanus ceylonicus*, Schiner, which have the abdomen almost

wholly reddish brown (not merely somewhat reddish brown at the sides as Schiner describes), by its whitish or yellowish beard and lighter palpi which even when darker have grey tomentum, appearing greyish, but on examining a long series of specimens of both species, I found that some with the reddish brown abdomen had yellowish beards but the palpi dark, or blackish beards and the palpi rather reddish. I can find no other specific difference to divide the species, and it appears doubtful whether they can be maintained as two distinct species, both in shape of palpi, antennae and frontal callosities are almost identical, and both occur in the same localities but Walker's species is not so numerous in the collection. Van der Wulp was mistaken in thinking *Tabanus pusillus*, Macq., had a black shining subcallus, his species has no relation to the Macquart type which I examined in the Paris Museum.

Tabanus ceylonicus, ♀, Schiner.

(Pl. xiv, fig. 22.)

Reise Novara Diptera, p. 93 (1868).

Tabanus nitidulus, ♀, Bigot, Mem. Soc. Zool. France, v, p. 679 (1892).

Bigot type from Java and other females in Brit. Mus. coll. from Trincomalee, Ceylon (Yerbury), with note from donor "Rare", from Dinding, Siam (Ridley); from Singapore, Straits Settlement (Falshaw), with note from donor "Found in Singapore and Federated Malay States, bites cattle and horses, found in town and jungle; very rarely seen and not so common as other Tabanidae"; from Tapah Road, Perak, Federated Malay States (Durham); and a long series from Bidor, S. Perak (Robinson and Annandale coll.); from Kuala Lumpur (Stanton coll.); from Kajoe-Tanan, Sumatra, Dr. Hagen, "on cow." One male from Trincomalee, Hot Wells, Ceylon (Yerbury).

Shining black, very bare, the thorax at the sides and especially the triangle at base of wings as well as the abdomen at the sides somewhat brown-red, on the sides of breast just under the root of the wings is a rusty brown small spot; the under side of abdomen is likewise but not very distinctly reddish brown, the short hairs on the sides of abdomen black. Head black, the face in certain lights dark cinnamon-brown, the forehead narrow, somewhat broader behind, the shining black callosity just above the antennae large, occupying the whole space between the eyes, beyond it a rather long square less shining spot, from which three fine shining stripes reach to the vertex, the space between it dull bluish grey. Antennae bright red-yellow, the third joint black at the apex, the first joint cylindrical, not wider above, the second short with no spine above, both bare, the third hardly concave above so that the angle projects but little, the joints ringed as in other genuine *Tabanus* species. Proboscis black with long sucking discs. Palpi black-brown, little shorter than the proboscis, broad at the base, ending in a point, somewhat curved; the scanty beard black. Legs black,

the knees and tibiae white-yellow, as well as the metatarsi of the middle and posterior legs, and to a certain extent the succeeding tarsal joints. Wings wholly hyaline, the subcostal vein pale yellow and similarly shaded, the first posterior cell open, no appendix, but the angle is acute; 6 lines.

Two females from Ceylon.

A species deviating very much from all *Tabanus* species, and which might be considered as the type of a definite group of species. Schiner, Reise Novara Dipt., p. 93.

The Bigot specimen agrees with above description and is no doubt the same. The species is easily recognised by its shining subcallus, black beard and *palpi*, black *legs* with white tibiae and almost clear *wings*, but the *abdomen* varies from wholly black to almost wholly brown-red, as in the specimens from Sumatra in which only the last four segments or only the apex are blackish, it is always shining but in undenuded specimens with unnoticeable short black pubescence. The *thorax* is blackish, sometimes with the shoulders and sides reddish, appressed fulvous pubescence appears on fresh specimens, but not in the wholly black specimens, sides with black hairs.

♀. The *face* is black covered with cinnamon-brown tomentum, the palpi always blackish, though yellowish on the inside. The *antennae* are rather narrow and slender, the third joint especially so, the first two joints *have* black pubescence which is thickest on their upper angles. The *forehead* is narrow, about eight times as long as it is broad, from a third to half narrower anteriorly, the frontal callus sometimes long and narrow, not square, but always reaching the eyes, linear extension not usually reaching the vertex. Forehead covered with the bluish grey tomentum, but posteriorly with darker brown tomentum and with black hairs. The eyes have two more cross-bands. The fore tibiae are black at their extreme apex. *Wings* with yellow veins and stigma and costal border. Length of Bigot type 12 mm., of others 10—12 mm.

♂. The male is similar to the female. The hairs on the *face* are much thicker and very black, as is the beard and the hairs on the *palpi*. Subcallus black, shining. Eyes with the large facets very distinct, reaching across, just beyond the apex of the frontal triangle, the small facets are continued as a narrow border to the vertex. The *abdomen* in this one specimen is reddish brown, black at the apex. Length 10½ mm. On the relationship of this species to *Tabanus simplissimus*, Wlk., see under that species.

Tabanus ardens, ♀, Wiedemann.

Dipt. exot., i, 78, 31 (1821); *id.*, Auss. Zweifl. Ins., i, p. 154, 68 (1828).

Macquart, Dipt. exot., i (1), p. 129, 16 (1838).

Thorax glauco, fulvo pubescente; abdomine ferrugineo; alis infumatis; pedibus fulvis. Thorax mouldy grey with golden yellow pubescence. Abdomen rusty yellow. Wings smoke-grey. Legs golden yellow, 6 lines. ♀. From Java.

Antennae very bright rusty yellow, black at their extreme apex. Face and beard golden yellow. Palpi light brownish; forehead ochre-brown, a little narrower than usual with a brown shining stripe very little broader below. Thorax rusty yellow striped. Breast sides golden yellow and mouldy grey. Abdomen with the first segment at the sides broadly, and the following ones only on the side-borders, waxy yellow with golden yellow pubescence, otherwise the abdomen above is almost rusty yellow, clothed with very short black small hairs, in the middle of the posterior border of the first segment a golden yellow haired spot. Wings on fore border and towards the base, also in the middle a little yellowish. Halteres golden yellow. Tarsi brown. In Westermann's coll. Wied., Auss. Zweifl. Ins., i, p. 154.

♀. Wiedemann only described the female. We refer to this species a male specimen from the collection of M. Serville. It differs from the female by the antennae, the third joint of which is blackish, yellow at the base. The face and the base of the forehead are of a dirty light yellow. The thorax is brown without distinct stripe. From Java. Macquart, Dipt. exot., i (1), p. 129.

This species is not known to me.

Tabanus fumipennis, Van der Wulp.

Sumatra Exped. Diptera, p. 18, 6, pl. i, fig. 10 (1881).

One female from Alahan (Sumatra), caught in October.

Bluish black, subglabrous. Antennae and legs piceous, the knees of anterior legs and base of tibiae red; wings brown. Length 16 mm.

Face and forehead with light ashy grey tomentum; moustache dirty white. Eyes naked. Forehead narrow, posteriorly somewhat broader, with a stripe-shaped, shining, black line. Antennae black-brown, the first joint cylindrical, the second very short, with a small spine above, the third at the base with a hardly perceptible tooth (see figure). Proboscis shining black. Palpi dark brown with a little ashy grey tomentum. Abdomen unicoloured, bluish black, a little shining; the thorax and the scutellum covered with a greyish bloom; the sides of breast, at least the part near the fore legs light grey, with pubescence of the same colour; under side with light grey segmentations. Legs black-brown, but because of the grey pubescence partly greyish; the knees of fore legs and the basal half of tibiae red-brown. Wings of a tobacco-brown tint, which is darker along the veins and on the fore border; the veins and the stripe-shaped stigma black-brown; neuration normal *Tabanus caerulescens*, Macq. (Dipt. exot., i (1), p. 128), might be noticed in the determination of this species, were it not for the antennae which are there described as brown-yellow, and the shining black spot on the forehead of which Macquart speaks is wanting in this species in the specimen lying before me. Van der Wulp, Sumatra Exped. Diptera, p. 18.

This species is not known to me; it would appear from the description that its chief differences from the Macquart species, to which it must be very nearly allied, lies in the black-brown not reddish antennae; thorax with no reddish stripes or colour; legs with the base of the tibiae red, not black as in the Macquart species, the posterior tibiae of which only are reddish. The shape of the forehead and frontal callus appears identical in both species.

Tabanus ixion, ♂, Osten Sacken

Berlin. Ent. Zeit., xxvi, p. 99 (1882).

Dark brown, abdomen and legs black; wings brown, the tips and a part of the discal cell hyaline. Length 15 mm.

Palpi and face dark brown, with some black pile; head, ♂, flattened from above; the division between the large and the small facets very distinct. Antennae dark brown or reddish brown; the third joint long and narrow; its upper angle projecting squarely, the excision of its upper side very shallow. Thorax dark brown, with black pile, especially on the pleurae; abdomen black, shining; legs black; halteres with a yellow knob. Wings brown, axillary angle paler, apex hyaline within the second submarginal cell, the proximal half of which is brown, a hyaline spot in the middle of the discal cell both ends of which are brown; on both sides of that hyaline spot the brown ground colour of the wing is somewhat yellowish; the first posterior cell open although somewhat coarctate towards the tips; no stump of a vein. Two ♂.

From Philippine Islands. Ost. Sacken, Berlin. Ent. Zeit., xxvi, p. 99.

This male is unknown to me. The females I have described as *Tabanus inobservatus* from Sumatra must be nearly allied to it.

Tabanus melanognathus, ♂, Bigot.

Nouv. Archiv. Mus. Hist. Nat. Paris (3), ii, p. 204 (1890). [*Atylotus.*]

Length 17 mm.

Antennae dull yellow, the third joint black at its apex, deeply incised above with a considerably projecting tooth; face, beard and palpi yellowish grey, the former very short, the lower half of the composite eyes blackish; the whole body yellow, thorax paler; pleurae brown, halteres yellow; legs entirely black; wings pale yellow at the base, the posterior third hyaline (apex widely hyaline in the Latin description); no appendix; eyes naked. Laos, one specimen. Bigot, *l.c.*, p. 204. This species is not known to me.

Tabanus laotianus, ♀, Bigot.

Nouv. Archiv. Mus. Hist. Nat. Paris (3), ii, p. 205 (1890) [*Atylotus.*]

Length 16 mm.

Antennae dull yellow, blackish at the base and at the apex, the third joint deeply incised above with a fairly prominent tooth; palpi dull yellow (in the Latin description flesh-coloured). Face, beard and forehead grey; frontal callus and spot at vertex blackish; the former very narrow, elongated, suddenly dilated below. Thorax dull yellow, a little reddish, with four wide stripes indistinct, abbreviated posteriorly, blackish (dull chestnut in the Latin description); sides greyish; scutellum brownish yellow; abdomen pale yellow, a little brown at the apex; pleurae brownish as well as the stem of the halteres, the club of latter whitish; wings very pale grey, narrowly tinged brownish at the base, stigma the same colour, no appendix; legs greyish black, tibiae pale grey at the base, the posterior ones longitudinally tinged with brown behind; eyes naked. From Laos. One specimen. Bigot, *l.c.*, p. 205.

This species is not known to me.

GROUP XI.

Subgenus **Therioplectes**, Zeller.

Isis, 1842, xi, 819 (1842).

In this group are comprised all species with distinctly pubescent eyes, and ocelligerous tubercle on vertex. The heads of the males not differing much in size or shape from those of the females. The facets of the eyes in the males are uniform in *T. hirtus*, Wlk., but in *T. subcallosus*, n. sp., they are very distinctly different in size; the other males are not known. Eyes with cross-bands.

There are only four species from the Oriental Region, forehead broad, three to four times as long as it is broad. Species rather pubescent. Length 11—17 mm.

Tabanus (Therioplectes) subcallosus, ♂ ♀, n. sp.

Types ♂ and ♀ and two other females from Mussoorie, India (Brunetti coll.); others from N.-W. Provinces and Dalhousie in Brit. Mus. coll.

A small black species with white bands on abdomen, easily recognised by the shining, yellowish brown subcallus, by the two separate transverse calli of forehead, and by the slightly incrassate white fore tibiae. Length 11½ mm.

♀. *Face* covered with greyish tomentum and white pubescence. *Palpi* obscurely yellow, thickly covered on the outside with grey tomentum, with thick long white pubescence at base and with some short black hairs elsewhere, stout, ending in short acute point. *Antennae* reddish, the first two joints yellowish with black pubescence, the tooth of third joint very slight. Subcallus convex, brownish yellow. *Forehead* broad, about three and a half times as long as it is broad, almost the same width throughout, covered with grey and

brown tomentum, frontal callus black, transverse, not reaching eyes, the fore border near subcallus irregular, the median callus black, smaller, irregularly heart-shaped, ocelligerous tubercle small, pubescence of forehead black. Eyes hairy; "green black, with central bright green band edged each side with purple" (from note by collector), thus with two stripes, ♂ with large facets above. *Thorax* black with grey tomentum and with black pubescence and some appressed fulvous hairs; at sides and base of wings with long white pubescence. *Scutellum* black covered with grey tomentum. *Abdomen* with white-haired bands on each segment, not produced in the middle, under side with the white bands broader. *Legs* black, tibiae yellowish white, black at apices, pubescence on coxae, under part of femora, light parts of tibiae white, elsewhere black. *Wings* hyaline.

Male identical, with the exception of the second and third segments of the abdomen which are yellowish red at the sides.

The hairiness of eyes is not very apparent in the specimen from N.-W. P. and the palpi are pale yellow with black hairs.

Tabanus (Therioplectes) hirtus, ♂, Walker.

Ins. Saund., p. 52 (1850). [*Tabanus.*]

Type male from India (coll. Saunders), and another male from India; females from Naini Tal, Himalayas (Lt.-Col. R. Moore); near Muktesar, U. P., India (Capt. J. E. Holmes), and N.-W. Provinces (C. Horne), all in Brit. Mus. coll.

In Indian Museum coll. females from Phagu, 9,000 ft., Simla hills (Annandale).

This species bears a superficial resemblance to *Tabanus orientis*, Wlk., but is at once distinguished by its hairy eyes. A robust species with black abdomen largely reddish yellow at the sides. Forehead almost parallel with the frontal callus, broad continued as a thick spindle-shaped line towards the vertex. Legs blackish. Length of male type 15 mm., of females 16-17 mm.

♀. *Face* and subcallus covered with greyish tomentum, the latter hairy, with long yellowish hairs, beard the same colour as hairs of face. *Palpi* dull reddish, covered at the base with long yellow hairs, elsewhere with chiefly short black pubescence, stout, ending in a short point. *Antennae* blackish, the first two joints with black pubescence, the third joint with hardly a perceptible angle in place of a tooth, broad at base. Eyes with three cross-bands, densely pubescent. *Forehead* rather darker than face, clothed with blackish pubescence, longer at vertex, almost parallel and barely four times as long as it is broad, frontal callus black, shining, triangular, broad at base almost reaching eyes, its apex continued in a spindle-shaped line, ocelligerous tubercle present on vertex.

Thorax blackish with three indistinct narrow greyish or yellowish stripes broadly separated, pubescence of black long hairs with fulvous short often appressed hairs intermixed, shoulders reddish with long black hairs, tufts of white hairs above wings on sides,

breast greyish with yellow and black hairs intermixed. *Scutellum* same colour as thorax, posteriorly reddish, with long black pubescence. *Abdomen* black, broad and stout for size of insect, the reddish yellow colour largely predominates on the first two segments, and sometimes on the third segment, the segmentations yellow haired, often produced in the middle as triangular spots, the whole dorsum in well-preserved specimens to a great extent covered with short yellow pubescence, intermixed with longer black hairs at the apex and on sides; under side blackish covered with grey tomentum and lighter segmentations. *Legs* blackish, the fore tibiae at base and the others more largely so, dull reddish, pubescence on coxae yellow, femora with some grey tomentum and chiefly black pubescence, some yellow hairs present, the pubescence on tibiae and tarsi almost wholly black.

Wings clear, tinged brown along veins, and on cross-veins, stigma and veins brown, appendix present, first posterior cell widely open.

♂ Similar, but the yellow on sides of *abdomen* is less, and the pubescence on dorsum chiefly black, the segmentations yellow haired. *Legs* darker. Eyes with three cross-bands, densely pubescent, facets uniform in size, hairs on cheeks long, blackish, in middle of face yellowish. *Palpi* reddish with long black hairs, some yellow hairs below.

Tabanus (Therioplectes) wyvillei, ♀, n. sp.

Type female and two others from Narkanda, Himalayas, 9,000 ft., July 1907 (Lt.-Col. F. Wyville Thomson, I.M.S.); and another female from Kasauli, India, from the same donor, who says of those from Narkanda, "Very common in the Himalayas; annoys man and animals by biting." He also notes the eyes are red with three transverse green bars.

A smaller species than *Therioplectes hirtus*, Walker, distinguished from it by the slender palpi, and by the golden yellow pubescence on abdomen, which in well-preserved specimens almost wholly covers it, whereas in the Walker species the same coloured pubescence is chiefly confined to the segmentations; the sides are very much less reddish yellow, only appearing so on the sides of the second segment. The tibiae are much lighter reddish yellow. Length of type 13 mm., others from 13-14 mm.

Face covered with greyish yellow tomentum and with long chiefly black fine hairs. Beard yellowish. *Palpi* reddish yellow, slender, stouter at the base ending in a long acute point, the pubescence long, black, a few yellow hairs at base below.

Antennae reddish, darker at apex, the first two joints with black pubescence, the third with hardly a perceptible angle in the place of a tooth, subcallus and *forehead* covered with grey tomentum, *forehead* almost parallel, very slightly narrower at the *vertex*, barely three times as long as it is broad, the frontal callus blackish, very indistinct in all the specimens, in the type it appears as a small

irregularly shaped spot, perhaps in well-preserved specimens the forehead may prove to have no real callus, ocelligerous tubercle small. Eyes hairy, not very thickly covered with pale yellowish hairs, with three cross-bands. *Thorax* black, covered with grey tomentum and with pale yellow hairs, shoulders with long black hairs, breast blackish with grey tomentum and yellowish pubescence. *Scutellum* same as thorax. *Abdomen* brownish black, appearing reddish yellow on sides of second segment, the whole dorsum almost wholly covered with short golden yellow pubescence, and the sides with identical pubescence; under side blackish almost devoid of hairs but with yellowish grey tomentum. *Legs* blackish, the femora with chiefly yellow pubescence, the fore tibiae except at apices, and the others wholly, reddish yellow, with black pubescence, but some yellow hairs intermixed, fore tarsi brownish, the others reddish yellow. *Wings* hyaline, shaded brown on transverse and longitudinal veins, stigma and veins brownish, no appendix present.

Tabanus (Therioplectes) albilateralis, ♀, Macquart.

Dipt. exot., i (1), p. 129, 17 (1838). [*Tabanus.*]

Black. Eyes hairy. Thorax with sides and stripes white. Abdomen with golden yellow dorsal spots and segmentations, the two first segments testaceous at sides. Legs red. Length 5 lines, ♀.

Palpi whitish yellow, elongated, pointed, the apex appearing to form a separate joint. Face and forehead fawn coloured with whitish tomentum, the latter wide, with a broad callus, brownish yellow, posteriorly with three points. Antennae are wanting. Eyes pubescent. Thorax black, with long brown hairs and whitish stripes; above the wings is a longitudinal stripe of long white hairs bordered above by yellow hairs; sides with long white hairs. Abdomen wide; the first two segments testaceous with a dorsal triangular spot; the others black with dorsal triangular spots; posterior borders testaceous covered with golden hairs; under side of a dirty fawn colour. Legs yellowish, anterior pair wanting. Halteres yellowish. Squamae brownish. Wings slightly brownish, darker at the base and on outer border, the first posterior cell a little narrowed. From Java. Macquart, Dipt. exot., i (1), p. 129.

Type in Paris Museum, distinguished from *Therioplectes hirtus*, Wlk., with which I compared it by its broader forehead with a broad yellowish callus, smaller size and yellow legs. A small species with a black *abdomen*, reddish yellow on the first two segments and partly so on the third segment, median spots and segmentations yellowish haired; under side pale yellowish white. *Thorax* with yellowish white hairs at sides. *Legs* yellow. *Wings* tinged brown, the first posterior cell much narrowed.

LIST OF SPECIES OF *TABANUS* FROM THE ORIENTAL REGION, INCLUDING ALL SYNONYMS.

[NOTE. – All synonyms are printed in italics.]

TABANUS abbreviatus, Bigot.
abscondens, Walker.
administrans, Schiner = amaenus, Wlk.
agricola,[1] Wied., an Arabian species recorded by Schiner from Hongkong; identification doubtful.
albilateralis, Macq. (Therioplectes.)
albimedius, Walker.
albocostatus, Bigot.
albofasciatus, n. sp.
alboscutatus, Rondani = optatus, Wlk.
albulus, Walker = virgo, Wlk.
amaenus, Walker.
andamanicus, Bigot ? = fuscicauda, Bigot.
angustus, Bigot = palpalis, Ricardo (*nomen bis lectum*).
annamitus, ♂, Bigot.
apicalis, Rondani = borniensis, Ricardo (*nomen bis lectum*).
ardens, Wied., *assamensis*, Bigot = sanguineus, Wlk.
atrohirtus, n. sp.
auricinctus, Macq. = barbarus, Coquebert. A species from S. Europe and N. Africa.
auriflamma, Walker.
auristriatus, n. sp.
aurotestaceus, Walker.
basalis, Macq.
bicallosus, Ricardo.
bicinctus, n. sp.
birmanicus, Bigot.
bituberculatus, Bigot = fulvus, Macq.
borniensis, Ricardo.
brunneus, Macq.
brunnipennis, n. sp.
bubali, Doleschall
bucolicus, ♂, Schiner ? = feideri, Wulp.
calidus, Walker ? = albimedius, Wlk. Type recorded from Asia with a query.
ceylonicus, Schiner.
chinensis, Thunberg ? = striatus, Fabr. Delete from list.
cinerascens, Bigot = subhirtus, Ricardo (*nomen bis lectum*).
clausacella, Macq. = amaenus, Wlk.

[1] Macquart records his species as from the islands of the Indian Ocean, but this large black species with golden haired bands on abdomen has not since been recorded from the Oriental Region, which makes it appear doubtful whether Macquart's locality is correct, so that for the present it is not included in the species from the Oriental Region,—see Macq. Dipt. exot., i, p. 134.

caerulescens, Macq.
conicus, ♂, Bigot ? = abbreviatus, Bigot.
consanguineus, Macq.
consocius, Walker = orientis, Wlk.
costalis, Lichtenstein. Delete from list, description unrecognisable.
crassus, ♂, Walker.
discrepans, n. sp.
dissimilis, n. sp.
ditaeniatus, Macq.
diversifrons, n. sp.
dives, Rondani { = univentris, Wlk., *in parte*. = stantoni, n. sp., *in parte*.
dorsilinea, Wied. = striatus, F.
equestris, Wulp = optatus, Wlk.
explicatus, Walker.
factiosus, Walker
felderi, Wulp.
[*fervidus*, Walker = conformis, Wlk., a South African species, therefore does not belong to the Oriental Region.]
flavicinctus, n. sp.
flavissimus, n. sp.
flaviventris, Bigot (= diversifrons, n. sp., *in parte*).
flavothorax, n. sp.
flexilis, Walker, from Celebes.
formosiensis, n. sp.
fulvimedius, Walker. Type described from unknown locality.
fulvissimus, Rondani.
fulvus, Mg.
fumifer, Walker.
fumipennis, Wulp.
fuscicauda, Bigot.
fuscicornis, n. sp.
geniculatus, Wulp.
hilaris, Walker.
hirtipalpis, n. sp.
hirtistriatus, n. sp.
hirtus, Walker. (Therioplectes.)
hybridus, Wied.
ignobilis, Rondani.
immanis, Wied.
incultus, Wulp.
indianus, n. sp.
[*indicus*, Fabr., a South American species not occurring in Oriental Region as stated by Walker.]
inobservatus, n. sp.
inscitus, Walker. Delete from list, type lost.
internus, Walker = rubicundus, Macq.

ixion, Osten Sacken.
javanus, Fabr.
joidus, Bigot.
jucundus, Walker.
justorius, Rondani.
khasiensis, Ricardo.
lacrymans, Bigot = albimedius, Wlk.
laotianus, Bigot.
leucocnematus, Bigot.
leucohirtus, Ricardo.
leucopogon, Bigot.
leucosparsus, Bigot.
macer, ♂, Bigot = striatus, Fabr.
malayensis, n. sp.
mandarinus, Schiner.
manilensis, Schiner? = striatus, Fabr.
megalops, ♂, Walker = striatus, Fabr.
melanognathus, ♂, Bigot.
melanopygatus, Bigot = fulvimedius, Wlk.
mentitus, ♂, Walker? = indianus, n. sp.
minimus, Wulp = simplissimus, Wlk.
monilifer, Bigot = internus, Wlk.
monotaeniatus, Bigot.
negativus, n. sp.
nemocallosus, Ricardo.
nephodes, Bigot.
nexus, Walker.
nicobarensis, Schiner.
nigromaculatus, n. sp.
nigropictus, Macq.
nigrotectus, Bigot.
nitidulus, Bigot = ceylonicus, Schiner.
non-optatus, n. sp.
obconicus, ♂, Walker.
optatus, Walker.
orientalis, Wied.
orientis, Wied.
oxyceratus, Bigot.
pagodinus, Bigot = fulvimedius, Wlk.
pallidepectoratus, Bigot.
palpalis, Ricardo.
partitus, Walker = striatus, Fabr.
pauper, Rondani.
perakiensis, n. sp.
perlinea, Walker = orientis, Wlk.
pictipennis, Wulp = flexilis, Wlk., from Celebes.
pratti, n. sp.
priscus, Walker = albimedius, Wlk. Type described from unknown locality.
puella, Walker = virgo, Wied.

puteus, n. sp.
pyrausta, Walker = servillei, Macq.
pyrrhus, Walker = ditaeniatus, Macq.
rarus, n. sp.
rubicundus, Macq.
rubidus, Wied.
rubiginosus, Walker. Delete from list, type lost.
rufiventris, Fabr. Delete from list, impossible to identify from description.
rufocallosus, Bigot = striatus, Fabr.
sanguineus, Walker.
servillei, Macq.
sexcinctus, n. sp.
siamensis, n. sp.
signifer, Walker.
significans, n. sp.
simplissimus, Walker.
sinicus, ♂, Walker = striatus, Fabr.
speciosus, n. sp.
stantoni, n. sp.
striatus, Fabr.
subcallosus, n. sp. (Therioplectes.)
subcinerascens, n. sp.
subhirtus, Ricardo.
sumatrensis, ♂, Macq. Delete from list, type lost, description being of ♂ only, not sufficient for identification.
tenebrosus, Walker.
tenens, Walker = striatus, Fabr.
tinctothorax, n. sp.
trigeminus, Coquillet = mandarinus, Schiner.
tristis, Wulp.
tuberculatus, n. sp.
umbrosus, Walker = albimedius, Wlk.
uniformis, n. sp.
univentris, Walker.
vagus, Walker = albimedius, Wlk.
vagus, Walker, from Hongkong. Delete from list, type lost.
vanderwulpi, Osten Sacken.
varicolor, Ricardo.
variegatus, Rondani = varicolor, Ricardo (*nomen bis lectum*).
virgo, Wied.
wyvillei, n. sp. (Therioplectes.)

Geographical Distribution of Species.

India, including Assam and Burma, 59 species.

Tabanus *hirtipalpis*, *bicallosus*, *flavicinctus*, *leucocnematus*, bicinctus, *sexcinctus*, ditaeniatus, *virgo*, *nemocallosus*, optatus,

non-optatus, *nephodes*, *albofasciatus*, basalis, *auriflamma*, striatus, *hilaris*, rubicundus, abbreviatus, rubidus, albimedius, speciosus, *monotaeniatus*, brunnipennis, abscondens, *auristriatus*, hybridus, jucundus, indianus, brunneus, *nigromaculatus*, *leucopogon*, crassus, *alboscutatus*, *explicatus*, *khasiensis*, sanguineus, *exycceratus*, *orientis*, fulvimedius, *consanguineus*, *orientalis*, birmanicus, *nigrotectus*, *tenebrosus*, *leucohirtus*, *nigropictus*, *joidus*, *palpalis*, flaviventris, *diversifrons*, *subcinerascens*, *obconicus*, *subhirtus*, *tuberculatus*.

Therioplectes *subcallosus*, *hirtus*, *wyvillei*.

Ceylon, 12 species.

Tabanus ditaeniatus, striatus, albimedius, speciosus, jucundus, *puteus*, *discrepans*, *flavissimus*, *atrohirtus*, flaviventris, fuscicauda, ceylonicus.

Nicobar Islands, 1 species.

Tabanus *nicobarensis*, Schiner.

Siam, Federated Malay States, Annam, and Cochin China, 29 species.

Tabanus *rarus*, bicinctus, pratti, *annamitus*, striatus, abbreviatus, rubidus, *hirtistriatus*, brunnipennis, hybridus, *stantoni*, brunneus, fumifer, *malayensis*, dissimilis, *significans*, *leucosparsus*, sanguineus, birmanicus, *flavothorax*, *tinctothorax*, *perakiensis* *pallidepectoratus*, *siamensis*, *uniformis*, simplissimus, ceylonicus, *melanognathus*, *laotianus*.

Sumatra, 16 species.

Tabanus optatus, basalis, striatus, rubidus, *tristis*, immanis, fumifer, sanguineus, *incultus*, *geniculatus*, *inobservatus*, fulvissimus, fuscicauda, simplissimus, ceylonicus, *fumipennis*.

Java, 17 species.

Tabanus *javanus*, optatus, striatus, rubicundus, abbreviatus, rubidus, albimedius, immanis, *bubali*, brunneus, *servillei*, sanguineus, *caerulescens*, *subhirtus*, ceylonicus, *ardens*.

Therioplectes *albilateralis*.

Borneo, 14 species.

Tabanus optatus, pratti, hybridus, *varicolor*, fumifer, dissimilis, *ignobilis*, *nexus*, *justorius*, fulvissimus, *univentris*, *pauper*, *borniensis*, simplissimus.

Philippines, 4 species.

Tabanus *vanderwulpi*, striatus, *factiosus*, *ixion*.

South China and Formosa, 18 species.

Tabanus *fulvus*, *negativus*, *fuscicornis*, striatus, abbreviatus, abscondens, hybridus, *aurotestaceus*, jucundus, *amaenus*, *mandarinus*,

indianus, *signifer*, *felderi*, crassus, sanguineus, fulvimedius, *formosiensis*.

The species peculiar to each district, *viz.*, not as yet recorded from elsewhere, are printed in italics. They number from Indian district 39, and two common to India and Ceylon (*flaviventris*, Bigot, and *speciosus*, n. sp.); from Ceylon 4 species, all new; from Nicobars 1 species; from Malay district 14 species, chiefly new species; from Sumatra 5 species; from Java 7 species; from Borneo 7 species; from S. China district 8 species; from Philippines 3 species.

SPECIES OF *TABANUS* FROM N. CHINA AND JAPAN.

The following is a list of species and synonyms occurring in China above the line dividing the Oriental Region from the Palaearctic Region, roughly about 35° lat. N., and in Japan. The descriptions of those species which occur in both Regions are included in those of the Oriental Region. The description of *Tabanus cordiger*, Mg., and *Tabanus fulvus*, Mg., are to be found in Brauer's monograph of the species of the Palaearctic Region in Denkschr. Akad. Wien, xlii. The descriptions of the other species are given here, with the exception of *Tabanus hoang*, ♂, Macq., which should be deleted from list being apparently destroyed.

TABANUS amaenus, Walker.
angusticornis, Loew. (? Atylotus.)
bituberculatus, Bigot = fulvus, Mg.
buddha, Portsch. = chrysurus, Loew.
chrysurus, Loew.
clausacella, Macq. = amaenus, Wlk., occurs in Palaearctic and Oriental Region.
confucius, Macquart = yao, Macq.
cordiger, Mg.
ditaeniatus, Macq.
fulvus, Mg., occurs in Palaearctic and Oriental Region.
hirticeps, Loew. (Therioplectes.)
hoang, Macq. Delete from list, type lost.
humilis, Coquillet.
japonicus, Bigot. (? Atylotus.)
lama, Portsch. [Region
mandarinus, Schiner, occurs in Palaearctic and Oriental
pulchriventris, Portsch. (Therioplectes.)
pusillus, Macq. "China" given as locality.
pyrrhoceras, Bigot ? = chrysurus, Loew.
pyrrhus, Walker = ditaeniatus, Macq., a South African species.
rufidens, Bigot ? = yao, Macq.
signatipennis, Portsch. = clausacella, Macq.
sinicus, Bigot [Bellardia] = amaenus, Wlk.
[1]tataricus, Portsch.

[1] This species is included here, though not strictly recorded from China, but being very near its borders, is likely to be found there.

tenebrosus, Coquillet (*nec* Walker).
trigeminus, Coquillet = mandarinus, Macq.
trigonus, Coquillet = yao, Macq.
yao, Macq.
yokoamensis, Bigot.

Tabanus angusticornis, ♀, Loew. [? *Atylotus*.]

Wien. Entom. Monatschr., ii, p. 104 (1858).

From Japan.

Ashy grey to yellow. Abdomen darker at base, on each side with luteous spots. Eyes short haired. Forehead very wide, with no smooth callus. Antennae ochraceous, narrow, the third joint angulated above. Legs obscurely luteous, base of anterior femora, apical half of anterior tibiae, anterior tarsi wholly and four last joints of posterior tarsi black.

Wings brownish cinereous, stigma and veins dark brown, no appendix. Length of body 5¾ lines. Length of wing 5 lines.

Face yellow pollinose and yellow haired. Palpi yellowish, clothed with pale yellowish and black hairs. Antennae: first joint produced, black haired, second black above, third ochraceous, narrow, above angulated, hardly forming a tooth. Forehead very wide, yellow pollinose, on vertex and as far as the anterior angle of eyes with very short black hairs, and with no shining callus. Eyes short pilose. Thorax yellow pollinose and yellow haired, intermixed with black hairs, at the base of the wings thicker. Abdomen blackish, slightly yellow pruinose and with a very large luteous spot on each side from the exterior angle of the first segment, and as far as the posterior margin of the third segment, a blackish spot lying between, which is extended contiguous to the anterior margin of the third segment; first segment with the borders of the following segments except the last, and lateral borders of abdomen yellow haired, rest of abdomen black haired. Under side blackish, with yellowish ashy grey tomentum, borders of apical segments luteous, pubescence of abdomen for the most part black, at the base, sides and posterior border of anterior segments yellow haired. Legs obscurely luteous, black haired, anterior femora at base, anterior tibiae on apical half, extreme apices of posterior tibiae, whole of anterior tarsi, and posterior tarsi from apex of the first joint, black. Halteres luteous. Wings brown cinereous, yellow before the first longitudinal vein, stigma and veins dark brown, with an appendix (!), first posterior cell at apex subdilated. Loew, Wien. Entom. Monatschr., ii, p. 104. This species is not known to me.

Tabanus chrysurus, ♀, Loew.

Wien. Entom. Monatschr., ii, p. 1035 (1858); Portschinsky, Horae Soc. Entom. Ross., xxvi, p. 202 (1891); Coquillet, Proc. U. States Nat. Mus., xxi, p. 309 (1898).

? *Atylotus pyrrhoceras*, ♀, Bigot, Ann. Soc. Entom. France (6), vii, Bullet. lxxvii (1887).

Tabanus buddha, ♀, Portschinsky, Horae Soc. Entom. Ross., xxi, 181 [*Budda*] (1887); *id.*, xxvi, p. 202 (1891).

Black brown. Eyes naked. Antennae broad, ferruginous red; palpi luteous, with reddish yellow hairs; face, forehead and dorsum of thorax with reddish yellow hairs; abdomen with reddish yellow and reddish yellow haired segmentations, the posterior segments wholly reddish yellow haired; femora black-brown, the apices yellowish; tibiae yellow, the anterior pair blackish at the apex, anterior tarsi black, the posterior one dark yellow; wings brown. Length of body 9⅔ lines, of wings 8⅔ lines.

Black-brown, but not wholly dark. Head with reddish yellow pubescence. Eyes naked. Antennae ferruginous red, the first joint arched (fornicatus), the third broad, the broad joints with short black hairs. Palpi yellow, clothed with very short reddish yellow hairs. Forehead narrow, the callus oblong below, continued upwards as a long stripe. Thorax on dorsum reddish yellow haired, more frequently with hairs intermixed towards the posterior margin. Scutellum with black hairs. Pleurae the same. Abdomen black-brown, anteriorly with short black hairs, the posterior margin of the first segment dull reddish yellow, at the sides reddish yellow haired, the posterior margins of the remaining segments reddish yellow and with reddish yellow pubescence; with the fourth segment almost wholly and the following ones wholly reddish yellow haired; under side black-brown, with short black pubescence, with all the segmentations except the first one reddish yellow, and with pale reddish yellow pubescence. Femora brownish black with black hairs, the apices yellowish and with ferruginous hairs, the tibiae luteous, with pale yellow hairs, the anterior ones with blackish apex and ferruginous pubescence; anterior tarsi brown-black, the posterior ones dull luteous. Halteres black-brown. Wings brown, the first longitudinal vein yellowish, the third one with no appendix, stigma hardly distinct, the discal cell longer than is usual in most large European species. From Japan. Loew, Wien. Entomol. Monatschr., ii, p. 103, 5.

Tabanus buddha is recorded from Chinese Mongolia and described in Latin in Horae Soc. Entom. Ross., xxi, and the following was published in the twenty-sixth volume in Russian, the translation of which I procured through a friend from Mr. Aylmer Maude:—

"The well-known dipterologist V. v. Röder, in a private letter among other things, kindly informed me that in his opinion, the above-named species described by me, is no other than the *Tabanus chrysurus* described by Loew from Japan. There is not the least doubt of the great resemblance of the two species; yet it seems to me certain, nevertheless, that they are different species. Not having a *Tabanus chrysurus* at hand, I can only point out the differences between the two species; basing myself on a comparison of my specimens of the *Tabanus buddha*, with Loew's description

of the *Tabanus chrysurus*. The chief difference is that the basal joints of the antennae of the *Tabanus chrysurus* are covered with short black hairs, the frontal callus is oblong and stretches upwards in the form of an elongated stripe; the thighs are of a brownish black, and the front tibiae blackish at the ends, the front metatarsus brownish black, and the discal cell of the wings is longer than that of large species of the European *Tabanus*.

The basal joints of the antennae of *Tabanus buddha* are quite bare; the frontal callus of the forehead is quite round, and does not extend upwards at all, all the legs are of a reddish yellow, only the thighs at the base are yellow-brown, and the discal cell of the wings does not differ from that of large species of our *Tabanus*."

These small differences hardly seem sufficient to keep *Tabanus buddha* as a distinct species, the lighter colour of the femora may perhaps allow it to be considered as the Chinese subform of *Tabanus chrysurus*.

Coquillet records seven specimens from Japan. In Brit. Mus. coll. are females from Yokohama District (Prior), and Hakodate, Japan (Fletcher); and in Kertesz coll. from Japan.

The frontal callus is large, reddish brown, shining, club-shaped, the linear extension usually short, rather stout, or nearly non-existent. The *forehead* about five times as long as it is broad, almost parallel. The *legs* in all of the specimens have the femora black, reddish yellow at their apices, in some the apices of fore tibiae are hardly darker, or very slightly so. Length 25—30 mm.

Atylotus pyrrhoceras was described from one female from north of Yeso, Japan; judging from the description it is probably a denuded example of *Tabanus chrysurus*, which is distantly related to *Tabanus barbarus*, Coq., which occurs in S. Europe and N. Africa, but easily distinguished from it by the wholly yellow-haired abdominal apex, by the yellow beard and darker femora. *Tabanus auricinctus*, Macq., Dipt. exot., i (1), p. 134. pl. xvii, fig. 2, described from the islands of the Indian Ocean, is apparently a synonym of *Tabanus barbarus*, as given by Pandellé in Revue d'Entom., ii, p. 201, i (1883), the older specimen is recorded from South Europe and N. Africa, and has therefore an extended range if Macquart's locality is correct, which appears doubtful from the absence of any specimens in the collections from the Oriental Region which I have had access to (see *ante*, p. 491).

Tabanus cordiger, Meig.

Syst. Beschreib., ii, p. 47 (1820).—see Kertesz's Cat. 1906 for full references.

In Brit. Mus. coll. four females and two headless specimens from Japan (Dr. Miyajima, 1909). The subcallus is almost entirely black, shining, perhaps from denudation as the insects suffered much damage on the journey; otherwise they are identical with European specimens. This species has thus a very wide

distribution over Europe and Asia, having previously been recorded from Asia Minor.

Tabanus hirticeps, ♀ , Loew. (Therioplectes.)

Wien. Entom. Monatschr., ii, p. 105 (1858).

From Japan.

Ashy grey. Thorax white striped. Abdomen marked with a double series of ashy greyish spots. Eyes hairy. Antennae black, the third joint brown, apex black. Forehead wide, the lower callus duplicated, large, the middle one smaller, tuberculated, the third wart-like at the vertex, all black. Legs black, tibiae brown. Wings ashy greyish, stigma and veins black brownish, no appendix. Length of body 6 lines. Length of wing 5½ lines.

Face white ashy grey, with white hairs. Palpi ashy greyish, clothed with longer white and black hairs. Antennae curved, the basal joints black, the first arched a little, the third joint brown, at apex black, wide, above angulated, the angle obtuse. Forehead very wide, ashy grey; lower callus duplicated, the anterior part wider and contiguous to antennae, upper part filling the whole width of the forehead, middle callus smaller, remote from margin of eyes, less smooth, below tuberculated, vertical callus minute, wart-like. Eyes hairy. Thorax and abdomen very much denuded, blackish, but with traces of whitish grey pollinose and ashy grey colouring, stripes of thorax whiter. Abdomen with double series ashy grey spots, the median stripe of abdomen composed of hardly apparent triangular spots. Hairs of thorax white, mixed with black at base of wings. Posterior margin of abdominal segments dull white. Legs black, tibiae brown, toward apices blackish, femora mostly white haired, tibiae black haired, the posterior ones at base white haired, tarsi black haired. Halteres black. Wings somewhat ashy grey, transverse veins very slightly shaded with brown, stigma and veins dull brown, no appendix. Loew, Wien. Entom. Monatschr., ii, p. 105.

This species is not known to me.

Tabanus humilis, ♀ , Coquillet.

Proc. U. S. Nat. Mus., xxi, 311 (1898).

Female from Japan, differs from *Tabanus trigonus*, as follows:

Head above antennae yellow and brightly polished, antennae wholly reddish yellow, the tooth of the third joint very small, hairs of the palpi mixed white and black, those of the occiput, lower side of the head and on the pleurae, white. Scutellum noticeably lighter grey than the mesonotum. Abdomen somewhat polished, black, marked with grey as in *trigonus*, the median triangles extremely small on the last two segments; venter black, light grey pruinose. Extreme apices of the middle and hind tibiae brownish black. Wings hyaline, stigma yellow, base of anterior branch of the third longitudinal vein not appendiculate, first posterior cell

not narrowed at its apex. Length 12-13 mm., two specimens. Coquillet, Proc. U. S. Nat. Mus., xxi, 311.

This small species with shining subcallus is not known to me.

Tabanus japonicus, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 632 (1802). [*Dichoelacera.*]
Ricardo, Ann. Mag. Nat. Hist. (7), xiv, p. 368 (1904).

Antennae yellowish, the apex black; palpi yellowish; eyes tomentose; forehead grey, callus narrow, elongated, black; beard white; thorax and scutellum black, with scattered yellowish tomentum, sides with yellowish grey hairs, abdomen reddish yellow, the base of the segments tinted with reddish brown, those of the last ones blackish; legs black, tibiae yellowish; wings almost hyaline, the outer border tinged pale yellow, stigma pale reddish. 15 mm. From Japan, one specimen. Bigot, Mem. Soc. Zool. France, v, p. 632. I have not seen any specimens of this species, which apparently has eyes hairy, and may possibly belong to the subgenus *Atylotus*.

Tabanus lama, ♀, Portsch.

Horae Soc. Entom. Ross., xxvi, p. 201 (1891), pl. i, fig. 1 (eyes).

From Chinese Mongolia.

Oblong, ovate, luteous. Eyes naked, ornamented with four bands, the middle ones dark purple with red margins. Head with white tomentum and hairs. Forehead grey, callus subquadrate, black, shining. Antennae luteous, the third joint testaceous, at apex darker. Palpi white and with white hairs. Thorax black, white pruinose with four dark grey stripes. Scutellum black, white or grey pruinose. Abdomen luteous, each segment in the middle with a white triangular spot girdled on each side with an oblique black line and with two small black side spots, under side and all legs wholly luteous, all hairs of abdomen white or whitish, only the last segment of abdomen at apex clothed with some black hairs. Wings subhyaline, shining white, nervures pale ferruginous with a long appendix. 4½—6 mm. Portsch., Horae Soc. Entom. Ross., xxvi, p. 201.

This species is not known to me.

Tabanus pulchriventris, ♀, Portsch. (**Therioplectes.**)

Horae Soc. Entom. Ross., xxi, p. 179 (1887).

From Etschjin-Choro, Chinese Mongolia.

In size, stature and colour of body this species is similar to *Tabanus tropicus*, but is easily distinguished from it by the abdomen being entirely and densely covered with long fine red golden hairs, brown palpi, etc.

Black, with rather long pubescence. Head black, ashy grey pruinose, underneath with white beard, round eyes with spare black pubescence. Frontal stripe rather wide, ashy grey, and with black hairs on vertex. Frontal callus not large, subrotund, black,

continued as a narrow black line. Eyes shortly but distinctly pale haired, with three bands ; ocelligerous tubercle small. Palpi brown, on apical half narrow with obtuse apex, above and a little below channelled, on basal half incrassate, and at base with proboscis with rather long black hairs. Antennae black, basal joints with rather long black hairs, second joint wholly, and third at base, widely red, third joint at base with no tooth. Thorax black with rather long black pubescence and numerous yellow hairs intermixed. Pleurae long and densely covered with snowy or white hairs. Scutellum black with rather long yellow pubescence. Abdomen black, the three first segments widely yellow at sides and all densely covered with red golden hairs, under side black, each segment in the middle black haired, but at apex narrowly margined with yellow hairs. Wings subinfuscate, darker round the transverse veins, stigma brown. Squamae ashy grey, margined with brown. Halteres brown. Legs black and black haired. Tibiae yellow testaceous with yellow hairs, and apex with tarsi brown or darker. Length 7 mm. Portsch., Horae, etc., p. 179.

This species is not known to me.

Tabanus pusillus, ♀ , Macq.

Dipt. exot., i (1), p. 131 (1838).

Black. Antennae red. Abdomen with yellow hairs.

Legs red. Length 4½ lines, ♀ .

Palpi of a pale yellow. Face and forehead brownish grey ; the latter with a black roundish callus. Antennae fawn coloured. Thorax black, denuded ; a brownish spot on each side. Abdomen black, with yellow hairs ; segmentations fawn coloured. Legs fawn coloured. Halteres yellow. Wings a little yellowish, pale yellow at base and on outer border.

From China. Museum, Macq., Dipt. exot., i (1), p. 131.

Type ♀ in very bad preservation seen by me in Paris Museum.

A small species with clear *wings*, the veins yellow. *Legs* wholly yellow. *Abdomen* apparently dark brown with yellowish pubescence. Eyes apparently bare. *Forehead* with only one callus, nearly square, not reaching eyes, no linear extension, the same width throughout, about four times as long as it is wide. *Antennae* yellow. *Face* hairy. Beard white. *Palpi* slender, a little stout at base with a slender point and rather long black hairs.

I have not found any specimens identical with this species. There is another *T. pusillus* named by Macquart from New Holland. This is left for the present in the Palaearctic Region, but as only "China" is given, it may belong to the Oriental Region.

Tabanus tataricus, ♀ , Portsch.

Horae Soc. Entom. Ross., xxi, p. 178 (1887).

From Btschan, Central Asia ; Mt. Altai,—see Verrall, British Flies, v, p. 10, 1909.

Related to *Tabanus astur*, Erichs.

Body ovate, black with rather long and dense pubescence. Head comparatively rather small, ashy coloured, pruinose and with the wide frontal stripe long and densely pale yellow haired. Forehead above antennae and the narrow band below, each side of eyes, black, shining. Frontal callus black, shining, short (but equal in width to the front), eyes shortly but distinctly yellow haired with three wide bands, ocelligerous tubercle small. Palpi black and black haired, with apex moderately acute.

Antennae reddish brown, at base black haired, the third joint at base with no tooth, brown testaceous, apex and upper side more or less widely black. Thorax, pleurae, breast and scutellum all wholly black with long and densely yellowish (shining white) hairs. Abdomen short, wide, ovate, stout, black, the three first segments at sides fulvous, the fourth with golden or reddish hairs, with shining luteous rather long and dense pubescence, the other segments with luteous pubescence; under side black, shining, the last segments alone with very narrow pale incisions, the first segments mostly with black incisions, the three last alone luteous haired. Wings subhyaline, stigma brown, all veins black, middle transverse veins clouded, the third vein with an appendix, clouded at its base, halteres brown, apices white. Squamae ashy coloured, margined with white. Femora all black and black haired, anterior tibiae yellow, anterior half and tarsi brown, intermediate tibiae and tarsi and all posterior ones wholly yellow with white hairs. 6-7″. Portsch., Horae, etc., p. 178.

This species apparently differs from *Tabanus astur* which was described from Siberia in the absence of the small tooth, the frontal callus being black, not grey, the thorax and abdomen more yellow haired, the femora black haired instead of yellow haired, the wings subhyaline, not black-brown.

It must be nearly allied to *Tabanus pulchriventris*, described on the next page by the author, from Chinese Mongolia.

Tabanus tenebrosus, ♀, Coquillet.

Proc. U. S. Nat. Mus., xxi, p. 310 (1898) (*nec* Walker).

Female. Differs from *Tabanus trigonus* as follows. Head above the antennae yellowish grey, pruinose, tooth of third joint of antennae very small, hairs of occiput, of under side of the head and on the pleurae, white.

Abdomen opaque, black, sometimes a reddish spot on sides of the second segment, wholly greyish pruinose, the median triangles, posterior and lateral margins of segments 2-6 a lighter grey than the remainder of the abdomen, the darker markings consist principally of pairs of spots bordering the median triangles; venter black, brownish grey pruinose in the middle, the sides a lighter grey. Wings hyaline, stigma pale yellowish. Length 18—20 mm.

Four specimens from Japan.

This name is preoccupied by a Walker species from India.

The species is very probably the same as the specimens I have identified from Japan as *Tabanus cordiger*, Mg., but the description is too short to make a decision possible.

Tabanus yao, ♀, Macquart.

Dipt. exot., v, p. 44 (1855).

Tabanus confucius, ♀, Macquart, *l.c.*, p. 46.

Tabanus trigonus, ♀, Coquillet, Proc. U. S. Nat. Mus., xxi, p. 309 (1898). (Japanese subform.)

? *Atylotus rufidens*, ♀, Bigot, Ann. Soc. Entom. France (6), vii, Bullet. lxxviii (1887). [*Atylotus*.]

Both the Macquart types in Mr. Verrall's coll. are from N. China, and with them are a series of females from Japan which are almost identical and may perhaps be considered as the Japanese subform *T. trigonus*.

In Brit. Mus. coll. are females from Wei Hai Wei, China (Muat), "biting horses;" and from Shanghai; and males from China (Walker coll.), and males and females from Japan (*T. trigonus*).

Black. Thorax with ashy grey pubescence. Abdomen blackish, with dorsal white spots and red segmentations. Antennae red with the apices black. Legs red. Wings with an appendix.

Length 9 lines, ♀. Palpi yellow. Beard white. Face with white tomentum, sides with yellow tomentum. Forehead anteriorly with white tomentum, then with yellowish grey tomentum; anterior callus testaceous, prolonged by a black line. Antennae yellow; the last four divisions of the third joint black, this joint with the usual tooth. Eyes naked. Thorax with ashy grey tomentum, and yellow hairs. Abdomen blackish, with dorsal triangular spots of a greyish white tomentum, as well as the posterior borders of the segments at the sides; sides of the three first sometimes of brownish yellow; under side yellow; the three last segments blackish with yellow posterior borders. Legs yellow, anterior coxae with yellow hairs. Wings a little yellowish, veins normal with the exception of the appendix. From N. China, M. Bigot. This *Tabanus* resembles *T. confucius* strongly; and as I have only observed males in this latter and females in the former, it appears that they belong to the same species. However the appendix, which is not found in *T. yao*, is a character that we have never observed to be sexual, and this determines us to consider these two species as distinct. Macq., Dipt. exot., v, p. 44.

On page 46 Macquart gives the description of *Tabanus confucius*, as follows:—

Black. Thorax with white stripes. Abdomen with the sides and segmentations testaceous. Antennae red with the apices black. Legs red.

Length 8 lines, ♂. Palpi brownish, the last joint oval. Beard yellow. Face with white tomentum, sides with yellow tomentum.

Forehead anteriorly with white tomentum, sometimes traversed longitudinally by a brownish stripe. Antennae yellow, the last four divisions of the third joint black, this joint with the usual tooth. Eyes naked. Thorax with indistinct yellowish grey tomentose stripes; sides with grey tomentum and yellow hairs; a small black stripe sometimes indistinct; breast with whitish tomentum and hairs. Abdomen: the testaceous sides reach more or less towards the middle, sometimes only leaving a black dorsal mark on the second and third segments; the last four segments with their posterior borders of a bright red testaceous; with a posterior yellow edging; under side testaceous, the three last segments black, with a testaceous posterior border. Legs of a dull testaceous; anterior coxae pale, with yellow hairs; posterior tibiae brownish on the posterior side. Wings almost clear, a little brownish on the outer border; veins normal, as those of *T. bovinus*.

From N. China. M. Bigot.

A large species allied to *Tabanus bovinus*, L., but distinguished from it by the larger tooth of the *antennae* which are bright reddish yellow, usually black at the apex, and by the wholly yellow legs. ♀. *Abdomen* reddish yellow with apex blackish, and a large median series of grey tomentose, triangular spots on a black median stripe and grey tomentose segmentations, the anterior borders of segments are to a great extent reddish brown; under side almost wholly yellow. *Legs* yellow, but the tarsi reddish brown. *Wings* often tinged with brown along the veins, or nearly clear. *Forehead* very slightly narrowed anteriorly, about eight times as long as it is narrow. Frontal callus pear-shaped, large, hardly touching the eyes with a linear extension. *Palpi* reddish yellow, long, almost the same size throughout. Length 24 mm.

This species may be considered as the Chinese form of *Tabanus bovinus*.

Tabanus confucius, ♂, Macquart, type (male), was distinguished from this species by the absence of an appendix to wing, which of course is not a trustworthy character, some of the specimens in Brit. Mus. coll. possess one and some have none; I believe the male type of *confucius* is the same species as *Tabanus yao* but so denuded that the black median stripe is not covered with the triangular median grey spots, though traces of them can be seen. *Tabanus trigonus*, Coq., is identical, with the exception of the colouring of the *legs*, with the Macquart species, and can only be considered as a subform so far peculiar to Japan. *Abdomen* darker. The femora and coxae are blackish or reddish brown with grey tomentum and bright yellow pubescence on the coxae and under part of femora, on the upper sides of the latter it is shorter and black, tibiae yellow, appearing blackish at apices owing to the thick black pubescence which elsewhere is [illegible]y yellow, tarsi blackish with black pubescence.

Atylotus rufidens, Bigot, [illegible]y possibly be a denuded specimen of the subform *trigonus*, descrit. d from one female, collected north of Yeso, Japan.

Tabanus yokoamensis, ♀ , Bigot.

Mem. Soc. Zool. France, v, p. 678 (1892).

Antennae black, base of the third segment reddish, this last joint very concave above with a projecting tooth ; palpi very pale yellow; face and beard white ; forehead grey, callus black, narrow, pointed above, much enlarged below and nearly square, on the vertex is a very indistinct tubercle and no ocelli ; thorax blackish with three wide greyish indistinct stripes ; scutellum blackish ; sides grey with grey hairs; the two first segments of abdomen grey. with a large blackish spot on each side, the others black narrowly bordered reddish, squamae whitish bordered with brown, halteres yellow, the club brown with its apex whitish ; legs black, base of tibiae widely whitish ; wings almost hyaline, stigma pale yellowish.

Var.? Abdomen black with a dorsal stripe formed of triangular greyish spots, smaller in size.

I place this species in the genus *Tabanus* (*proprie dictus*) but with some doubts, owing to the very mediocre development of the vertical tubercle. Length 14 or 17 mm. Yokohama, Japan, three specimens, Bigot, Mem. Soc. Zool. France, v, p. 678 (1892).

This type and species is unknown to me.

SPECIES OF *TABANUS* FROM PERSIA, TURKESTAN, AFGHANISTAN, BALUCHISTAN, ASIA MINOR AND SYRIA.

The following is a list of the species with all synonyms from the above localities in the Palaearctic Region, including three new species here described. *Tabanus infuscatus*, Loew = *apricus*, Mg., *Tabanus fulvicornis* = *montanus*, Mg., var., and *Tabanus bromius*, L., are given on the authority of Bigot who inserts them in a Catalogue of species of *Tabanus* from N. Persia and Caucasus, in Ann. Soc. Ent. France (5), x, p. 140 (1880).

Tabanus abazus, ♀ , Bigot, Ann. Soc. Ent. France (5), x, p. 146 (1880), was described from two specimens as black, with some greyish reflections. Eyes hairy. *Antennae* black. Frontal callus cordiform with linear extension. *Abdomen* with segmentations narrowly white and three series small indistinct grey spots. *Legs* black, tibiae pale testaceous. ? Persia, Caucasus.

Tabanus niveipalpis. ♀ , Bigot, Mem. Soc. Zool. France, v, p. 645 (1892) [*Atylotus*], described from one specimen from ? Persia. Eyes naked. *Abdomen* blackish with the segmentations narrowly yellowish, and a large oval spot on the sides of second and third segment reddish yellow. *Legs* blackish, anterior tibiae whitish, the apices black, the other tibiae testaceous white. *Wings* hyaline. Length 12 mm. Bigot used this name later for a species from the Cape of Good Hope which is however a synonym of *Tabanus albilinea*, Wlk.

Tabanus canipalpis, Bigot, Mem. Soc. Zool. France, v, p. 649 (1892) [*Atylotus*], from Persia was described from one specimen. *Abdomen* black with yellowish segmentations and red on the first two segments. Length 11 mm.

Tabanus polyzonatus, Bigot, Mem. Soc. Zool. France, v, p. 648 (1892) [*Atylotus*], from Persia. *Abdomen* black with three series greyish spots and segmentations greyish. Length 17 mm.

These types are not known to me.

Tabanus glaber, Bigot, *polygonus* and *pulverifer*, Wlk., *sabuletorum* and *quadrifarius*, Loew, not included in Brauer's monograph of species of Palaearctic Region, are therefore given here, with the descriptions of the four new species, one from Japan, one from Perso-Baluchistan Frontier, one from Cyprus and Persia and one from Persia.

TABANUS abazus, Bigot (? Atylotus).
adjacens, n. sp.
alexandrinus, Wied.
apricus, Mg.
autumnalis, L.
bifarius, Loew (Atylotus).
bromius, L.
canipalpis, Bigot.
cordiger, Mg.
cyanops, Brauer.
cyprianus, n. sp.
decorus, Loew (Therioplectes).
eggeri, Schiner.
fulvicornis = montanus, Mg., var.
gigas, Herst. (Atylotus).
glaber, Bigot.
graecus, F.
infuscatus, Loew = apricus, Mg.
ispahanicus, Rond. [aspahanicus] = spectabilis, Loew.
lunatus, Fabr. (Atylotus).
montanus, Mg., var.
mühlfeldi, Brauer (Therioplectes).
miyajima, n. sp.
nigrita, Fabr.
niveipalpis, Bigot. ? Persia.
persis, n. sp.
polyzonatus, Bigot.
polygonus, Walker.
pulchellus,[1] Loew.
pulverifer, Walker.
quadrifarius, Loew (? Atylotus).
sabuletorum, Loew (? Atylotus).
solstitialis, Mg.
spectabilis, Loew.
tricolor, Zell. (Atylotus).
umbrinus, Mg. (Atylotus).
unifasciatus, Loew.

---

1 Occurs also in Algeria, see Ricardo, Ann. Mag. Nat. Hist. (7), xvi, p. 200 (1905).

Tabanus adjacens, ♀, n. sp.

Five females. Co-types from Perso-Baluchistan Frontier in Indian Museum coll.

A small species with reddish yellow or yellow abdomen and a large broad black median stripe, yellowish legs and antennae. Forehead with two small callosities. Length 8½—10 mm.

Face brown covered with grey tomentum. Beard very scanty, white. *Palpi* whitish, large and nearly the same width throughout. *Antennae* yellow, the third joint with little more than an angle, broad at base. *Forehead* parallel, about three and a half times as long as it is broad, the frontal callus small, heart-shaped, not reaching the eyes, the median one about the same size, irregular in shape, both reddish brown. *Forehead* and subcallus same colour as face. *Thorax* shining black, no trace of stripes, but with thick grey tomentum on the anterior border, and on sides which are yellowish. Breast blackish covered with grey tomentum. *Scutellum* black. *Abdomen* bare, shining, reddish yellow, the broad black median stripe with irregular lateral borders, frequently extending on the posterior borders of segments to the sides of abdomen as narrow segmentations, and on the last three segments occupying their whole surface with the exception of the sides; under side yellowish. *Legs* yellowish, the fore tibiae at apices, and fore tarsi brown. *Wings* very hyaline, the veins brown, yellow on the fore border and at base, with a long appendix, the stigma yellow. None of the specimens are in good condition and are probably denuded.

Tabanus cyprianus, ♀, n. sp.

Type ♀ from Kelopside, Cyprus (Dr. G. A. Williamson), and two females from Seistan, Persia (A. S. Leese); these last in the Howlett coll., with label "from horse, very common."

This species *Atylotus*-like in the shape of head, though no hairs are visible on eyes with a lens, does not appear to have been described before, though it may be related to *Tabanus agricola*, Wied.; it is related to the group containing *Atylotus ditaeniatus*, *fulvus*, *rusticus*, *latistriatus* and *fuscipes*.

Seistan is a province in Eastern Persia bordering Afghanistan, so that the species presumably has a wide range.

A small yellowish grey species with clear wings, yellow legs and antennae, broad forehead with two small callosities, abdomen yellowish at base and on segmentations, covered with grey tomentum and with four series small black spots. Length 12-13 mm.

Face covered with greyish white tomentum and with white pubescence. Beard white. *Palpi* yellowish white with white pubescence, almost straight, not so curved as usual, stouter at base ending in a point. *Antennae* pale yellow, the third joint more reddish yellow, the first two joints with chiefly white hairs, but a few black ones are visible, first joint small, not cap-shaped, second very small, third with hardly any tooth but only an angle, broad at

base for its size. *Forehead* and subcallus same colour as face, the former about four and a half times as long as it is broad, parallel, the frontal callus small, square or oval, not reaching eyes, the median one smaller, both shining, mahogany-brown, hind part of head with white hairs, pubescence on forehead scanty, yellowish. Eyes with no bands.

Thorax, *scutellum* and *abdomen* blackish but covered with grey tomentum appearing greyish, and clothed with short yellowish or white pubescence, some black hairs on shoulders. *Abdomen* reddish yellow on sides of first two segments, and segmentations the same colour, hardly appearing so in the type, owing to the pubescence, four round black dots appear on the fore border of each segment except the last one; under side a little paler with same pubescence, the black spots not present. *Legs* pale reddish yellow, apices of fore tibiae and tarsi blackish brown, the other tarsi brownish, pubescence on coxae and femora white, on tibiae mixed white and black, and on tarsi black. *Wings* clear, veins brown, stigma pale yellow, long appendix present.

Tabanus eggeri, Schiner.

Reise Novara Dipt., 81 (1868).

Tabanus intermedius, Egg., Verh. zool.-bot. Ges. Wien, ix, 389 (1859); Brauer, Denkschr. Akad. Wien, xlii, 182, 42, pls. iii and vi, fig. 42 (1880); Gobert, Mem. Soc. Linn. Nord. France, 21, 6 (1881); Pandellé, Revue d'Entomol., ii, 202, 4 (1883).

This species is as yet only recorded from South Europe, Egypt and Asia Minor.

Two females in Mr. Howlett's coll. identified as this species from Seistan, Persia, "on horse, uncommon" (A. S. Leese).

The males have the first posterior cell open, not narrowed, the females have it closed or very considerably narrowed, in these specimens the latter is the case.

Tabanus glaber, ♀, Bigot.

(Pl. xiv, fig 23.)

Mem. Soc. Zool. France, v, p. 678 (1892).

Type ♀ from Afghanistan (in description India is given) in Brit. Mus. coll. Six females from Helmund, Afghanistan, Indian Boundary Commission (Aitchison), 1889, and another female labelled *T. glaber* in Bigot's handwriting from Afghanistan, in Indian Museum coll. These appear to have been the original series of specimens from which Bigot made his type, all having a small yellow-papered "♀" attached to them.

One ♀ in Brit. Mus. coll. from Kashgar, E. Turkestan (Lansdell), 1889, and two ♀ from Seistan, Persia, in Howlett coll., "taken from horse"; these are identical though the frontal callus differs a little from that of type. This species does not appear to have been

described under any other name among the Palaearctic species to which Region it belongs.

A species easily recognised by the broad black stripe on the red abdomen, with the thorax black, the wings clear, the antennae black, the legs black, the tibiae reddish yellow.

Length type 14 mm.

Face covered with grey tomentum and with white pubescence. Beard white. *Palpi* pale yellow, almost devoid of pubescence, with only a little short white pubescence, and an occasional black hair, large, ending in a fairly long apex. *Antennae* wholly black. *Forehead* of medium breadth, narrower anteriorly, about five times as long as it is wide at its narrowest point, covered with grey tomentum and with a few white hairs at vertex. Frontal callus blackish brown, square, reaching the eyes, at a short distance beyond it appears a spindle-shaped callus in the middle of forehead, united posteriorly to a broader irregular shaped callus on the vertex. Eyes with cross-bands. *Thorax* with grey tomentum, stripes hardly distinct, shoulders reddish, pubescence on dorsum consists of black hairs with some scattered pale yellowish hairs intermixed.

Abdomen: the black stripe almost entirely covers the first segment, on the next three segments it is about a third of the width of abdomen, and on the remaining segments almost entirely covers them, leaving only their sides and narrow segmentations red; underside reddish, the stripe not so well marked, the pubescence on dorsum black with some yellow hairs, and grey tomentum on the red parts. *Legs* black, the knees of femora and the tibiae pale yellow or reddish yellow, the apices of fore tibiae black. *Wings* clear, veins and stigma yellowish brown, the first posterior cell slightly narrowed at its opening.

Tabanus miyajima, ♂ ♀, n. sp.

Type (male) from Japan (Miss Pascoe's coll.), 1896. Co-types, four females from Tokio, 1909, and Japan sent by Dr. Miyajima in a small collection of Japanese Diptera to the British Museum; unfortunately the collection was much damaged by the journey, but these females are sufficiently well preserved and of such a striking, easily distinguished appearance, as to justify their description as a new species.

♀. A black species, the abdomen with whitish-haired bands, most prominent on the fourth and fifth segments where they are produced in the middle as triangular spots; scutellum grey. Legs black, the tibiae largely yellowish white. Wings with all posterior cells widely open. Frontal callus club-shaped with stout linear extension. Length of male 18 mm., of females 18-19 mm.

The species has a general resemblance to *Tabanus significans*, n. sp., of the Oriental Region.

Face covered with greyish tomentum and with some silvery white pubescence, the sides of cheeks and the subcallus and centre of face immediately round base of antennae covered with yellowish brown tomentum, the hairs on sides of cheeks short, brown. Beard

silvery white. *Palpi* obscurely reddish, with some grey tomentum and with thick black pubescence, stout, ending in an obtuse point.

Antennae incomplete, the first two joints dull red with black pubescence. *Forehead* narrow, about seven times as long as it is broad, very slightly narrower anteriorly, black, with greyish tomentum, and some black hairs, the frontal callus brownish black, club-shaped, a little protuberant, long, stout, not quite reaching the eyes, prolonged in a stout short linear extension. *Thorax* black with grey tomentum, disposed as indistinct stripes, pubescence sparse, black, with some appressed fulvous hairs intermixed, shoulders with longer black hairs, at base of wings some tufts of white hairs. *Scutellum* thickly covered with grey tomentum and with some white pubescence on its outer border. Breast black, covered with grey tomentum and with white pubescence. *Abdomen* black, the first segment with only some white hairs at sides, the second and third with indistinct grey tomentose narrow bands on their posterior borders, silvery white hairs only on the sides, the fourth with a wider one, covered with silvery white pubescence extending in the middle as a short triangle not reaching the anterior border, on the fifth a broad median white-haired spot; the dorsum is covered elsewhere with close black pubescence; under side black, covered with grey tomentum and short silvery white pubescence, the last three segments blackish without the lighter tomentum and pubescence. *Legs* black, the fore tibiae on their basal half, the other tibiae on their basal two-thirds yellowish white, the pubescence whitish on fore coxae, on femora black with white hairs intermixed on under side chiefly, on pale parts of tibiae white, on their dark parts and on all tarsi black. *Wings* hyaline, very slight traces of brown shading on the cross-veins, stigma and veins brown, no appendix.

♂. Male is browner, the *abdomen* conical brownish black, not so thickly covered with black pubescence, *scutellum* brownish like the thorax with rather thick brownish pubescence. *Legs* with wholly black pubescence, the fore tibiae only yellowish white on their basal third. *Face* brown with brownish black pubescence, the palpi brownish with black hairs. Beard blackish. *Antennae* brownish black, the third joint long, slender, with a fairly prominent tooth at base. Eyes large, convex, with large facets on their upper surface reaching to the middle of the frontal triangle, the small ones occupying the lower part and continued as a narrow border to the vertex.

Tabanus persis, ♂, n. sp.

(Pl. xiv, fig. 24.)

Type male and female from Seistan, Persia, on the Afghanistan frontier, in Mr. Howlett's coll., and others from same locality. The females are labelled by the collector, A. S. Leese, as taken off camels or horses and common, the males as uncommon and taken off horse, and off gauze door.

This species, *Atylotus*-like in the shape of head though no hairs are to be discovered on the eyes with a lens, does not appear to

have been described before; it has a general resemblance to *Atylotus rusticus*, L., but is distinguished from it by the shape of frontal callosities and by its black antennae.

A small species with greyish black abdomen reddish at sides of first two segments, clear wings, yellow legs, broad forehead with two transverse callosities, and black antennae. Length ♂ type 12 mm., ♀ type 13 mm., other females 13—15 mm.

Face covered with whitish tomentum and thick silvery white pubescence, with a yellowish brown band above between the antennae and eyes. *Palpi* stout, short, ending in a point, white with white pubescence. Beard silvery white. *Antennae* black, a character which distinguishes it from other species of the same group, the first two joints with some greyish brown tomentum and black hairs, the third joint broader at base but with hardly a perceptible tooth, only an angle, with some grey tomentum on the basal part of joint. Subcallus and *forehead* covered with greyish tomentum, the latter hardly three times as long as it is broad, and a third narrower anteriorly, the frontal callus large, transverse, almost reaching the eyes, convex, black, shining, with its posterior border towards vertex irregular, the median callus is the same colour but smaller, not reaching the eyes, irregular in shape, in the type broken up, but in others heart-shaped, the pubescence of forehead short, yellow, scanty, thicker towards the vertex. Eyes with apparently one band starting from the frontal callus. *Thorax* blackish covered with grey tomentum, stripes indistinct. Scutellum the same. *Abdomen* narrow, blackish with grey tomentum, the first three segments reddish yellow at the sides, so that the blackish colour appears only as a median stripe, on each side round grey tomentose spots appear, and also as narrow median ones on the black colour, the segmentations and sides of abdomen reddish yellow, pubescence white at sides and on segmentations, black at apex, but always scanty; under side paler, yellowish, covered with grey tomentum. *Legs* yellow, fore tibiae at apex and tarsi blackish, middle tarsi with the last four joints brown, the posterior tarsi almost wholly brown, femora with some whitish pubescence. *Wings* clear, veins brown, no appendix or only the root of one, stigma yellow, very narrow and small.

♂. Similar, the *thorax* and *abdomen* more pubescent, the former with yellowish pubescence, the *scutellum* with long white hairs on posterior border, the abdomen with chiefly whitish yellow pubescence.

Eyes large, bare, the large facets yellowish, very distinct, the smaller ones black, continuing to vertex as a narrow border, no stripe is visible. One male measures 16 mm., the reddish yellow colour of abdomen is more extended in the males.

Tabanus polygonus, ♂ ♀, Walker.

List Dipt., v, Suppl. i, p. 237, 357 (1854); Ricardo, Ann. Mag. Nat. Hist. (7), xvi, p. 201 (1905).

Male (type) from Bagdad (W. K. Loftus), 50, 105; and another male from the same locality.

Female (type) from same locality.

The males would come in Brauer's table near *autumnalis*, *spectabilis* and *rectus*. The female, which is much smaller, may possibly not belong to the same species and has a slight resemblance in appearance to *Atylotus rusticus*, L.

A redescription may prove of use:—

Reddish brown species, with grey median triangular spots on the abdomen. Eyes bare; no long hairs on the hind part of the head.

Male. Head large; facets of eyes unequal, sharply divided, the large facets yellowish, extending over more than half the eyes, surrounded by a narrow zone of small facets above and a broad zone on the basal half. Frontal triangle grey, reddish at apex. Antennae red, with the apex darker; the third joint with a small tooth, long and slender, the annulated portion not so long as the basal joint; the ocelligerous tubercle small, brown. Face whitish, with white hairs; beard white; palpi white, the second joint oval, with white pubescence. Thorax blackish, with four grey stripes and greyish pubescence; the shoulders red; the sides reddish, with black hairs above and whitish ones below; scutellum black, with grey tomentum. Abdomen long and narrow, reddish, with a row of median grey triangular spots, which on the second and last segments are surrounded by black margins; the hind borders of the segments narrowly white, the pubescence black; the under side brighter red, with some irregular black markings. Legs red; the coxae and femora with longish white hairs; the tibiae with short black pubescence on the sides and some whitish yellow hairs on their flat surfaces; tarsi with black pubescence, pulvilli yellow. Wings longer than the abdomen, hyaline, the stigma and veins yellow; no appendix.

Length 18 mm., width of head 5 mm.

Female. Eyes not large, the facets equal, with two bands (in the male I can see no trace of bands). Frontal callus reddish brown, almost square, a little wider at its base, nearly touching the eyes; frontal stripe grey, forehead parallel, about five times as long as it is broad, with black markings (probably denuded), the middle callus being a black stripe not joining the frontal callus; the vertex blackish; no ocelligerous tubercle. Antennae at base red (the rest wanting). Frontal triangle grey. Face grey, with white hairs; beard white; palpi pale yellow, the second joint long and slender, at the base stouter, gradually tapering to a point, nearly straight, with a few black hairs. On the abdomen the grey triangular spots are replaced by a broad stripe of greyish tomentum, the black pubescence is longer, the abdomen not so pointed as in the males. Wings with the first posterior cell distinctly narrowed at the apex (this is not the case in the male).

Length 14 mm., width of head 4 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xvi, p. 201.

Tabanus pulverifer, ♀ ♂, Walker.

List Dipt., v, Suppl. i, p. 236, 356 (1854); Ricardo, Ann. Mag. Nat. Hist. (7), xvi, p. 201 (1905).

Male (type) from Turkey in Asia (Loftus).

Three females from the same locality (co-types) are nearly related to *Tabanus cordiger*, Mg., but belong to a distinct species; they differ in the following particulars:—

Antennae wholly red, black at the apex. Forehead one-third narrower anteriorly, about four times as long as it is broad, frontal callus reddish brown. Coxae and femora reddish yellow, as are the tibiae, only the anterior tibiae with a brown apex; tarsi reddish brown, all with white pubescence. The under side of abdomen has no median black stripe. The species is much lighter in colour and slighter in form than *cordiger*; the four specimens vary in size from 12—14 mm. In the female the band under the eyes is narrow and yellowish brown. In the male the black hairs on the hind part of the head are not present; the under side of the abdomen is reddish, greyer at the apex. Ricardo, Ann. Mag. Nat. Hist. (7), xvi, p. 201.

Tabanus quadrifarius, ♀, Loew.

Zeitschr. f. d. ges. Naturwis., N. F., ix, xliii, p. 414, 3 (1874). [*Atylotus.*]

From Schahrud, Turkestan.

Near *Tabanus bifarius*, Loew, but ornamented with four black stripes on abdomen, and with the femora except the grey base easily distinctly luteous, fore tibiae except the apices and the posterior wholly, the posterior tarsi at base wholly luteous. Eyes with one band. Forehead with two black spots. Length $5\frac{3}{4}$—6 lines. Wings $5\frac{1}{4}$—$5\frac{1}{2}$ lines. Loew, Zeitschr., etc., p. 414.

There are examples of *Tabanus bifarius*, Loew, in the Brit. Mus. coll. determined by Dr. Kertesz, from Greece and Hungary; these (females) have the frontal callus square, yellow, not reaching the eyes, the middle callus oblong, larger than the frontal callus, black. The femora wholly blackish, the tibiae yellow, black at apices, all tarsi blackish.

Presumably *Tabanus quadrifarius* has likewise two calli on forehead and probably belongs to the subgenus *Atylotus*; there is one female from Bagdad in Brit. Mus. coll. which may possibly be this species.

Tabanus sabuletorum, ♀, Loew.

Zeitschr. f. d. ges. Naturwis., N. F., ix, xliii, p. 414, 4 (1874). [? *Atylotus.*]

From Schahrud, Turkestan.

Dull whitish, with the thoracic stripes and the scutellum cinereous. Eyes naked, banded. Forehead very wide, the lower callus large, the upper one in undenuded specimens irregularly shaped, black. First joint of antennae whitish, the second red,

the third black, towards the base widely red, above concave but hardly at all excised. Palpi short, thick, white, and white haired. Abdomen cinereous, white spotted.

Legs black, femora greyish, knees and tibiae except the apices pale yellowish. Wings white, hyaline, veins however pale brown, auxiliary wholly and others towards base of wing dull yellowish with appendix. Length $5\frac{1}{3}$ lines, wings $4\frac{1}{2}$ lines. Loew, Zeitschr., etc., p. 414.

This species is not known to me.

Tabanus spectabilis, ♀, Loew.

Verh. zool.-bot. Ges. Wien, viii, p. 605, 34 (1858).

Tabanus ispahanicus, ♂, Rondani, Ann. Mus. Civ. Genova, i, p. 300, 8 (1873) [*aspahanicus*].

Rondani's type was not labelled, but owing to its striking appearance, I had no difficulty in recognising the one male specimen from N. Persia described by Rondani, and have no doubt it is the male of *Tabanus spectabilis*, recorded from Europe and Brussa in Asia Minor. The type ♀ came from Servia. There are two females of this species in the Brit. Mus. coll. from Bulgaria.

INDEX.

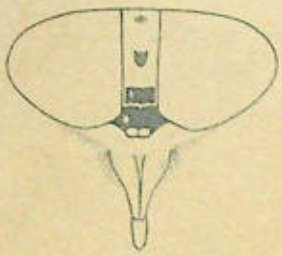
	Page
Bellardia sinicus	170
Group I	128
,, II	130
,, III	133
,, IV	135
,, V	138
,, VI	143
,, VII	149
,, VIII	167
,, IX	188
,, X	200
,, XI	227
Introduction	111
List of oriental species of *Tabanus*	231
List of species of *Tabanus* from Persia, etc.	246
Tabanus abazus	246
abbreviatus ..	153
abscondens ..	161
adjacens	248
agricola	135
albilateralis ..	230
albimedius ..	156
albocostatus ..	190
albofasciatus ..	146
alexandrinus ..	247
amaenus	167
angusticornis ..	237
annamitus ..	149
apricus	247
ardens	224
atrohirtus ..	209
auriflamma ..	148
auristriatus ..	161
aurotestaceus ..	163
autumnalis ..	247
basalis	147
bicallosus	129
bicinctus	132
bifarius	247
birmanicus ..	200
borniensis ..	216
bovinus	185
bromius	247
brunneus	176
brunnipennis ..	160
bubali	166
canipalpis ..	247
caerulescens ..	203
ceylonicus ..	223
chinensis	152
chrysurus ..	237
consanguineus ..	197
cordiger	239
Tabanus costalis	153
crassus	189
cyanops	247
cyprianus ..	248
decorus	247
discrepans ..	185
dissimilis	180
ditaeniatus ..	134
dives	180
diversifrons ..	214
eggeri	249
erythrocephalus ..	136
explicatus ..	191
factiosus	179
fielderi	186
flavicinctus ..	130
flavissimus ..	207
flaviventris ..	213
flavothorax ..	201
flexilis	141
formosiensis ..	220
fulvicornis ..	247
fulvimedius ..	197
fulvissimus ..	205
fulvus	133
fumifer	177
fumipennis ..	225
fuscicauda ..	217
fuscicornis ..	144
fuscomaculatus ..	183
geniculatus ..	200
gigas	247
glaber	249
graecus	247
hilaris	153
hirticeps	240
hirtipalpis ..	129
hirtistriatus ..	158
hirtus	228
hoang	134
humilis	240
hybridus	162
ignobilis	180
immanis	166
incultus	199
indianus	175
infuscatus ..	247
inobservatus ..	205
intermedius ..	187
ixion	226
japonicus ..	241
javanus	138
joidus	211
jucundus	164

		Page
Tabanus	justorius	192
	khasiensis ..	193
	lama ..	241
	laotianus ..	226
	leucocnematus ..	131
	leucohirtus ..	208
	leucopogon ..	184
	leucopterus ..	136
	leucosparsus ..	187
	lunatus	247
	malayensis ..	178
	mandarinus ..	170
	melanognathus ..	226
	miyajima ..	250
	monotaeniatus ..	159
	montanus ..	247
	mühlfeldi ..	247
	negativus ..	137
	nemocaliosus ..	137
	nephodes	145
	nexus	181
	nicobarensis ..	191
	nigrita	247
	nigropictus ..	210
	nigrotectus ..	202
	niveipalpis ..	247
	non-optatus ..	140
	obconicus ..	215
	optatus	139
	orientalis	198
	orientis	195
	oxyceratus ..	195
	pallidepectoratus ..	209
	palpalis	212
	pauper	207
	perakiensis ..	204
	persis	251
	polygonus ..	252
	polyzonatus ..	247
	pratti	143
	pulchellus ..	247
	pulchriventris ..	241
	pulverifer ..	254
	pusillus	242

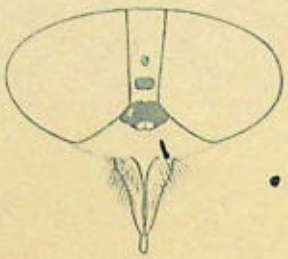
		Page
Tabanus	puteus	165
	quadrifarius ..	254
	rarus	128
	rubicundus ..	172
	rubidus	155
	rufiventris ..	185
	sabuletorum ..	254
	sanguineus ..	194
	servillei	188
	sexcinctus ..	133
	siamensis ..	212
	signifer	181
	significans ..	182
	simplissimus ..	221
	solstitialis ..	247
	speciosus	157
	spectabilis ..	255
	speculum	143
	stantoni	174
	striatus	149
	subcallosus ..	227
	subcinerascens ..	215
	subhirtus	219
	tataricus	242
	tenebrosus, Coq ..	243
	tenebrosus, Wlk. ..	203
	tinctothorax ..	202
	triangularis ..	167
	tricolor	247
	tristis ..	163
	tuberculatus ..	220
	umbrinus ..	247
	uniformis ..	218
	unifasciatus ..	247
	univentris ..	206
	vanderwulpi ..	143
	varicolor	172
	virgo	136
	wyvillei	229
	yao	244
	yokoamensis ..	246
Table of groups ..		113
Table of species ..		114
Therioplectes subgenus ..		227

EXPLANATION OF PLATE XIII.

FIG. 1.—*Tabanus varius.*
,, 2.— ,, *hirtipalpis.*
,, 3.— ,, ,,
,, 4.— ,, *bicallosus.*
,, 5.— ,, *bicinctus.*
,, 6.— ,, *nemocallosus.*
,, 7.— ,, *striatus.*
,, 8.— ,, *albimedius.*
,, 9.— ,, *brunnipennis.*
,, 10.— ,, *jucundus.*
,, 11.— ,, *puteus*
,, 12.— ,, *rubicundus.*

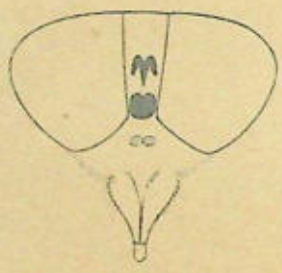


1

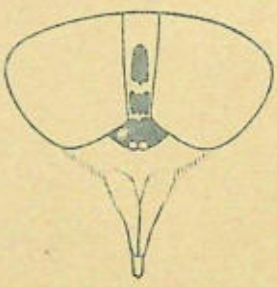


2

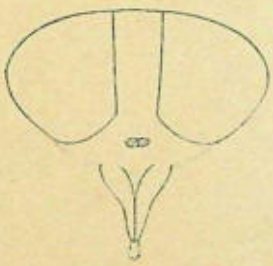
3



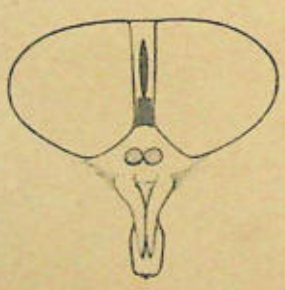
4



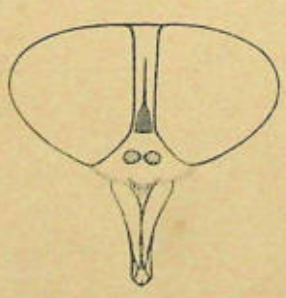
5



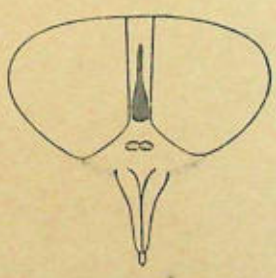
6



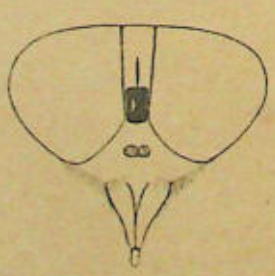
7



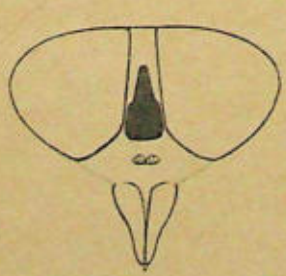
8



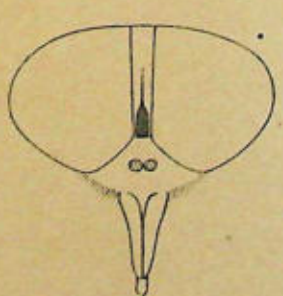
9



10



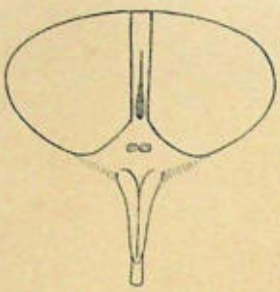
11



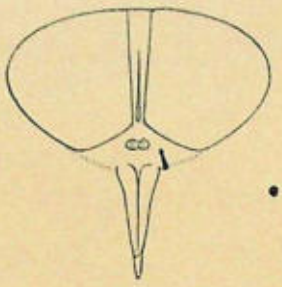
12

EXPLANATION OF PLATE XIV.

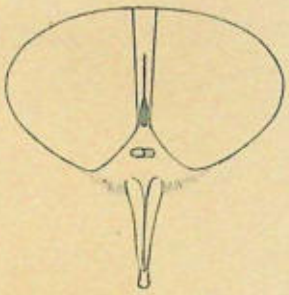
FIG. 13.—*Tabanus stantoni*.
,, 14.— ,, *fumifer*.
,, 15.— ,, *dissimilis*.
,, 16.— ,, *leucopogon*.
,, 17.— ,, *discrepans*.
,, 18.— ,, *orientis*.
,, 19.— ,, *palpalis*.
,, 20.— ,, ,,
,, 21.— ,, *subcinerascens*.
,, 22.— ,, *ceylonicus*.
,, 23.— ,, *glaber*.
,, 24.— ,, *persis*.



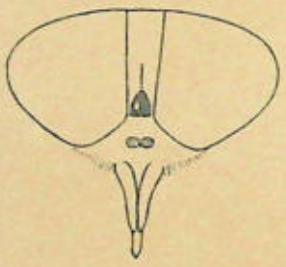
13



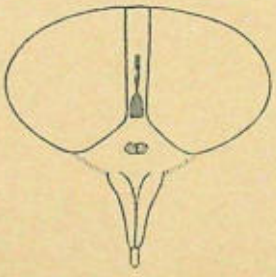
14



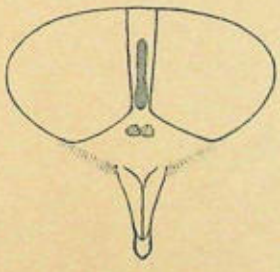
15



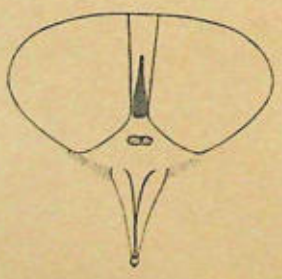
16



17

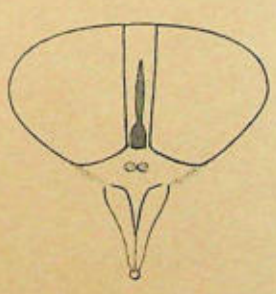


18

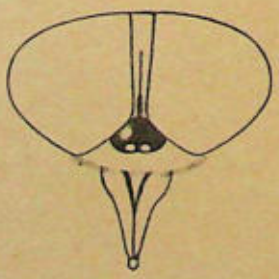


19

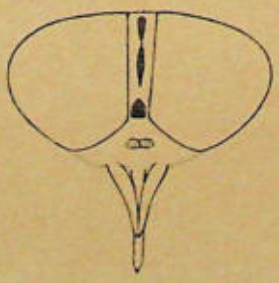
20



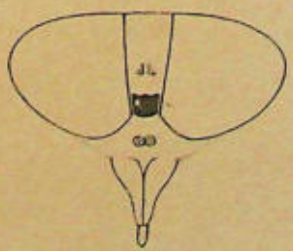
21



22



23



24

VII. NEW ORIENTAL NEMOCERA.

By E. Brunetti.

In the present paper are described nearly fifty new species belonging to the first suborder of Diptera. Figures of some of them, especially wings of the somewhat closely allied species of *Rhyphus* and *Dixa*, will appear in my forthcoming volume on Nemocera (exclusive of Culicidae and Chironomidae) for the "Fauna of British India" series.

RHYPHIDAE.

No less than six species of *Rhyphus* from the East have come before me, including the only one previously recorded (*maculipennis*, Wulp); a European species, *punctatus*, F., about the identification of which there can be little doubt, and also a variety of the common European *fenestralis*, Scop.

All these forms are rather easily separated by the following characters:—

Table of species.

A	Antennae conspicuously vari-coloured.	
B	Sub-apical clear spot in wing (at tip of 2nd longitudinal vein) elongated, and entirely clear	*maculipennis*, Wulp.
BB	The above spot nearly circular, and enclosing a distinct dark round spot	*pulchricornis*, sp. nov.
AA	Antennae wholly black.	
C	Thorax bluish ash-grey with chocolate-coloured stripes.	
D	Wing more deeply and extensively marked; distinct blackish spot at tip, whole distal margin more or less light blackish grey	*fenestralis*, Scop., var. nov. *indicus*.
DD	Wing much less deeply marked, and quite clear on distal portion, beyond the cross-veins; no apical spot whatever	*punctatus*, F.
CC	Thorax yellow, or brownish yellow, with reddish brown stripes.	
E	Costa darker, towards tip of wing showing distinctly a *quite clear*	

square spot on costa, only descending to the 3rd longitudinal vein, with a smaller contiguous spot below; a distinct, narrow brown streak beyond outer cross-vein; distal part of wing below 3rd longitudinal, nearly clear, with posterior veins very lightly suffused .. *distinctus*, sp. nov.

EE Costa much lighter, showing towards tip of wing only one, much less clear, *oval* spot, always descending below 3rd longitudinal vein, without any second spot adjacent; no brown streak outside outer cross-vein; distal part of wing below 3rd longitudinal, very slightly darker grey, and this towards the margin only, the posterior veins not individually suffused .. *divisus*, sp. nov.

Rhyphus maculipennis, Wulp.

A ♀ in the Indian Museum collection, dated 30-vii-10 (no locality given, but probably Assam), and one in my own collection from Peradeniya, Ceylon, xii-07, are almost certainly this species, although in the former specimen both the hind legs are missing. The wing agrees perfectly with Van der Wulp's plate. The antennae and abdomen in his type specimen were injured. Of the former, the first *three* (not *two*, as he says[1]) joints are yellow, joints 4 to 8 yellow with brownish marks, or wholly brownish, 9, 10 quite black, 11, 12 yellowish white, 13 to 16 quite black, the 16th with a short white style. The abdominal two basal segments are mainly dirty yellow, with black posterior borders, the remainder being brownish yellow with broadly black borders; the apical segments wholly blackish. Belly similar. The palpi are black.

Rhyphus pulchricornis, mihi, sp. nov.

♀. Base of Darjiling Himalayas. Long. 3½ mm.

Head.—Frons, fully one-third width of head, reddish yellow, bare; vertex with a few hairs; ocellar triangle small, black, isolated; antennae long, 16-jointed, variegated, the joints mostly reddish yellow and black, with a short, white style and two or three bristles at apex. The antennal joints 1, 2, 3 are reddish yellow, 4, 5, quite black, 6, 7, 8, reddish yellow, 9, 10, black, 11, 12 brownish yellow, 13 to 16 black, the appearance of the antenna suggesting that it is liable to variation. Palpi bright reddish yellow, with a few bristles; proboscis very short, yellow.

[1] Quite possibly a variable character.

Thorax yellowish, with three wide, dark, soft reddish brown stripes. Sides yellow, with black streaks. Some bristles on the dorsum. Scutellum yellow, with a few bristles.

Abdomen brownish yellow, blackish towards tip, posterior borders of basal segments widely black. Belly apparently concolorous.

Legs brownish yellow, minutely pubescent: tips of the femora, of the tibiae and of the tarsal joints blackish.

Wings pale grey: anterior border a little yellowish on basal half; posterior border pale blackish, slightly deeper at tip. A dark irregular band from the costa, reaching to the discal cell, and another, of about equal width, placed between the first and the infuscated wing tip. The clear space immediately adjoining the infuscated wing tip encloses a pale blackish oblong spot placed lengthwise on the costa. Outer side of the discal cell with a black suffusion, a black round spot in the 1st basal cell; posterior cross-vein and the anal vein narrowly black suffused. Halteres pale yellowish brown.

Described from a specimen in good condition in the Indian Museum collection from Siliguri (18—20-vii-07).

N.B.—This species is very near Van der Wulp's *maculipennis*, but I believe it quite distinct, differing in the wing marks, and in the wholly yellowish hind femora, these joints in Wulp's species having a black ring in the middle. The palpi, too, in Wulp's species are blackish and the thorax is described as yellow with *black* stripes.

Rhyphus fenestralis, Scop., var. nov. **indicus**, mihi.

♂ ♀. Himalayas and Assam. Long. 4-5 mm.

A number of specimens in the Indian Museum, from the Himalayas, show a difference from the usual form of this common European species, the difference being constant in all the specimens examined.

The apical spot in the wing is distinctly black, clearer cut, and of a different shape. In *fenestralis* (typical) it is brownish, and its inner sides form a right angle, and, at the edge of the wing, the spot extends distinctly below the 3rd longitudinal vein; whereas in *indicus*, it is quite black, the edge much more clearly cut, and the distal half of the spot does *not* extend below the 3rd longitudinal vein, although above this vein it reaches the wing tip as usual, so that the inner form of the spot is not a right angle, but irregular. Moreover, the abdomen is darker, especially in the ♀ in which sometimes the usual black bands extend over nearly all the abdomen. The abdomen in the ♂ is lighter than in the ♀, and shows traces of a dorsal line of elongated spots. In size, the variety is slightly larger, and all the examples have the brown ring on the hind femora, but though always present, it varies in intensity, and is darkest in the ♂.

From a careful comparison of the specimens with four ♀ ♀ from Austria, four ♀ ♀ taken by me in Wales, and a ♀ taken by Dr. Annandale in Mull, Scotland, 4—6-x-07 (all in the Indian Museum), I find no other difference from typical *fenestralis*. I have no European ♂ present to compare with, but in *indica* both sexes appear equally common.

This new form appears common in the Himalayas, the Indian Museum possessing it from Simla (7,000 ft.), 24-iv-07 and 10-v-09 [*Annandale*, common]; Matiana, Simla district (8,000 ft.), 28—30-iv-07 [*Annandale*]; Darjiling (7,000 ft.), 5—9-viii-09 [*Paiva*, common); also from Ukhral, Manipur (6,400 ft.) [*Pettigrew*].

Rhyphus punctatus, F.

Though I have no specimen to compare them with, I have little doubt that three ♀ ♀ in the Indian Museum represent this species, agreeing almost perfectly with Schiner's description. Two are from Kurseong, Darjiling (5,000 ft.), 10—26-ix-09 [*Lynch*], and the third from the same place taken on 9-ix-09 by Dr. Annandale.

Rhyphus distinctus, mihi, sp. nov.

♂ ♀. Darjiling district. Long. 3-4 mm.

Head.—Eyes absolutely contiguous in ♂ from the conspicuously raised ocellar triangle, which occupies the whole vertex, almost to the base of the antennae. Under side of head blackish grey. Frons in ♀ one-fourth the width of the head, and, with vertex and face, whitish grey; under side of head somewhat yellowish. Antennae wholly black with a little short grey pubescence, tips of both scapal joints sometimes narrowly brownish yellow; palpi black. Back of head with some soft long hairs, proboscis yellowish.

Thorax brownish yellow; with three moderately broad, somewhat reddish brown stripes; the outer ones extending from just below the anterior margin, nearly to the posterior one. The middle stripe extends from the anterior margin nearly to the scutellum, tapering gradually; often narrowly divided in front: there is also a small unicolorous transverse mark just below each shoulder.

A dorso-central row of stiff hairs, gradually diminishing in length extends from the posterior margin forwards, thence curving towards and over the humeral swellings.

There is a lateral row of 6 or 7 long stiff hairs above each wing and some post-alar ones. Scutellum brownish yellow, with a broad median brown band, and the extreme edges brown: metanotum shining dark brown.

Abdomen dark reddish brown, with a moderate amount of soft short yellow hair; hind margins of segments more or less narrowly yellowish, sometimes the posterior corners of the segments also. Basal segment sometimes lighter coloured. Belly yellowish, more or less dark marked, genitalia inconspicuous.

Legs light brownish yellow; tarsi dark; extreme tips of posterior femora black. There is generally a more or less distinct broad irregular blackish band occupying about the middle third of the hind femora, and the hind tibiae are more or less blackish for some distance at both base and tips: legs minutely pubescent.

Wings very pale grey, with brownish markings. The cross-veins are rather deeply but narrowly brown, whilst moderately dark brownish markings occur as follows: a square mark in the middle of the upper basal cell; a brown well-defined streak from the middle of the costa, narrowing gradually, passing between the above-mentioned square mark, and the inner transverse vein, crossing the base of the discal cell and continuing narrowly along the 5th longitudinal vein: a broader, also well-defined stripe from the costa (narrowing hindwards) passing clear of the outer transverse vein, terminating at the upper fork of the lower branch of the 4th longitudinal.

The tip of the wing down to the 3rd longitudinal vein is brown, leaving in front of it a distinct square shaped, quite clear spot, touching the costa and contiguous to the previously described stripe. It may be described differently by saying the whole of the costa is brownish, deepening towards the tip, with a quite clear square spot placed just touching the tip of the 2nd longitudinal vein, extending from the costa to the 3rd longitudinal. The distal part of the wing from below the 3rd longitudinal down to a little beyond the lowest branch of the 4th, is light brownish grey leaving a clearer streak across the 1st, 2nd and 3rd posterior cells, just before their centres and almost below, but a little previous to, the clear square costal spot. Nearly below this latter spot, but a little beyond it, yet just touching it in the 1st posterior cell is a nearly upright, oblong quite clear spot, on the outer side of which the brown colour is distinctly deeper for a very small space. The 6th longitudinal vein is very narrowly and not deeply suffused. Halteres yellowish.

Described from a number of both sexes from Darjiling (7,000 ft.), taken by Mr. Paiva, 5—8-viii-09, and a ♀ taken by Dr. Annandale at Kurseong, 2,000 feet below Darjiling, 4-ix-09.

Rhyphus divisus, mihi, sp. nov.

♂ ♀. Himalayas. Long. 3½—5 mm.

This species considerably resembles *distinctus* but differs in some minor characters, and very essentially in the wing markings. The row of stiff hairs behind the eyes and across the vertex is stronger. The basal abdominal segments in the ♂ are more yellowish on their posterior borders, and the middle line on the thoracic dorsum is very distinctly divided. The blackish band on the hind femora is confined to the ♂, whereas in *distinctus* it is sometimes present, though indistinctly, in the ♀. The wing markings are entirely different.

On a pale grey ground colour, the cross-veins are deeply but narrowly infuscated as is also the 5th longitudinal vein; the proximal two-thirds of the marginal cell is rather deeply blackish, with a slightly paler spot in a line with the outer cross-vein; the distal part of the wing is light blackish grey, much deeper at tip just above the 3rd longitudinal vein and a little below it, leaving a nearly clear oval spot touching the costa, at the tip of the 2nd longitudinal and extending downwards into the 1st posterior cell, a second, much fainter and more irregular clear spot occurs just beyond the outer cross-vein. The praefurca appears slightly obliterated about its middle. Halteres yellow.

Described from a good series of both sexes in the Indian Museum from the following localities:—

Darjiling (7,000 ft.), 5—12-viii-09 [*Jenkins* and *Paiva*, common]; Kurseong, 10—26-ix-09 [*Lynch*]; Gangtok, Sikhim State, 9-ix-09; also two pairs taken *in cop.*, Darjiling, 5-viii-09, and Gangtok, 8-ix-09. An apparently immature specimen from Phagu, Simla hills, 12-v-09 [*Annandale*].

A ♂ and two ♀ ♀ taken at Darjiling in company with the others have the thoracic markings almost obliterated, and the clear parts of the wing more extended; but they apparently belong to the same species.

N.B.—Of the three species (*fenestralis*, *distinctus* and *divisus*) taken by Mr. Paiva at Darjiling in August, 1909, he says that some were taken on windows and others along the roads of the town, where they were hovering in small swarms under the shade of the trees, but it would be impossible to say now whether all the species occurred in both habitats or not, as at the time of collecting, identification was impracticable.

DIXIDAE.

This family, like the Rhyphidae, contains but a single genus—, and this one, *Dixa*, has not previously been recorded from the East. Five species are here offered as new, as I am unable to identify any of them with such descriptions of Palaearctic species as are accessible to me.

DIXA, Meig.

Table of species.

A	Wing with more markings than a narrow transverse streak across the middle.	
B	Wing tip not infuscated. Thoracic stripes dark brown, abdomen brown.	
C	Wing nearly clear; only a few infuscated spots, mostly in basal and anal cells: no deeper black spots ..	*montana*, sp. nov.
CC	Wing with several blackish streaks; and four rather deep black marks	

	contiguous to and below the 1st longitudinal vein	*maculipennis*, sp. nov.
BB	Wing tip distinctly infuscated for a little distance. Thoracic stripes brownish yellow; abdomen brownish yellow	*ochrilineata*, sp. nov.
AA	Wing with only a narrow transverse streak across the middle. Thoracic stripes dark brown. Abdomen blackish.	
D	The transverse streak on the wing extending over the posterior cross-vein	*bistriata*, sp. nov.
DD	The transverse streak not continued over the cross-vein	*bifasciata*, sp. nov.

N.B.—*D. bifasciata* is possibly the ♀ of *bistriata*.

Dixa montana, mihi, sp. nov.

♂ ♀. Western Himalayas. Long. 2-3 mm.

Head.—Frons and back of head, lighter or darker, grey. Proboscis robust at base, pointed, moderately long, pubescent, brownish yellow; palpi dark brown. Antennae: 1st joint large, globular, yellowish brown, flagellum of apparently 12 joints, brownish yellow, closely pubescent, filamentous towards the tip, making it difficult to discover the exact number of joints.

Thorax.—Dorsum grey, sometimes a little yellowish, sometimes almost whitish. Three dark brown stripes, the median one, which is very narrowly divided more or less by a longitudinal pale stripe, runs from the anterior margin to beyond the middle, posterior to which it continues, much narrowed. The two outer stripes which are separated from the median one by a narrow space, begin some distance behind the shoulder and continue to the posterior margin of the dorsum; the space between them, posterior to the broad part of the median dark stripe, being light grey, traversed longitudinally by the attenuated continuation of the median stripe. A more or less indistinct transverse streak, or darker space, on the shoulders, brown or grey of a lighter or darker shade, sometimes with traces of a thin line connecting them. Scutellum yellow, metanotum brownish. Sides of thorax brownish or brownish grey, irregularly tinted.

Abdomen dark brown, with very sparse pale hairs. Genitalia in ♂ very small, yellowish, mainly concealed. The tips of (presumably) a pair of small claspers are visible. Ovipositor in ♀ small, with a reddish brown tip.

Legs pale brownish yellow. Tips of femora and tibiae, and the tarsi towards the tips, blackish; the hind tibiae being very distinctly though not greatly incrassated.

Wings pale grey; venation in accordance with the generic description. Three moderately small pale brown spots. The 1st

embraces the end of the praefurca, the base of the fork of the 2nd vein, and the anterior cross-vein: the 2nd spot is in the middle of the basal cell: the 3rd is placed across the middle of the 5th vein, thus falling in both the 2nd basal and the anal cells. A very pale grey, irregular, narrow but just distinctly perceptible streak joins the fork of the 2nd vein to the fork of the 4th. In addition there are some indistinct pale grey spots placed apparently irregularly in the basal half of the wing. Halteres yellowish.

Described from three ♂ ♂ and two ♀ ♀ in the Indian Museum collection, all captured by Dr. Annandale in the Simla district, with the following data: Simla (7,000 ft.), 10-v-09 (type ♂); Barogh (5,000 ft.), 10-v-10; Phagu (9,000 ft.), 11-v-09 (type ♀).

Types in Indian Museum.

Notes.—This species must bear some resemblance to the common European *D. maculata*, Mg. Of the descriptions available to me that of this species is the only one in which the slight but very distinct incrassation of the hind tibiae is mentioned. Yet this character, although distinctly present in all five Oriental species treated of here, and apparently common to both sexes, has not, so far as I am aware, been described as generic, unless indeed, Macquart is referring to this peculiarity in his words "jambes terminées par deux pointes, peu distinctes."

In the European species, *maculata*, the thorax is described as pale yellow, and there are stripes on the sides of the thorax, the base of the wing is yellowish, and lesser differences also are apparent between Meigen's species and the present one, which may be regarded as distinct.

Dixa maculipennis, mihi, sp. nov.

♂ ♀. Eastern and Western Himalayas. Long. 2-2¼ mm.

Head.—Back of head, vertex and frons light grey. Proboscis yellowish, distinctly dark brown at base; palpi dark brown. Antennae with two very distinct basal (scapal) joints, the 1st circular, very short, the 2nd subglobular, both orange-yellow: flagellum of at least 14 joints, possibly one or two more, if such are shorter, as they are not at all easily counted.

Thorax rather bright yellowish. Three dark brown thoracic stripes as in the previous species; and on each shoulder a distinct but not sharply defined brownish, curved, transverse streak, connecting the tip of the median stripe with the tip of the outer stripe. Prothorax forming a sort of imperfect collar, swollen on each side into an elongate lobe, lying close to the thorax. Scutellum dark brown, with a broad yellow median indistinct stripe; metanotum dark brown. A small brown scutellar bridge with a narrow yellow upper margin, joins the scutellum on each side to the wing base.

Abdomen brownish, a small blackish mark towards each side on the posterior margins, the segments becoming blackish towards

the tip of the abdomen. Genitalia in ♂ black, a pair of claspers, large, conical, fleshy, the 1st joint of which is yellowish; the 2nd joint is also conical, smaller, apparently pointed at the tip. (The claspers are closed together so that exact vision is impossible.) Ovipositor blackish.

Legs pale yellowish; tips of femora and tibiae, and the tarsi towards the tips, narrowly black: hind tibiae slightly but distinctly incrassated at tips.

Wings.—Venation normal. Pale grey, costal cell unmarked, the brown spots beginning on the 1st longitudinal vein. Four distinct brown spots in a row, with fairly clearly cut sides, are placed in juxtaposition to this vein; the 1st small, rounded, near the base; the 2nd, larger, squarish, below the tip of the auxiliary vein, both these two spots limited posteriorly by the 4th vein. The 3rd spot is a streak, beginning beyond the origin of the 2nd vein, and ending on the 4th vein, proximad of the anterior cross-vein. The 4th spot is over the fork of the 2nd vein. Much lighter pale brownish grey small spots are placed, possibly irregularly over the rest of the wing. In the single specimen present they are situated as follows: Two in the 2nd basal cell, two in the anal cell, one in the axillary cell; one each in the marginal, submarginal, and the 1st posterior cells, all united more or less into a streak, placed towards the tip of the wing. Two each in the basal (one basal, one central) and 2nd submarginal cells, also in the 1st posterior cell; one each at the base of the 3rd, 4th, and 5th posterior cells. Halteres yellowish.

Described from one ♂ and one ♀, the ♂ from Darjiling, 29-v-10, taken by me, the ♀ from Matiana (8,000 ft.), Simla district, 28—30-iv-07 [*Annandale*].

Types in Indian Museum.

NOTE.—Easily known by its marmorated wings.

Dixa ochrilineata, mihi, sp. nov.

♀. Darjiling district. Long. 2 mm.

Head light yellow. Eyes separated by a frons one-third the width of the head. Proboscis yellowish, with rather well-developed terminal dark brown lips; palpi dark brown. Antennae: 1st scapal joint very short and indistinct, 2nd large, globular, yellow; flagellum of 14 to 16 joints (?), dark brown, extreme base of 1st, yellow.

Thorax distinctly gibbous, prominent in front, yellow. Three brownish yellow dorsal stripes, somewhat normally placed, the median one attaining the anterior margin, the outer ones distinctly curved towards and over the sides anteriorly. Some soft long hairs in the neighbourhood of the stripes and in front of the wings.

Scutellum and metanotum yellow, the former a little brown at the sides, the latter in the middle. Sides of thorax with a dark

brown lateral stripe on a level with and passing across the bases of the coxae.

Abdomen brownish yellow, a little darker towards the sides. Ovipositor small, inconspicuous, pale yellow.

Legs.—Coxae and femora pale brownish yellow, femora a little lighter near the tips, the tips themselves blackish brown ringed. Tibiae and tarsi brownish.

Wings.—Venation normal. Very pale grey, costal cell wholly unmarked. Tip of wing very pale blackish from beyond the fork of the 2nd vein, the shade extending posteriorly as far as the 2nd posterior cell, filling it. A dark brown streak from the 1st longitudinal vein, passing over the origin of the 3rd vein, the anterior cross-vein, then in diminished intensity to the hind margin of the wing by way of the posterior cross-vein and the last section of the 5th longitudinal vein. A very pale blackish spot in the 1st basal cell, near its tip, an elongate one in the basal part of the 2nd basal cell, turning down at its proximal end into the anal cell. Wings a little yellowish at the base. Halteres pale yellow.

Described from ♀ from Kurseong, 9-ix-09 [*Annandale*].

Type in Indian Museum.

Dixa bistriata, mihi, sp. nov.

♂. Darjiling. Long. 2½ mm.

Head.—Proboscis and palpi brownish yellow, the former brown at the tip. Antennae: 1st scapal joint very wide and short, saucer-like, 2nd normal, subglobular; flagellum of not less than 12 joints, closely pubescent: the whole antennae dark brown, except the pale yellow extreme base of the 1st flagellar joint.

Thorax pale yellowish. Three dark chocolate-brown stripes of normal pattern, the median one extended somewhat linearly in front just below the shoulders. The shoulders themselves with a very pale blackish streak.

Scutellum and metanotum dark brown, a narrow yellowish stripe in the middle of the former. Sides of thorax yellowish, with brown marks.

Abdomen blackish, with a little pale yellow pubescence. Genitalia of moderate size, consisting of a pair of dark brown claspers, of which the second joint is cylindrical, much thinner, yellow; apparently a small dorsal plate is present in addition to the moderately large ventral one.

Legs pale brownish yellow, tips of femora and tibiae narrowly black ringed; tarsi darker.

Wings practically clear, a blackish narrow irregular streak in the middle from the 1st longitudinal vein, over the cross-veins, continued in an attenuated form along the posterior cross-vein and the terminal section of the 5th longitudinal vein. A very pale blackish streak in the basal part of the anal cell. Halteres yellow.

Described from a single ♂ taken by myself at Darjiling, 29-v-10.

Type in Indian Museum.

Dixa bifasciata, mihi, sp. nov.

♀. Western Himalayas. Long. nearly 3 mm.

Head.—The broad flat vertex light grey dusted, through which the dark ground colour can be seen. Proboscis yellowish brown, palpi long, concolorous. Antennae with its two scapal joints very distinct, dark brown; flagellum brown, except the pale yellow extreme base of the first joint.

Thorax pale yellowish. Three dark brown stripes of normal pattern, the outer ones continued much further forward than in the last species. Dorsum between the stripes greyish. Scutellum yellowish, metanotum dark brown. Sides of thorax yellowish, brown marked.

Abdomen blackish, with whitish pubescence; belly similar.

Legs pale yellowish, knees almost imperceptibly black, tarsi darker. Hind tibiae with the slight incrassation at the tip as usual, but yellowish.

Wings very pale grey, a rather dark brown narrow short streak in the centre over the cross-veins, not extending to the posterior cross-vein. A pale blackish streak filling the basal half of the anal cell. Halteres pale yellow.

Described from a single ♀ taken by Dr. Annandale at Phagu (9,000 ft.) in the Simla district. 12-v-09.

Type in Indian Museum.

NOTES.—This species is very near *bistriata*, and may possibly be identical with it. The differences lie in the respective lengths of the 1st scapal joint and in the lengths of the thoracic stripes; the femora and tips tips, black ringed in one species and practically all yellow in the other. The wing marks in the two species may be differentiated as follows: In *bifasciata* the central streak stops before or at the posterior cross-vein, this vein itself not being at all suffused, whilst in *bistriata* the suffusion is continued narrowly to the posterior margin. The basal pale streak in the anal cell is much more distinct in *bifasciata* than in *bistriata*. When placed side by side the two forms appear distinct, although the descriptions read so similar.

BIBIONIDAE.

PLECIOMYIA, mihi, gen. nov.

TYPE *Penthetria melanaspis*, Wied., Auss. Zweifl., i, 72 (1828) *Plecia melanaspis*, auct.

Allied to *Plecia*, W., from which it differs by the 4th longitudinal vein rather broadly forking immediately at the point of contact with the anterior cross-vein.

The 3rd longitudinal vein forks almost immediately beyond the anterior cross-vein, the upper branch lying almost parallel to the lower one.

A third but lesser character is the presence of twelve joints to the antenna, two short normally shaped basal ones forming

the scape, a comparatively long first flagellar joint, followed by eight others of a flattened bead shape, with a moderately long, conical terminal joint. This is not entirely a conclusive character, as at least one other allied Oriental species (*Plecia fulvicollis*, F.) has twelve-jointed antennae, instead of ten- or eleven-jointed as in the other allied species belonging to this region.

Pleciomyia melanaspis, Wied.

Even as early as 1828 Wiedemann recognised a generic difference between this species and the species of *Plecia*, by placing it in *Penthetria*. I have not seen any other species that can be referred to my new genus.

P. melanaspis is quite common apparently all along the Himalayas, the Indian Museum series representing Naini Tal, v-1893; Bhim Tal, 19—22-ix-06; Theog (Simla district), 27-iv-07; Kurseong, 9-ix-09; Siliguri, 18—20-vii-07 (both Darjiling district, hills and plains respectively). From the latter locality there is a ♂ and ♀ *in cop.* Also from Soondrijal and Katmandu (both Nepal), Sikhim and Mungphu in the E. Himalayas, and Sibsagar, Shillong, Margherita in Assam.

It is known from Siberia, China and Japan, and I found it common both at Darjiling, 21-ix to 2-x-08, and also at Hankow, China, 22—26-iv-06, but only sparingly at Mussoorie, 20-v-05.

PLECIA, Wied.

Table of species.

A	The 3rd longitudinal vein forks at some distance beyond the anterior cross-vein (nearly at half the length of its lower branch) and always distinctly beyond the fork of the 4th vein.	
B	Whole thorax reddish yellow, including dorsum, sides, scutellum and metanotum. Antennae 12-jointed ..	*fulvicollis*, F.
BB	Dorsum of thorax and scutellum reddish yellow; the sides and metanotum black. Antennae 10-jointed ..	*tergorata*, Rond.
AA	The 3rd longitudinal vein forks shortly beyond the anterior cross-vein (distinctly before one-third of the length of its lower branch), and approximately opposite the fork of the 4th vein; the upper branch lying almost parallel to the lower one, not almost erect as in Division A.	
C	Not wholly black species. Dorsum of thorax reddish yellow. Antennae 11-jointed	*indica*, sp. nov.

CC Wholly black species.
D Legs wholly black. Long. 8—12 mm.
Antennae 11-jointed .. .. *atra*, sp. nov.
DD Legs mainly brownish. Long. 6-7 mm.
Antennae 10-jointed .. .. *obscura*, sp. nov.

Plecia fulvicollis, F.

P. subvarians, Wlk.
P. thoracica, Guer.

This species appears as common in the plains of the eastern tropics as *melanaspis*, Wied., is in the higher and more northern parts. The Indian Museum has it from many parts of India, Lower Burma, Assam, Java and Ceylon.

I have taken it myself at Jubbulpore, Meerut (both India), and in Java. It is known from many of the East Indian and Philippine Islands.

Through the kindness of Mr. E. E. Austen, who has examined the type ♂ and ♀ of *subvarians*, Wlk., in the British Museum, I am able definitely to allot this name synonymic rank, and from notes on *thoracica*, Guer., supplied by the same gentleman I have no hesitation, knowing the variability of *fulvicollis* from the large number of specimens examined from many parts of the East, in regarding Guerin's species as also identical.

Moreover, Van der Wulp's reference to *thoracica* is incorrect; it should be Belanger's Voyage aux Indes Orientales (1833).

Like many species in this family, it varies considerably in size, from 5½ to 7 mm., one specimen in the Indian Museum being barely 4 mm. long.

Plecia tergorata, Rond.

In the Indian Museum from Bhim Tal (4,500 ft.), 19—27-ix-06; Sukna (500 ft.), 1-vii-08 [both *Annandale*]; Darjiling, 6—9-viii-09 [*Paiva*]; Shan Hills, Upper Burma [*J. Coggin Brown*]. A pair *in cop.* from Bhim Tal, 27-ix-07.

It is also known from Burma, Borneo and Java.

N.B.—In spite of Rondani's remark that the wing is wholly black, without trace of yellow at the base, three or four of the above-mentioned specimens have the wings wholly yellowish brown, yet there can be little doubt of their identity with this species. In both *Pleciomyia melanaspis* and *Plecia fulvicollis* the wings are sometimes more brown than black. The scapal joints and first flagellar joint of the antennae are relatively longer than in either *melanaspis* or *fulvicollis*.

Plecia indica, mihi, sp. nov.

♀. Himalayas. Long. 6—9 mm.

Entire body black, with the exception of the dorsum and upper part of the thorax, above the ridge line about the insertion

of the wings. This part is wholly bright ferruginous red, and very minutely pubescent.

Wings blackish, darker on anterior border; stigma and halteres black. *Antennae* as in *atra*, but the first flagellar joint hardly longer than those immediately following.

Described from two ♂♂ and several ♀♀ in the Indian Museum from Darjiling, 2-x-08 [*Brunetti*]; Theog (Simla hills), 27-iv-07, and Kumaon, ix-1906 [both *Annandale*]; Soondrijal (Nepal), Kangra Valley (4,500 ft.) and Kimoli, 24-x-07. I also took it at Darjiling, 10—16-x-05.

Plecia atra, mihi, sp. nov.

♀. Nepal and Western Himalayas. Long. 8—12 mm.

Entire body deep velvet-black, especially on the dorsum of the thorax. Antennae of eleven joints, the scapal two, subcylindrical, the 2nd being wider at the tip; the 1st flagellar joint is cup-shaped at its base; the following seven joints of equal size, of flattened bead shape, the last one, small, conical; the whole antenna straight and slightly pubescent.

Abdomen rough, minutely pubescent. Legs bare, pulvilli greyish white.

Wings blackish, anterior part much darker, stigma black; halteres greyish black. The 4th longitudinal vein not forked until some distance from the anterior cross-vein. Upper branch of the 3rd longitudinal vein long, almost parallel to the lower one, originating close to the anterior cross-vein.

Described from four ♀♀ in the Indian Museum from Kumaon (Bhim Tal, 4,500 ft.), 19—22-ix-06 [*Annandale*], and from Soondrijal, Nepal.

This is the only wholly black eastern species except my *obscura*, which is more dirty black in colour with a tendency to brown in the legs, besides being smaller in size.

Plecia obscura, mihi, sp. nov.

♂♀. Western Himalayas. Long. 6-7 mm.

Wholly dirty black, minutely pubescent. Thorax, on dorsum and sides sometimes brownish (in one specimen). Femora dark mahogany-brown, remainder of legs blackish brown. Antennae rather stout, black, scapal joints equal in length, short; 1st flagellar joint longer than each scapal joint, slightly pinched in the middle; remaining seven joints subequal, normal (no obvious minute apical joint in one example, antennae incomplete in the other two).

Vertex in ♂ wholly occupied by the very large cup-shaped ocelli, which are placed, so to speak, on their sides with their bases united.

Genitalia in ♂: a pair of strong hairy claspers, two-jointed, the basal joint the longer and stronger, the 2nd joint ending

apparently in a single claw. In the ♀ the genital organ is narrow, cylindrical, short, ending in a pair of rather slender palp-like appendages.

Wings blackish brown, darker on anterior part: venation as in *indica*.

Described from two ♂♂ and one ♀ in my collection captured by me at Mussoorie, 24-v-05. Not in very good condition but the specific characters quite distinct enough to recognise as representing a good species.

BIBIO, Geoff.

Table of species.

A	Thorax partly or wholly reddish yellow or brownish yellow (at least the *dorsum wholly red* in all the species except *discalis*, in which it is black).	
B	Dorsum of thorax yellowish.	
C	Abdomen wholly reddish yellow ..	*hortulanoides*, ♀, sp. nov.
CC	Abdomen wholly black	*bicolor*, Wlk.
BB	Dorsum of thorax black	*discalis*, sp. nov.
AA	Thorax wholly black.	
D	Abdomen wholly reddish yellow ..	*abdominalis*, sp. nov.
DD	Abdomen wholly black.	
E	Larger species; at least 10 mm. long. Basal section of 3rd longitudinal vein usually much longer than the anterior cross-vein.	
F	Species 14 mm. long	*hortulanoides*, ♂, sp. nov.
FF	Species 10 to 12 mm. long	*obscuripennis*, Meij.
EE	Smaller species; at most 7 mm. long. Basal section of 3rd longitudinal vein barely, if any longer than the anterior cross-vein.	
G	Femora wholly bright reddish or yellowish.	
H	Femora yellowish, tibiae yellow ..	*johannis*, L.
HH	Femora reddish, tibiae and tarsi black	*rufifemur*, sp. nov.
GG	Femora wholly black or dark brown.	
I	Hind tibiae reddish yellow. Veins on posterior part of wing distinct to hind margin, but paler than those in anterior half	*fuscitibia*, sp. nov.
II	Hind tibiae dark brown or black. Veins uniformly distinct, or those on posterior half of wing paler, and either distinctly continued to the hind margin or abbreviated.	

J	Veins on posterior half of wing, viewed from certain directions, as distinct as those on anterior half. Hind tibiae black	*approximatus*, sp. nov.
JJ	Veins on posterior half of wing less distinct than those on anterior half.	
K	Hind tibiae dark brown, lower branch of 4th vein and upper branch of 5th vein not reaching border of wing ..	*defectus*, sp. nov.
KK	Hind tibiae black. All the veins attain the wing margin	*proximus*, sp. nov.

N.B.—The above table is constructed for the sake of convenience only, and does not illustrate the affinities of the species. The order in which the descriptions are arranged is intended to represent their affinities. Schiner and others have adopted the relative lengths of the basal section of the 3rd longitudinal vein and the anterior cross-vein, as the preliminary distinction in separating the species, but in view of its decided variability in *obscuripennis* and the closely allied European *marci*, L., it seems safer to distinguish the species comprised in the present paper by their conspicuous differences of colour.

Bibio hortulanoides, mihi, sp. nov.

♂ ♀. Darjiling district. Long. ♂ 14 mm., ♀ 11-12 mm.

Head.—In ♂ eyes closely contiguous from the vertex to immediately above the antennae, leaving a very small frontal triangle, the eyes with dense dark brown hair. Proboscis, palpi and antennae black with thick long dark brown hair, which is also long and thick behind the vertex. Vertical triangle conspicuously elevated bearing the three ocelli.

In the ♀ the frons is one-third the width of the head, shining black, with some black short hair, ocellar tubercle as in ♂. The other parts as in the ♂ but the hair is more blackish than brown, whilst the pubescence on the proboscis, palpi, under side of head and behind the eyes is yellowish.

Thorax.—In ♂, dorsum, scutellum and sides shining black, densely covered with blackish brown hair. In the ♀ the dorsum is bright brownish yellow (with microscopic concolorous pubescence), the colour very sharply delimited. The remainder of the thorax black, moderately shining, with short black hairs. Scutellum and scutellar ridge black; metanotum black.

Abdomen.—In ♂, shining black, wholly covered on all sides with thick blackish brown hair. The genital organs shining black, obtuse, bilobed. In the ♀, bright brownish yellow with short concoiorous pubescence; belly similar. Genital organs inconspicuous.

Legs shining black, pubescent, spines on fore tibiae with a dull carmine tinge, pulvilli yellowish white.

Wings brownish in ♂ as in *obscuripennis*, Meij.; in ♀ very pale grey, conspicuously lighter than in the ♂, anterior border a little blackish in the ♂, but wholly deep black in the ♀. Stigma large, black. Halteres black.

Described from a ♂ and ♀ in bad condition in the Indian Museum (labelled simply "Ind."), which were returned by Bigot marked "*hortulanus* ♂ ♀ ?"; also a perfect ♀ obviously of the same species taken at Kurseong, 15-v-10.

Types in the Indian Museum.

NOTE.—This is either a large and well-marked variety of *hortulanus*, L., or distinct. The differences apparent are, the much greater size of the ♂, *hortulanus* being generally about 8 to 11 mm. in length; the brown, not whitish wings in the ♂, the yellowish hair in the ♀ on the under side of the head and behind the eyes, the hair in this position in *hortulanus* (♀) being black.

Bibio obscuripennis, Meij.

This species was abundant at Darjiling during a few days before and after October 16th 1905, when I captured several pairs *in cop.* in addition to a good number of males and a lesser number of females. My identification of the species was confirmed by Herr Meijere.

Its chief distinction from *marci*, L., to which it bears a remarkably close resemblance, is the brown wings in the ♂. In *marci* they are nearly clear, with a whitish tinge. The basal section of the 3rd longitudinal vein in both species varies distinctly in its length relative to that of the anterior cross-vein, in some specimens being one and a quarter times as long, in others as much as nearly double, and it cannot be relied on exclusively as a specific character.

The species is represented in the Indian Museum by specimens from the following localities: Chitlong (Nepal); Darjiling, 16-x-05 [*Brunetti*]; 27-v-10 (6,000 ft.) [*D'Abreu*]; Kurseong, 23-iv-10 [*D'Abreu*]; Naini Tal, 28-ix-07; Matiana (Simla hills, 8,000 ft.), 28, 30-iv-07 [*Annandale*]; Chinese Frontier, N. W. Burma (4—5,000 ft.). xi-10 [*C. W. Beebe*].

Bibio proximus, mihi, sp. nov.

♂. Darjiling. Long. 5 mm.

Head wholly black, clothed with black hairs, including dense pubescence on the eyes.

Thorax wholly black, dull, dorsum rather more shining anteriorly, pubescence black.

Abdomen black with black pubescence.

Legs black: hind femora barely incrassated posteriorly, distinctly less so than in *marci*; hind tibiae more incrassated towards

tips than in that species, giving a distinct clubbed appearance: hind metatarsus distinctly incrassated, the second joint of the tarsi two-thirds as long as the metatarsus. (In *marci*, the metatarsus is not at all incrassated, and is twice the length of the next joint.) Spines on fore tibiae carmine tipped.

Wings very pale grey, only the anterior veins dark, those on hind part of wing normally pale: 1st section of 3rd vein barely as long as anterior cross-vein (in *marci* it is always distinctly longer, often twice as long). Halteres black.

Described from a single ♂ from Darjiling taken November, 1910, by Mr. D'Abreu.

Type in Indian Museum.

Notes.—This species is intermediate between *marci*, L., and *obscuripennis*, Meij. From the former it is distinguished by the black, not dark brown pubescence; the shortness of the basal part of the 3rd longitudinal vein, and the incrassation of the hind metatarsus. Minor differences are the lesser incrassation of the hind femora, the greater incrassation of the hind tibiae and the pale grey wings, as contrasted with the quite whitish wings of *marci*.

When placed by the side of a specimen of *marci*, these differences appear sufficiently distinctive.

From *obscuripennis*, Meij., it differs by its smaller size and clearer wings and in the structure of the hind metatarsus, which in Herr de Meijere's species is not distinctly incrassated and is twice the length of the following joint.

Bibio abdominalis, mihi, sp. nov.

♂ ♀. Western Himalayas. Long. 7-8 mm.

Head wholly black; vertex very small, shining black, with small distinct ocellar triangle. Eyes (which are densely pubescent in the ♂ with very dark brown or nearly black hair), contiguous from vertex to antennae, the frontal triangle very small. Antennae and palpi wholly black, moderately pubescent.

Thorax shining black, closely pubescent; a fan-like bunch of hair in front of and another one below the root of the wing. Scutellum and metanotum shining black, the former with long soft black hairs on posterior margin, with a tendency to curl forwards; metanotum bare.

Abdomen shining black in ♂, with close long black pubescence; belly similar. Genital organs confined in a hard squarish segment-like case. In the ♀ the abdomen is normally wholly reddish yellow, with minute sparse black pubescence; belly similar. Genital organs apparently comprised in a flat elevation on the under side of the last abdominal segment.[1]

[1] In the type ♂ and ♀, which still remain united, both abdomens are considerably stretched out, as though the insects in life had endeavoured to separate themselves, yet no extension of any part of the male genitalia can be seen. There

Legs shining black, anterior femora with dense black hair, hind pair with the hair much sparser: tibiae and tarsi moderately pubescent.

Wings dark grey in ♂, a little blackish in ♀, in both sexes somewhat iridescent in certain lights, costal cell and stigma brownish, veins dark brown. The basal section of the 3rd longitudinal vein is almost exactly equal to the anterior cross-vein. The 4th longitudinal vein forks immediately before the posterior cross-vein. Halteres blackish.

Described from a type ♂ and ♀ taken *in cop.* by Mr. A. D. Imms at Badrinath (10,200 ft.), Garhwal district, 27-v-10, also from one additional ♂ and three additional ♀♀ of the same date and locality, and a ♀ taken by Dr. Annandale at Phagu (Simla district, 9,000 ft.), 11-v-09.

Types in the Indian Museum (also most of the other specimens).

NOTES.—One of the three females referred to above has the abdomen blackish except towards the side, where the colour is sufficiently distinct to identify the specimen with certainty with this species.

This species is very like *B. marci*, L., the common Palaearctic and North American species, but in that species the ♀ abdomen is wholly black as in the ♂, so that in spite of the resemblance between the males, the specific difference between the two forms is indisputable.

Bibio approximatus, mihi, sp. nov.

? = *venosus*, Meig., var.

♀. Darjiling district. Long. 5-6 mm.

Body wholly black, head much flattened, slightly pubescent. Dorsum of thorax with sparse short black hairs; a very small brownish yellow spot just below posterior corners of dorsum. Scutellum and metanotum black. Legs with terminal spines on fore tibiae reddish brown, apical spurs on posterior tibiae, brownish yellow. Hind metatarsi not at all thickened, nearly twice as long as the 2nd tarsal joint. Abdomen with very pale yellowish hairs. Ovipositor normal.

Wings pale yellowish grey, hardly darker on anterior part; veins pale brownish yellow, but clearly defined; those on hinder part of wing when viewed from certain directions appear almost as dark as the anterior veins. Stigma large, well defined, oval, black, a slight narrow blackish suffusion over base of 5th longitudinal vein. Basal portion of 3rd longitudinal vein almost exactly equal to the length of the anterior cross-vein. Halteres black, but basal half of stem yellowish.

---

is a small thick rounded organ between the two abdomen tips of the same red colour as the ♀ abdomen, but it is not obvious to which abdomen it really belongs.

Described from one ♀ from Kurseong, November, 1910, taken by Mr. D'Abreu.

Type in Indian Museum.

Note.—This species must bear a considerable resemblance at first sight to *Bibio venosus*, Meig., owing to the rather clear wings, the distinctness of the veins, and the similarity in size. Though the abdomen is given as only a little over 5 mm. in length, it is probably more in living specimens, as the single example examined appears to be shortened by shrinkage; otherwise the wings are abnormally long, their full expanse being 20 mm. The relative length of the hind metatarsus to the following joint is practically identical in both species, and it is quite possible the specimen before me really is a variety of *venosus*, Meig., bearing about the same relation to it as *obscuripennis* does to *marci*, the only suggested differences in my new species from *venosus* being the grey instead of clear wings, and the pale yellow instead of whitish colour of the abdominal pubescence.

Bibio discalis, mihi, sp. nov.

♀. Western Himalayas. Long. 5½ mm.

Head.—Frons over a third the width of the head, dull black with sparse short black hair. Ocellar triangle normal. Pale hairs behind the vertex. Antennae black, scape yellowish. Tip of proboscis yellowish and the 1st joint of the palpi also, the remainder black, all the organs with black pubescence.

Thorax.—Dorsum dull black, sharply delimited from the wholly yellowish remainder of the thorax. Prothorax considerably enlarged, conspicuously over the anterior corners of the dorsum. Scutellum yellowish, metanotum black. The whole thorax, with the scutellum with pale yellow hairs.

Abdomen black; pale yellow hairs on both dorsal and ventral sides, extreme tip and belly yellowish.

Legs yellowish, knees narrowly black; fore tibiae and tarsi (in one example) with a slight pale reddish brown tinge and the spurs carmine tipped; tips of tarsi brown.

Wings pale grey, anterior border no darker, stigma light brown, elongate. Halteres yellowish.

Described from two ♀ ♀ from Phagu, Simla district (9,000 ft.), 11-v-09, taken by Dr. Annandale.

Type in Indian Museum.

Note.—This species has considerable resemblance to *B. johannis* ♀, but the distinctly yellowish thorax with well-defined black dorsum at once distinguish it from the European species, in which the whole thorax is black or blackish brown.

Bibio johannis, L.

Two males, taken by Dr. Annandale at Matiana, 28—30-iv-07, and another from Theog (9,000 ft.), 2-v-07 (both places, Simla district), certainly represent this well-known European species.

Bibio rufifemur, mihi, sp. nov.

♀. Darjiling. Long. 6-7 mm.

Head black; antennae with a little blackish pubescence; some short grey hairs behind head. Ocelli close together on a small triangle on extreme vertex; frons wholly bare.

Thorax black, a little brownish grey hair on pleurae. Scutellum and metanotum shining black, former with a few short black hairs on hind margin.

Abdomen black, roughened, with black and brown hairs.

Legs.—Coxae shining black, with microscopic yellow pubescence, and a few longer hairs; tips reddish on outside. Femora bright orange-red, with sparse, very short, yellow hairs, tips black. Remainder of legs black, with short black or brown hairs, tips of tarsi joints narrowly yellowish brown.

Wings brownish grey, darker anteriorly; costal cell rather dark brown; stigma distinctly dark brown, rather small, elongated egg-shaped, not touching 3rd longitudinal vein. Veins on front half of wing brown, 4th, 5th and 6th veins brownish yellow: 4th vein forks rather widely at junction with posterior cross-vein and just beyond tip of 2nd vein. Halteres black.

Described from two ♀ ♀ in my collection, taken by me at Darjiling, 20-x-05.

Bibio fuscitibia, mihi, sp. nov.

♂. Western Himalayas. Long. 5-6 mm.

Head black, with rather long and thick black hairs, mixed with some dark brown ones; antennae and palpi black, mouth greyish white.

Thorax and scutellum shining black, black haired.

Abdomen black, moderately shining, with blackish and dark brown hairs. Belly similar.

Legs normal; femora black with brown hairs; fore tibiae dark brown, ending in a light brown spine, posterior tibiae reddish brown, middle pair darker, black at tips, shortly setose; hind pair with softer hairs, darker towards tips; tarsi brown, darker at tips; hind metatarsus thickened, one-and-a-half times as long as next joint.

Wings nearly clear, stigma dark brown, moderately long, and distinct: 4th longitudinal vein forking exactly at junction with outer cross-vein, the branches not widely separated. Halteres black.

Described from a ♂ in the Indian Museum collection from Phakia, Kumaon district (10,700 ft.), taken by Mr. A. D. Imms, 3-vi-09.

N.B.—This species bears a considerable resemblance to the European *B. laniger*, Mg., but that species has greyish brown, thicker, woolly hair, and a comparison of specimens of the two species shows them to be quite distinct.

Bibio defectus, mihi, sp. nov.

♂. Darjiling. Long. 3½ mm.

Head and appendages wholly black, very shortly pubescent.

Thorax shining black, with dark brown hairs; scutellum and sides black.

Abdomen black with brown hairs, greyish hairs at the tip and at the sides near the base.

Legs dark brown, hind femora nearly black, somewhat long, distinctly though not greatly clubbed, hind tibiae a little lighter, with darker streaks, also clubbed.

Wings pale brownish grey; stigma moderately large and distinct; 4th longitudinal vein forking distinctly proximad of the posterior cross-vein, the branches moderately diverging; lower branch of 4th and upper branch of 5th veins shortened, not reaching the wing-margin. Halteres black.

Described from a unique ♂ from Kurseong, taken 13-viii-09 [*Paiva*]; preserved in the Indian Museum.

Note.—This species comes in the group containing the European species *clavipes*, *varipes*, etc.

Dilophus graciosus, Big.

Redescription.

♂ ♀. N. India; China. Long. ♂ 3 mm., ♀ 3½-3¾ mm.

♂. Eyes rather bright reddish brown, some long whitish hairs below the head. Thorax shining, abdomen somewhat roughened; posterior margin of scutellum, and a scutellar ridge below it, connecting it with the metanotum, bright brownish yellow. The whole body with short sparse pale hairs. Legs reddish brown, with yellowish hairs (longest on the femora); coxae and tarsi tips darker. Wings (damaged) nearly clear, stigma dark brown, distinct but ill-defined; halteres black, rather large, stems yellow.

♀. Head black, shining, eyes long, antennae jet black. Thorax bright ferruginous, with a thin black dorsal line, which widens anteriorly and extends along the anterior borders of the thorax nearly to the shoulders.

Abdomen dull ferruginous, dorsum of segments blackish, the first two or three segments nearly wholly blackish on upper side. Belly ferruginous. Legs black, all the coxae, the fore femora wholly, middle femora wholly, except the tips, and the basal half of the hind femora, bright ferruginous. Wings uniformly yellowish grey, stigma large, clear cut, black.

Redescribed from specimens of both sexes in the Indian Museum including the type ♂ and ♀, which were taken *in cop.* by Major Sage in September 1890 at Dharamsala, Western Himalayas. The other specimens are from Amangarh, Bijnor District, United

Provinces, 24-ii-10; Kurseong, 24-vi-10; Theog (8,000 ft.), 2-v-07; Phagu (9,000 ft.), 11-v-09 [*Annandale*]; Kumaon district (5,700 ft.), July 1909 [*Imms*]; Darjiling, 21-iv-10 [*Beebe*].

A ♀ in the same collection from Yunnan, South China, almost certainly represents the same species.

Type ♂ and ♀ in Indian Museum.

Scatopse brunnescens, mihi, sp. nov.

♀. Ceylon. Long. 2 mm.

Whole body and legs dark shining brown, slightly yellowish, tinged here and there with short whitish pubescence. Dorsum of abdomen nearly black, belly dark brownish yellow. Antennae with 2nd scapal joint a little longer than the 1st, followed by six flagellar short, wide, rounded joints, with a long (equally broad at its base), conical terminal joint; all the antenna with close greyish pubescence.

Wings with the two anterior distinct veins joined towards the base by a short cross-vein, the 1st of these veins ending before the middle of the costa, the 2nd ending some little distance before the tip of the wing, at the spot where the costal vein ends. Of the faint veins, the 1st is perfectly straight, ending some little distance below the tip of the wing, forked beyond its middle, the branch vein being anterior to the vein itself, the prong of the fork ending exactly at the wing tip. The next vein is slightly curved, attaining the wing-border faintly: the 3rd and 4th veins are short and distinct, both curved rather suddenly downwards towards their tips to the hind margin.

Described from one specimen from Peradeniya, 9-viii-10 [*Gravely*].

Type in Indian Museum.

Scatopse nigronitida, mihi, sp. nov.

♂ ♀. Western Himalayas. Long. 2-2½ mm.

Wholly shining black with minute black pubescence. Femora with a tinge of dark brown in certain lights. Wings clear; 4th vein originating immediately proximad of tip of 1st, the branches diverging gradually up to half their length, afterwards diverging widely. Upper branch of 5th nearly straight; lower branch, originating near base, almost at right angles, nearly straight. Halteres thick, brown.

Described from two pairs taken *in cop.*, an additional ♂ and 2 ♀ ♀ in the Indian Museum from Dharampur (5,000 ft., Simla hills), 14-v-08 [*Annandale*].

SIMULIIDAE.

SIMULIUM.

Table of species.

A	Thorax distinctly reddish brown, with short yellow hair	*rufithorax*, sp. nov.
AA	Thorax black; at most with a dull reddish brown tinge occasionally.	
B	Thorax with grey shoulder spots, and a wide greyish band on posterior margin	*griseseens*, sp. nov.
BB	Thorax without either grey shoulder spots or posterior marginal band.	
C	Abdomen destitute of any sign of yellow hair.	
D	Hind metatarsus much incrassated, nearly as long and as large as the tibia[1]	*metatarsalis*, sp. nov.
DD	Hind metatarsus not so conspicuously incrassated: distinctly less in size than the tibia.[1]	
E	Antennae wholly black. Long. 2½ mm	*griseifrons*, sp. nov.
EE	Antennae reddish yellow at base. Long. 1½ mm.	*rufibasis*, sp. nov.
CC	Abdomen with short bright yellow hair, or with rather shaggy brownish yellow hair.	
F	Abdomen with normal, short, very bright yellow hair.	
G	Abdomen with at least the first two segments distinctly yellowish or brownish yellow, often several segments so coloured	*indicum*, Becher.
GG	Abdomen all black	*aurcohirtum*, sp. nov.
FF	Abdomen with distinctly longer shaggy brownish yellow hair	*senilis*, sp. nov.

Simulium rufithorax, mihi, sp. nov.

♂ ♀. Bombay; E. Himalayas. Long. 2 mm.

Head.—Eyes dull red, the upper facets in the ♂ very large, the lower ones small, sharply demarcated from each other, the eyes being absolutely contiguous from the extreme vertex to the antennae. In the ♀ the facets uniformly small, the frons dark grey, nearly blackish, covered with golden yellow hairs. Proboscis and palpi blackish, the former with well-developed labella at the

[1] Probably a sexual character, but no better one offers itself, and the two forms may possibly be the ♂ and ♀ of the same species.

tip, the latter with the last joint distinctly the largest. Antennae more or less reddish brown (in the type ♂, the scape and two basal flagellar joints reddish,[1] in one ♀ wholly red, in the other only slightly so at the base, in all cases with whitish pubescence over the whole flagellum). A row of whitish hairs behind the eyes encircling the back of the head.

Thorax wholly rather dull but obviously reddish brown on dorsum, covered with bright golden yellow hairs, sides of thorax wholly blackish grey. Scutellum reddish brown, metanotum dark grey.

Abdomen blackish, the posterior margins of the segments very narrowly whitish, dorsum with a few pale scattered hairs.

Legs.—Apparently normally the coxae and femora dull reddish brown or brownish yellow, the tibiae and tarsi blackish, but the brownish colour extends at least to the hind femora in one of the female specimens. Hind metatarsus much enlarged in both sexes, especially so in the ♂, in both sexes as long as or slightly longer than the rest of the tarsus and about two-thirds as long as the tibia.

Wings clear, venation normal. Halteres brownish or blackish.

Described from one ♂ from Kanara, Bombay, viii-07, and two ♀ ♀ from Karwar, Bombay, viii-07. Two ♀ ♀ in the Indian Museum are from Kurseong, 10—26-ix-09 [*Lynch*], and 7-ix-09 (type ♀) [*Annandale*].

Type ♂ in the Pusa collection, type ♀ in the Indian Museum.

Simulium grisescens, mihi, sp. nov.

♂. Darjiling district. Long. 1½ mm.

Head set very close on the thorax. Eyes with conspicuously large facets on upper side; a moderately narrow face below the antennae light grey. Antennae black, with rather thick short grey pubescence, scape brownish yellow. Proboscis blackish, yellowish at tip; palp black.

Thorax deep velvet-black, evidently originally covered with the short bright yellow hairs common to most of the Oriental species, shoulders broadly and squarely pale blue greyish dusted, the inner corner of the spot nearly rectangular; also a broad similarly coloured band on the posterior margin. This rather gives the appearance of the dorsum being of blue-grey ground-colour with a broad deep black transverse band occupying the major portion of the surface with a contiguous perpendicular broad stripe reaching to the anterior margin. Sides of thorax conspicuously blue-grey dusted; scutellum blackish, metanotum black.

Abdomen black, apparently with a little brownish yellow pubescence; 1st segment with blue-grey shimmer, the fan-shaped side hairs brownish yellow. Belly black.

[1] Under a strong light, the microscope reveals the whole antenna as dull reddish brown, though the flagellum appears mainly black to the naked eye.

Legs.—Fore coxae pale yellowish, posterior coxae blackish grey. Fore femora principally brownish yellow, a little blackish towards the tip: posterior femora blackish, the base shortly yellowish. Fore tibiae and tarsi shining black, the proportions of the joints as in *indicum*; but the *three* first tarsal joints are widened, although none of them to such an extent as in that species: 4th and 5th joints very narrow.

Middle tibiae black, narrowly yellowish at base, metatarsus yellowish, black at tip, rest of tarsus black, the joints narrowly yellowish at base. Hind tibiae considerably widened, black, very narrow at base, where it is a little yellowish; hind metatarsus much enlarged, basal half yellowish, the rest black: remainder of tarsus black, base of 2nd joint a little yellowish: hind metatarsus much longer than the rest of the tarsus and practically as long as the tibia. Both hind tibia and metatarsus with long hairs on the upper side.

Wings quite clear, venation normal, halteres bright yellow, large and thick.

Described from a unique type male in the Indian Museum from Kurseong, taken by Mr. Lynch, 10—26-ix-09.

Note.—This is a very distinct species, recognisable by the bluish grey dusted spots on the shoulder; the similarly coloured band on the posterior margin of the thoracic dorsum, and the first abdominal segment tinged with the same colour also. The third fore tarsal joint being widened is also a specific distinction, and noticeable when specimens of *grisescens* and *indicum* are placed side by side.

Simulium metatarsalis, mihi, sp. nov.

♂. Darjiling district. Long. barely 2 mm.

Head very closely applied to the thorax. Eyes contiguous from vertex to antennae, upper facets very large. Proboscis and palpi black. Antennae black, with close greyish pubescence.

Thorax black; dorsum with close bright yellow hairs which appear reddish orange when viewed from certain directions. Scutellum black, with yellow hairs. Sides of thorax and metanotum black. Lower part of thorax anteriorly, grey dusted.

Abdomen wholly black with rather sparse black pubescence, no trace of gold hairs. Belly similar. The hairs towards the sides of the 1st segment light brownish.

Legs.—Fore coxae yellowish, posterior pairs blackish. Fore femora and tibiae dull yellowish, with golden yellow hair nearly as far as the tip of the latter, which with the whole tarsus, is black, the tarsus narrow, of equal width throughout. In spite of the gold hair the fore tibiae viewed from above appear whitish grey. Middle femora and tibiae slender, basal half of each yellowish, with some yellow hair, apical half black, as are the slender middle tarsi. Hind femora mainly black, slightly pale yellowish at base, tibiae much incrassated, basal half yellowish,

with gold-yellow hair, metatarsus much incrassated also. Nearly as large as the tibia. Relatively larger than in any other Oriental species, the basal half yellowish, rest of tarsus black. The hind tibiae and metatarsi with numerous long hairs on upper side.

Wings colourless, venation normal. Halteres brownish.

Described from a perfect unique ♂ from Kurseong, taken 28-iii-10, by Dr. Annandale.

Type in the Indian Museum.

NOTE.—From the general resemblance between the two species, it seems possible that *griseifrons* may be the ♀ of this species.

Simulium griseifrons, mihi, sp. nov.

♀. Western Himalayas. Long. nearly 2½ mm.

Head.—From between one-third and one-fourth the width of the head; grey dusted, without any vestige of gold hair; face convex, blackish. Proboscis and labella reddish brown, palpi black. Antennae wholly black. Back of head blackish grey (seen from above, whitish grey), with some black hairs, which form an irregular fringe behind the eyes.

Thorax (partly denuded) black, apparently covered with short golden yellow pubescence. Scutellum black, covered with gold pubescence and with a row of long soft black hairs on hind margin. Sides of thorax blackish.

Abdomen black, the extreme edge of each segment pale.

Legs.—Fore coxae dull brownish yellow, posterior coxae black. Femora brownish yellow, apical half black, the colour less pronounced and less extensive on the fore pair. Tibiae, basal two-thirds yellowish, apical third black; the outer sides of the tibiae, seen from above, appear whitish. Tarsi black, the anterior ones with metatarsus as long as the rest of the tarsus, but only slightly wider. Hind metatarsus considerably incrassated, distinctly longer than rest of tarsus, and with the basal half yellowish white.

Wings clear; venation in accordance with the generic characters. Halteres pale yellow.

Described from one ♀ from Kalighat, Kumaon (6,000 ft.), Western Himalayas, taken by Mr. A. D. Imms, 4-vi-10.

Type in Indian Museum.

NOTE.—Possibly the ♀ of *metatarsalis*. The only distinctive character between them seems to be the difference in the size of the hind metatarsus, and this is probably a sexual one.

Simulium rufibasis, mihi, sp. nov.

♀. Darjiling district. Long. 1½ mm.

Head.—Frons blackish grey without trace of gold hair, face light ash-grey. Proboscis and labella dull dark reddish brown; palpi black. Antennae black, basal two or three joints reddish yellow.

Thorax as in previous species, except that the scutellum is slightly reddish brown at the tip, and that (being denuded) no golden yellow hair is visible on its dorsum, though such is probably present in perfect specimens.

Abdomen wholly black, dull.

Legs.—Fore coxae yellowish, posterior coxae black: all trochanters brownish yellow. Femora black, but fore pair a little yellowish at the base. Fore tibiae whitish yellow, except a little blackish at the tip, posterior tibiae yellowish on basal half, blackish on apical half. Tarsi exactly as in the previous species.

Wings clear; venation normal. Halteres bright yellow.

Described from a single type ♀ in the Indian Museum, taken by Dr. Annandale at Kurseong, 18-vi-10.

Simulium indicum, Becher.

This species was described originally (Journ. Asiat. Soc. Bengal, liii, 199, pl. xiv) in 1884 from female specimens in the Indian Museum from Assam.

It appears to be fairly common and widely distributed along the Himalayas and into Assam, the Museum possessing specimens from Mussoorie (7,400 ft.), 19-x-09 [*Badley Scott*]; Simla (7,000 ft.), 14-iv-07 [*Annandale*]; Darjiling (7,000 ft.), 12-viii-09 [*Jenkins*]; Kurseong, 10—26-ix-09 [*Lynch*]; Sylhet, 18-iv-05 [*Hall*]; Khasi Hills, "Assam," 2-iii-05 [*Hall*]; and Jaunsa, Tons Valley [*C. G. Rogers*].

Of the ♂, which has apparently not previously been recorded, there are two specimens from the island of Bombay, 25-xi-09, one of which I propose as the new type of the species, the original type ♀ not being traceable.

Two other ♀ ♀ in the same collection appear to represent a variety with wholly black abdomen; they come from Darjiling, 10-viii-09 [*Paiva*], and Ukhral, Manipur (6,400 ft.) [*Pettigrew*].

The extent of the yellow on the abdomen is very variable, in the series of specimens examined.

In general appearance the species resemble *aureohirtum*, but differs in the following points:—

The frons is shining greyish white, the humeral calli are distinctly and rather broadly reddish brown, the colour varying in extent; the sides of the thorax are distinctly grey dusted (in one example there is a grey dusted band along the lateral margins of the dorsum); the antennae are always more or less reddish brown at the base. The two principal specific characters are, the yellow colour of, generally at least, the first two abdominal segments, and the fore metatarsi are distinctly incrassated as well as lengthened. The fore coxae are yellowish, the posterior ones blackish; the femora and tibiae are pale on the basal half, the remainder being black; the fore and hind tibiae are shining whitish yellow. Tarsi black, posterior metatarsi pale on basal half, more so on hinder pair. The fore metatarsus and hind metatarsus are both

lengthened and considerably incrassated; the golden yellow hair on the hind legs reaches to and covers the metatarsus; it is apparently sparser on the anterior legs.

Simulium aureohirtum, mihi, sp. nov.

♂ ♀. Assam and Bombay. Long. 2-3 mm.

Head.—The large upper facets of the eye in the ♂ relatively smaller than in the other species, the eyes closely contiguous from vertex to antennae. Antennae dull reddish brown, varying to nearly black; sometimes scape and one or two basal flagellar joints pale also, the remainder blackish, occasionally the whole antennae brownish yellow. Frons nearly one-third of the head in ♀, blackish grey with rather thick bright yellow hair; face dark grey with a few yellow hairs. Proboscis and palpi blackish or dark brown.

Thorax blackish, occasionally with a little dull reddish brown tinge; with close bright yellow hair covering the whole of the dorsum. Shoulders sometimes reddish brown, the colour occasionally extending narrowly along the anterior margin of the thorax. The sides blackish grey, bare. Scutellum normally black, but sometimes reddish brown, always with close yellow hair. Metanotum blackish.

Abdomen blackish, with gold-yellow hair; in some specimens the characteristic ridge on the first segment is pale on the hind margin; the usual fan-shaped row of yellow hairs towards each side on the first segment. Belly black.

Legs.—Normally, fore coxae brownish yellow or pale yellowish, posterior coxae black or blackish grey. Femora principally reddish brown or brownish yellow, with a broader or narrower apical band, this band generally wide on the posterior legs; often the fore femora wholly pale; sometimes the remaining femora also almost wholly so. Tibiae generally with basal half (or rather more) brownish yellow, the remainder black, sometimes wholly dark brown or brownish black; a slight whitish grey shimmer is visible in some specimens viewed from above. Tarsi blackish or dark brown, basal half of metatarsus normally pale, the extent of the colour varying considerably. Fore tarsi ♂ ♀ not widened, metatarsus barely as long as rest of tarsus, whole tarsus distinctly longer than tibia. Middle tarsi in both sexes about as long as the tibia, metatarsus equal to the remainder of the tarsus. Hind tarsi in ♂ considerably thickened, three-fourths as long as tibia, and distinctly longer than the rest of the tarsus, whole tarsus a little longer than tibia. Hind tarsus in ♀ of the same proportion as in the ♂ except being less thickened.

The coxae, femora, outer side of tibiae, and the under side of the hind metatarsus (the latter in ♂ only) bear golden yellow hair more or less prominently in ♂, more sparsely in ♀.

Wings clear, venation normal. Halteres brownish or brownish yellow.

Described from two ♂♂ from Umling, Assam, iii-07 (including type ♂), and several ♀♀ from Kanara, Bombay, viii-07 (including type ♀), also two ♀♀ from Umling, iii-07, all in the Pusa collection. A ♀ with all the pubescence rubbed from the abdomen is probably this species. It is in the Indian Museum, from Kurseong, 6-ix-09.

Types in Pusa collection.

Notes.—Although none of the specimens are in good condition, the specific characters as illustrated by the full series seem to be sufficiently distinctive from *indicum* to warrant the claim of the species to specific rank. The differences I perceive are, (i) the abdomen is wholly black, instead of yellowish at the base; (ii) the blackish grey, not whitish grey sides to the thorax; (iii) the barely widened fore tarsi in the ♀, compared with the conspicuously widened two first joints in *indicum*. The amount of bright yellow hair also appears greater in this species, especially on the legs.

Simulium senilis, mihi, sp. nov.

♂. Western Himalayas. Long. 3 mm.

Head.—Eyes closely contiguous, the head applied very closely to the thorax. Proboscis, palpi, antennae and under side of head wholly black.

Thorax black, with short bright yellow hair. Sides black, with a little greyish reflection. Scutellum black, with bright yellow hair, metanotum black.

Abdomen black with moderately sparse but rather ragged yellowish or brownish yellow hairs which are distinctly longer than in any other Oriental species, and present an appearance of shagginess. The first segment has the characteristic (generic) ridge a little pale, with, towards each side, very long shaggy brownish yellow hair which reaches nearly to the middle of the abdomen.

Legs.—Fore coxae pale yellowish, posterior coxae blackish. All femora yellowish, a little darker at the tip, especially the hind pair. All tibiae dirty yellowish, a little darker towards the tip; both femora and tibiae with golden yellow hair, which is less obvious on the latter. Anterior tarsi black, narrow, not at all enlarged, metatarsus equal in length to the remainder of the tarsus, the whole tarsus about as long as the tibia. Hind metatarsus enlarged, two-thirds as long as the tibia, yellowish, the tip black, remainder of tarsus black with the bases of one or two of the joints a little yellowish.

Wings colourless, venation normal.

Described from a single ♂ in good condition in the Indian Museum taken by Dr. Annandale, 8-v-07, at Phagu (8,700 ft.), Simla district.

Note.—The length and somewhat shaggy appearance of the hair on the abdomen effectually distinguishes this species from other eastern ones.

PSYCHODIDAE.

Table of subfamilies.

The 7th longitudinal vein absent.[1] The 2nd longitudinal forks at, or only very little before, the middle of the wing. Prongs of upper branch always fork distad of middle of wing (in *P. malabaricus*, *at* the middle). Genitalia of the ♂ with three pairs of appendages; ovipositor in ♀ without horny scimitar-shaped pair of valves .. PHLEBOTOMINAE.

N.B.—One genus only, *Phlebotomus* Rond., is Oriental.

The 7th longitudinal vein conspicuously present. The 2nd longitudinal forks quite near base of wing; always before the first fourth of the wing's length. Prongs of upper branch always fork proximad of middle of wing. Genitalia in the ♂ with two (*Psychoda* Latr., *Pericoma* Wlk.) or three (*Brunettia* Ann., *Parabrunettia* gen nov.) pairs of appendages; ovipositor in ♀ consisting of a conspicuous horny scimitar-shaped projecting appendage, forming a pair of valves .. .. PSYCHODINAE.

Since the publication by me, comparatively recently (Rec. Ind. Mus., ii, 369), of several new species of *Psychoda* and *Pericoma* from India, a considerable quantity of fresh material has accumulated at the Indian Museum, but it is to be regretted that the present notes and description do not in any way bring our knowledge of the Oriental, or even the Indian species up to date, as there still remains a residuum of small obscure specimens which I have been unable to deal with successfully. They may represent few species or a number of either described or of undescribed ones. Much further study is required on the limits of those already known before additional ones should be described. At present I am able to sink my *Pericoma appendiculata* definitely as the ♀ of *spinicornis*; and *P. bella* as a synonym of *margininotata*. No further specimens of *Psychoda distincta*, *albonotata* and *albonigra* have come before me, but good or fair series of *bengalensis*, *nigripennis*, and *villata* have stamped these as good species. The first three species of *Psychoda* in my table

[1] In *Phlebotomus papatasii* an exceedingly short 7th longitudinal vein occurs at the base of the 6th running almost direct to the wing-margin. It is liable to be entirely overlooked but Grassi figures it, and it is found in *P. perturbans*, Meij.

(*l. c.*, p. 370) are referred to a new genus, closely allied to the recently established *Brunettia*, Annandale, but of these species, no further specimens have been seen of *squamipennis* and *argenteopunctata*.

Four genera are recognised here in the Psychodinae, *Psychoda* and *Pericoma*, which never possess conspicuously scaled wings and *conspicuous* chaetae together in the same species;[1] and *Brunettia* and *Parabrunettia* (the latter, new) in which both scaled wings and tolerably or very conspicuous chaetae on the flagellar joints of the antennae are simultaneously present. I am still much in doubt, however, as to the limits of both these latter genera.

Eaton's genera are, to my thinking, untenable,[2] yet the group of species with thickly scaled, broad wings, generally with hairs closely covering the surface also, and with distinct chaetae on the flagellum, seems a well-defined one; all of these possess the venation of *Psychoda* except *superstes*, which, being the first species described, must remain typical of *Brunettia*.

At the present state of our knowledge it appears to me that it will eventually be found that the three genera *Psychoda*, *Pericoma* and *Parabrunettia* all possess some species with and some species without: (1) areas of conspicuous extent on the wings covered with scales; (2) hairs on the *surface* of the wings in addition to those on the veins; and (3) some species with the 2nd longitudinal vein forking before (proximad of) the origin of the 3rd longitudinal vein whilst other species have the fork beyond (distad of) the origin of the 3rd vein. None of these can by any means be regarded as generic characters, but serve very well as primary divisions of the species into groups.

The genital organs have not occupied much attention hitherto, but Dr. Annandale is engaged to some extent on their examination. In dried specimens their exact observation is always difficult.

The presence of the spiral chaetae (so conspicuously developed in *Brunettia superstes*) in *Psychoda distincta*, *Pericoma spinicornis* and *margininotata*, though much inferior in size, affords a further point on which to separate or substantiate species, but they must not be regarded as of more than specific value. Dr. Annandale has also discovered in *Psychoda bengalensis* and *nigripennis* a previously overlooked peculiarity in the shape of a pair of very small bifid chaetae on each joint (except the last) of the flagellum, having the appearance of two pairs of cow's horns. They may, quite possibly, be present in some other species, but require very minute examination, being almost transparent.

---

[1] "Conspicuous" is emphasized, as very small chaetae (differing only in size from those in *Parabrunettia*), are found by Dr. Annandale to be present in some species of *Pericoma*. They appear to be absent in most species of *Psychoda*.

[2] A number of genera in Psychodidae, created on variations of scales on the wings, seems wholly undesirable, as tending to reduce the family to the level of taxonomic absurdity at present happily to be found only in the Culicidae.

PSYCHODA and PERICOMA.

A closer study of the Indian species in these two genera (which represent the only Oriental ones available) results in several characters being found which were not made use of in my previous paper on this family.

Firstly there is the presence or absence of distinct scales on the wings—nearly always of some shade of brown, although sometimes appearing whitish or greyish when viewed from certain directions. These scales appear in only one species (*apicalis*) of *Psychoda*, but characterise several species in *Pericoma*, whilst in *Parabrunettia* they are present in some species on both the upper and lower surfaces of the wing, and in others on the lower surface only.

In referring to these scales, allusion is not made to a certain number of scale-like hairs or even true scales, few in number and irregularly placed, at the base of the wing, and which may be present in many species, possibly adventitiously; but only to cases where the scales are numerous, eminently conspicuous and arranged in regular rows, covering thickly the whole of such portion of the wing-surface as they may occupy.

The second character, which, like that of scales, is quite consistent in its occurrence or absence, is that of hairs, comparatively soft or at least less bristly than usual, closely covering the *surface* of the wing as well as the veins and arranged *longitudinally* or nearly so, so that they do not form the "criss-cross" pattern obvious in the case of all those species in which the hairs are confined to the veins. It is quite obvious at a glance to which category any wing belongs except in the densely scaled ones.

The third consistent character is the position at which the 2nd longitudinal vein forks (always near the base of the wing); whether before or after (proximad or distad of) the origin of the 3rd longitudinal vein.

Further characters appear less definite and should best be applied only to the separation of closely-allied species, being liable to occasional variation.

The three principal characters above specified can be used in both *Psychoda* and *Pericoma*.[1] Under *Brunettia* and *Parabrunettia* (two at present rather indefinitely characterised genera) are given some considerations relating, chiefly or wholly, to those species at present referred to them.

PSYCHODA, Latr.

Table of species.

A *Surface of wing* either *without scales*, or (when such are present) limited to a

[1] Probably they will be found to apply equally well to at least *Parabrunettia* also, when this genus is more closely characterised and a larger number of its species better understood.

few small tufts forming spots placed at the tips of the veins, on the margin of the wing or at the forking of the veins: never covering any appreciable extent of the wing-surface.[1] Sometimes a few, irregularly placed, at the base of the wings.

B Wings with the *hairs on the veins only*, arranged in two divaricate depressed rows, one on each side, and generally overlapping those of the contiguous veins, presenting a "criss-cross" appearance to the whole wing. *No hairs whatever on the surface of the wing. No obvious scales*, except as forming the small spots.

C Wing with *distinct black hair-spots* at the tips of many or all of the veins.

D The 2nd longitudinal vein forks *very closely* proximad or distad of the base of the 3rd vein.

E Fore metatarsi wholly white scaled .. *geniculata*, sp. nov.

EE Fore metatarsi never wholly white scaled (at the tip only in *albonigra*, and not at all in *bengalensis*).

F Wings with thick black bushy hair on costa, with small spots (each composed of one or two white scales), placed along a considerable section of it, at apparently regular intervals. (The 2nd longitudinal vein forks immediately proximad of the base of the 3rd vein; the fork of the anterior branch of the 2nd vein opposite that of the 4th vein.) .. *albonigra*, Brun.

FF Wings with only normally blackish grey hair; *scale-spots wholly absent*. The 2nd longitudinal vein forks barely distad of the base of the 3rd vein, practically simultaneously. The fork of the anterior branch of the 2nd vein a little distad of that of the 4th vein .. .. .. *bengalensis*, Brun.

DD The 2nd longitudinal vein forks *considerably* distad of the base of the 3rd vein.

[1] An apparent exception is *P. orbicularis*, in which scales are present on the basal portion of the *veins only*, but never on the *surface* of the wing, that is to say, *emanating* from the surface.

G White scale-spots *absent* from tips of veins. Tips of tibiae and metatarsi not white scaled .. .. *distans*, sp. nov.

GG White scale-spots *present* at tips of veins. Tips of tibiae and metatarsi with white scales .. .. *albopicta*, sp. nov.

CC Wings without hair-spots at tips of veins.

H Veins of wings *wholly without rows of distinct scales* on any part of their length, nor distally in the form of spots.

I The 2nd longitudinal vein forks distad of the base of the 3rd vein. Hairs on veins uniformly blackish—no conspicuous lighter sections of hairs. The middle veins (2nd, 3rd and 4th) nearly straight or gently bisinuate.

J Thorax with *blackish grey* hair. Anterior branch of 2nd longitudinal vein forking a little beyond the middle of the wing, the 4th forking a *little before the middle* .. .. *nigripennis*, Brun.

JJ Thorax with *bright yellowish brown* hair. Anterior branch of 2nd vein forks as in *nigripennis*, but the 4th vein forks *near base of wing* .. *fulvohirta*, sp. nov.

II The 2nd longitudinal vein forks proximad of the base of the 3rd vein. Hairs on veins mainly blackish but with a transverse band of light brown hairs, formed by a short row placed beyond the middle part of each vein, in the distal portion of the wing. The middle veins (2nd, 3rd, 4th) distinctly arcuate .. *vittata*, Brun.

HH *Veins* of wings with *distinct scales* on the *basal fourth* of all of them .. *orbicularis*, sp. nov.

BB Wing with the *surface closely covered with hairs* as well as the veins, the hairs placed much more longitudinally than in the species of B section, giving a longitudinal appearance to the pubescence instead of a criss-cross network.

K Distinct spots at least near the margin of the wing, white or black or both, composed of small scales or stiff hairs.

L	The white spots on wing chiefly confined to the wing-border, or at forking of 2nd and 4th veins.	
M	Anterior branch of 2nd longitudinal vein forks opposite fork of the 4th vein. *A few scales* near the base of the wing. The small white scaly hair-spots placed *at the tip* of each vein, wherever they occur ..	*albonotata*, Brun.
MM	Anterior branch of 2nd longitudinal vein forks a little proximad of the fork of the 4th vein. The white spots composed of white *hairs*, not scales, and placed *between* the tips of the veins, not at the tips ..	*distincta*, Brun.
MMM	Anterior branch of 2nd longitudinal vein forks near middle of wing, a little distad of the fork of the 4th vein. All three terminations of the 2nd, and that of the 3rd vein with a pair of small spots placed very closely together, composed of a few elongate yellow bristly hairs. Lower branch of 4th vein, and the 5th vein, at their tips with conspicuous black hair-spots. Tips of other veins with more or less inconspicuous black hair-spots, or a tendency thereto	*decora*, sp. nov.
LL	The white spots (20 or more) distributed irregularly along all the veins, giving the entire wing a spotted appearance	*maculipennis*, sp. nov.
KK	No distinct spots near or at the wing-margin. With or without two transverse narrow bands of grey scale-like hairs.	
N	With such transverse bands ..	*transversa*, sp. nov.
NN	Wing wholly unmarked	*hirtipennis*, sp. nov.
AA	Surface of wing *wholly covered* with *closely-placed* imbricating dark *scales*	*apicalis*, sp. nov.

Psychoda geniculata, mihi, sp. nov.

♀. Ceylon. Long. about 1½ mm.

Very near *P. albonigra*, mihi.

A dark brown species with dark brown wings and conspicuous white spots on the legs. Wings with black and white spots near tips of veins.

Body clothed with thick blackish brown hair, with which is intermixed on the thorax, some fan-shaped tufts of whitish grey hair. White bristly, almost scale-like, hair on vertex and bristly black hair on frons and face. Antennae with very elongate flask-shaped joints, verticillate as in *P. bengalensis*; scape with milk-white elongate scales; chaetae present on flagellum, but small, curved, not S-shaped; pubescence of flagellum greyish white.

Legs with light brown scales and some bristly hairs. Knees narrowly but distinctly white, through the presence of a few snow-white small elongate scales. Tips of tibiae and of the metatarsi with a circlet of small elongate snow-white scales. Front metatarsi almost wholly white scaled. Some pale stiff bristles on the legs but apparently no actual isolated elongate scales as in *albonigra*.

Wings with hairs situated on the veins only, rich brown in colour, showing golden brown with violet iridescence in certain lights. No surface scales on the wings, the only ones present being the small ones forming the spots at the tips of the veins. Black bristly hair-spots at tips of practically all the veins; some white scaly hair-spots near tips of some of the veins, and a few on each of the two lower branches of the 2nd longitudinal vein and both branches of the 4th vein, all placed at a little before their tips. A larger white scaly hair-spot near the base of the costa, and some isolated erect white hairs placed irregularly here and there on the veins. The 2nd longitudinal vein forks immediately distad of the base of the 3rd vein, the upper branch of the former forking barely beyond the middle of the wing, and very little distad of the fork of the 4th vein.

Described from one ♀ in the Indian Museum from Peradeniya, Ceylon, taken by Mr. E. E. Green in October 1910.

It is in perfect condition and is a distinctly good species.

Psychoda albonigra, mihi.

To the description of this species may be added, "knees with a very few small white scales; tips of the metatarsi with a circlet of white scales."

The type still remains the only known specimen.

Psychoda bengalensis, mihi.

In the figure of the wing of this species, no auxiliary vein is shown, although it is, of course, distinctly present, extending at least to a point beyond the fork of the 2nd longitudinal vein.

Additional data.—Darjiling (5,000 ft.), 3—4-vii-08 [*Annandale*]; (7,000 ft.), 5—8-viii-09 [*Paiva*]; Kurseong, 24-iii-10; 25—26-vi-10 [*Annandale*]; Phagu (9,000 ft.), 11-v-09; Barogh (5,000 ft.), 10-v-10; Kasauli (6,300 ft.), 15-v-08; Dharampur (5,000 ft.), 13-v-08 (all four localities, Simla hills, taken by Dr. Annandale), Naini Tal (6—7,000 ft., Western Himalayas) [*Lloyd*]; Calcutta;

common vi, vii, viii [*Annandale* and others]; Dum Dum, near Calcutta, 29-vii-09 [*Lord*]; Madhupur, Bengal, 22-x-09 [*Paiva*]; Port Canning (Ganges delta), 6-xii-07 [*Annandale*]; Bangalore, Mysore State (3,000 ft.), 16-x-10; Trivandrum, 13-xi-08; Kulatupuzha (W. base of Western Ghats, Travancore), 19-xi-08; Maddathorai, same district, 17-xi-08 (all three, South India, taken by Dr. Annandale); Peradeniya, Ceylon, 8-vi-10 [*Gravely*]; Moulmein, Lower Burma, 25-ii-08 [*Annandale*].

Psychoda distans, mihi, sp. nov.

♀. South India. Long. barely 1 mm.

Body covered with dark brown hair, mixed here and there with grey, the ground colour of the thorax yellowish brown, with dark greyish hair. Legs brown, the tarsi a little lighter. no white tips to tibiae or metatarsi.

Wings with the two divaricate rows of hairs on the veins only. The 2nd longitudinal vein forks considerably distad of the base of the 3rd; the anterior branch forking just beyond one third of the wing, and nearly opposite the fork of the 4th vein. A distinct and rather large black bristly hair-spot at the tip of each vein. No white scale- or hair-spots on the wing. A distinct though not conspicuous spot composed of black hairs, at the fork of the 2nd longitudinal vein and the fork of its anterior branch also.

Described from a single ♀ in the Indian Museum from Maddathorai, Travancore State, South India, taken by Dr. Annandale, 16-xi-08.

N.B.—The genital organs are not easily seen but the specimen appears to be a ♀.

Psychoda albopicta, mihi, sp. nov.

♀. Bengal. Long. $1\frac{3}{4}$ mm.

Very near *P. distans*, but differing from that species, by very distinct though small white scale-spots at the tips of most of the veins, including the 3rd vein. A conspicuous bunch of black scaly hairs at the fork of the anterior branch of the 2nd longitudinal vein, and the fork of the 4th vein. Some of the black hair-spots at the tips of the veins are much less distinct than in *distans*.

Fringe of wing dark brown on costa, lighter brown on posterior margin, the whole appearing golden brown in certain lights. The hairs on the wing are brown, darker towards the base.

The *body* is dark, with brownish yellow hair, which is darker brown on the thoracic dorsum, and almost yellow in places. Antennae brown, flagellar joints flask-shaped with long necks, the verticillate hairs widely expanded. Long sinuous chaetae

distinctly present. The tips of the tibiae and of the metatarsi with a narrow circlet of white scales; the legs moderately dark brown.

Described from a single type ♀ in the Pusa collection, taken at Pusa, Bengal, 8-i-08.

Psychoda nigripennis, mihi.

Several specimens recently acquired by the Indian Museum through the generosity of Mr. C. W. Beebe, are in all probability this species, taken by that gentleman ten miles south of Kuching, Sarawak, Borneo, 25-vi-10.

Being mounted on microscopic slides their absolute identification is impossible, in the absence of any previous examination.

Additional data respecting this species—Darjiling, 3-vii-08 [*Annandale*]; 8—11-viii-09 [*Paiva*]; Kurseong, 23—25-vi-08 [*Annandale*]; Simla, 9-v-09, and Phagu (Simla district, 9,000 ft.), 11-v-09 [*Annandale*]; Calcutta, common in June, July, August; 24-ii-10, hatched from partially dried freshwater sponge from edge of a garden pond; Kichha, Naini Tal (plains), 4-iv-09 [*Hodgart*]; and the following localities from South India, collected by Dr. Annandale: Trivandrum, 13-xi-08; Shasthancotta, near Quilon, 7-xi-08, "at light;" Maddathorai, 16—18-xi-08; Tenmalai, 22-xi-08; Nedumangad near Trivandrum, 14-xi-08; Ernakulam (Cochin), 4-xi-08.

Psychoda fulvohirta, mihi, sp. nov.

♀. Darjiling district. Long. 1½ mm.

Body covered with blackish grey hair, with the exception of the thorax where the hair is conspicuously *bright yellowish brown*, that of the alulae being more yellow. Antennae as in *nigripennis*. Legs blackish, without any ornamentation.

Wings with the appearance of those of *nigripennis*. The 2nd longitudinal vein forks distinctly distad of the base of the 3rd vein, and its anterior branch forks a little beyond the middle of the wing very considerably beyond the fork of the 4th vein, which occurs towards its base. The 3rd vein is gently bisinuate.

The hairs on the wings are blackish grey, those towards the base being blacker, and those of the posterior marginal fringe somewhat greyish.

Described from two ♀ ♀ from Darjiling (7,000 ft.), 7-viii-09, type [*Paiva*]; and Kurseong, 26-vi-10 [*Annandale*]; both in the Indian Museum.

N.B.—The bright yellowish brown colour of the hair on the thorax makes this species easily distinguishable from all others except those specimens of *margininotata* with similarly coloured hair, but from that species the wholly unmarked wing and unornamented tarsi will readily separate it.

Psychoda vittata, mihi.

A ♂ has been taken by Dr. Annandale at Maddathorai, Travancore, South India, 18-xi-08. This sex was not previously known, but the genital organs appear normally generic in character. The wings in this species are distinctly lanceolate, the fringe of the wings is darker on the section contiguous to the brownish band of hairs, and also in the neighbourhood of the wing tip. A good specific character is the curved nature of the middle veins of the wing (2nd, 3rd and 4th, with their branches), which distinguish it to some extent from its nearest allies, *nigripennis* and *fulvohirta*.

Of the "further specimens" remarked by me after the original description of the species, as being in the Indian Museum, two are now destroyed, and the other two are certainly *vittata*.

Additional data.—Several specimens in the Indian Museum, 11—26-vii-08, and one 16-xi-08, from Calcutta.

Psychoda orbicularis, mihi, sp. nov.

♀. Bengal. Long. $\frac{3}{4}$ mm.

Very near *P. nigripennis*, but differing by the presence of distinct elongate brown scales on the basal fourth of all the veins. The wing is lanceolate in shape, the entire margin very distinct, whence its name, the costal fringe blackish, but appearing lighter if viewed from certain directions; the fringe of the posterior margin light greyish. The 2nd longitudinal vein forks distinctly distad of the base of the 3rd vein, the anterior branch forking immediately before the middle. The 4th vein forks distinctly before one-third of the wing.

The body is covered with brown or brownish grey hair. The antennae as in *P. nigripennis*, with grey pubescence. The legs yellowish grey, with light greyish pubescence.

Described from a single ♀ in good condition from Pusa, 21-xii-08. In the Pusa collection.

Psychoda albonotata, mihi.

It should be noted that the whole surface of the wing is hairy in this species, as in all the following species. Moreover there are some distinct shortly elongate *dark brown scales* over the base of the wing. The Sylhet specimen noted by me [1] is almost certainly this species and the few white scales on its abdomen were probably accidentally attached, not forming part at all of the insect's vestiture.

Psychoda distincta, mihi.

In the original description of this species is an inaccuracy respecting the scales noted to occur on the basal half of the wing

[1] Rec. Ind. Mus., ii, 374.

In the type specimen (the only one now existing, as the one dated 1-i-05 has been accidentally destroyed) there is absolutely no trace of any such scales, either at the base of the wing or elsewhere on it, with the exception of the very small ones that compose the wing-margin spots.

The pinned specimen dated 30-i-05 is the type; the third specimen (which is mounted on a slide, and which shows the scales mentioned), not belonging to this species.

Psychoda decora, mihi, sp. nov.

♀. South India. Long. 1 mm.

Body covered with blackish hair, the thorax covered with bright yellowish brown hair. Antennae with the pubescence rather closely compressed, as in *P. nigripennis*. Legs brown, normally scaled and pubescent.

Wings with dark brown and blackish hairs covering the surface as well as the veins. Two inconspicuous and incomplete narrow transverse lines passing across the wing similar in position to those in *P. transversa*, composed of light brown or yellowish brown hairs, placed in small sections. Two distinct black spots near the base of the wing, composed of stiff, erect long black thickened hairs, one spot on the base of the 2nd vein, just before the fork, and the other on the anterior branch just beyond the fork. The wing-fringe is greyish, with blacker sections here and there, the hair is also darker along the costa.

Described from one ♀ in the Indian Museum taken by Dr. Annandale at Tenmalai, Travancore State, South India, 22-xi-08.

Psychoda maculipennis, mihi, sp. nov.

? ♂. Ceylon. Long. 1 mm.

Body with rich dark brown hair towards sides of dorsum, yellowish grey in middle and anteriorly, deep blackish brown on abdomen. Antennae with verticillate hairs thick and close, brownish, but showing greyish reflection. Palpi black with grey scales; grey scales on face, black bristly hair on frons; grey hair on vertex.

Legs brownish, with concolorous bristly hair and scales; tarsi with dirty grey scales.

Wings with surface as well as veins closely covered with dark brown hairs. Wing-border with a narrow fringe of black hairs, which is tolerably well defined from the longer greyish fringe around the whole margin. At numerous and apparently irregular intervals these short black hairs are replaced by white or greyish ones, and along most of the veins irregularly placed, and at the tips of most of the veins are very small spots composed of a few white hairs. These small white spots (to the extent of twenty or more) give the whole wing a spotted appearance that immediately distinguishes it from all other species.

Described from a single specimen, apparently a ♂, in good condition, from Peradeniya, Ceylon, taken 17-vi-10 by Mr. E. E. Green. In the Indian Museum.

Psychoda transversa, mihi, sp. nov.

? ♀. Darjiling. Long. 1 mm.

Body covered with brownish grey or brownish yellow bristly hairs. Antennae as in *nigripennis*. Legs blackish with the tarsi showing a lighter shade in certain lights, the tips of the joints with small pale scales.

Wings densely covered with blackish hairs situated over the entire surface of the wings as well as on the veins.

No hair-spots nor scale-spots at the tips of any of the veins, but two narrow transverse bands composed of elongated, thickened (almost scale-like) greyish white hairs, the first placed just before the middle of the wing, the second just beyond three-fourths of the wing: both bands extending from the costa to the hind margin.

Described from a single specimen, which is apparently a ♀ (the genital organ not being clearly visible), in the Indian Museum, from Kurseong (4,700—5,000 ft.), 20-vi-10, taken by Dr. Annandale.

N.B.—The two conspicuous transverse bands of grey stiff hairs on the wings immediately distinguish this species from all other Oriental ones.

Psychoda hirtipennis, mihi, sp. nov.

♀. Darjiling district; S. India; Bengal. Long. about $1\frac{1}{3}$ mm.

Body brownish yellow, with yellowish brown or brownish grey hair varying both in shade and intensity. Antennae practically as in *P. nigripennis*. Legs with light brown scales, tarsi not obviously lighter, except when viewed in certain directions.

Wings lanceolate, the brown hairs covering the surface of the wing and placed mainly longitudinally, no regularly divaricate rows of hairs on the veins. Some erect bristly hairs on the basal fourth of the wing.

Described from several specimens in the Indian Museum presenting the following data: Kurseong, 5-ix-09; Bangalore, 15-x-10; Maddathorai, 18-xi-08; Trivandrum, 12—13-xi-08 (the last three places in South India, taken by Dr. Annandale); Calcutta, 27-xi-10.

N.B.—One example of the above series (from Maddathorai), varies more than the others by having browner legs, brighter brown hair on the thorax, and a tendency to patches of darker hairs on the wing, with light greyish reflections here and there. The specimen seems to come within the probable specific range of *hirtipennis*, which is certainly of variable nature.

Psychoda apicalis, mihi, sp. nov.

? ♀. South India. Length of wing 2 mm.

Body with dark brown hair on the thorax, a little lighter here and there. The abdomen (subsequently lost) seems to have been covered with small elongate whitish scales, which, when viewed in certain lights, show prismatic colours. Antennae as in *P. nigripennis*, the pubescence very dense, lying rather close, so that the outline of the flagellum appears to have parallel sides. Legs closely covered with blackish scales; tips of tibiae and of metatarsi, with a row of white scales, of which there are a few on the tarsi.

Wings very lanceolate and narrow, wholly covered with closely placed, overlapping dark brown scales. It is difficult to see whether hairs are present on the actual surface of the wing or not, but apparently (and in all probability) they are present. Some are present on the veins.

The 2nd longitudinal vein forks considerably distad of the base of the 3rd vein; the anterior branch forking again distinctly beyond the middle of the wing, a good distance beyond the fork of the 4th vein, which occurs just before the middle of the wing.

Wing-border wholly unmarked, bearing a blackish brown fringe, darkest on the costa and at the base of the hind margin: a small arc of nearly snow-white hairs at the tip of the wing.

Described from a single ♀ (?) in the Indian Museum from Maddathorai, Travancore State, South India, 16-xi-08, taken by Dr. Annandale.

N.B.—Very distinct from all other species by the densely scaled wing, with snow-white fringe at the tip. The abdomen has been lost in mounting the specimen for the microscope, after the description was drawn up, but the length of the insect was overlooked. It is a small species, the wing measuring 2 mm. in length. The sex is not quite certain, but was noted originally as "probably ♀."

PERICOMA, Wlk.

Table of species.

A	Wing with two rows of depressed *scales* on all the veins from the base to the middle where they gradually develop into bristly hairs ..	*squaminervis*, sp. nov.
AA	Wing *without scales*, except small ones in the nature of tufts forming spots at the tips of the veins or at or near their forkings.	
B	Wing *surface* completely covered with comparatively soft black hairs, in addition to those on the veins ..	*annandalei*, Brun.
BB	Wing *surface wholly destitute of hairs* (except an isolated one or two near	

the margin and a few at extreme base of wing). The hairs placed exclusively on the veins.

C Lower branch of 4th longitudinal vein with a distinct appendix at its basal angle. (The 2nd longitudinal vein forks proximad of the base of the 3rd vein.) Antennae in ♂ with six prominent erect spines on the upper side of the 1st flagellar joint, which is considerably lengthened. (Antennae in ♀ without such spines, the 1st flagellar joint not abnormally lengthened.) .. .. *spinicornis*, Brun. (*appendiculata*, Brun.)

CC Lower branch of 4th longitudinal vein without such appendix at its basal angle. The 1st flagellar joint not abnormally lengthened in either sex, and always without the prominent spines.

D Wing with small but distinct spots at the tips of many or all of the veins, composed of black or white hairs, scale-like hairs, or true scales, often a black and a white spot both present at the tip of the same vein.

E A distinct section of the marginal fringe at the tip of the wing, composed wholly of white or whitish hairs.

F Metatarsus normally black, except for an apical fringe of small white scales. Marginal fringe of wing with sections composed of grey or whitish grey hair. (The 2nd longitudinal vein forks proximad of the base of the 3rd vein.) .. .. *margininotata*, Brun. (*bella*, Brun.)

FF Metatarsus with at least the apical half covered with whitish scales.[1] Marginal fringe of wing with only one arc of whitish grey hair, which is apical. (The 2nd longitudinal vein forks proximad of the base of the 3rd vein.) .. .. .. *metatarsalis*, sp. nov.

EE No distinct section of white hairs in the marginal fringe at the wing-tip.

[1] In two out of the three specimens present before me it is wholly covered with the whitish scales, except rather narrowly at the base.

G Distinct bright yellow hairs in short sections on the veins, these sections so situated as to form an irregular transverse line from the costa to near the distal end of the posterior margin. Costa with very thick black bristly hair. (The 2nd longitudinal vein forks distad of the base of the 3rd vein.) .. .. *mixta*, sp. nov.

GG No distinct sections of bright yellow hairs on the veins, any hairs of such colour being isolated and exceptional. Costa with only normally black or blackish hairs, with some sections of lighter coloured hairs.

H Tarsi (apart from metatarsi) wholly white.

I Metatarsi wholly white. The 2nd longitudinal vein forks proximad of origin of 3rd vein .. .. *lacteitarsis*, Brun.

I Metatarsi black, with white scales at tips. The 2nd longitudinal vein forks distinctly distad of the origin of the 3rd vein .. .. .. *gilvipes*, Brun.

HH Tarsi black: (apical third of fore metatarsi) and tips of posterior metatarsi with small white scales .. *proxima*, sp. nov.

DD Wings without distinct hair- or scale-spots at tips of veins. Hairs on veins long enough to overlap those of the adjacent veins. No white scale-spots on wings.

J Wings rather smaller than usual. The 2nd longitudinal vein forks (apparently) distad of the base of the 3rd vein .. .. *impunctata*, sp. nov.

JJ Wings very large. The 2nd longitudinal vein forks immediately proximad of the base of the 3rd vein .. .. *unicolor*, sp. nov.

Pericoma squaminervis, mihi, sp. nov.

? ♀. Darjiling district. Long. 1½ mm.

Body covered with light brown and greyish hair; ground colour of thorax light brown, that of abdomen blackish. Antennae as in *Psychoda bengalensis*. Legs brownish grey, tarsi distinctly lighter, almost as pale as in *lacteitarsis* when viewed from certain directions.

Wings with a depressed row of elongate brown scales on each side of each vein, from the base to beyond the middle of the wing where they gradually become narrower until eventually, towards the margin of the wing, they are replaced by stiff hairs. They lie close together, although not always touching one another, and are long enough to overlap those emanating from the adjacent veins. A distinct spot of bristly black hairs at the tip of each vein, and apparently a slightly clearer spot in the wing immediately in front of the vein-tip.

Described from a single specimen (apparently a ♀) in the Indian Museum taken by Dr. Annandale at Kurseong, 4-viii-08.

N.B.—A very distinct species from all others, readily distinguished by the conspicuous, scaled veins.

Pericoma spinicornis, mihi.

P. appendiculata, mihi.

As noted in the original descriptions these two forms represent the sexes of a single species. There can be no reasonable doubt about the point, although no actual pair has been found *in cop.* The number of spines on the first flagellar joint in the ♂ is six: the palpi consist of four subequal, oblongo-cylindrical joints.

The Indian Museum possesses a good series giving the following data: Darjiling (7,000 ft.), 26—28-v-10 and 2-x-08, common [*Brunetti*]; 8—11-viii-09 [*Jenkins*]; 6—10-viii-09 [*Paiva*]; Kurseong (5,000 ft.), 20—26-vi-10; 3—5-vii-08; 4—5-ix-09 [*Annandale*]; 10—26-ix-09 [*Lynch*]; Kurseong (4,700—5,000 ft.), 24-iii-10 [*Annandale* and *Gravely*]; Siliguri, base of Darjiling hills, 18—20-vii-07 [*Hodgart*]; Simla, 11-v-08, 5-v-10, 10-v-09, on windows [*Annandale*]; Phagu (9,000 ft.), 11-v-09 [*Annandale*]; Naini Tal (6,000 ft.), 2-vi-09 [*Hodgart*].

Pericoma annandalei, mihi.

Eight examples of this species have been acquired by the Indian Museum, captured by Dr. Annandale at Kurseong, 22—29-vi-10, where he found them running over *Caladium* leaves at dusk, in thick jungle.

Pericoma margininotata, mihi.

P. bella, mihi.

Long. $1\frac{1}{2}$—$1\frac{3}{4}$ mm.

From a good series of this species (with which must be included the form described as *bella*), recently acquired by the Indian Museum, it is possible to emend the original description. The species is very variable in its coloration.

The 2nd scapal joint is subglobular, a little more than half as long as the 1st, which is cylindrical, twice as long as its width. The flagellum is composed of either fifteen distinct joints, or of

fourteen joints with an apical style to the last one. The 4th palpal joint is the longest and thinnest.

At the tip of each vein, normally, is a black hair-spot and a small white scale-spot, the latter sometimes almost in the marginal fringe. The costal fringe comprises some short sections composed mainly of white or whitish hairs, including generally a section of some length just beyond the middle; whilst the wing-tip is always clothed with white hairs for some distance, there being also some few short patches of white hair in the fringe of the posterior margin.

An error has crept into the sentence (Rec. Ind. Mus., ii, 383) about the 3rd vein, which should read: "the 3rd vein originates in a right angle from the 2nd, just beyond where the latter forks; its basal portion very narrow, but quite distinct in wings denuded of vestiture; and there is a distinct appendix at the angle."

The study of a good series in the Indian Museum makes it clear that the black hair-patches on the wing are tolerably constant, especially those at the fork of the upper branch of the 2nd longitudinal vein, and at the fork of the 4th vein. The hairs at the wing-tip are generally wholly white, always mainly so.

The wing as described under the specific name *bella* in my previous paper on this family, may be regarded as the typical form; whilst the form described (*loc. cit.*) in the subsequent note is not at all uncommon.

The colour of the hair on the dorsum of the thorax varies from greyish white to rather bright reddish brown, all intermediate shades being represented in different individuals.

The tarsi are best described as variable; generally pale yellowish at base, darkening to dark brown at the tips; with long, irregularly placed bristly hairs, which are pale on the basal half of the tarsi and dark brown on the apical half, being concolorous with the ground colour of the limb. The rest of my description of the tarsi is correct, and may be supplemented by "the distance covered by the white apical scales at the tips of the basal joints of the tarsi, varies, especially on the 2nd tarsal joint, which is in some examples all white, the colour in all cases being that of the *scales*, as the ground colour of the whole tarsus is always black."

The Indian Museum has this species from Darjiling (7,000 ft.), 26-v-10 [*Brunetti*]; 11-viii-09 [*Dr. Jenkins*]; 5—8-viii-09 [*Paiva*]; Kurseong, 25—27-vi-10 [*Annandale*]; Simla, 25-iv-07, 11-v-08, 9—10-v-09 [*Annandale*]; Phagu (9,000 ft., Simla district), 11—15-v-09 [*Annandale*]; Pallode (20 miles N. E. of Trivandrum, South India), 15-xi-08 [*Annandale*].

Pericoma metatarsalis, mihi, sp. nov.

♀. Western Himalayas. Long. 1¾ mm.

This species differs from the *bella* form of *margininotata* in only two characters, but these are practically consistent in the three examples examined.

The metatarsus is, with the exception of its immediate base, covered rather thickly with whitish scales (in the type and in one other specimen), or at least for more than the apical half (as in the third specimen).

In *margininotata* the last three tarsal joints often have a greyish or blackish grey appearance, but in the present species they are all uniformly intensely black.

The second character is that the fringe of the wings possesses no admixture of whitish hairs either singly or in short sections, with the exception of a broad section at the tip, comprised between the lower branch of the 2nd longitudinal vein and the upper branch of the 4th vein.

The 2nd longitudinal vein forks a short distance before the base of the 3rd vein, at which spot is placed the anterior cross-vein; the fork of the anterior branch of the 2nd vein is distinctly proximad of the fork of the 4th vein.

In view of the close affinity of *lacteitarsis* and *gilvipes* to *margininotata*, although they appear to be perfectly good species, there seems no reason to refrain from establishing the present form as a distinct species.

Described from three ♀ ♀ from Simla district, two from Simla, 9-v-09 (type) and 12-v-09, the third from Phagu (9,000 ft.), 11-v-09, all taken by Dr. Annandale.

Type and the other specimens in the Indian Museum.

Pericoma mixta, mihi, sp. nov.

♀. Western Himalayas. Long. 2 mm.

Of the general appearance of that form of *margininotata*, which was described as *bella*.

Body with blackish and grey hairs, the former predominating chiefly on the dorsum of the thorax and at the base of the wings.

The *wings* have a dark brown appearance. The 2nd longitudinal vein forks some little distance beyond the base of the 3rd vein, although still quite near the base of the wing, as the latter vein begins sooner than in most species, its exact origin near the root of the wings being obscured by the pubescence. The fork of the upper branch of the 2nd vein and the fork of the 4th vein are approximately opposite one another. The veins are closely covered with a double row of black or dark brown hairs, with a distinct black hair-spot at the tip of each vein; a few small pale hairs in front of some of these black hair-spots. Some erect short, snow-white hairs towards the bases of the veins, and others on the three branches of the 2nd vein, placed some little distance before their tips; also to a less extent in short sections on the veins in other parts of the wing.

A number of *bright yellow hairs*, distributed (1) along the veins, apparently thickest along the costa, especially at its base, intermixing with the normal, thick black or dark brown hairs forming the fringe, (2) at the bases of the veins, but disposed in

small sections separate from the snow-white ones in that region of the wing, and (3) on the three branches of the 2nd longitudinal vein proximad of the white hairs. To an apparently less extent they also occur on the veins in other parts of the wing. The wing-fringe on the posterior margin is really dark brown, although in some lights it appears light brown or even greyish here and there. The tip of the wing bears a few whitish hairs but of less white colour and to an extent of much less obvious demarcation than in the *bella* form of *margininotata*.

Legs dark yellowish grey, thickly clothed with stiff bristly hairs; the tibiae, the metatarsi and 2nd joint of tarsi with a narrow circlet of whitish scales at the tips of each.

Described from a single ♀ in good condition from Simla (7,000 ft.), taken by Dr. Annandale, 6-v-09.

Type in Indian Museum.

Pericoma lacteitarsis, mihi.

This form, originally described by me as a variety of my *margininotata*, with the suspicion that it might prove distinct, is now, to my thinking, sufficiently established as a good species through the acquisition of several specimens by the Indian Museum.

The black hair-spots at the tips of the veins, the relative positions of the forks of the 2nd and 4th longitudinal veins, and the coloration of the tarsi are constant. The 2nd longitudinal vein forks proximad[1] of the base of the 3rd vein; the anterior branch of the 2nd vein forks before the middle of the wing and a little distad of the fork of the 4th vein.

There are no white hair-spots in the fringe of the wing, nor on the absolute margin of the wing (at or very near the tips of the veins) as in typical *margininotata*, which character alone is almost sufficient to distinguish the two forms. The whole wing has a more brownish appearance, without the variegated appearance of *margininotata*, and the *absence of the white fringe* at the wing-tip will at once identify it from that species.

A second good character that I believe separates it from all other Oriental species is that of the whole of the tarsi being milk-white. In the allied species, *margininotata*, *gilvipes*, *proxima* and *mixta*, some portion of the tarsus is always black, often the major portion.

A specimen in the Indian Museum, taken by Dr. Annandale at Quilon, Travancore, 9-xi-08, has the hairs of the body, on the tibiae and metatarsi (except the tip of the latter) darker brown, also the lower branch of the 2nd longitudinal vein runs almost directly to the wing-tip. The blackish hair-spots on the

[1] This is the case in the original type specimen (a ♀). In a second specimen the pubescence obscures a vein of the base of the wing. In a specimen mounted for the microscope, the 2nd vein forks distad of the base of the 3rd, and for this reason it is doubtful if it is of this species.

disc of the wing, on the fork of the anterior branch of the 2nd vein, and on the fork of the 4th vein, are well marked.

Pericoma gilvipes mihi.

This form also, is certainly a good species, distinct from *margininotata*, as a questionable variety of which I first described it. The distinguishing character is the absence of white hairs at the wing-tip and of white hair-spots on the margin of the wing, also of isolated small patches of erect white hairs on the veins. Another good character is the distad forking of the 2nd longitudinal vein in reference to the origin of the 3rd vein, instead of the proximad forking as in *margininotata*. From its nearest ally, *lacteitarsis*, it is known by the nearly wholly black metatarsi, and by the distad instead of proximad forking of the 2nd vein, in relation to the origin of the 3rd vein. The anterior branch of the 2nd vein forks a little before the middle of the wing and a little distad of the fork of the 4th vein.

Additional specimens in the Indian Museum afford the following data:—Calcutta, 9-ii-10, 17—18-vii-07, 28-vii-08, 8—23-viii-08, 1—26-ix-08 [all *Annandale*, some taken "at light"]; Madhupur, Bengal, 17-x-09 "at light" [*Paiva*]; Ernakulam, Cochin, Malabar Coast, 4-xi-08 [*Annandale*]; Quilon, Travancore, 9-xi-08 [*Annandale*].

Pericoma proxima, mihi, sp. nov.

♀ ♂. Ceylon. Long. 1⅓ mm.

Body with dark brown hairs, intermixed with grey hairs here and there; bushy white hair on head above, and black hair below also on palpi. Abdomen with black hairs. Antennae with black scales on scape; flagellum like *Psychoda bengalensis*, the verticillate hairs widely spread out, the hairs whitish.

Legs dark, with blackish scales, black bristles and paler stiff hairs; fore metatarsi with apical third bearing white scales, posterior metatarsi with white scales at tips only.

Wings with hairs only on the veins, rich, moderately dark chestnut-brown. Very distinct and moderately large black hair-spots at tips of veins, where there are also some small white scaly hair-spots. Isolated groups of a few white scaly hairs placed apparently irregularly on the veins.

A distinct arc of white scaly hairs on the wing-fringe between the lower branch of the 4th longitudinal vein, and the 5th vein, but the wing-tip itself has distinctly rich brown hairs and no trace of white hairs. The wing-fringe brownish grey.

A distinct spot of black bristly erect hairs at the fork of the anterior branch of the 2nd longitudinal vein, and another at the fork of the 4th vein, both spots with a few white hairs beyond them.

Anterior branch of 2nd vein forking approximately opposite the fork of the 4th vein, distinctly but not greatly before the

middle of the wing. The pubescence hides the base of the wing sufficiently for it not to be clearly seen whether the 2nd longitudinal vein forks before or after the origin of the 3rd.

The example appears to be a ♂; the genitalia are covered with bristly bright yellow hair.

Described from a single specimen in good condition in the Indian Museum collection, taken at Peradeniya, Ceylon, viii-1910, by Mr. Green.

Pericoma impunctata, mihi, sp. nov.

Sex ? South India. Long. 1½ mm.

Body thickly clothed with long, very dark brown bristly hair; the surface of the body itself also dark brown. Antennae brownish yellow.

Legs with dark brown bristly hair; tarsi light brown but without traces of any pale scales at tips of joints.

Wings thickly clothed on all the veins with a double row of dark brown bristly hairs, denser and more bristly along the costa and at the base of the wing In certain lights the fringe of the wing and some of the stiff hairs on the basal part appear greyish, but the true colour of practically every part of the insect is dark brown.

Described from one specimen (sex uncertain) from Tenmalai (west side of Western Ghats), Travancore, South India, 22-xi-08, captured by Dr. Annandale.

Type in Indian Museum.

N.B.—The 2nd longitudinal vein apparently forks beyond the base of the 3rd vein but the root of the wing is too closely covered with hairs to speak with certainty.

Pericoma unicolor, mihi, sp. nov.

Sex ? Darjiling district. Long. nearly 1¾ mm.

This species is wholly brown in colour, only the tarsi being rather lighter. The antennae (partly broken) have flask-shaped flagellar joints. The wings are very large, and bear almost wholly dark brown hairs which appear rich golden brown in certain lights and show a violet tinge when viewed from different directions. The 2nd longitudinal vein forks immediately proximad of the base of the 3rd vein, the anterior branch of the 2nd forking again near the middle of the wing, much distad of the fork of the 4th which occurs towards the base, only shortly after the almost invisible posterior cross-vein, which latter is situated in a line with the basal section of the 3rd vein. The hairs at the tips of some of the veins are blacker but do not form distinct spots.

Described from a single specimen (sex uncertain) in the Indian Museum, from Kurseong, taken by Mr. D'Abreu in November, 1910.

N.B.—Although the actual difference in length between this species and *impunctata* is so little, the present form has a much

larger appearance owing to the considerable enlargement of the wings, which in *impunctata* are smaller than usual.

BRUNETTIA, Annand., and PARABRUNETTIA, gen. nov.

The characters of *Brunettia* (as defined by its author) which appear to me to be most strikingly generic are the closely scaled wings and the presence of *prominent* S-shaped chaetae on the flagellar joints.

To these may be added the lesser ones of broader wings than in the other genera in this family, but this character is almost certain to be a somewhat variable one.

The original species was *superstes*, Annandale, which was at first placed by its author in *Diplonema*, Lw. (an extinct genus), and afterwards removed to the present genus, which was established by Dr. Annandale for its reception; and to this new genus he added a second species from South India, *travancorica*.

As *superstes* was placed first (of the two species) in the new genus, it must be regarded as the generic type, as indeed, was intended and expressed by its author. Moreover, as *superstes* has a venation identical with that of *Pericoma*,[1] that type of venation must stand good in all species of *Brunettia*.

B. travancorica, Annand. (which was afterwards recognised as synonymous with my *Psychoda atrisquamis*), has, however, *Psychoda*-like venation, and therefore this species cannot remain in *Brunettia*, for it would be illogical to allow the two types of wing in a single genus, when *Psychoda* and *Pericoma* themselves are mainly differentiated by this difference in the venation.

It therefore appears that the genus Dr. Annandale has flatteringly named after me, still contains but the original species *superstes*, the consequence being that a new genus must be formed for all those other species of the present group that possess *Psychoda*-like venation.

This new genus it is proposed to call *Parabrunettia*, and it differs from *Brunettia* primarily in the different venation.

Its other characters may be regarded as—

(2) the presence of closely placed dark imbricating scales on at least some considerable portion of the wings, on both their upper and lower surfaces, or on the under side alone[2]; (3) the *surface* of the wing generally rather thickly covered to some considerable extent with more or less longitudinally placed *hairs*[3]; (4) chaetae present on the flagellar joints (possibly not on all of them, irrespective of the apical joint, which, even in *B. superstes*, is devoid of them). They are not so large nor so conspicuous in any

[1] That is to say, the 3rd longitudinal vein ends a little *below* the wing tip, instead of *at* the tip.

[2] Any species (if discovered), with scales on the upper side of the wing only, would logically fall in the new genus.

[3] These are absent in two species provisionally placed here, but this may be better regarded perhaps as a subgeneric character, as species both with and without hairs on the surface of the wings occur equally in *Psychoda* and *Pericoma*.

of the species as they are in *superstes*, and appear to vary a good deal in size, according to the species.[1]

In many species there is a rather noticeable patch of smooth depressed silky long hairs extended posteriorly from the alulae, and which may probably figure as a secondary character of the new genus.

Both *Brunettia* and *Parabrunettia* belong distinctly to the Psychodinae subfamily of Psychodidae, the 7th longitudinal vein being conspicuously present, and the 2nd longitudinal vein forking quite near the base of the wing.

PARABRUNETTIA, mihi, gen. nov.

To this new genus must be admitted the three species placed by me in *Psychoda* but divided off from the others by the presence of large scale-covered areas in the wings: *squamipennis*, *atrisquamis* and *argenteopunctata*.

Brunettia travancorica, Annand., has been shown to be synonymous with my *atrisquamis*.

To these three species are now added four new ones, *albohumeralis*, *9-notata*, *flavicollis* and *longichaeta*.

Owing to the denseness of the vestiture of the wings (the basal hairs, the surface hairs and the opacity of the scales), it has been impossible to note the exact position of the forking of the 2nd longitudinal vein in some of the species, but in all those in which it has been noted, it occurs distad of the origin of the 3rd longitudinal vein.

PARABRUNETTIA.

Table of species.

A	Hairs thickly present on *surface* of wing.	
B	*Upper* surface of wing as well as lower surface covered to a considerable extent with small dark imbricating scales.	
C	No white spots on wing-border. (The 2nd longitudinal vein forks distad of origin of 3rd vein.)	*squamipennis*, Brun.
CC	White spots on wing-border ..	*atrisquamis*, Brun.
BB	*Upper* surface of wing without any considerable area covered with scales (a few may be present at the base of the wing).	
D	Under surface of wing *wholly* covered with dark scales.	

[1] Similar chaetae but much smaller, have been detected by Dr. Annandale in *Pericoma marginimotata* and *Psychoda distincta*, so they cannot be considered of generic importance.

E	A silvery white scale-spot below shoulder	*albohumeralis*, sp. nov.
EE	Such silvery white spot absent ..	*argenteopunctata*, Brun.
DD	Under surface of wings with scales covering at most the basal half. (The 2nd longitudinal vein forks apparently distad of the base of the 3rd vein.)	9-*notata*, sp. nov.
AA	Hairs wholly absent from the surface of the wing. (The 2nd longitudinal vein forks distad of the origin of the 3rd vein.)	
F	....	*flavicollis*, sp. nov.
FF	....	*longichaeta*, sp. nov.

Parabrunettia atrisquamis, mihi.

Psychoda id., mihi.
Brunettia travancorica, Annand.

The brown or blackish short and moderately short scales on the upper surface of the wing are thickly present on the upper as well as the lower surface, but *on the basal half only*. They appear silky black when viewed in some directions and dull greyish white viewed from other directions. On the lower surface these dark scales cover the whole area.

The very small white hair-spots at the tips of the veins are placed on the absolute edge of the wing, almost in the adjacent fringe.

Some specimens taken by Mr. E. E. Green at Peradeniya, Ceylon, afford the data 18-vii, 14-viii and October (all 1910).

N.B.—A specimen in the Indian Museum, unfortunately in too bad condition to describe, certainly represents an undescribed species allied to *atrisquamis*, from which it differs by the scales on the under surface of the wings covering the basal half only. No obvious patch of silky hairs on the alulae. Traces of small white spots on the extreme border of the wing.

Parabrunettia albohumeralis, mihi, sp. nov.

♀. Ceylon. Long. 1¼-1½ mm.

Body covered with dark blackish brown hair, which, at least on the abdomen, appears dark greyish in certain lights. A small but very conspicuous tuft of snow-white scaly hairs at the sides of the thorax, nearly below the shoulders, a little in front of the base of the wing.

Antennae with general appearance of those of *Psychoda bengalensis*. Legs with brown hairs and scales, which are darker on the tarsi. Tips of tibiae and of metatarsi with white scales.

Wings with surface closely covered with dark brown hairs; the upper surface without any covering of scales except a very few at the base and the small ones forming the white spots. Under side of wing closely covered with dark brown imbricating small scales, extending almost to the margin. Conspicuous though small spots, composed of elongate snow-white scales, appear to be placed normally at the tips of nearly all the veins, but in the three examples present there is a little variability in their exact position. In the type they occur as follows: at a little distance before tip of 1st longitudinal vein; shortly before the 1st ending of the 2nd vein; at tips of the other two endings; at tips of 3rd vein, both branches of 4th, the 5th and 7th. A single white hair still remaining shows another spot to be present on the 7th vein some little distance before its tip. Tip of 6th vein without a spot. In one example there is a white spot behind the tip of the 6th vein, in another specimen the spot is at the vein tip. Venation *Psychoda*-like.

Described from three specimens, females, from Peradeniya, taken by Mr. E. E. Green, ix- and x-1910.

Type in Indian Museum.

N.B.—The white shoulder-spots immediately distinguish this from all other species.

Parabrunettia 9-notata, mihi, sp. nov.

♀. Orissa Coast. Long. 1½ mm.

Body covered with rich dark brown bristly hair on thorax, blackish brown on abdomen, with a few white hairs at the abdomen tip.

Antennal scape with dark elongate scales; flagellum with pear-shaped joints and brown verticillate hairs, which appear greyish when viewed in certain directions. Distinct long, curved chaetae present.

Legs blackish; femora with a considerable number of greyish, elongate, depressed scales; tibiae and metatarsi with whitish grey scales at tips; a few scales of a similar nature are also present at the tips of the tarsi.

Wings with the whole surface as well as the veins covered with blackish hair, which is much thicker and denser on the costa, where it is distinctly prominent and its colour distinctly black. Around the remainder of the border of the wing it is dark brown. A very conspicuous spot at the extreme edge of the wing-border, at the tips of every vein, composed of small white scale-like hairs. A number of white erect hairs on most of the veins in the basal half of the wing. Anterior branch of 2nd longitudinal vein forks opposite the fork of the 4th vein. The pubescence prevents a clear view of the base of the wings, but apparently the 2nd longitudinal vein forks distad of the base of the 3rd vein. Venation *Psychoda*-like.

Described from one ♀ from Puri, Orissa, east coast of India, 12-xi-10, taken by Dr. Annandale on a window pane; the specimen is now in the Indian Museum.

N.B.—The conspicuous, curved chaetae on the flagellum suggest that this species belongs here, and the hairy surface of the wing is a second character of the genus. However, the wing is destitute of scales, except the small ones forming the spots, and the species is placed here provisionally, pending the satisfactory elucidation of this group of forms.

Parabrunettia flavicollis, mihi, sp. nov.

♂. Ceylon. Long. about 1¼ mm.

Vertex with bushy yellow bristly hair; frons and face with black bristly hair. Antennae with flask-shaped flagellar joints, long necked, the brown verticillate hairs widely spread: long S-shaped chaetae distinctly present: scapal joints with scales.

Thorax with rather bright yellowish hair, with some grey hair intermixed. Abdomen with moderately dark brown hair. Genital organs with close long bristly hair, apparently normal in form.

Legs covered with dark brown scales; some yellowish white bristly hairs on tibiae, longest on hind pair, which latter are thickened at their tips and bear a circlet there of yellowish grey scales. Tips of anterior tibiae and tips of all the metatarsi with narrow circlets of yellowish white scales.

Wings with the 2nd longitudinal vein forking considerably distad of the base of the 3rd. Anterior branch of 2nd vein forking distinctly before the middle of the wing and a little beyond the fork of the 4th vein. *Hairs placed only on the veins*, not on the surface of the wings. A black hair-spot at tips of the veins and a few stiff yellowish grey hairs at or just before the tips of the veins. A black bristly hair-spot at fork of anterior branch of 2nd longitudinal vein. Venation *Psychoda*-like.

Described from a single ♂ in the Indian Museum collection from Peradeniya, Ceylon, taken August, 1910.

Parabrunettia longichaeta, mihi, sp. nov.

♂. South India. Long. 1½ mm.

Thorax with dark ground colour and yellowish bristly hair. Abdomen with dark ground colour with light brownish grey hair. Hair on head brown Palpi dark brown. Antennae generally as in *Psychoda bengalensis*; the verticils of hair widely spread out, light brown: the chaetae very long and conspicuous, although pale, S-shaped.

Legs light brown, with concolorous scales and bristles, also whitish scales on knees and on base of tibiae, on tips of tibiae and of metatarsi, and very minute yellowish white scales on the tips of the remaining joints. Femora and tibiae with short stiff black hairs here and there.

Genitalia large and distinct, very pubescent.

Wings (rather rubbed) with hairs on surface only; light brown or greyish, with small patches of light erect hairs irregularly disposed. The 2nd longitudinal vein forks distinctly distad of the base of the 3rd vein; the anterior branch forking a little beyond the fork of the 4th vein, both very near the middle of the wing. Venation *Psychoda*-like.

Described from a single ♂ in the Indian Museum, taken by Dr. Annandale at Maddathorai, Travancore State, South India, 17-xi-08.

N.B.—Referred doubtfully and provisionally to the present genus. There being no hairs on the surface of the wings and no scales, it is questionable whether a new genus should not be erected for it. The species, however, is quite a good one.

BLEPHAROCERIDAE.

Apistomyia trilineata, mihi, sp. nov.

♂. Darjiling district. Long. 4 mm.

Head.—Eyes closely, microscopically pubescent, upper facets very distinctly larger than lower ones, divided by a distinct narrow space, the upper ones being about one-fourth the total height of the eyes. Frons one-third the width of the head, bare, the eye-orbits narrowly silvery; ocellar triangle distinct, elevated the three ocelli conspicuous, reddish brown. Face whitish grey, with silvery reflections. Antennae black, bare; 1st scapal joint much broader at tip than at base, 2nd joint twice as long as the 1st, much broadened at tip, where it is produced on the under side into an elongate blunt point. Flagellum of 8 joints, the 1st barely half as long as the 2nd scapal joint, the following joints of thickened bead shape, the apical joint ovate.

The proboscis consists of a long elongo-conical rostrum, moderately stout at the base, whitish in colour, with blackish dorsum, thence produced into a tapering, very sharply pointed brownish yellow horny piece quite separate from the proboscis proper, which is very long, black, narrowly cylindrical, geniculated before the middle, beyond which it is bilobed, the ends curled up.

Thorax ash-grey, the central part of the dorsum up to beyond the middle occupied by three broad velvet-black stripes almost contiguous, extending laterally almost to the sides; the median stripe produced forwards to the anterior margin, which is wholly black to the shoulders, leaving a narrow grey space in front. Pleurae, scutellum and metanotum blackish.

Abdomen velvet-black, the anterior corners of most of the segments a little reddish brown with more or less silvery reflections. Belly reddish brown. Genitalia moderately small, oval, blackish, not conspicuous.

Legs.—Coxae wholly and the femora more or less at the base, brownish yellow: remainder of anterior legs blackish; tibiae and tarsi of hind legs brownish yellow, extreme tips of joints black. Anterior femora distinctly clubbed at the tips, the hind femora moderately thickened towards tips. The hind femora and tibiae are each twice as long as the anterior ones, and the hind tarsi are fully as long as the hind tibiae.

Wings absolutely clear, costa very narrowly black; a small brownish infuscation at extreme tip of wing. Venation normal, agreeing with Kellogg's figure.[1] Halteres black, stems yellowish.

Described from a single specimen in the Indian Museum taken by Dr. Annandale at Kurseong (5,000 ft.), 4-ix-09.

Blepharocera indica, mihi, sp. nov.

♂ ♀. Western Himalayas. Long. 4—5 mm.

Head.—Frons narrow,[2] dark grey or blackish; ocelli large and conspicuous. Face whitish. Proboscis brownish yellow, blackish at the base on upper side; elongate, pointed, about as long as the height of the head. Palpi elongate, four joints of about equal length, pale brownish yellow, with some stiff black hairs.

Thorax.—Dorsum blackish. Sides, scutellum and metanotum brownish yellow. A very small yellowish mark behind each shoulder.

Abdomen blackish; the base of each segment very narrowly yellowish white. Genitalia inconspicuous.

Legs brownish or brownish yellow: the hind femora slightly thickened towards the tips, about one-and-a-half times as long as the anterior femora.

Wings very pale yellowish grey; unmarked; venation normal. Halteres: stem yellowish, club black.

Described from two ♂♂ and a single ♀ in the Indian Museum from Phagu (9,000 ft.), Simla district, 12—15-v-09, taken by Dr. Annandale.

N.B.—Both sexes are presumed to be present from the appearance of the abdomens, which in the two examples I consider males is blunted, with an exceedingly small projecting piece; and in the supposed female is widened before the tip, with a short pointed ovipositor-like termination.

[1] Plate ii, fig. 20, in Gen. Ins., Fasc. 56.

[2] The head in each of the examples is either damaged or shrunken in drying, so that the proportionate width of the frons is not easily gauged. It is apparently quite narrow.

MISCELLANEA.

SYNONYMY IN CORETHRINAE.—Many recent authors have followed Theobald (Gen. Ins., Fasc. 26) (1905) in referring to *Sayomyia*, Coq., most of the species till recently incorporated under *Corethra*, Mg., but the American author's genus must give way, on his own admission,[1] to *Chaoborus*, Lichtenstein, established as long ago as 1800; so that a few synonymical notes may be useful.

Corethra, Mg. (1803), was originally erected (Illig. Mag., ii, 260) for the *Tipula culiciformis* of De Geer (1776); and for many years it contained only that species, with *pallida*, F. (1781), and *plumicornis*, F. (1794). It was not until 1823 that another species was added,—*punctipennis*, Say., followed by *flavicans*, Mg., in 1830 and others of more recent date.

Mochlonyx, Loew (1844), was formed for *Corethra velutina*, Ruthe, and to this genus has been added *effoetus*, Wlk., and actually *culiciformis*, De Geer (!), the very type species of *Corethra*; even Prof. Kertesz, in his catalogue of the world's diptera (vol. i, 1902), making the same error.

Theobald (Gen. Ins.) admitted Corethrinae as a subfamily of Culicidae and correctly replaced *culiciformis* in *Corethra*, with *velutina* (*effoetus*, Wlk., being added as synonymous with this)[2] and a third, recently described species, *cinctipes*, Coq. Therefore, unless *velutina* can be generically separated from *culiciformis* (and I have no means of forming an opinion on this), *Mochlonyx* must sink in favour of *Corethra*, Mg.

Schiner (Fauna Austr., ii, 624) placed *velutina* and *effoetus* (the latter not described, not being Austrian) in *Mochlonyx*; and placed *culiciformis* (also undescribed for the same reason), with the names of five other undescribed non-Austrian species, after his description of the three Austrian species (*pallida*, *plumicornis* and *fusca*) of *Corethra*. It is quite possible that he may not have seen all these species, and therefore his generic separation of *velutina* and *culiciformis* may not have represented an individual opinion.

Chaoborus, Lichtenstein, was erected for "*antisepticus* sp. nov.," which proved synonymous with *crystallina*, De Geer, this latter, queried by Theobald (Gen. Ins.) as synonymous with *plumicornis*, F., being definitely given by Kertesz as identical with it.

---

[1] Proc. U. S. Nat. Mus., vol. 37, p. 603 (1910).

[2] As Mr. Theobald has presumably examined the type of Walker's species, some importance attaches to this opinion.

Now *plumicornis*, F., *pallida*, F., and *punctipennis*, Say. (a North American species), with others, are retained by Kertesz under *Corethra*. This is obviously wrong, since Loew's principle in establishing *Mochlonyx* was a sound one, *i.e.*, "metatarsus several times shorter than the next tarsal joint," as contrasted with those species in which the metatarsus is longer than the 2nd tarsal joint.[1] The separation of these groups is justified: Loew lost his genus through unfortunately giving the name *Mochlonyx* to that group of species containing the type species of *Corethra*, Mg. Of course, in the days in which he wrote it was sometimes not easy to distinguish which species was intended by an author as the type of his genus[2] and this may have authorised him to split off any group, or particular species at will.

Corethra, Mg., must therefore always stand for *culiciformis*, with its congeners.

Coquillett in 1903 erected *Sayomyia* for "Corethra punctipennis" Say., which he admitted as congeneric with *plumicornis*, F. (the latter species possessing *crystallina*, De G., and others as synonyms), both of which species have now to be placed in *Chaoborus*.

The synonymy of the species immediately concerned will stand thus:—

Corethrinae (*Subfamily of Culicidae.*)

CORETHRA, Mg., 1803.

(*Mochlonyx*, Loew, 1844.)

1. *culiciformis*, De Geer (*Tipula id.*). TYPE of genus.
2. *velutina*, Ruthe (*Mochlonyx id.*, Loew; TYPE of *Mochlonyx*) (*effoetus* Wlk.).
3. *cinctipes*, Coq.

CHAOBORUS, Lichtenstein, 1800.

(*Sayomyia*, Coq., 1903.)

1. *plumicornis*, F. (*Tipula id.*). TYPE of genus.
2. *punctipennis*, Say. (TYPE of *Sayomyia*).
3. All other species referred to *Sayomyia* since Theobald's acceptance of the genus, but previously placed in *Corethra*.

The three other genera recorded by Theobald appear to me built on very weak characters and I should prefer to regard them as subgenera of *Chaoborus* only. Each contains but one species. They are *Pelorempis* (Joh.) *americana*, Joh., *Corethrella* (Coq.) *brakeleyi*, Coq., and *Eucorethra* (Underwood) *underwoodi*, Underw.

E. BRUNETTI.

---

[1] Theobald (Gen. Ins.) is distinctly wrong in terming the joint following the metatarsus as the first, since the *metatarsus itself is the 1st tarsal joint*, the succeeding joint being the *second*.

[2] I have seen it stated somewhere that Meigen placed what he considered all the most typical species in the middle of the genus, and those tending to aberration at one end or the other of it.

FURTHER NOTES ON INDIAN *Phlebotomi*.—The recent acquisition of a number of specimens of *Phlebotomus* from different parts of India and especially from Ceylon enables me to amplify the notes published in these "Records" last year (vol. iv, No. ii, pp. 35—52), and I have been helped greatly to gain a true appreciation of certain characters by frequent discussions with Mr. E. Brunetti.

Hitherto I have laid great stress on the relative lengths of the different parts of the second longitudinal vein as a specific character, but these lengths are evidently more variable than I thought. They would provide a method of separating a species such as *P. himalayensis* from one such as *P. argentipes* at a glance, but in the latter the length of the upper branch of the vein, and consequently that of the other parts also, varies within fairly wide limits. I have had, therefore, to recognize that the form recently described by me as *P. marginatus* is not a "good" species but merely a colour variety of *P. argentipes*.

Regarding the sanitary importance of *Phlebotomus* attention may be directed to a paper just published by Major F. Wall, I.M.S.[1] The facts cited suggest (1) that troops moved into certain barracks in Chitral become infected with a fever akin to or identical with what is called *Papatacifieber* in Austria, these barracks being frequented by *P. papatasi* and *P. babu*, and (2) that men from districts in which these two species occur are less liable to suffer from this fever (having perhaps become to some extent immune) than those from districts in which the common species are *P. major* and *P. himalayensis*.

Phlebotomus argentipes, Annandale and Brunetti.

Rec. Ind. Mus., iv, p. 44, pl. iv, fig. 3, pl. vi, fig. 6; *Spolia Zeylanica*, vii, p. 59.

I have recently examined a good many specimens from Peradeniya, which is situated in the interior of Ceylon at an altitude of about 1,500 feet. The species occurs all over the plains of India except in the extreme north-west. Apparently it does not occur in the Himalayas.

Var. *marginatus*, Annandale.

P. marginatus, *Spolia Zeylanica*, vii, p. 62, fig. 7.

This form cannot be regarded as more than a colour variety, distinguished from the typical form of *P. argentipes* by the fact that the dorsum of the thorax is brown instead of black and the sides of the thorax rather darker than in the typical form.

The var. *marginatus* occurs in Calcutta as well as at Peradeniya and is apparently not a seasonal form.

[1] *Ind. Med. Gazette*, xlvi, p. 41 (1911).

Phlebotomus major, Annandale.

Rec. Ind. Mus., iv, p. 46, pl. v, fig. 4, pl. vi, fig. 4.

Specimens appear to be invariably larger than those of *P. argentipes*, from which both the typical form and the variety here described may be distinguished by the fact that the dorsum of the thorax is never black or brown.

Var. *grisea*, nov.

Distinguished from the typical form by the general greyish or brownish (instead of golden) colour.

I took several specimens in a house at Kurseong in the Darjiling district (alt. 4,700 feet) in June, 1910, and also saw the variety in the same house in April, 1911. The two varieties are easily distinguished by the naked eye.

Phlebotomus babu, Annandale.

Rec. Ind. Mus., iv, p. 49, pl. iv, fig. 1, pl. vi, figs. 3, 3a; *Spolia Zeylanica*, p. 61.

As I have pointed out in a recent paper, this species is probably identical with "*Hebotomus*" *minutus*, Rondani, but it is impossible to state that it is synonymous without a comparison of specimens. I have recently obtained specimens of *P. babu* from Peradeniya in Ceylon and from Drosh in Chitral in the Hindu-Kush Mountains (4,700 ft.). The species is probably distributed all over the plains of India and ascends the Western Ghats to an altitude of at least 2,000 feet, but is not known from the Himalayas.

Var. *niger*, nov.

Darker than the typical form and as a rule larger.

This form was at first regarded as a distinct species and is marked as probably being so in Mr. F. M. Howlett's collection. I cannot, however, distinguish any constant difference in its venation or genitalia.

As yet the variety has only been taken in Bihar. I have not seen it in Calcutta.

Phlebotomus papatasi (Scopoli).

Rec. Ind. Mus., iv, p. 51, pl. iv, fig. 4, pl. vi, fig. 2.

I have recently received specimens from Drosh, Chitral (Major F. Wall, I.M.S.), and from Quetta, Baluchistan (Lt.-Col. Wimberley, I.M.S.). The species appears to be common, together with *P. babu*, all over the north-west of India, ranging as far east as Pusa in Bihar.

N. Annandale.

VIII. A REVISION OF THE ORIENTAL SPECIES OF THE GENERA OF THE FAMILY TABANIDAE OTHER THAN *TABANUS*.

By GERTRUDE RICARDO.

Family TABANIDAE.

Subfamily *TABANINAE*.

Hind tibiae with no spurs. Ocelli usually absent.

The genera found in the Oriental Region, besides the large genus of *Tabanus* proper, are: *Haematopota*, Meigen, small flies with peculiarly marked wings; *Udenocera*, Ricardo, formed for a species from Ceylon with the long antennae situated on a tubercle; *Diachlorus*, Macquart, including chiefly species from S. America, distinguished by the simple antennae not situated on a tubercle, by the brown or yellowish markings of the wings and by the curved dilated fore tibiae, and slender build. The one species described from the Philippines is unknown to me. A new genus *Neotabanus* is now added, allied to *Udenocera* in having the antennae situated on a tubercle, but the antennae themselves are similar to those of the genus *Tabanus*.

HAEMATOPOTA, Meigen.

Illiger's Magazine, ii, p. 267 (1803); *Chrysozona*,[1] Meigen, Nouvelle Classification, 23 (1800); Kertesz, Cat. Dipt., iii, p. 201 (1908).

The described species from the Oriental region now amount to 31, including 11 new species described in this paper.

The following is a list of all the described species and synonyms:—

[NOTE.—The synonyms are printed in italics.]

HAEMATOPOTA annandalei, n. sp.
assamensis, n. sp.
asiatica, Rondani = javana, Wied.
atomaria, Walker.
bilineata, n. sp.
borneana, Rondani.

[1] For reasons against the adoption of this name see Verrall "British Files," v, p. 772 (1909) Austen, African Blood-Sucking Files, p. 121 (1909).

brevis, Ricardo.
cana, Walker.
cilipes, Bigot.
cingalensis, Ricardo.
cingulata, Wiedemann.
cordigera, Bigot (nomen bis lectum) = fusci-frons, Austen.
dissimilis, n. sp.
fasciata, n. sp.
fuscifrons, Austen.
immaculata, n. sp.
inconspicua, n. sp.
irrorata, Macquart.
javana, Wiedemann.
lata, Ricardo.
latifascia, n. sp.
limbata, Bigot.
lunulata, Macquart.
marginata, n. sp.
nigra, Wiedemann ? = javana, Wied.
pachycera, Bigot.
punctifera, Bigot.
roralis, Fabricius.
rubida, Ricardo.
sinensis, n. sp.
singularis, Ricardo.
tessellata, Ricardo.
unizonata, Ricardo.
validicornis, n. sp.

The small flies of this genus are easily recognized by the peculiar marking of the wings, three rosettes more or less distinct, formed by pale marks on the darker ground colour are usually present, though in a few species they are absent and only pale streaks are present. The great majority of the species have typical paler rings of colour on the middle and posterior tibiae, occasionally absent, or only present on the middle pair, this character is sometimes indistinct owing to denudation. In the grouping of the species I have taken this character as a means of division, afterwards relying chiefly on the shape of antennae (in the females only) and on the form of the apical band of wing. As many more species will probably be discovered from India and other Oriental districts it seems useless as yet to draw up a table of species.

Synopsis of the Divisions and Groups of Haematopota.

Division I. Legs uniform in colour with no typical rings on the tibiae .. .. *Group I.*
Division II. Legs not uniform in colour, but with the base of the fore tibiae at least white or yellowish, no rings on tibiae .. .. *Group II.*

DIVISION III. Legs not uniform in colour, but with typical rings on the middle tibiae only, all tibiae whitish at base *Group III.*

DIVISION IV. Legs not uniform in colour, but with typical rings on the middle and posterior tibiae *Groups IV, V, VI, VII.*

Group IV. First joint of antennae abnormally large and stout, and as long as or longer than the third joint.

Group V. Third joint of antennae broad and flattened on the first annulation, the last three annulations forming a narrow apex, the first joint incrassate, nearly as long as or longer than the first annulation of third joint.

Group VI. Third joint of antennae not very broad at base, the first joint short, often only half as long as or at least always shorter than the third joint which is usually long and slender.

Group VII. Antennae long and slender, the first joint as long as the second and third together.

DIVISION I.

Group I.

Legs uniform in colour, with no rings on the tibiae or pale bases to fore tibiae.

Haematopota roralis, Fabr.

(Plate xvii, fig. 24.)

Syst. Antl., 107, 2 (1805); Wied. Dipt. Exot., 97, 1 (1821); *id.*, Auss. zweifl. Ins., i, 215 (1828); Bigot, Bull. Soc. Zool. France, xvi, 78 (1891).

Wings with white spots, abdomen brown, with three stripes and spots, white. Habitat—Tranquebar. Related to *H. pluvialis*. Antennae elongate, yellow. Head ashy grey with two frontal black spots. Thorax dark, with an ashy grey stripe. Abdomen elongated, brown, with three white stripes and spots. Median stripe and spots linear. Wings dark with very numerous white spots and little lines. Legs testaceous. Fabr., Syst. Antl., 107.

Brownish grey. Thorax and abdomen with white stripes. Wings with hyaline little spots. ♀ $4\frac{3}{4}$ l. From Tranquebar.

The head is gone in the Fabrician type and the abdomen is crushed; but it is easily distinguished from *H. pluvialis*, by the legs being unicoloured, blackish[1] ochre-brown, not variegated, and by the chestnut brownish costal border and stigma of the wings; segmentations of the abdomen reddish, but of the under side greyish white. In the Fabrician collection. Wied., Auss. zweifl. Ins., i, p. 215.

In Brit. Mus. coll. a male from Velverry, a female from Hot Wells, Trincomalee, and another female from Pankullam Road, Trincomalee; Ceylon (Yerbury), 1891.

[1] In Dipt. exot. Wiedemann describes the legs as ochre-brown.

In Indian Museum, males and females from Calcutta; and Goalbathan, E Bengal.

In Howlett coll , a series of females from Gorakhpur, United Provinces; and from Belgatchia, Bengal, " on cow."

A species distinguished by its testaceous legs with no darker bands, or base of fore tibiae lighter, and by the absence of any spots on the face.

The female is long, slender, greyish brown, the abdomen marked with a median grey stripe and with lateral grey spots on each segment. Antennae yellow, long, the first joint nearly as long as the third one which is blackish at apex. Forehead with the usual paired spots, no unpaired spot present. Frontal callus yellowish, transverse. Wings viewed from the base usually appear pale in the basal cells and in the basal portions of the discal, first posterior and submarginal cells, elsewhere greyish brown, with three rosettes distinct, the apical band simple, short, a row of short whitish disconnected bands run from it round posterior border of wing.

The males are more reddish yellow on the abdomen, the first joint of antennae short, stout.

Length of males 9—11 mm., of females 8½—11 mm.

♀. *Face* greyish with some short white pubescence, the fovea alone appearing darker. *Palpi* pale yellow with black pubescence, stout, ending in an obtuse point. *Antennae* reddish yellow, the first joint yellowish cylindrical, slightly incrassate, barely as long as the third joint, the second joint very small, yellow, both the two first joints with black pubescence, the third joint slender reddish, blackish on the annulated apex. *Forehead* same colour as face or a shade darker, with some white pubescence, broad, hardly narrower at vertex, the frontal callus reddish yellow, shining, reaching the eyes, produced to a short point in the middle of its upper border, a narrow spot proceeds from its lower border to between the antennae, the paired spots blackish, not touching eyes. *Thorax* blackish brown with three grey stripes and *sides grey*, the scanty pubescence consists of short greyish yellow hairs: *scutellum* blackish brown, largely covered with greyish tomentum. Breast greyish. *Abdomen* blackish brown or brownish, with a distinct ashy grey median stripe, and grey roundish spots on each segment not reaching the anterior or posterior border, these markings are only distinct in well-preserved specimens, the pubescence chiefly consists of very fine short yellowish hairs, under side uniformly greyish. *Legs* reddish yellow, coxae greyish, base of femora sometimes darker, tibiae not incrassate or hardly so. *Wings* greyish, paler at base and at base of submarginal, first posterior and discal cell, though not always very distinctly so, the stigma and veins yellow, an appendix present on fork of third longitudinal vein, the two upper rosettes distinct, the third small, its outer ring incomplete, continued from above across the anal cell into the axillary lobe of wing, reaching the border, the short pale bands begin from the anal cell and continue round the border

of wing to the apical band which is small and often inconspicuous, crossing the anterior branch of third longitudinal vein, but not always reaching the second longitudinal vein.

♂. Similar, but the *abdomen* is largely reddish yellow, darker at apex. *Eyes* with the large facets occupying two-thirds of surface, coppery coloured, the basal small facets blackish. *Face* more hairy. *Palpi* pale whitish yellow. *Antennae* with the first joint incrassate only about half as long as the third. Frontal triangle with small yellowish callus, the spot between the antennae brown. Hind tibiae fringed with black hairs on each side. Fore tibiae more filiform than in female.

Haematopota limbata, Bigot.

Bull. Soc. Zool. France, xvi, p. 78 (1891); *id.*, Mem. Soc. Zool. France, v, p. 626 (1892); Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 115 (1906).

Antennae, palpi and proboscis dull fawn coloured; beard grey; face whitish below, above dark shining chestnut; forehead whitish with two side black spots; the first segment of antennae hardly incrassate; thorax dull reddish; the dorsum with four diffuse blackish stripes, scutellum blackish, sides whitish with hairs of the same colour (or, in the Latin, pleurae ashy grey); abdomen brownish (in Latin, chestnut coloured) with a wide dorsal stripe very regular and greyish white, all the segments narrowly bordered with yellow, with a lateral blackish spot; pleurae and halteres pale fawn coloured; legs uniformly pale fawn coloured; wings very pale yellow, the stigma narrow, reddish, and all the veins bordered with a pale reddish colour, some indistinct very pale white markings. India: one specimen, ♀, 11 mm. Bigot, Mem. Soc. Zool. France, v, p. 626.

The author in his first notice of the species in his table for *Haematopota* in Bull. Soc. Zool. France, xvi, p. 78, describes the antennae as almost entirely yellowish, abdomen chestnut coloured with a wide whitish dorsal stripe; wings yellowish with pale indistinct spots.

From the type kindly lent me by Mr. Verrall in 1906 I made the following description, published in the "Annals" as above:—

Type (female) from Bengal, and another female from Khasi Hills. A fair-sized species, easily distinguished by the prominent bluish grey median stripe of abdomen, with large black spots on the upper part of the face.

Brown. *Face* grey; a large irregular-shaped black spot on each side of antennae, reaching to the eyes. Frontal callus yellow, shining, narrow, concave on the posterior or lower border; the spot between the antennae black. *Forehead* grey, the paired spots black and distinct, the unpaired spot brown, indistinct. *Antennae* yellow; the first joint stout, not so long as the third joint, with black pubescence; the second joint very small, with black hairs; the third joint broad, becoming narrower where the annulations

begin, and tapering to a point. *Palpi* yellow, with dense black pubescence. *Thorax* blackish brown, lighter coloured at the sides, with faint narrow grey stripes, the breast with hoary markings. *Abdomen* brown, the posterior borders of the segments narrowly yellowish; some faint black markings on the sides of abdomen; the under side brown, covered with grey tomentum. *Legs* yellow, with fine black pubescence; the coxae grey pollinose. *Wings* grey, with yellow veins and a long appendix; most of the veins are faintly shaded with darker colour; the typical markings are faint: there is one rosette apparent, enclosing the appendix, and another beyond. Length 11½ mm.

In Indian Museum are two females from Khasi Hills, Assam. One of these is labelled *H. limbata*, n. sp., Bigot, in his handwriting and no doubt may be considered a para-type. Both agree in all particulars with the descriptions, the apical band of wing is simple, narrow, but curved on the part crossing the anterior branch of third vein.

Division II.

Group II.

Legs not uniform in colour, with no rings, but with the base of fore tibiae at least white or yellowish.

(*A*) *Wings with no typical rosettes but with a pale band and streaks.*

Haematopota cingulata, ♀, Wied.

Auss. zweifl. Ins., i, p. 216 (1828); Bigot, Bull. Soc. Zool. France, xvi, p. 79 (1891); Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 115 (1906).

Thorax brown, with a wide yellow stripe; abdomen blackish with whitish segmentations; wings brown, with base, band, and two curved streaks, hyaline. ♀ 4½ lines. From Java.

Antennae leather-yellow, with the apex of third joint blackish. Palpi blackish. Face blackish brown, faintly greyish white at sides with black dots; cheeks blackish brown, forehead shining blackish brown, above in certain lights grey with two brown contiguous spots. The yellow stripe of thorax is as broad as the full clear brown sides and is continued on to the scutellum, breast sides full clear brown, breast greyish. Abdomen blackish brown, the first segment with a broad triangular whitish spot which reduces the ground colour at the base to a triangular spot; second segment with a narrower, triangular spot which attains the base and at its own base unites with the white segmentation; the following segments merely with white segmentations; perhaps in perfect unrubbed specimens these may have white hairs and triangular spots. Under side the same colour, likewise with white segmentations. Wings at the base as far as the middle cross-veins fairly hyaline, only yellowish between the last two veins and on the costal border; otherwise blackish brown; the hyaline band lies a

little behind the middle cross-veins, is somewhat oblique, and is narrower towards the fore border where it meets the posterior end of the stigma, on the inner border it is abbreviated, behind it lies the first streak which starting from the fore border, decreasing, curves forward bow shaped and ends in the band; the second streak nearer the apex begins from the fore border close to the apex of the second vein and runs curved forward, so that it gradually approaches the first one and ends on the inmost part of the band; the inner border of the wing is brown much further towards the base than to the middle. Halteres white. Legs blackish brown, base of tibiae white, posterior femora brown at the base, at the apex to far beyond the half, honey yellow. In the Leyden Museum. Wied., Auss. zweifl. Ins., i, p. 216.

The reference given by Kertesz in both of his Catalogues, *viz.*, Cat. Tabanidarum, 1900, and Cat. Dipt., vol. iii, 1908, to v. d. Wulp, Tijd. v. Entom., xxxiv, p. 197, 1891, is incorrect. In Wulp's Cat. of Oriental Diptera, 1896, there is no such reference against *H. cingulata*, and I have not been able to find any reference to this species by v. d. Wulp, and it is unknown to me. It should be an easily identified species by means of the wings which apparently have not the usual rosettes, but are allied to those of *H. rubida* and *singularis*, Ricardo.

(*B*) *Wings with the usual rosettes, the apical band double.*

Haematopota punctifera, Bigot.

(Pl. xvii, fig. 20.)

Mem. Soc. Zool. France, v, p. 629 (1892); Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 125 (1906).

Antennae incomplete, blackish at base, *first joint very short*: face and palpi whitish; forehead wide, dull black with grey tomentum, and a large shining black callus above the antennae; thorax dark chestnut coloured with four greyish white stripes; scutellum brown, greyish in the middle; abdomen blackish brown, sides of segments, a narrow, interrupted, median stripe, and two spots on each segment, greyish; squamae grey, halteres brown; legs brown, tibiae pale yellow, black at apex, tarsi black, anterior tibiae almost wholly black; wings grey, with fine white marking (specimen damaged). The shortness of the first antennal joint makes the exact position of this species doubtful. Length 11 mm.: Java, one specimen. Bigot, Mem. Soc. Zool. France, p. 629.

The following description was published by me after seeing the type:—

The *antennae* are incomplete; the first joint red, short, and incrassate, the second one red, small.

Face grey, with white hairs, no spots, but a dark brown band between the eyes and the antennae. *Palpi* reddish, with black pubescence. Frontal callus black, shining, reaching the eyes, narrow, curved on the posterior border and produced to a point in

the centre; a black spot between the antennae. *Forehead* (denuded) blackish, with grey tomentum and some golden pubescence. *Thorax* (denuded) brown, with grey stripes and tomentum and some black and grey pubescence; sides grey, with traces of fulvous and grey pubescence; *scutellum* brown, with median grey stripe and greyish pubescence. *Abdomen* brown, with grey median stripe, grey spots on each side, and grey sides; the greyish pubescence rather dense. *Legs* reddish brown, the tibiae yellower, the anterior ones whitish at the base, brown at the apex; the anterior tarsi brown, the middle and posterior tarsi yellow, darker at the joints and apex; coxae with rather long white pubescence; femora with short white pubescence; tibiae and tarsi with some black pubescence. *Wings* greyish, with appendix; veins yellowish brown; stigma brown; a darker spot is visible above the stigma. Length 8 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 125.

(*C*) *Wings with the usual rosettes, the apical band single.*

Haematopota indiana, ♀, Bigot.

(Pl. xvii, fig. 19.)

Bull. Soc. Zool. France, xvi, 78 (1891); *id.*, Mem. Soc. Zool. France, v, p. 626 (1892); Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 124 (1906).

Antennae double as long as the head, first and second joints reddish yellow, the third brown, at the base a little reddish yellow, the first cylindrical, the third not incrassate; palpi chestnut coloured, proboscis brown; cheeks and face white below; forehead ashy grey with two black spots, and with a black, shining, anchor-shaped spot below; thorax chestnut coloured with four ashy grey stripes, scutellum chestnut coloured, pleurae ashy grey; abdomen brown, with white segmentations and with a median broad white stripe; anterior and intermediate femora pale chestnut, paler at their apices, the posterior ones dull brown, tibiae not with rings, black, at the base widely white, anterior tarsi black, intermediate and posterior ones white at base: pleurae brown, halteres reddish yellow with apex black; wings pale cinereous, at the apex diffusely pale brown, and ornamented with numerous white spots and lines. Bigot, Mem. Soc. Zool. France, v, p. 627.

In Indian Museum one female from Tezpore, Assam.

The following description was published by me in the "Annals" after an examination of the type:—

A brown species, distinguished by its long slender antennae and all the tibiae white at the base.

Face grey, dark brown in the centre, immediately below the antennae; the stripe between the antennae and the eyes brown, but broken up into dots and spots. *Palpi* reddish, rather long, with brown pubescence and some white hairs; beard white. Frontal callus narrow, long, reaching the eyes, shining brown, both borders nearly straight; the spot between the antennae black, bordered

with grey; the paired spots dark brown, large, reaching the eyes and almost touching the callus; the unpaired spot brown, small; forehead yellowish, with brown markings and grey tomentum and short black pubescence. *Antennae* long, slender, yellow; the third joint dusky, reddish at base, black at apex; the first joint as long as the part of the third joint which is unannulated, the second joint small, both with black pubescence. *Thorax* brown, with grey shoulders and three narrow grey stripes; short yellowish pubescence is visible on the dorsum; the sides brown with black hairs, the breast grey. *Abdomen* a redder brown, with light narrow borders to the segments, darker at the apex; the pubescence on the light borders short and yellowish, on the other parts black; a hoary grey median stripe is very distinct from the second to the fifth segment; the under side brown, grey at the sides. *Legs* reddish brown, the fore tibiae and tarsi darker brown, with black pubescence, the base of all the tibiae whitish, on the middle tibiae the white extends further; the basal joint of the middle and posterior tarsi whitish. *Wings* brown, with yellowish brown veins and stigma and an appendix; the apical band single, broad; the first second, third, and fifth posterior cells light coloured at their apices; the dark spot on the fifth posterior cell (as shown in figure) is only noticeable in the wing in certain lights. Length 9 mm. The type is labelled "Margherita, 5373. 8."

Haematopota borneana, ♀, Rondani.

Ann. Mus. Civ. Genova, vii, p. 461 (1875); Bigot, Bull. Soc. Zool. France, xvi, p. 78 (1891).

Length 6—7 mm. ♀.

Antennae with the first joint yellowish brown; the second pitchy blackish with the greater part of the third, whose apex is black.

Forehead dull brown, with two rather small black spots and a wide shining ferruginous brown anterior callus. Face and palpi reddish with two small impressed spots at sides. Thorax with the scutellum above red, the intermediate stripe and side spots brownish, not very distinct; pleurae paler coloured. Abdomen at the base yellowish brown, then black, with white segmentations to the posterior segments, wings brownish, the costal border towards the apex browner, white spotted, the spots small, and a white transverse stripe distinct at apex. Halteres with a white stalk and ferruginous club. Legs with anterior and posterior femora pitchy black, the intermediate ones yellowish brown; all the tibiae white with the apex blackish; anterior tarsi wholly black, the posterior ones reddish at base. Rondani, Ann. Mus. Civ. Genova, vii, p. 461.

I saw the type in the Museum at Genoa in the spring of 1909, it is not in good condition, 6½ mm. long. A small species with a red thorax marked with a broad black median stripe and traces of lateral ones. *Face* dull reddish, convex, no dark spots on it, the

frontal callus reddish brown, shining transverse, produced in the middle on posterior border near antennae. *Forehead* reddish, no other spots visible. *Antennae* yellow, the first joint nearly as long as the third. *Palpi* yellow: *Wings* with the apical band single, the first rosette distinct.

Haematopota cana, ♀ , Walker.

List Dipt. Brit. Mus., i, p. 207 (1848); Bigot, Bull. Soc. Zool. France, xvi, p. 79 (1891); Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 116 (1906).

Body hoary; head white beneath; eyes bronze colour; feelers black, a little longer than the head; first joint tawny towards the base; mouth black; palpi hoary, tawny towards the tips; chest with four indistinct whitish stripes; abdomen with a broad brown stripe on the back: hind borders of the segments pale tawny; legs piceous; shanks (tibiae) tawny, with piceous tips; four hinder feet (tarsi) tawny at the base; wings very pale grey, adorned with numerous colourless segments of circles; wing ribs and veins tawny, the latter piceous towards the tips of the wings; poisers tawny. Length of the body 3½ lines; of the wings 7 lines.

N. Bengal. From Miss Campbell's collection. Walker, List Dipt. Brit. Mus., i, p. 207.

Type (female), Northern Bengal, 42, 25 (Lieut. Campbell).

A small yellow-brown species, with large grey spots at the sides of abdomen and an indistinct median stripe.

The type is in very poor preservation, which makes any description of it incomplete.

Face grey, no spots; the frontal callus brown, both its borders somewhat irregular; a small brown spot is situated between the antennae; the paired spots are brown, large, oblong, the unpaired one is small. *Forehead* grey. *Antennae* brown, the first joint yellowish, stout, not quite so long as the third; the *palpi* yellow, with black pubescence. *Thorax* blackish, with three grey stripes, the sides and breast greyish. *Abdomen* yellowish, darker at the tip, with large hoary grey spots on the sides; the median stripe appears incomplete, the hind borders of the segments narrowly yellow. *Legs* yellow; the fore coxae very long; the femora brownish; the fore tibiae brown, yellow at the base; the tarsi brown at the tips. *Wings* grey, the veins yellow, with an appendix; the light rosettes and spots fairly distinct. Length 8 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 116.

This type being so deteriorated it is impossible to place it even with any certainty in this group. The wings bear some resemblance to those of *H. roralis*, Fabr., the basal cells being largely pale, the apical band is single lineal, curved towards the apex where it joins the first small transverse band, which joins the succeeding one, all these bands forming a nearly continuous line round the border of wing, no pale openings are visible in the posterior cells, three rosettes are distinct; only one wing remains.

DIVISION III.

Group III.

Legs not uniform in colour but with rings on the middle tibiae only, all tibiae white at base.

(*A*) *Apical band of wing double.*

Haematopota dissimilis, ♀, n. sp.

(Plate xvii, fig. 22.)

In British Museum type (female) and others from Baste, and Gersoppa, N. Canara, India, 1907 (T. R. Bell).

A species allied to *H. bilineata*, n. sp., in the wing but distinguished from it by the first joint of antennae being cylindrical hardly incrassate, yellowish or yellowish brown in colour, the frontal callus is also broader. Tibiae not incrassate, the hind tibiae with a white-haired ring at the base, the middle tibiae only with typical rings, in this allied to *H. atomaria*, Walk., but distinguished from it by the cylindrical antennae and narrow frontal callus. Apical band of wing double, the upper branch proceeding from the inner border, the lower and larger one from the outer border. Length 8½ mm.

Face ashy grey with some short black pubescence, a brown band is present on upper part, broken up into spots, so that the ground colour appears yellowish brown, and the spots are dark brown or black. *Palpi* with the second joint swollen at base ending in a narrow apex, obscurely reddish, with black pubescence. *Antennae* reddish yellow, slender, long, the first joint fully as long as the first annulation of third joint, shining with black pubescence, hardly incrassate, the second joint very small cup shaped, likewise with black pubescence, the third joint slender, only slightly broader at base, dusky in colour at tip; a large black spot is present between the antennae. *Forehead* brownish, the frontal callus dark blackish brown, shining, almost straight on both borders, in the type produced slightly on the upper border, reaching the eyes anteriorly and posteriorly, occupying in breadth about a third of the width of forehead; the paired spots large, black, touching the eyes and the frontal callus, the paired spot small, triangular. *Thorax* brown with some yellowish brown tomentum and short pale pubescence, shoulders with some ashy grey tomentum. *Scutellum* similar to thorax. *Abdomen* chocolate-brown with narrow grey segmentations, under side similar, pubescence on dorsum scanty, white on segmentations, elsewhere black. *Legs* blackish, the base of fore tibiae whitish and the usual rings on the middle tibiae reddish yellow or whitish, often indistinct, hind tibiae with only a white ring near base and sometimes a tuft of white hairs beyond, the white base of fore tibiae is more correctly a white ring near the base, fore tibiae hardly incrassate, femora reddish yellow, the basal joint of middle and posterior tarsi pale. *Wings* very similar to those of *H. bilineata*, n. sp., the apical

band in type has the upper branch proceeding from the inner border very insignificant consisting of a very short narrow line not reaching the anterior branch of the third vein, but in the other specimens it usually crosses it or at least reaches it, the lower and larger branch is wide at its base, becoming narrower as it proceeds, crossing the upper branch of third vein.

(*B*) *Apical band of wing single.*

Haematopota atomaria, ♀, Walker.

(Plate xvi, fig. 11.)

Proc. Linn. Soc. London, i, p. 112 (1856); Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 117 (1906).

In British Museum coll.

Type (female), Sarawak, Borneo (Wallace), 56, 44, and two other females from Sarawak, 57, 36.

A small dark species, with brown wings, distinctly marked with the usual rosettes and spots; the first joint of the antennae incrassate.

Face grey; two small black spots beneath the antennae; the upper part of the face with a brown stripe, which becomes yellowish near the antennae; the *palpi* yellow, with black pubescence; the beard white. Frontal callus pitchy brown, shining, broad, reaching the eyes, with the posterior border convex, rounded, the anterior border reaching round the antennae; the paired spots black, round, reaching the eyes and the frontal callus, with yellow borders. *Forehead* brown, yellower on the vertex; the unpaired spot not present. *Antennae* blackish; the first joint dark red, shining, with black hairs, slightly incrassate, considerably shorter than the third; second very small; third broad, ending in a point. *Thorax* brown with traces of darker stripes and of short white pubescence; *scutellum* the same colour; breast brown. *Abdomen* brown, with narrow greyish borders to the segments, which are broader on the under side. *Legs* reddish brown, with black pubescence, which becomes fringe-like on the hind legs; the base of the anterior tibiae white, the middle tibiae with the typical rings, the posterior tibiae brown at the extreme base, then white and brown on the apical half. *Wings* brown, with brown veins and an appendix; the apical band single; all the posterior cells and apical cell with a triangular white spot at their openings with the exception of the fourth posterior cell. Length 9 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 117.

The posterior tibiae are white at base.

Haematopota unizonata, Ricardo.

(Plate xvi, figs. 12, 13.)

Ann. Mag. Nat. Hist. (7), xviii, p. 118 (1906).

Type (male) from Ceylon, 1892 (Yerbury).

Type (female) from Hakgala, and three females from Niuwara Eliya, Ceylon, 1891 (Yerbury), females from Pundaluoya, Ceylon, 1890 and 1898, and one female from Galagedara, Ceylon, 1897 (Green).

There is a note by Col. Yerbury on this species, *viz.*, "Very common at Niuwara Eliya, May 1891."

A reddish brown species, with rings on the middle tibiae only; the other tibiae white at the base; the antennae long, cylindrical.

Face grey; a yellowish stripe covered with brown dots and spots reaches from the antennae to the eyes on each side; *palpi* yellow, with white pubescence; beard white. Frontal callus dark brown, shining, concave on the anterior (lower) border, convex on the posterior (upper) border; the spot between the antennae black, oblong: the paired spots black, oblong, just reaching the eyes, with grey borders. *Forehead* brownish yellow, darker on the vertex, grey at sides. *Antennae* long and slender, reddish yellow, the third joint darker; the first joint not quite so long as the third, the second small, both with black pubescence. *Thorax* reddish brown, the shoulders, two stripes which reach the suture and end in two spots, the base of thorax and a spot on each side grey; traces of a short white pubescence on the dorsum; breast brown with brown pubescence, then grey with white pubescence; *scutellum* reddish brown. *Abdomen* a redder brown, segments bordered with narrow whitish bands; pubescence black, white on the borders of the segments and at the sides; traces of grey spots on the apical segments; the under side brown, with white borders to the segments, grey at the sides. *Legs* dark brown, the middle tibiae redder, with two white rings, and the base of the tarsi yellowish, as are also the posterior tarsi; the middle femora are reddish, with white pubescence. *Wings* brownish, with brown veins and an appendix, the light markings distinct, with three rosettes, the apical band single. Length 8 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 118.

Distinguished from *H. atomaria*, Wlk., by the narrower frontal callus, and by the longer cylindrical first antennal joint.

Division IV.

Legs not uniform in colour but with typical rings on the middle and posterior tibiae.

Group IV.

The first joint of antennae abnormally large and stout, and as long as or longer than the third joint.

Haematopota validicornis, ♀, n. sp.

(Plate xvii, fig. 23.)

In Brit. Mus. coll.

Type (female) from Biserat, Siam (Robinson and Annandale); others from Phrapatoon, Siam (Dr. P. G. Woolly); and from Siam (W. Palmer).

In Indian Museum females from Biserat, Siam (Robinson and Annandale).

This and the following species are distinguished by the very large stout first joint of antennae as long as the third joint. The antennae in this species are reddish yellow, the face with no black band but one spot on each side touching the eyes, about half way between the antennae and the oral opening. Frontal callus yellowish brown. Thorax with grey stripes stopping short at suture, two others meeting them from the base. Abdomen blackish brown with grey spots. Wings with the apical band single, broad, legs with the usual rings on tibiae, hind tibiae fringed. Length 9 mm.

Face greyish, where the dark band is usually apparent it is more yellowish brown, the black spot irregular in shape, pubescence of face whitish. *Palpi* pale yellow with pale hairs at base, and black pubescence. *Antennae* reddish yellow, the first joint very large, incrassate, as broad as the third joint at its widest part, with black pubescence, the second joint very small with thick black pubescence, the third joint broad and flattened on its basal annulation with the three last ones forming a small apex. *Forehead* greyish with black pubescence, the paired spots touching the eyes and the frontal callus, almost round in shape. Frontal callus yellowish brown, shining, almost straight on both borders, and reaching the eyes on lower border, its outer angles rounded receding from eyes, no well-marked spot between the antennae but brown rings surround the base of each antenna. *Thorax* brown with short yellowish pubescence, the grey stripes dispersed as in *H. javana*, Wied., and the base of the thorax grey. *Scutellum* brown with grey tomentum in centre. *Abdomen* blackish brown, or reddish brown with ashy grey segmentations and round lateral spots and a grey median stripe is often apparent. Under side blackish brown with grey segmentations. *Legs* blackish brown, the fore tibiae at base yellowish, the middle and posterior tibiae brownish, each with two yellowish rings, the tarsi on the basal joints of middle and posterior pair yellowish, the femora with black pubescence, thick below, on the hind pair thickest, above, and below at apex. The fore and hind tibiae slightly incrassate, all with black pubescence, which is thickest on the hind pair, forming fringes. *Wings* brownish, the apical band in type is continuous, crossing the whole width of apex, crescent-shaped, concave towards the apex, in the other specimens often broken in the middle, the small white spot above stigma has a dark centre, which is occasionally absent, another white spot meets it, partly surrounding the appendix and forming the centre of the first rosette, the second rosette is distinct, encircling the small transverse vein and apex of discal cell, the third and fourth rosettes are fairly distinct below, on the hind border of wing white marks are present in the

first, second, third and fifth posterior cells but are small, that in the first cell being largest, below them short bars of white colour appear.

Haematopota annandalei, ♀, n. sp.

(Plate xvii, fig. 21.)

In Brit Mus. coll.

Type (female) from Govt. Gardens, Shillong, Assam; and another from Khasi Hills.

In Howlett coll. females from Govt. Gardens, Shillong, and from Umling, Assam, "on cattle."

Distinguished by the very stout large first joint of antennae, differing from *H. annandalei* [1] by the presence of a black band on face, and the antennae are shining black, the third joint is narrower. The apical band of wing is single but a different shape, being short and curved, not reaching the posterior border. Frontal callus black, shining. Length 8½ mm. (type), other females 7—8 mm.

Face greyish with rather thick long white pubescence, the band between eyes and antennae a deep black, extending across the face below antennae, the *palpi* small, greyish, with white pubescence, darker at tip. *Antennae* black shining, the first joint longer than the third one, very stout along its whole length, the second joint very small, the third joint much narrower than the first joint, the first annulation being hardly broader and the last three annuli only slightly narrower. *Forehead* a darker grey colour, almost brown with some grey tomentum, the frontal callus narrow, black and shining, reaching the eyes on its lower border, above with rounded angles receding from the eyes, almost straight on both borders, the paired spots large, black, touching the frontal callus with their apices, and the eyes with their bases, the unpaired spot narrow, distinct. *Thorax* blackish brown with scattered short yellow pubescence, two grey stripes are apparent ending at the suture, two similar stripes proceed from the base of thorax towards them; sides of thorax a little grey. *Scutellum* same colour as thorax. *Abdomen* blackish brown with grey segmentations, round small side spots are visible in some of the specimens; under side dark with grey segmentations. *Legs* blackish, the base of fore tibiae and two rings on the other tibiae, and basal joints of middle and posterior tarsi yellowish or white, pubescence on femora chiefly black, scanty, a little thicker in posterior pair on whose upper side some white pubescence is visible, tibiae slightly incrassate on fore and posterior pair, with black pubescence on the dark parts and white on the pale rings, the hind tibiae fringed with thicker black hairs, tarsi with black pubescence. *Wings* brown with the apical band simple, short, beginning just above apex of second vein crossing the first branch of third vein ending just beyond it, it has an outward curve towards the base

[1] This is perhaps a mistake for *validicornis*.—ED.

of wing and is concave on its apical border, the round white spot above the stigma is distinct and with no brown centre in the type, in other specimens it is present as a half circle, three rosettes are clearly formed and pale spots appear in the apices of the first, third and fifth posterior cells, and smaller ones occasionally in the others.

Haematopota pachycera, ♀ , Bigot.

Nouv. Archiv. Mus. Hist. Nat. Paris (3), ii, p. 206 (1890); *id.* Bull. Soc. Zool. France, xvi, p. 76 (1891); Ricardo, Ann. Mag. Nat. Hist (8), i, p. 59 (1908).

Length 8½ mm.

Antennae twice the length of head, yellow, the first joint somewhat incrassate, cylindrical, apex brown; second joint stout, pyriform, compressed, apex brown; others yellow, small. Palpi, beard and face dull ashy grey. Forehead ashy grey, at base with a shining transverse yellow callus, brown at vertex with two frontal black spots. Thorax ashy grey, with wide indistinct brown stripes; scutellum brown, abdominal segments with narrow grey borders, and side spots irregular in shape, of same colour. Wings almost black, with white markings. Legs brown, fore tibiae dull white at base, intermediate and posterior tibiae pale yellow, at base apex and ring brown.

Antennae at least twice as long as head, yellow, the first joint cylindrical, rather thick, black at apex, the second shorter, thick, pyriform, truncated, laterally compressed, likewise black at its apex, the last joints indistinct and very small, bright yellow; palpi, beard and face dirty grey, forehead same shade, with a large reddish shining transverse callus situated above the base of antennae, and with two small black spots at border of eyes; thorax blackish, indistinctly striped with grey lines, sides grey; scutellum brown; abdomen blackish, border of segments and two series of little indistinct spots greyish; calyptrae and halteres yellowish grey; wings blackish with rather extensive white markings and spots; legs brown, naked, fore tibiae whitish at base, intermediate and posterior ones pale yellow with the base, apex and a median ring blackish.

Laos, one specimen.

The unusual form of antennae, *notwithstanding the general appearance*, seems to authorize the establishment of a new genus for this and the preceding species. Bigot, Nouv. Archiv. Mus. Hist. Nat. Paris, 1890, ii, p. 206.

The following notes were published after I had seen the type in the Paris Museum :—

This type from Cambodia (the description gives Laos) is also in the Paris Museum.

This species would come under heading " 15 " in my table of Indian and Ceylon species next to *H. lata*, Ricardo, from which it is distinguished by the hind tibiae not being fringed, and the third joint of the antennae is wider and shorter. It resembles *H. rubida*,

Ricardo, in the antennae. Bigot seems to have overlooked the second joint, which is very small, and described the third joint as the second one; the first joint is long, cylindrical, and the third joint very wide, the basal division being large and swollen, the remaining divisions very small. The abdomen is black, with the segmentations grey; the two rows of spots mentioned by Bigot are hardly noticeable. The legs have two rings of light colour on the middle and posterior tibiae, and the base of the fore tibiae is yellowish. The wings have two indistinct rosettes. Ricardo, Ann. Mag. Nat. Hist. (8), i, p. 59.

This species probably belongs to this group with the first joint of antennae very stout and it is possible that my new species *validicornis* is identical, though it is apparently distinguished by the presence of fringes of hair on hind tibiae, said to be absent in Bigot's species; a further examination of Bigot's type with regard to the markings of wing is imperative before coming to a decision.

Since writing this paper I have received from M. Surcouf of the Paris Museum a copy of his paper in Bull. Mus. Hist. Nat. de Paris, 1909, No. 7, p. 453, in which he establishes a new genus *Potisa* for this species and suggests my *H. rubida* will belong to it also, but as already remarked I have left this species near *H. singularis* owing to the peculiar markings of wings. The conformation of the first joint of antennae in these species *H. pachycera*, *validicornis* and *annandalei* hardly seems to justify the establishment of a new genus divided off from *Haematopota*, as the shape of the antennae in *Haematopota* varies very considerably, but only in small gradations, while the typical markings of wings and other characteristics remain the same.

Group V.

The third joint of antennae broad and flattened on its first annulation, the last three annulations forming a narrow apex; the first joint incrassate, nearly as long as or longer than the first annulation of the third joint.

This group is allied to the genus *Parhaematopota* established by Grunberg (Zool. Anzeig., xxx, p. 360) in 1906 for a new East African species which he named *P. cognata*. Speiser in Hymen Dipt., vii, p. 360 (1907), added *H. vittata*, Loew, to this new genus [Mr. Austen states this is incorrect, see African Blood-Sucking Flies, p. 122 (1909)] and remarks that *H. decora*, Wlk. (*H. dorsalis*, Loew, is now a synonym of this species), and its related species —differing from other *Haematopota* species by the peculiar form of the third antennal joint—form a connecting link with *Parhaematopota*, the establishment of which as a genus is only justified provisionally, in the present imperfect state of our knowledge. It certainly seems advisable to refrain for the present from creating new subgenera, and to rest content with grouping allied species

together. The figure of the antennae of *Parhaematopota* is not unlike those of this group as regards the third joint, but the produced upper angle of the first joint is not present in these Oriental species.

(*A*) *Wings with a pale oblique transverse streak and no rosettes.*

Haematopota rubida, Ricardo.

(Plate xvii, fig. 18.)

Ann. Mag. Nat. Hist. (7), xviii, p. 120 (1906).

Type (female) from Burma, 57, 16 (Mrs. Waring).

An easily distinguished red species, with the hind tibiae incrassate; the hind femora with a white bunch of hairs above and a fringe of black hairs on the under side.

Face grey, the whole upper part deep black; the *palpi* yellow with black pubescence and white hairs below. Frontal callus shining brown, protuberant, rounded, the posterior border produced, the anterior border with a deep incision in the middle, filled by the black spot usually present between the antennae, which is large and square with yellow borders; the frontal callus is short, not reaching the eyes; *forehead* grey, darker in the centre; the paired spots are black, small and isolated, the unpaired spot not present. *Antennae* are of an unusual form; the first joint very much incrassate and large, nearly as long as the third joint, yellow and shining, the second very small and narrow, yellow, both joints with black pubescence; the third joint very broad, ending in an obtuse point, reddish yellow, darker at the tip. *Thorax* reddish brown, with lighter stripes, darker at the sides; the breast grey, with white hairs; the *scutellum* the same colour. *Abdomen* reddish brown, with very narrow yellow borders to the segments, darker at the apex; the under side yellow, with grey tomentum. *Legs* reddish brown; the anterior and posterior pairs the darkest, the anterior tibiae white at base, the middle tibiae yellowish brown, the two yellow rings not well defined; the posterior femora broad, with the fringe of hairs on the under side black, on the upper side black on the basal half, on the apical half a tuft of white hairs are present; the posterior tibiae very stout and broad, with ill-defined rings as on the middle pair, and fringed with black hairs above and below; the basal joints of the middle and posterior tarsi pale yellow. *Wings* reddish brown, the veins yellow, with a long appendix, the apical band single; the pale streak across the middle of the wing is very noticeable, and at once distinguishes the species from *H. lata*, n. sp. Length 10 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 120.

This species in the shape of its antennae is very nearly allied to my two new species *H. validicornis* and *annandalei*, and might be almost included in that group, but is left for the present here owing to the similarity of the wing to *H. singularis*, Ricardo.

Haematopota singularis, ♀, Ricardo.

(Pl. xviii, fig. 27.)

Ann. Mag. Nat. Hist. (8), i, p. 58 (1908).

Type (female) from Nhatrang, Annam, 22-x-1905 (Dr. Vassal).

This species I had placed under *H. cilipes*, Bigot, in my paper on *Haematopota* in Ann. Mag. Nat. Hist. (7), xviii (August 1906), p. 126; but since that was published I have had the opportunity of examining the type of *H. cilipes* in the Paris Museum, and find this is quite a different species, not previously described; it is related to *H. rubida*, Ricardo, from Burma, in the wings and also in the fringed incrassate hind tibiae, but differs from it in having all the femora and tibiae fringed, in this resembling *H. cilipes*, Bigot, and *H. lata*, Ricardo, with which it should be placed in the table on p. 114. It is a handsome small black species with densely hairy legs, and is immediately noticeable by the pale streak across the brown wings, which have no rosettes apparent, thus differing with *H. rubida* considerably from the other described species of *Haematopota* from the Oriental Region. In the shape of the antennae it resembles *H. rubida*, with the long incrassate first joint, the very small second joint, and the broad basal division of the third joint, the last division being small and short.

Face grey, the whole upper part deep black, the lower half grey, with white hairs; the beard and under part of head also with white hairs. *Palpi* yellow, with short black pubescence and some longer white hairs. Frontal callus black, shining, narrow, almost reaching the eyes; *forehead* brownish, with grey markings surrounding the two black spots and continued across the forehead; there is a tuft of white hairs on each side of the forehead on the outer border of the black spot and reaching the frontal callus; on each side of the forehead bordering the eyes there is a narrow grey border of tomentum. *Antennae* yellow, in shape as described above, with long black pubescence on the first and second joints; the third is bare. *Thorax* black, with three short grey stripes, the centre one shortest, none reaching the posterior border; the sides grey; the posterior border of thorax is fringed with white hairs; the pubescence on the dorsum black, short, with some white pubescence on the stripes and on the sides; above the root of the wings there is a black tuft of hairs, with some long white hairs below. *Scutellum* appears yellowish, bordered with a fringe of white pubescence. *Abdomen* deep black, the second, third and fourth segments with white segmentations; the pubescence black, with white hairs on the sides of the dorsum of second segment, on the white segmentations, and on the sides of the first segment, on the sides of the other segments chiefly black; under side the same, but more hairy. *Legs* all with fringes of black hairs, which are least thick on the middle femora; they are brown in colour, with two yellow rings on the middle and posterior tibiae, and the base of the fore tibiae is yellow; the middle and posterior femora are largely yellow; the fore tibiae and femora with wholly black fringes, long

on each border of the femora, long on the outer border and short on the inner border of the tibiae; the middle femora with whitish pubescence forming a scanty fringe on their lower borders, with some thick black hairs at apex; the middle tibiae with a fringe of coarse black hairs on each border and white and black pubescence on the dorsum; hind femora with very thick black and white pubescence; the hind tibiae broad, flat, with fringes of short black hairs on their borders and black and white pubescence on the dorsum; tarsi with short black pubescence; the middle and posterior tarsi are almost wholly yellow. *Wings* dark brown, the pale streak is continuous from the round pale spot above the stigma to beyond the apical cell; the pale markings of the apex and the external border are so placed that, viewed by the naked eye, a second pale streak is seen divided from the first by a brown parallel band, with a few brown markings on it, but no rosettes are apparent. Length 8 mm.

(*B*) *Wings with no pale oblique transverse streak but with the usual rosettes apparent.*

(*a*) Apical band of wing double.

Haematopota javana, ♂ ♀, Wiedemann.

(Plate xvii, fig. 25.)

Dipt. exot., p. 100 (1821); *id.*, Auss. zweifl. Ins., i, p. 218 (1828), v. d. Wulp, Sumatra Exped. Dipt., 19, pl. i, fig. 12 (1881).

? *Haematopota nigra,* Wiedemann, Dipt. exot., p. 101 (1821).

? *Haematopota asiatica*, Rondani, Ann. Mus. Civ. Genova, vii, p. 461 (1875).

Black; posterior border of thorax, scutellum and segmentations of abdomen whitish (male); or grey-brownish. Abdomen with a whitish stripe of spots, segmentations and femora a little reddish (female); wings smoky grey with whitish markings. 4 lines ♂ ♀. From Java.

Very similar to *H. pluvialis.*

Male. Antennae ochre-brown; face greyish white, with white hairs, a deep black spot on each side between the eyes and the antennae; forehead near the antennae with a black spot. Thorax black and black-haired, brown at the sides, posterior border and scutellum whitish haired. Abdomen at the base slightly ochre-brown; the under side almost wholly reddish ochre-brown. Wings with a white median band, convex towards the apex, with pale brownish spots enclosed in it; behind the stigma with an oblique lambdoidal mark, and with several whitish little lines and spots. Halteres yellowish with a brown club. Legs alternately banded yellow and black.

Female. Antennae and frontal callus ochre-brown; face grey haired, with a deep black spot on each side, another behind the antennae, and the usual two eye-spots on the forehead. Thorax brownish grey, sides and three lineal stripes whitish. Abdomen

somewhat deeper brownish, posterior border of the first segment more broadly reddish, with a triangular grey-haired spot in the middle, round which the reddish colour is conspicuous; second and third segment with a narrow triangular median, and grey-haired side spots; the others with only a median spot. Under side grey-haired with a very broad blackish median stripe and narrow reddish segmentations. Markings of the wings hardly different from those of *H. pluvialis*. Femora very pale reddish, white haired, apex brown above; hind tibiae with three brown bands; the fore tibiae brown, only whitish at the base. In Westermann's collection. Wied., Auss. zweifl. Ins., i, p. 218.

Two males caught in May and July at Rawas and Silago (Sumatra). The first joint of antennae distinctly thicker than the following ones, and very shining black at the end. The facettes of the eyes with the exception of those of the lowermost third are very large. Tibiae very broad and flat, on each side with thick black-brown pubescence, which is longer on the posterior pair. The markings on the wings are, according to Wiedemann, very distinct; I will only add that the light band at the apex is double and that a large square pale spot is present on the posterior part which lies in the middlemost basal cell and traverses the middle of the lowest basal cell. V. d. Wulp, Sumatra Exped. Dipt., p. 19.

The plate given by Wulp shows the apical band double, and light markings below the stigma (which is not shown itself).

Bigot in Bull. Soc. Zool. France, 1891, p. 74, where he gives a table of *Haematopota* species, remarks that he does not include *H. asiatica* (Rondani) in it, as the author attributes it to Wiedemann, but Bigot cannot find in what paper Wiedemann published it, neither can I. Probably it is an error of Rondani's—he gives the first two lines of the description of "H. javana," from Dipt. exot., p. 100, and then adds a few further particulars. V. d. Wulp, in his Cat. Dipt. S. Asia, says "asiatica" is a *lapsus calami*. I saw the type in the museum at Genoa; it was in bad condition, but the face appeared to have no spots, so that it is very probable that it is not a specimen of *H. javana* at all.

The following is the description of *H. nigra*, Wiedemann, given as a synonym by Kertesz in his Cat. Dipt., 1906, on what authority I do not know, and without an examination of the type it is impossible to decide:—

Black, the posterior margin of thorax, scutellum and segmentations of abdomen white; wings smoke coloured, with white spots. Length 4 lines, from Java.

Antennae ochraceous, hypostoma greyish white, white haired and on each side between the antennae and eyes is a large black spot; forehead near antennae with a black spot. Thorax black and black haired, sides brown, the posterior border and the scutellum white haired. Abdomen a little ochraceous at base; the under side almost wholly reddish ochraceous. Wings with a median dark band, convex behind, enclosing an obsolete white spot, with

a transverse lambdoidal design beyond the stigma and with many other white lines and spots. Halteres yellowish, the club brown. Legs yellow with alternate black bands. Mus. Westermann. Wiedemann, Dipt. exot., p. 101 (1821).

In Brit. Mus. coll. a series of females from Darien Tipus, Federated Malay States (Stanton coll.).

In London School Tropical Medicine coll. females from Jelebu, Negri Sembilan, Federated Malay States (Stanton); and one from Federated Malay States (H. C. Pratt).

In Indian Museum males from Pusa, Calcutta, Purneah, Rajmahal, and Goalbathan, Bengal; females from Rajmahal (at light on banks of Ganges), Port Canning, Bhogaon in Purneah district, Khoolna and Goalbathan, Bengal.

In Howlett coll. males and females from Pusa, and female from Calcutta "on cattle."

In Kertesz coll. a female from Lushai Hills.

These females belong to this species I believe, though Wiedemann's description is wanting in particulars, but the face with the deep black spots on each side and the similar spot between the antennae, the ochre-brown frontal callus, the yellowish red antennae, the whitish or greyish markings on base of thorax and on scutellum besides the usual stripes, and the pale reddish femora white haired, brown at apex, serve to distinguish the species with the help of the figure of wing given by v. d. Wulp, to which the above specimens correspond. The wing appears to the naked eye distinctly marked with brown and white, the brown colouring being so disposed as to appear a dark square blotch surrounding the stigma with another similar one above, separated from it by a pale interval; the apical band is double, its lower larger half united to a pale blotch in the first posterior cell in Wulp's figure, but in these specimens it is usually disconnected. Length of specimens $9\frac{1}{2}$—10 mm.

♀. *Face* greyish with silvery white pubescence; the large deep black spots very distinct between the eyes and the antennae, the centre of face just below antennae is also blackish. *Palpi* pale yellow with short black pubescence and some longer white hairs at base and on upper side. *Antennae* yellowish red, the first joint a little incrassate after the base, but not broader than the basal annulation of third joint, which it about equals in length; it has dense black pubescence, as has also the second joint which is extremely small, the third joint devoid of pubescence, the basal annulation large, with the three apical annulations very small and narrow. *Forehead* brownish grey, the two black paired spots large, not touching the frontal callus which is shining yellowish brown, barely reaching the eyes, its upper border straight but produced in the middle, its lower border concave, receiving the black spot between the antennae; no unpaired spot present or only represented by a small brown spot. *Thorax* brownish grey with short pale fulvous pubescence on its dorsum, the three grey stripes distinct, narrow, the lateral ones ending in a grey spot at median suture of

thorax, from the base of thorax other lateral stripes proceed and the base of thorax is grey, this is only apparent in unrubbed specimens; sides of thorax grey, pubescence whitish, breast grey with whitish pubescence. *Scutellum* wholly covered with grey tomentum and with some short fulvous pubescence. *Abdomen* not very well preserved in any of the specimens, blackish or reddish brown, the first two segments usually reddish, the grey stripe apparent and the segmentations grey, side spots not always apparent; under side appears lighter at least at sides. *Legs* brown, the femora pale reddish or yellowish, white haired below, but the fore femora have a fringe of short black hairs; the middle pair has a few at its apices, and the hind femora have a tuft of thick black hairs at the apex, thickest on the under side, tibiae with two yellow rings, the fore tibiae whitish yellowish at base with white hairs, incrassate on the dark part with fringes of short black hairs, the middle tibiae with black pubescence chiefly on the dark rings, the posterior tibiae broader with fringes of longer black hairs intermixed with white hairs on the yellow rings, tarsi blackish, first joint of hind tarsi pale. *Wings* dark brown, with the rosettes not very well defined, but two fairly distinct ones appear, the apical band is double, its upper part narrowest, the lower part concave on its upper border, continued when perfect across the second branch of third vein joining a white mark in the apex of first posterior cell, above the stigma is a large white mark consisting of a round white ring with a dark centre, the upper rosette joins it and encloses the appendix, the second rosette is nearer the posterior border of wing, encircling the upper part of discal cell and bases of second and third posterior cells; below this appear a series of short white bands reaching the fore border of wing below stigma, and continued to the anal cell border, and into the basal cells, representing the third rosette but irregular, forming however a very perceptible mass of pale colouring, the anal cell has a curved white streak, and on the posterior border a pale mark appears in the species of most cells.

♂. The specimens from India in Indian Museum are more reddish coloured than the females, the abdomen largely reddish yellow, blackish at apex. Thorax scutellum lighter coloured.

The antennae are wholly reddish yellow, not black at apex of first joint as v. d. Wulp states is the case with his specimens, the first joint stouter and shorter than in the female. In the wing the pale markings in the fourth and fifth posterior segment almost fill up the basal halves of these cells as shown in Wulp's figure which is taken from his male specimens.

(*b*) Apical band of wing single.

Haematopota assamensis, ♀, n. sp.

(Plate xviii, fig. 29.)

In British Museum coll. type (female) and others from Nangpoh, Khasi Hills, Assam (H. Maxwell Lefroy); and from Shillong,

Assam (H. Maxwell Lefroy). In Howlett coll. females from Nangpoh.

This species is very nearly allied to *Haematopota javana*, Wied., but is at once distinguished from it by the apical band of *wing* which is single, short; starting from the costal border just above where the second vein ends, it crosses the anterior branch of the third vein, curving downwards, and ends just beyond; it is broad at its base, gradually becoming narrower; a pale indistinct spot sometimes appears beyond it; the first posterior cell is in some specimens more largely filled at its apex with white markings. The frontal callus is black, shining, centre of face with no black spot. The first joint of *antennae* not quite so incrassate or so long and the third joint not quite so wide. The grey stripes of *thorax* and grey colour of *scutellum* is here ashy grey, *abdomen* blackish brown with whitish segmentations, only median spots sometimes apparent on second and third segments, and side spots not present. The hind tibiae are fringed with black hairs. Length 10 mm.

Haematopota lata, ♀, Ricardo

(Plate xvii, fig. 26.)

Ann. Mag. Nat. Hist. (7), xviii, p. 121 (1906).

Type (female) from Khasi Hills district, India (Chennell), 1878: five females from N. Chin Hills, Burma, iv-93 (Watson).

A dark brown broad-bodied species distinguished by the broad hind tibiae fringed with black hairs.

Face grey, with some brown marks below the antennae, the stripe between the antennae and the eyes yellow, with some brown dots; the beard white; the *palpi* yellow, with white pubescence and a few black hairs intermixed. Frontal callus brown, shining, narrow, reaching the eyes; the anterior border irregular with yellow edges; the posterior border nearly straight; the paired spots black, large, touching the eyes; the unpaired spot small, bordered with yellow; *forehead* grey, yellower on the vertex with short black pubescence. *Antennae* very similar to those of *H. rubida*, long, robust, yellowish red, darker at the tips with black pubescence; the first joint shorter than the third, stout, incrassate, the second very small, the third broad, ending in an obtuse point. *Thorax* brown, with a narrow, indistinct, grey median stripe continued to the scutellum; the side stripes grey, broader, ending at the suture in triangular spots; the shoulders and posterior border of the thorax grey; a short grey stripe from each side of the base of the thorax running up to the suture outside the usual side stripes; the sides and breast grey, the latter with white hairs. traces of silvery white pubescence on the dorsum, with some black pubescence. *Scutellum* brown, grey on its anterior border. *Abdomen* brown, with distinct greyish white borders to the segments; the sides of the first four segments grey; from the fourth segment large grey spots are apparent on each side; a grey median stripe

is here indistinct, but apparent on the other specimens: the pubescence brown, with some white hairs, especially at the sides; under side grey. *Legs* yellowish, the fore tibiae white at base, dark brown on the apical half; the fore tarsi brown, the middle and posterior pale at base; the anterior and middle femora with whitish pubescence, the hind ones with a fringe of black hairs; the tibiae yellowish, with a brown ring in the middle and brown at base, thus appearing as yellow rings on the tibiae; the hind tibiae with a heavy fringe of black hairs extending two-thirds of the length to the apex. *Wings* greyish, with yellow veins and stigma and a long appendix; the apical band single, divided in half, the two upper rosettes distinct; in the corner of the wing is a round circle, and above this a double concave circle extending into the anal cell; above the stigma is a small round circle; the basal half of the first posterior cell is wholly pale; only the upper part of the third rosette is distinct. Length 9 mm.

In the females from Burma the wings are browner and the white markings more numerous at the opening of the cells. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 121 (1906).

This species is distinguished from *H. assamensis*, n. sp., by the shape of the first joint of antennae which is much stouter, and as long as the first annulation of the third joint, whereas in *H. assamensis*, it is shorter and not much incrassate. The face has hardly a trace of black spots and there is no spot between the antennae.

The apical band in the type does not reach across the wing, but extends only a short way beyond the anterior fork of third vein, in other specimens it reaches across but is broken in the middle, and in others it is broader, extending the whole width of apex of wing.

Haematopota sinensis, ♀, n. sp.

(Pl. xviii, fig. 28.)

In Brit. Mus. coll. type (female) and others from Wei Hai Wei, China (Dr. W. M. Muat), 1907; and two females from Shanghai (Walker coll.), 1892.

A species distinctly allied to the Oriental species, distinguished by the short antennae with the disk-like broad third joint, on the upper and lower border of which at base appears a perceptible fringe of black hairs, an unusual characteristic; it is allied to *H. assamensis*, n. sp., from which it may be distinguished by the paler coloured wings and by the much broader third antennal joint; from it and from *H. lata*, Ricardo, it is also distinguished by the hind tibiae not being heavily fringed and by the shorter first antennal joint.

The face has no distinct band, the frontal callus is triangular in shape, the thorax distinctly striped, and the abdomen with lateral spots and a median stripe. Wings with a single apical band and the fifth posterior cell largely pale on its apical half. Length of type 9 mm., others from 9—11½ mm.

Face greyish with white pubescence, a dark brown spot is present usually, between the antennae and the eyes, but in the series of specimens is often absent or indistinct, the *palpi* long and slender, pale yellow with black pubescence. *Antennae* reddish yellow, short, the first joint short, stout, not so long as the first annulation of the third joint, the second joint very small, with its upper and lower borders produced to a narrow process crowned with black hairs, both joints with black pubescence, the third joint with the first annulation remarkably broad, flattened out, on its upper border with a distinct angle about half-way up and distinct black hairs on the upper side nearly the whole length (these are denuded to a great extent in the type), they are also visible on the lower border, the three last annulations almost bi-equal, forming a short apex, some black hairs also visible on them; between the antennae a dull brown spot is visible. *Forehead* greyish with some black markings. Frontal callus triangular in shape, its lower margins touching eyes, shining, brown; the paired spots large, black, not reaching the frontal callus and only touching the eyes at one point in the middle of their outer border, the unpaired spot small, round. *Thorax* brown with three distinct grey stripes, the outer ones interrupted in the middle, and the sides also grey, breast brown with grey tomentum. *Scutellum* covered with grey tomentum. *Abdomen* brown, same shade as thorax, with a narrow median grey tomentose stripe most distinct on the first three or four segments and with round grey tomentose lateral spots, pubescence whitish, short, but when not denuded fairly abundant; under side brown with grey tomentum and pubescence. *Legs* pale reddish yellow, the femora with some grey tomentum, the fore tibiae brownish, hardly incrassate, pale at base, the middle and posterior tibiae brown with the usual pale rings, the hind tibiae with no distinct heavy fringes of hair, the fore tarsi brown, paler at apices, middle and posterior tarsi more largely pale, the pubescence on femora and pale parts of legs whitish, otherwise black. *Wings* pale brown, the stigma darker, yellowish brown, veins brown, three rosettes distinct, the apical band single, lineal, starting from a pale blotch at apex of the second vein and reaching across apex of wing in a sinuous course to the posterior branch of third vein, the first four posterior cells with small pale markings at their apices, the fifth with a large pale irregular-shaped blotch filling up the apex, occupying more than a third of the whole space of cell, three more pale bands are visible in the cell towards the base, the small transverse bands at inner border distinct and regular, in axillary angle the curved pale line is V-shaped.

Group VI.

Third joint of antennae not very broad at base, the first joint short, stout or cylindrical, often only half as long as the third joint or at least never longer than third joint which is usually long and slender.

(*A*) *Apical band of wing broad, double, almost filling up the apex of wing.*

Haematopota marginata, ♂ ♀, n. sp.

(Plate xviii, fig. 32.)

In Howlett coll. type (female) and another from Pusa, Bengal, and another from Tezpore, Assam.

In Indian Museum type (male) and others from Goalbathan, E. Bengal; and females from same locality.

A species distinguished by the wide double apical band which almost reaches the extreme apex of wing, and continues round the posterior border reaching the second branch of fork of third vein, a pale band continues from it unbroken round the posterior border to the end of wing. The female is blackish brown with a grey median stripe and spots, the frontal callus very narrow, the paired spots large, a black spot present between eyes but no spots or band on face. Antennae reddish yellow, the first joint cylindrical, curved. Male with abdomen yellow at base, blackish at apex, legs pale yellowish, no rings apparent, the first joint of antennae considerably incrassate. Length male, type 8 mm., others $7\frac{1}{2}$—8 mm.; female, type $7\frac{1}{2}$ mm., others 7—9 mm.

♀. *Face* grey with hardly any white pubescence. *Palpi* reddish, covered with grey tomentum, and with black pubescence. *Antennae* slender, reddish yellow, apex black, the first joint not so long as the first annulation of the third joint, the second small, roundish, about one-fourth the length of the first joint, both with some black pubescence, the third joint long slender, only slightly broader at base. *Forehead* blackish brown with lighter circles round the spots and some grey tomentose marks, the frontal callus very narrow, shining, blackish brown, its upper border somewhat curved, on its inner border concave, the band at ends is broader and produced on its inner border forming almost a half circle; a small black spot is present between the antennae; paired spots large, black, oval, not quite reaching the eyes or the frontal callus. *Thorax* blackish brown, with three narrow grey stripes; *scutellum* same colour. *Abdomen* blackish brown with indistinct grey tomentose median stripe and grey tomentose lateral spots; under side darker. *Legs* reddish brown, the pale rings of tibiae yellowish, not always very distinct, fore tibiae at base yellowish, very slightly incrassate, posterior tibiae not incrassate, with some black pubescence. *Wings* brown, the pale markings very numerous, three rosettes distinct, the small transverse bars on posterior border are zigzag and almost touch the pale border, stigma very distinct, dark brown, two zigzag pale stripes cross the axillary angle of wing, the lower branch of the apical band is very narrow and not always continued to end of the upper broad part of band.

♂. *Eyes* with the lower third composed of small facets. *Antennae* yellowish, the first joint very stout, almost as long as the first annulation of third joint, the second very small, the third joint

slender, only slightly wider at base, the first two joints with black pubescence; the black spot between the antennae present and a small shining yellow frontal callus. *Abdomen* with the first four segments reddish yellow, the posterior border of fourth and other segments blackish. *Legs* rather paler than in female, and the ring of tibiae not always apparent. *Wings* identical in design, the small transverse bars smaller, reduced to spots.

This species is allied in the wing to *H. pallens*, Loew, Neue Beschreib. Europ. Dipt., ii, p. 61 (1871). The six specimens of Loew's species in the Brit. Mus. coll. recorded by me in the "Annals" (7), xviii, p. 96 (1906), are *females*, not *males* as erroneously printed; the Indian females of my species have the antennae reddish and no band on the face, whereas in the Algerian specimens the antennae are blackish, only the third joint being pale yellow, black at apex and there is a black band on the face broken up into spots. The Indian males have this band but the first joint of antennae is wholly yellow, incrassate but less so and shorter than in *H. pallens*. The spot between the antennae in both males and females of my species is small and brown, in the Algerian females it is large and black.

(*B*) *Apical band of wing double, but not almost filling up the apex of wing.*

(*a*) Both branches of apical band joined at their base, diverging later.

Haematopota tessellata, ♀, Ricardo.

(Plate xvi, fig. 14.)

Ann. Mag. Nat. Hist. (7), xviii, p. 120 (1906).

Type (female), Hot Wells, Trincomalee, 8-xi-91 (Yerbury), 92, 192.

A grey species with brown wings, the white markings very clearly defined, so that the wings have a chequered appearance; the middle and hind tibiae with rings.

Face grey, only a trace of a brown stripe between the antennae and the eyes. Frontal callus black, short, not reaching the eyes, very much produced on the posterior border, ending in a point; the anterior border almost straight; the paired spots large, black, not reaching the eyes; the *forehead* is apparently grey, and no paired spot visible. *Antennae* yellow; the third joint dusky, the first joint incrassate, rather shorter than the third, the second very short, the third long, tapering to a point. *Thorax* brown, with three grey stripes; the shoulders, base, and sides of thorax grey; a short white pubescence on the dorsum; the breast grey. *Abdomen* brown, with rather wide white borders to the segments, grey spots on the posterior segments, and a faint grey median stripe. *Legs* brown, the femora lighter, the middle and posterior tibiae with rings, the basal joint of the tarsi of the middle and

posterior legs whitish. *Wings* brown, with yellowish brown veins and an appendix; the apical band double, the openings of the posterior cells light coloured.

Length 8½ mm.

A male from Velverry, Ceylon, 26-x-91 (Yerbury), 92, 192, in poor preservation, is probably the male of this species. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 120.

The apical band of wing is double, both branches united at base, diverging later. The first joint of the antennae is as long as the first annulation of the third joint.

Haematopota brevis, ♀, Ricardo.

(Plate xvi, fig. 16.)

Ann. Mag. Nat. Hist. (7), xviii, p. 122 (1906).

Type (female), Kanthalla, Ceylon, 19-x-90 (Yerbury), 92, 192, and another female; one female from Velverry, Ceylon, 18-i-91 (Yerbury), 92, 192; two females from Bangalore, Mysore, June 24 (Watson), 95, 28, and type (male) from the same locality.

This species is distinguished from *H. cingalensis* by the short first joint of the antennae, and from *H. javana*, Wied., by the blackish brown abdomen with white incisions and a mere trace of a grey stripe.

A brown species, distinguished by its short first antennal joint and by the rings on the middle and posterior tibiae.

Face grey, with brown pubescence; a dark spot under each antenna and some darker colour continued to the mouth; the stripe on each side yellowish, with brown dots and spots; the beard brown; the *palpi* yellow, with black pubescence and white hairs below. Frontal callus yellow-brown, in some specimens darker in the middle, short, broad, not reaching the eyes, the anterior border nearly straight, the posterior convex; the spot between the antennae small, ill-defined, brown. *Forehead* yellowish brown, darker on the vertex; the paired spots black, triangular, the apices touching the frontal callus. *Antennae* yellowish, densely covered with grey tomentum, at the apices black; the first joint short, robust, with black pubescence, the second small, with black hairs, the third slender, twice as long as the first. *Thorax* brown, with short silvery white tomentum, and three grey stripes all ending in a grey spot, but the median one the longest; the base of thorax and shoulders grey; *scutellum* brown, grey on the posterior border, pubescence at the sides brown; breast reddish brown. *Abdomen* the same colour as the thorax, the borders of the segments whitish, the sides of the first two segments grey; there is a trace of a grey stripe on the second segment only. *Legs* brown-black, the base of the tibiae white; the first joint of the fore tarsi nearly as long as the four remaining joints, which are broad and short; the middle and posterior tibiae reddish brown, with yellow rings; the base of the middle and posterior

first joint of the tarsi yellow. *Wings* brownish, the veins brownish, with an appendix; the apical band double; the openings of the posterior cells mostly light coloured.

Length 9 mm.

Type (male) differs in the third joint of the antennae being broader and shorter, the forehead grey, with a large oblong brown spot. The abdomen is redder brown, with a distinct grey stripe; the scutellum wholly grey, the fore tarsi not so broad, the wings and the base of the tarsi more white than yellow, the apical line of the wing broader. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 122.

The short first joint of antennae—shorter than the first annulation of the third joint—and the triangular shape of the yellowish frontal callus distinguishes this species from *H. tesscllata*, Ricardo.

(*b*) Both branches of apical band separate, starting from opposite borders of wing and usually overlapping in the middle.

Haematopota bilineata, ♀, n. sp.

(Plate xviii, fig. 34.)

In Brit. Mus. coll. type (female) and another. In Indian Museum females, all from Igatpuri, Bombay, 2,000 ft. (H. Maxwell Lefroy).

A species distinguished by the narrow apical band of wing composed of two short lineal bands, each starting from opposite sides and overlapping at ends, the lower branch often broken up into spots, the wing is dark brown, with the pale markings distinct chiefly as small round spots, four rosettes are clearly outlined. The first joint of antennae is considerably incrassate. Face with a band and lower spot. Frontal callus narrow. Paired spots large, touching eyes and frontal callus. Abdomen brown with grey segmentations. Length type 7 mm., others 8—9½ mm. Distinguished from *H. cingalensis*, Ricardo, by the shorter incrassate first antennal joint.

Face grey, the band between antennae and eyes dark brown, in some specimens partially broken up into spots, an oblong brown spot is present below. *Palpi* pale reddish with black pubescence. *Antennae* dusky reddish, the first two joints shining black, the first joint incrassate, as long as first annulation of the third joint, the second very small, cup-shaped, both with black pubescence, the third slender, very little wider at base, and the apex not very narrow. Frontal callus shining, blackish brown, narrow, its upper border straight, the lower one concave in centre, a black spot apparent between the antennae. Paired spots large, black, oblong, their upper apices touching frontal callus, and their base reaching eyes, unpaired spot black, small. *Thorax* brownish with short yellow pubescence, stripes not apparent (denuded).

Scutellum similar. *Abdomen* brown with distinct grey segmentations. *Legs* blackish brown, the fore tibiae at base, and the other tibiae with two rings, yellowish, the base of posterior tarsi paler. *Wings* dark brown, with apical band as described, posterior cells with small pale markings in their apices, the transverse small bands small, chiefly appearing as spots, the stigma darker brown than the colouring of wing.

Haematopota cingalensis, ♀, Ricardo.

(Plate xvi, fig. 15.)

Ann. Mag. Nat. Hist. (7), xviii, p. 119 (1906).

Type (female), 19th milestone, Candy Road, 1890 (Yerbury); two females from Tamblegum, 1890 (Yerbury); and a serise of females from Anaradhupura, Ceylon; 1899 (Oliver Bartholomew).

There is a note with Col. Yerbury's specimens to the effect that the species is common on the road near Tamblegum in October and November.

This species is distinguished from *H. cordigera*, Bigot, by the paired spots not coalescing, by the longer first joint of the antennae, and by the fore legs being lighter in colour.

A dull greyish brown species.

Face grey; an oblong black spot under the antennae, and a black stripe reaching from the eyes half-way across to the lower edge of this spot, the colour above the spot being yellowish. Frontal callus pitchy brown, shining, with a concave fore border, from which a black spot proceeds to between the antennae; the posterior border is produced in the middle; the paired spots are black, large, almost touching the eyes; the unpaired spot apparent, sometimes indistinct; forehead yellowish, grey at the sides. *Antennae* yellow; the third joint darker, its last three annulations dull black; the first joint curved, not quite so long as the third, the second joint very small. *Thorax* brown, with three well-marked grey stripes and four grey spots on its posterior border, the side ones ending at the suture in a spot; there are traces of short white pubescence on the dorsum; the breast is grey, with some white hairs. *Abdomen* light mahogany-brown or brownish, with light yellow borders to the segments and a well-marked grey stripe starting from the second segment; there are also distinct oblong grey spots on each side, beginning from the third segment; there is some short white pubescence, thickest on the yellow borders of the segments; the under side with grey tomentum. *Legs* reddish yellow, the fore tibiae white at base, or rather, with one narrow white ring on the basal half; the apical half black; the middle and hind tibiae with well-marked typical whitish rings. *Wings* greyish, with a yellowish brown stigma and yellow veins and an appendix; the rosettes and markings are distinct; the apical band in the type and other specimens is double, but in others the double

branch is only represented by two small spots, as shown in the photograph. Length 8 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 119.

The first joint of the antennae is long and cylindrical, nearly as long as the third joint. Frontal callus narrow.

(C) Apical band of wing single, formed of spots.

Haematopota irrorata, ♀, Macquart.

(Plate xviii, fig. 30.)

Dipt. exot., i (1), p. 167, pl. xix, fig. 3 (1838); V. d. Wulp, Sumatra Exped. Dipt., 19, pl. i, fig. 13 (1881); Ost. Sacken, Ann. Mus. Civ. Genova, xvi, p. 419 (1882); Bigot, Bull. Soc. Zool. France, xvi, p. 75 (1891).

? *Haematopota pungens*, Doleschall, Naturkund. Tijd. Nederl. Ind., x, p. 407, pl. iv, fig. 3 (1856).

Red. Antennae with the first joint elongated, cylindrical. Legs red, tibiae with white rings. Wings red with white spots (pl. 19, fig. 3). Length 4 lines, ♀.

Palpi fawn coloured. Face of a yellowish grey colour. Forehead greyish brown, base shining black; an oval oblique dull black spot on each side of forehead, near the eyes and contiguous to the black spot at base. Antennae: the first two joints fawn coloured; the first one long cylindrical, the third joint wanting. Thorax fawn coloured; sides with scanty grey tomentum. Abdomen fawn coloured. Legs fawn coloured; tarsi brown; anterior tibiae with a whitish ring at base; intermediate and posterior tibiae with two yellowish white rings and apex brownish. Halteres brown. Wings a rather pale reddish brown, with scattered white spots; a whitish circle towards the middle of the marginal cell. From Java Museum. Macq., Dipt. exot., i (1), p. 167.

The ring in the figure of wing has a round white circle on fore border near stigma and another in the axillary lobe of wing, the apical band is only represented by small white spots. The type seen by me in Paris Museum in 1906 is almost destroyed, only the wings remaining.

Nine females from Grabak, Alahan and Lebong (Sumatra).

The specimen caught at Grabak corresponds the most to Macquart's description and figure, owing to its rusty colouring. All the others are darker, but cannot be specifically divided from it, as they do not differ in any important characters. Even the above-mentioned specimen from Grabak has the last segment of abdomen black-brown, always with pale red-yellow segmentations which indeed are also apparent on the anterior part of the abdomen. The figure furnished by Macquart does not give a very exact notion of the insect; the dark, instead of pale, spots on the wings cause the design to be unlike what it is in reality. The third antennal joint (which is missing in the specimen described by Macquart) is one and a half times as long as the first one, and

always black; the short second joint the same and even the first one at least at the end is darker and very shining, in most specimens wholly black-brown. The pubescence on the face and chin is whitish. The fore legs are darker than the posterior ones, even in the palest specimens, mostly black, so that the white base of the tibiae stands out distinctly. The species can be well identified by the wings, which are almost wholly of a dark colour, the pale colouring being for the most part confined to small round points, which are not present on the border of wing at all; an oblique series of these points runs through the cubital and basal cells, and the pale band which is present at the apex of wing in other species is here hardly outlined by a pair of spots on both sides of the upper branch of third vein; the second basal cell is intersected by a pale band, a continuation of pale spots in the first basal cell, and this band continues strongly curved into the posterior angle of wing. It is not unlikely that Doleschall had a specimen of this species before him when he described *H. pungens* but his remarks are too short to make it possible to decide this point: of the wings he only says that they have white spots and points, and his figure bears witness to the contrary, because it delineates the rows of points as distinct stripes. As I have already remarked, not much value can be attached to them; however they are, on the whole, better than those of Macquart. V. d. Wulp, Sumatra Exped. Diptera, pl. i, fig. 13, p. 19.

Four females. Mt. Singalang, Sumatra, July 1878 (Beccari). I determine this species in agreement with Mr. V. d. Wulp who showed me three closely-allied species from Sumatra, but which could easily be distinguished by the arrangement of the spots at the tip of the wing. Macquart's description shows slight discrepancies. *H. pungens*, Dol. (Java), may be the same species, but the description is too incomplete. Osten Sacken, Ann. Mus. Civ. Genova, xvi, p. 419.

The following is a translation of the description of *Haematopota pungens*, by Doleschall:—

Red-brown, the abdominal segments with paler segmentations; eyes brassy brown, wings dark with white spots and points, legs with indistinct white lines. Length 4 lines.

Numerous in the woods of the mountain Oenarang, and very troublesome to horses in the rainy season.

The figure given by Doleschall is useless as a means of identification.

In the British Museum are two females, one from Negri Sembilan, Malay Peninsula (H. V. Ridley), 1900, and the other from Kobele, N. Borneo (D. Cater), 1895, which I believe belong to this species judging from the wings and the rusty or reddish yellow colour of abdomen, darker at the apex. The wing as figured by V. d. Wulp does not show the round pale circle above the stigma or in the axillary lobe of wing, present in Macquart's type and figured by him; in these specimens the one above the stigma is present, though not forming a perfect circle, the second one is

absent; the two spots forming the apical band and the small transverse bars usually formed of two spots continued round the posterior border of wing, and the absence of any pale markings in the apices of cell on posterior border of wing distinguish this species from others; two rosettes are fairly distinct. The frontal callus is broad, triangular, being produced on its upper border, the paired spots touch the eyes but not the frontal callus, an indistinct reddish spot appears between the antennae. The first joint of antennae is yellowish cylindrical, not quite so long as the first annulation of the third joint, the second joint yellow, the third is slender, dusky reddish, but black at apex. Legs: in one specimen the fore legs are blackish, in the other the same colour as the remaining ones, *viz.*, reddish, white at the base in both specimens.

(*D*) *Apical band of wing single, broad, band-like, reaching from outer to inner border of wing.*

Haematopota lunulata, ♀ , Macquart.

Dipt. exot. Suppl. iii, p. 175, pl. i, fig. 6 (1847); V. d. Wulp, Sumatra Exped. Dipt. 20, pl. i, fig. 14 (1881); Ost. Sacken, Berlin. Ent. Zeit., xxvi, p. 97 (1882).

Black. Antennae red at the base. Legs red, tibiae whitish. Wings brown, spotted with white, with a lunate spot (pl. i, fig. 6). Length 4 lines. ♀ .

Palpi brown with white tomentum. Face with white tomentum. Forehead black with scanty grey tomentum; anterior callus black; a small dull black spot on each side at border of eyes and contiguous to the callus. Antennae: first joint fawn coloured, cylindrical, a little elongated, second and third black; third joint once and a half as long as the first. Thorax with scanty greyish tomentum. Abdomen dull brownish black; a little whitish at the segmentations; second segment with a dorsal triangular spot of white tomentum. Femora of a fawn colour inclining to brown; anterior tibiae incrassate, a little convex on the outer border, anterior half white; posterior half black; anterior and posterior white with black apex (*sic*); tarsi black, first joint of anterior pair fawn coloured. Wings with white spots and a lunate shaped white one at apex. From Java, from M. Payen. Macquart, Dipt. exot. Suppl. iii, p. 175.

One male from Moeara Laboe, and one female from Alahan.

Both agree so nearly with Macquart's description as regards the design of the wing that I do not hesitate to ascribe them to this species; a male from Silago probably belongs here but is not in good condition and is set in such a manner that it cannot be distinctly identified. The male from Moeara Laboe is 8 mm. long: the antennae are wholly black or black-brown; the first joint is little stouter than the following ones, and very shining; the eyes

have tolerably large facets above, below very small ones, the small triangular forehead is almost wholly occupied by the shining black frontal callus.

The legs are very dark brown, the fore legs black, except the basal third of the tibiae which is white; on the middle tibiae the white colour extends further, almost three-fourths of the length; the hind tibiae are distinctly incrassate, more red-yellow and only white at the base, on both sides with thick black-brown fringes of hairs.

The female is somewhat larger and has more wholly black antennae contrary to Macquart's account, who described the female only and called the first antennal joint red-yellow. The legs are also distinctly darker than Macquart's description would lead one to believe. The facets of the eyes are wholly very small. The ground colour of the wings is darker than that of the two preceding species, especially on the anterior part; the pale colouring consists of a large quantity of spots which are spread over almost the whole wing, but are absent at the apex, being there replaced by a very broad transverse band which is convex on its discal border, commencing at the apex of the second vein (radial vein), crossing the upper branch of the third vein and across the apex of wing, ending in the posterior border of wing (this is probably the moon-shaped form which was the cause of the specific name); the pale band intersecting the second basal cell ends in the posterior angle of wing, curving like a hook and forming with a pale spot situated on the anal vein a more or less eye-like form. V. d. Wulp, Sumatra Exped. Diptera, p. 20, pl. i, fig. 14.

Osten Sacken places the following remarks under the heading of *H. lunulata*, Macq.:—

H. sp. ?

All the specimens before me have the design on the wings like the above-quoted figure of v. d. Wulp, but some of them have the antennae reddish, except the latter part of the third joint which is black; and at the same time two whitish rings on the hind tibiae; the other group of specimens has altogether black antennae and only one white ring near base of hind tibiae. Neither of them agrees entirely with Macquart's description. Osten Sacken, Berlin. Ent. Zeit., xxvi, p. 97.

Type in the Paris Museum seen by me in 1906. A small species. Frontal callus black, convex, reaching eyes, and the two usual black spots on forehead present. Legs yellowish with brown rings. Macquart's figure shows the apical band (his "lunule blanche") single, crescent-shaped, the same width throughout: v. d. Wulp figures it as broader and more irregular; in the apices of cells on posterior border he shows small pale markings, the third posterior cell appears paler with many white spots, the fourth and fifth and axillary angle of wing largely paler, only the first rosette at all distinct. Macquart's figure is useless except as regards the

drawing of the apical band. I have not seen any specimens of this species in the collections to which I have had access.

Haematoppta latifascia, ♀, n. sp.

(Plate xvi, fig. 10.)

Type (♀) in Brit. Mus. coll. from Shillong, Assam (H. Maxwell Lefroy).

In Howlett coll. a female from the same locality.

A species distinguished by the broad band-like apical band of wing extending across the whole breadth of apex of wing, by the long stout first antennal joint, fully as long as the first annulation of the third joint, by the black band of face and the narrow frontal callus. It differs from *H. lunulata*, which it approaches in the shape of apical band, by the greater length of first antennal joint and by the presence of the black band on face. Length 9 mm.

Face covered with greyish tomentum, more yellowish brown in centre, the black band very distinct, reaching across from border of one eye to the other and extending more than half-way down the cheeks; pubescence on face white. *Palpi* fawn coloured, slender, with black pubescence and some grey tomentum. *Antennae* reddish yellow, the first joint stout, the same width throughout, the second one very small, both with black pubescence, the third joint dusky at apex, the first annulation moderately broad, the last three narrower; spot between antennae present, blackish. *Forehead* brownish, with grey circular markings, the pubescence black; the frontal callus blackish brown, narrow, almost straight on both borders, reaching the eyes, the paired spots large, blackish, almost touching it and contiguous to eyes at one point, unpaired spot present. *Thorax* reddish brown, with some reddish yellow short pubescence, stripes hardly apparent, sides greyish. *Scutellum* similar to thorax. *Abdomen* brown with greyish white segmentations and some greyish white hairs at sides; under side brown. *Legs* blackish brown, the base of fore tibiae, the rings on middle tibiae, the base and ring of posterior tibiae yellowish white, the basal joint of middle and posterior tarsi also pale coloured, the fore tibiae are slightly incrassate, the hind tibiae broad with thick black fringe of hairs on borders, thickest on the outer one. *Wings* brown, with three rosettes clearly outlined, the broad apical band starts from the junction of the second vein at border and crosses in an almost straight line to the inner border, which, commencing from the first posterior cell, has a continuous pale edging to the axillary angle; this is not quite so continuous in the second female; the small transverse bars between this and the rosettes are distinct, each usually taking up the whole breadth of the cell in which it is situated; the white spot above the stigma is conspicuous either as a round white circle or a plain spot; veins and stigma brown.

(*E*) *Apical band of wing single, narrow, not band-like, reaching from outer to inner border of wing.*

Haematopota fuscifrons, Austen.

(Plate xvii, fig. 17.)

Ann. Mag. Nat. Hist. (8), i, p. 411 (1908).

Haematopota cordigera ♀, Bigot, Bull. Soc. Zool. France, xvi, p. 76 (1891); *id.*, Mem Soc. Zool. France, v, p. 626 (1892); Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 125 (1906).

Antennae yellow, the first joint cylindrical, the third not at all swollen, blackish toward the apex, about twice as long as the axis of head: palpi whitish, proboscis brown, face and beard white; a large wide shining black spot above the antennae; and beyond this on the pale ashy grey forehead a large dull black cordiform spot, vertex brownish; thorax dull reddish with three greyish stripes, sides with white tomentum, scutellum chestnut coloured, greyish in the middle; squamae greyish, halteres pale yellow; abdomen blackish, and little shining, all the segments narrowly bordered with white; femora yellow, the base and apex brownish, the anterior pair blackish, anterior tibiae black with the base white and the tarsi black, intermediate and posterior tibiae with the base, apex and median ring black, white above the latter and reddish below, their tarsi black, yellow at the base; wings grey, with numerous whitish spots dispersed in irregular series, and at the apex a transverse concave straight simple whitish band.

Length 9 mm. Bengal, one specimen. Bigot, Mem. Soc. Zool. France, v, p. 626.

Type from India.

This species is easily distinguished by the colouring of the forehead, by the cylindrical antennae, and by the rings on the middle and posterior tibiae.

Face grey, no spots except faint traces of two below the antennae. *Palpi* yellow with black pubescence; beard white. Frontal callus dark brown, shining, reaching the eyes, broad, bordered in front by a shining yellow narrow band, which is continued between the antennae instead of the usual black spot. *Forehead* grey, with a large brown-black heart-shaped spot in place of the usual paired spots; it joins the posterior border of the frontal callus and almost reaches the eyes at the sides; becoming narrower on its posterior half it is continued to the vertex as a broad stripe. *Antennae* yellow, long, slender, but not so long as those of the preceding species (*H. indiana*, Bigot), the first joint being not much more than half as long as the third, the second joint short, both with black pubescence; the third with the extreme apex dusky. *Thorax* brown, with grey shoulders and grey stripes, ending in spots at the suture; grey spots at the base; the sides are also grey, as is the breast which has white hairs. *Scutellum* brown, grey in the centre. *Abdomen* dark brown, with distinct white borders to the segments, but no sign of stripe

or spots; the under side brown, with grey tomentum. *Legs* yellowish brown; the fore tibiae white at base, the middle and posterior tibiae with the typical rings, and the basal joint of the tarsi whitish. *Wings* pale brown, with brown veins and an appendix: the apical band single, broad and curved. Length 8 mm. Ricardo, Ann. Mag. Nat. Hist. (7), xviii, p. 125 (1906).

Haematopota fasciata, ♀, n. sp.

Type (female) from Howlett collection, Shillong, Assam; and another in Howlett collection from same locality.

A species allied to *H. latifascia*, n. sp., but distinguished from it by the narrower, more irregular apical band, by the first joint of antennae being less cylindrical but more incrassate or globular, as long as the first annulation of the third joint, by the band of face being indistinct, broken up into brown spots, and the hind tibiae are not incrassate and are less heavily fringed. Length 8 mm.

Face greyish with white pubescence, the band is represented by an upper and a lower brown spot. *Palpi* reddish yellow, slender, with black pubescence, and some longer white hairs below. *Antennae* reddish yellow, the first joint shining, slightly narrower at base, incrassate, almost bare of pubescence, the second joint small with black hairs, the third joint dull red at base and then blackish, narrow; the difference between the antennae and those of the preceding species is not very marked. *Forehead* greyish with black pubescence. Frontal callus blackish brown, narrow, almost straight on both its borders, spot between antennae black; paired spots black, touching eyes and frontal callus; unpaired spot present. *Thorax* blackish with short appressed yellowish hairs, and some grey tomentum. *Scutellum* similar. *Abdomen* reddish brown, redder on basal segments, with distinct pale segmentations clothed with short yellowish hairs which are also scattered over dorsum, sides with white hairs; under side reddish yellow. *Legs* reddish yellow, fore pair blackish, the base of fore tibiae white, middle and posterior tibiae with faint brown typical rings which are fairly distinct however on the other female, apical joints of all tarsi blackish. *Wings* very similar to those of *H. latifascia*, but the apical band is not band-like but narrower and irregular, reaching across the whole width of wing however or very nearly so, broadest at its base, the inner border with a less pronounced pale edging.

(*F*) *Apical band of wing single, narrow, not band-like, short, not reaching from outer to inner border of wing.*

Haematopota inconspicua, ♀, sp. n.

(Plate xviii, fig. 31.)

In Brit. Mus. coll. Type (female) and another from Igatpuri, Bombay (presented by H. Maxwell Lefroy). In Indian Museum temales from same locality and collector (1904).

A small species with brown wings, the apical band single, short, and five distinct small transverse white bars on posterior border of wing in the submarginal, first, second, third and fourth posterior cells, distinctly divided from the rosettes and almost touching the pale marks in the apices of these cells. Frontal callus black, shining, narrow, reaching the eyes, the paired spots large, touching it. Antennae reddish yellow, the first joint about half as long as the third one. Face with narrow black band and a black spot between the antennae. Abdomen brown with grey segmentations. Length type 7 mm., the other specimens $6\frac{1}{2}$—$7\frac{1}{2}$ mm.

Face grey with white pubescence, with narrow black or brown band between eyes and antennae and below on each side touching eyes a brownish or black spot almost joining or distinct from the band. *Palpi* dull reddish yellow with pale pubescence. *Antennae* dull reddish yellow, the first two joints with black pubescence, the first joint cylindrical, not incrassate the second small, round, about a third of the size of the first joint, the third joint slender, the first annulation a little dilated and broader than the three last ones. *Forehead* yellowish grey, broad, the paired spots large, almost round, not quite touching the eyes on the frontal callus, the unpaired spot small, round. Frontal callus black, narrow, a little produced on its upper border; a black spot is present between the antennae. *Thorax* brown with three distinct yellowish grey stripes interrupted at median suture, base of thorax with a grey border; sides of thorax yellowish grey; breast grey. *Scutellum* same colour as thorax or more reddish brown. *Abdomen* reddish brown with distinct grey segmentations, no spots visible, pubescence short and fulvous; under side similar. *Legs* reddish brown with base of fore tibiae, two rings on middle and posterior tibiae and basal joints of middle and posterior tarsi yellowish, the fore tibiae hardly incrassate, pubescence of legs nowhere thick or noticeable. *Wings* pale brown, the pale markings very distinct, the apical band single, short, three rosettes distinct, from the centre of the lower one situated in the apex of the second basal cell a curved white line starts, crossing the anal cell into the axillary angle of wing, reaching the posterior border, produced to a point in the middle of the axillary angle; stigma and veins reddish brown.

Haematopota immaculata, ♀, n. sp.

(Plate xviii, fig. 33.)

In Howlett coll. type (female) and others from Kanara, Bombay, and from Bombay.

A species allied to *H. inconspicua*, n. sp., but distinguished by its larger size, the greater length of the first joint of *antennae* (more than half as long as the third joint), by the absence of any black spot between the antennae, and of any black band on the face, though a spot is usually present below on each side. Frontal

callus is wider and with its borders straight, the paired spots are smaller and further removed from the frontal callus. *Thorax* with no stripes visible as a rule, brown with short fulvous pubescence. *Scutellum* similar. *Abdomen* brown or blackish brown with some greyish yellow tomentum which in some specimens appears as lateral spots, but in the type the colour of abdomen is uniform with some pale yellowish pubescence at sides. *Wings* very similar to those of *H. inconspicua*, n. sp., the apical band similar, and the transverse bars near posterior border of wing, but on the border there are no light markings in the apices of the cells. In all other respects similar to *H. inconspicua*, from which however it is very distinct. Length type 8 mm., others 8—9 mm.

Group VII.

Antennae long and slender, the first joint as long as the second and third together.

Haematopota cilipes, ♀, Bigot.

Nouv. Archiv. Mus. d'Hist. Nat. Paris (3), ii, p. 205 (1890): *id.*, Bull. Soc. Zool. France, xvi, p. 77 (1891); Ricardo, Ann. Mag. Nat. Hist. (8), i, p. 57 (1908).

Length 11 mm.

Antennae chestnut coloured, elongated, the first segment not incrassate, as long as all the others taken together, the third joint at base very much longer than the apical ones together; palpi and face ashy grey, beard white; forehead black-brown, at the base shining chestnut coloured, marked with two lateral black spots; the whole body black-brown. Thorax ashy grey behind, with narrow margins, pleurae ashy grey; calyptrae and halteres brown; wings almost black with white markings and spots; anterior and posterior tibiae fringed below with thick short black hairs, anterior legs black, tibiae at base white, intermediate femora and tarsi dull chestnut coloured, intermediate tibiae pale fulvous, base, apex and median ring brown, posterior legs similarly coloured, femora above with long white pubescence.

Antennae rather slender, much longer than the head, brownish, at the base slightly reddish, the first joint narrow, the first annulation of the third joint much longer than the following ones together; palpi and face grey; beard white; forehead blackish, a transverse irregular callus above the base of the antennae, shining red, two black spots near the eyes; body wholly blackish, with the posterior border of thorax and of the abdominal segments very narrowly bordered with grey colour; calyptrae and halteres brownish, wings blackish with white markings and rather scattered spots; *anterior* and *posterior* tibiae shortly and densely fringed black; anterior legs black, the tibiae whitish at base, intermediate and posterior legs brownish, the tibiae fawn coloured, black at base and apex, ornamented with a median black ring, the posterior femora furnished above with white hairs. Laos 1 specimen.

The conformation of the antennae and in particular the hairiness of the tibiae as well as the posterior femora might establish this species as a new genus, divided off from the old genus *Haematopota*, which perhaps itself is very little homogeneous. Bigot, Nouv. Archives Mus. d'Hist. Nat. Paris, 1890 (3), ii, p. 205.

The type came from Laos, a district of Siam, and was seen by me in the Paris Museum after my paper on *Haematopota* had gone to the printers.

It should go in the table published on p. 114 of the Ann. Mag. Nat. Hist. (7), xviii (August 1906), under the heading "15", preceding *H. lata*, Ricardo, thus:—"Black species, with all the tibiae densely fringed and the posterior femora with white hairs on their lower border." The hind tibiae have a very thick black fringe, and with the white-haired femora should easily distinguish the species. The antennae are long, the first joint being longer than the second and third together and is a little incrassate; the second is very small, the third rather long and slender. The wings are of the ordinary type and have three distinct rosettes, the apical band reaching across the apex; the appendix is long. The frontal callus is large, reddish, with the black paired spots above. Ricardo, Ann. Mag. Nat. Hist. (8), i, p. 57.

UDENOCERA, Ricardo.

Ann. Mag. Nat. Hist. (7), xiv, p. 352 (1904).

This genus is nearly related to the two South American genera *Diachlorus*, Ost. Sack., and *Acanthocera*, Macq., and is formed for a species from Ceylon which bears a general resemblance to the latter genus, but is distinguished from it by the absence of a tooth on the third joint of the antennae, which also divides it from *Dichelacera*, Macq. It is distinguished from *Diachlorus* by the length of the first joint of the antennae, which is nearly as long as the third joint, and by the altogether longer slender antennae, the third joint being cylindrical; the fore tibiae are neither curved nor broader; these differences, together with the presence of a tubercular projection situated more than half-way down the face on which the antennae are placed, seem to justify the formation of a new genus.

Generic characters.—Antennae long, cylindrical, with no tooth or projection on the third joint; the first joint is quite two-thirds the length of the third joint, the second more than half as long as the first joint, the third joint has the first division as long as the four last divisions together, the latter being of equal length, with the exception of the last one, which is a little longer, ending in a blunt point; they are situated on the lower edge of a protuberant tubercle which reaches the eyes on each side and is itself placed more than half-way down the face; the forehead is long, gradually narrowing to the vertex. The palpi are *Tabanus*-like in shape, ending in an acute point. The abdomen is long and narrow,

the same width throughout. The wings are longer than the body and rather large. The legs are long and slender.

Udenocera brunnea, ♀, Ricardo.

(Plate xvi, fig. 8.)

Ann. Mag. Nat. Hist. (7), xiv, p. 355 (1904).

Three females from Kandy, Ceylon (Yerbury). The type is numbered 31, 5, 92, the others 18, 5, 92 and 30, 5, 92.

Brown. *Face* shining brown below the antennae, forming a triangular convex tubercle, with the apex reaching the proboscis, and longer than the cheeks; on each side of the face is a brown shining stripe bordering the eyes for a short distance and then the facial tubercle to its apex; the cheeks are ashy grey, with long white hairs. The proboscis short, the *palpi* nearly as long; the first joint short, the second stout at its base, curved, ending in a point, yellow, with black pubescence. The first two joints of the *antennae* yellow, with black pubescence, the third black; the antennal tubercle brown, shining, grey below; the *forehead* brown, shining, convex in the middle, with a transverse groove near the tubercle. Eyes bare, the facets of equal size; on the posterior border the eyes project beyond the vertex of the forehead. *Thorax* brownish, shining, with indistinct linear yellow stripes on each side, yellow at the sides; the breast brown with black hairs, then grey with whitish hairs. *Scutellum* yellow-brown at extreme base, with yellow pubescence. *Abdomen* of a uniform brown, somewhat shining, with brown pubescence, the under side yellowish at the base. *Legs* pale yellow, with the femora, apices of tibiae and apices of all the joints of the tarsi except the first one brown; the last joint of the tarsi wholly brown, with pulvilli and claws; the pubescence of the legs is yellow on the yellow parts and black on the brown parts. *Wings* hyaline, the veins yellowish brown, the fore border and the apex brown; some light spaces are apparent in the brown of the apex; the brown shading extends along the posterior border faintly into the fourth posterior cell; on one wing of the type the apical brown is reduced to a shading of the veins.

Length 11 mm.

♂. Four specimens from Kandy, Ceylon, are evidently the males of this species though differing in colouring, being reddish yellow.

Eyes.—The large facettes occupy two-thirds of the eye, reaching the upper end of frontal triangle. *Face* ashy grey with some weak brownish hairs. Beard white. *Palpi* short and stout, yellow with greyish tomentum and brown hairs. Antennal tubercle not quite so protuberant as in female Frontal triangle blackish with grey tomentum. *Thorax* bare, chamois-coloured, with a few long yellowish hairs on dorsum and shorter ones. *Scutellum* the same, covered with greyish tomentum. *Abdomen* reddish yellow, shining,

darker and narrower at apex, some black short pubescence on dorsum, with some yellow hairs at the segmentations. *Wings* with the brown colouring fainter.

The specimen named by Walker *Chrysops parallelus*, and referred by me doubtfully to *Diachlorus* [see Ann. Mag. Nat. Hist. (7), ix, p. 372 (1902)], from Batjan Island (Batchian) (Wallace coll.), may possibly belong to this genus; but the antennae are wanting, the formation of the forehead, of the antennal tubercle and face, besides the shape of the abdomen and legs, agrees with that of the species described above.

NEOTABANUS, gen. nov.

This genus is formed for a species from Ceylon not unlike a *Tabanus* species in appearance, but distinguished from any species of *Tabanus* known to me by the prominent tubercle below the forehead where the subcallus is usually situated, bearing the antennae, and by the narrow forehead with *no frontal callus* or other spots visible, the narrowest part of the forehead is at the vertex. No ocelli present. Hind tibiae with no spurs. Antennae are *Tabanus*-like, the first two joints short, the third slender with a very slight angle at base, and composed of five divisions. The genus therefore belongs to the division Tabaninae, and is allied to *Udenocera*, Ricardo, in the possession of the antennal tubercle, but differs in the shape of antennae.

Neotabanus ceylonicus, ♀, n. sp.

Two co-types ♀ from Pundaluoya, Ceylon.

A species not unlike a *Tabanus* species, with a blackish thorax and a brownish abdomen, covered with yellowish grey tomentum and some scattered pale yellow pubescence. Antennae and legs yellowish red. Wings hyaline, tinged yellow on the fore border. Length 12—13 mm.

Face greyish yellow with some greyish tomentum, the cheeks with long blackish hairs, below and on face some pale yellow hairs are discernible, face with small foveae on each side below antennae. Beard pale yellow. *Palpi* red or yellow with long pubescence, chiefly black, but whitish on outer sides and at base, the first joint very small, the second swollen, curved, ending in an obtuse point, nearly as long as the short proboscis. *Antennae* reddish, the third joint black, the first two joints with black pubescence, the first joint short, stout, nearly as broad as it is long, the second small, roundish, barely half as long as the first joint, the third slender, slightly wider at base, the last four divisions narrower, the last division longer than the preceding ones, some black hairs present at each segmentation. *Forehead* brownish with black pubescence, the tubercle projecting above the plane of forehead, shining reddish brown with traces of grey tomentum, placed below the eyes, and rounded off below, divided in the middle, so that

each antenna may be said to be surrounded by a tuberculous base, the forehead is narrow, about three times as long as it is broad anteriorly above the tubercle, at vertex about half as broad as it is anteriorly. *Thorax* blackish brown with traces of grey tomentum, with some appressed yellowish pubescence, and scattered black hairs on dorsum, thick at sides which with shoulders are lighter in colour. *Scutellum* similar to thorax. *Abdomen* yellowish brown with some grey tomentum, with appressed yellowish pubescence and some short black pubescence, sides with yellow hairs; under side similar. *Legs* reddish yellow, pubescence on femora chiefly yellowish white, yellow and black on tibiae and tarsi. *Wings* hyaline with the usual neuration of *Tabanus* species, short appendix present, fore border narrowly tinged yellow, veins yellow.

DIACHLORUS, Osten Sacken.

Diachlorus flavipennis, ♀, Macquart.

Dipt. exot. Suppl. iv, p. 339 (1850).

Thorax black. Abdomen red, with the apex brown. Antennae and legs red. Wings yellow, unspotted. Length 4½ lines ♀. Palpi pale yellow. Face with whitish tomentum, sides shining black, as well as the forehead. Antennae pale fawn coloured. Thorax (denuded) shining black, traces of whitish tomentum, a fawn-coloured spot at base of wings. Abdomen shining (denuded), rather narrow and elongated; the three first segments dark fawn coloured, with a dorsal brown stripe; the four others black with fawn-coloured segmentations; under side black with grey tomentum and fawn-coloured segmentations. Legs fawn coloured; posterior femora blackish. Wings a little yellowish, at base and on outer border yellow; neuration normal.

From the Philippines. M. Bigot. Macquart, Dipt. exot. Suppl. iv, p. 339.

Subfamily *PANGONINAE*.

Hind tibiae with spurs. Ocelli usually present.

The following table is drawn up for those genera only which are represented in the Oriental Region:—

1. Third joint of antennae with eight or at least seven divisions. Proboscis usually prolonged 2
   Third joint of antennae with five divisions. Proboscis short 3
2. Proboscis long. First posterior cell of wing open. Eyes hairy .. .. *Diatomineura*, Rond.
   Eyes bare .. Subgenus *Corizoneura*, Rond.
3. First and second joints of antennae short .. 4
   First and second joints of antennae long .. 7

4. Face concave in the middle .. *Rhinomyza*, Wied.
   Face not concave in the middle 5
5. Third joint of antennae with an acute spine on the first annulation .. .. *Gastroxides*, Saunders.
   Third joint of antennae simple 6
6. Second joint of antennae shorter than the first joint. Wings usually hyaline .. *Silvius*, Meigen.
7. Second joint of antennae as long or nearly as long as the first joint. Wings usually with a black or brown design .. .. *Chrysops*, Meigen.

The genus *Mycteromyia*, Philippi, is not included in the table owing to the uncertainty of the genus and of the one species recorded from India.

PANGONIA, Latreille.

This genus was subdivided by Rondani into four genera: *Pangonia* and *Erephopsis* with the first posterior cell closed, *Diatomineura* and *Corizoneura* with it open. The only genus as yet represented in the Oriental Region is *Corizoneura* with two species, not including the doubtful *Pangonia amboinensis*, Fabr.

Corizoneura longirostris, Hardwicke.

Trans. Linn. Soc. London, xiv, p. 135, pl. vi, fig. 5—6 (1823) (*Pangonia*); Wied., Auss. zweifl. Ins., ii, p. 621 (1830) (*Pangonia*); Gay in Griffith's Cuvier Anim. King., xv, pl. cxiv, fig. 3 (1832) (*Pangonia*); Macq., Ann. Soc Entom. France, vi, p. 429, pl. xv, figs. 20—23 (1837) (*Pangonia*); Röder, Stett. Entom. Zeitg., xlii, p. 384 (1881) (*Pangonia*); Ricardo, Ann. Mag. Nat. Hist. (7), v, pp. 167 and 168 (1900).

Pangonia with yellow hairs, thorax ferruginous, abdomen black-brown; margins of segments yellow, wings unspotted (pl. vi, figs. 5 and 6). Rostrum about twelve times longer than the head. Antennae approximated at the base, short, consisting of three pieces, the two lowest of which are very small, the upper one long, tapering to a point, and composed of eight small articulations. Eyes large, very prominent. Head and thorax very hairy both above and beneath, longer under the throat; of a bright yellow beneath, brownish above. Wings longer than the abdomen, hyaline; costal nerves brown. Body black; the margins of each segment shining, the sides hairy. Halteres short, having the shafts yellow and the knobs ovate, black. Length of the insect from the base of the rostrum to the apex of the abdomen ten lines; and of the rostrum two inches and a half. Hardwicke, Trans. Linn. Soc. London, xiv, p. 135. Hardwicke's figure of wing has the first posterior cell very narrow, but not quite closed at border.

Gay, in Griffith's Cuvier Anim. Kingdom, xv, p. 696, pl. cxiv, fig. 3, gives in the figure of *P. longirostris* the wing with the

first posterior cell closed and the proboscis nearly three times the length of the body.

Macquart in Ann. Soc. Entom. France, vi, p. 429, only refers to the species in a general article on the genus *Pangonia*.

Röder, after some remarks on the descriptions given by other authors, more especially by Wiedemann who probably did not know this species, adds, from a specimen he had from Allahabad, the following particulars:—

The two first antennal joints are brownish black the third quite black. The two first furnished on the upper and lower sides with long black hairs. The long face is covered with yellow tomentum. Palpi yellow. Ocelli absent. The very long proboscis black, but not two and a half inches long as Wiedemann gives, but only 1 inch 7 lines; my specimen is only 9 lines long. The beard on cheeks and chin is long, yellow, but the forehead clothed with short black hairs. The thorax has a brown ground colour, covered with longer pale brown hairs, which are quite pale yellow on the lateral borders and breast sides, so that two paler stripes thus appear on the side borders. The scutellum is brown like the thorax and with the same pubescence. The abdomen is reddish at the sides, dark brown in the middle, the pubescence is more golden yellow. Under side of abdomen yellow, becoming brownish towards the apex. The legs are wholly yellow. The first two joints of fore tarsi are wider in a peculiar form, the tarsal joints of the fore legs increasing in length.

On the two hind pair the metatarsus is longer than the other tarsal joints together, the legs have only very sparse yellow pubescence. Wings tinged yellowish, the upper fork of the third vein with an appendix. The first posterior cell is rather narrower at its apex. Wings longer than the body. Halteres not so short as Wiedemann gives, with a pale stalk and browner head. Röder, Stett. Entom. Zeitg., xlii, p. 384.

The males have the prolongation on fore tarsi as in some African species. Röder mentions it. One or two of the females have long bristles on these joints. The first posterior cell is closed in some of the females with a short petiole. Two males, one of which was wrongly labelled "*amboinensis*, Fabr.," seem a variety of this species, having no prolongation on the fore tarsi; the third joint of antennae is bright red, not black. The yellow colour on the abdomen is more prominent; the face is shining and dark, with hardly any greyish pubescence.

Hab.—North-West India; Muktesar, North-West Provinces (Lingard); Thibet (Landor). Ricardo, Ann. Mag. Nat. Hist. (7), v, p. 168 (1900).

This species is easily recognized by the very long proboscis, the first posterior cell of wing is usually open, though it varies in degree, often being so very narrow that it appears closed at the border, but is never pedunculated. The males mentioned above as differing slightly from the typical form will belong to the subspecies given below.

Corizoneura longirostris, Fabr., subsp. **varipes**, subsp. nov.

The males with no prolongation on the first two joints of fore tarsi and the females with these joints not at all prolonged cup-like appear to be a distinct subspecies of *C. longirostris* distinguished by the plain fore tarsi and also by the bright reddish third antennal joint, the first two joints being reddish grey with black hairs, by the shining reddish brown face, no grey or yellow tomentum covering it, and by the abdomen being usually more largely reddish yellow, the first three segments being almost wholly so, with only median blackish spots, the remaining segments blackish with reddish segmentations covered with short yellow hairs.

Male specimens of this subspecies in Brit. Mus. coll. from Nepal (Hardwicke bequest); and from Darjiling (G. C. Champion, 1895).

In Indian Museum from Sikhim; Trivandrum, Travancore; Sadiya, Assam; Margherita, Assam; Himalayas.

Corizoneura taprobanes, ♀, Walker.

List Dipt. v, Suppl. i, p. 324 (1854) [*Pangonia*].

Ricardo, Ann. Mag. Nat. Hist. (7), v, p. 167 (1900); *Pangonia rufa*, ♀, Macq., Dipt. exot. Suppl. iv, p. 322 (1850), *nomen bis lectum.*

I believe the type of *taprobanes* is the same as the species described by Macquart as *P. rufa*, but I have not seen this last type. The species belongs to the subgenus *Corizoneura* probably, though Macquart describes his type as having the first posterior cell closed; in most of the specimens I have seen it is open, varying in width, but in two specimens it is so narrow that it might almost be called closed. Walker's name must take precedence as Macquart described another *P. rufa* from Peru in 1838.

In Brit. Mus. coll. the Walker type ♀ from Ceylon (Templeton); others from Karwar, N. Canara, India (Bell); Bangalore; Nilghiri Hills, 6,000 feet (Hampson); Periyakulam, Kandy and Trincomalee (where it is stated to be very common), Ceylon (Yerbury).

In Indian Museum specimens from Bangalore (common), Arnadi, Melghat, Berar, 1,800 feet (I. H. Burkill) (1908).

Thorax black, with red pubescence. Abdomen red with dorsal black spots. Eyes naked. Antennae and legs red. Wings with the second submarginal cell appendiculated.

Length 6 lines ♀, proboscis as long as the body. Palpi brown. Beard yellow. Face black, with some grey tomentum. Forehead black, sides with yellowish tomentum; ocelli present. Antennae a light fawn colour. Thorax with indistinct bands. Abdomen fawn coloured; the first four segments with transverse black spots; the three last with black bands on the anterior borders; segmentations yellow; under side wholly of a testaceous fawn colour. Legs fawn coloured; coxae brown. Wings reddish, second submarginal cell with a long appendix; the first posterior closed.

From Bombay. M. Fontanier. Museum. Macq., Dipt. exot. Suppl. iv, p. 322.

A species with a comparatively short proboscis, about the length of the whole insect, with a reddish yellow abdomen marked with median black spots and white or yellowish segmentations on the apical segments. Thorax blackish with two well-marked stripes. Antennae and legs reddish yellow. Palpi with the second joint shorter than the first (female). Length (without proboscis) males 14—17 mm., females 13—18 mm.

♂. *Face* black, protuberant, covered more or less with greyish tomentum, cheeks black but densely covered with greyish yellow tomentum and with yellow hairs. *Palpi* brown, the second joint nearly as long as the first joint, slightly pointed, with short black hairs, first joint with some longer yellow hairs at its base. Beard pale yellowish or white. *Antennae* bright reddish yellow, the first two joints dull yellowish grey, with some long yellow hairs, the third joint bare. *Forehead* covered with yellowish grey tomentum and with pale pubescence. *Eyes* not quite contiguous. *Thorax* blackish brown with yellowish sides and two yellowish grey tomentose narrow stripes, these and the whole dorsum with fairly thick yellow pubescence, sides and breast with yellowish pubescence. *Scutellum* blackish brown with a yellowish grey tomentose outer border and with yellow pubescence. *Abdomen* pale reddish yellow, the first segment with a median black spot which extends anteriorly to the sides, the second and third with broad transverse black marks, the fourth with a narrower one, the last two almost wholly black, with whitish grey or yellowish segmentations, on the second and third these are slightly indicated on the centre, all segmentations with yellow hairs, which are white on the last two or three, some scanty black pubescence appears even on the yellow parts and also on the black parts; under side paler, only blackish at extreme apex, segmentations with white hairs. *Legs* light reddish yellow, coxae black, posterior tibiae and all tarsi at apex brownish, pubescence on femora yellowish, elsewhere chiefly black. *Wings* hyaline, fore border pale yellowish, veins brown, first posterior cell open.

♀. *Palpi* brown, the first joint long, narrow, about one and a half times as long as the second joint, which is slightly incrassate and awl-shaped. *Forehead* almost twice as broad anteriorly as it is at vertex, covered with yellowish grey tomentum and with two distinct brown stripes which start from vertex and reach more than half-way towards antennae, pubescence anteriorly black, posteriorly yellow.

The species is at once distinguished from *C. longirostris*, Hardw., by the shorter proboscis which is rarely longer than the body.

Pangonia amboinensis, Fabr.

Syst. Antl., p. 91 (1805); Latr., Encyclop. Méthod., viii, p. 704 (1811); Wied., Dipt. exot., i, p. 53 (1821), et Auss. zweifl. Ins., i, p. 92 (1828); Ricardo, Ann. Mag. Nat. Hist. (7), p. 167 (1900).

Thorax with indistinct stripes; abdomen above brown; margins of segments testaceous, white below. Head with ashy grey pubescence, antennae ferruginous and at apex brown. Thorax brown with white indistinct stripes. Abdomen brown above, the segmentations testaceous. Body below pale. Legs testaceous. Fabr., Syst. Antl., p. 91.

Head with ashy grey hairs, its vertex is blackish. Antennae are fawn coloured. Thorax is blackish almost striped with white. Abdomen blackish above, the borders of segments of a yellowish fawn colour, under side of abdomen pale. Legs of a yellowish fawn colour. The insect was brought from Amboina by M. Labillardiere. Latr., Encyclop. Méthod., viii, p. 704.

Brown; thorax with white stripes; abdomen with side spots and segmentations ferruginous; under side pale red (or chamois leather coloured). Six lines ♀. From Amboina.

Antennae and palpi rusty yellow. Face chamois leather coloured. Beard whitish. Thorax with yellow pubescence; breast sides mouldy grey coloured. The side spots of abdomen are situated on the first three segments; on the others the side borders are also rusty brown; segmentations with yellow little hairs. Wings brownish grey. In Fabricius's coll. Wied., Auss. zweifl. Ins., i, p. 92.

This species may possibly be the same as *Corizoneura rufa* or *Corizoneura longirostris*, subsp. *varipes*, but as no mention is made of the length of the proboscis nor of the first posterior cell of wing it is impossible to decide without seeing the type or specimens from further east; I have seen no specimens of the genus beyond Malaysia.

RHINOMYZA, Wied.

Rhinomyza fusca, ♀, Wiedemann.

Nova Dipt. Gen., 8 (1820); *id.*, Dipt. exot. i, 59 (1821); St. Farg. et Serv., Encyclop. Méthod., x, 544 (1825); Wied., Auss. zweifl. Ins., i, 104, pl. i, fig. 3 (1828); Jensen, Bullet. Soc. Imp. Nat. Moscow, iv, 323 (1832); Macq., Suites à Buffon, i, 196 (1834); Ricardo, Ann. Mag. Nat. Hist. (7), viii, 289 (1901).

Brown; base and middle of abdomen rusty yellow; wings brown with two yellow spots, 6 lines ♀. From Java. Wiedemann, Nova Dipt. Gen., p. 8. Antennae black; a tooth-like prolongation at the base of the last joint; face yellowish brown, concave. Thorax slightly shining, brown with brown down; sides of breast with a yellow spot. First segment of abdomen rusty yellow, in the middle a little brownish, the second dull brown narrowly whitish at the base, third and fourth rusty yellow in the middle, brown at the sides and on posterior borders, the others brownish black. Wings at extreme base and a median and smaller apical spot yellowish. Pleurae blackish brown with brown fringes of hair. Halteres brownish with yellow club. Legs blackish brown. In Westermann's collection. Wied., Auss. zweifl. Ins., i, p. 104.

The other references are merely copies of the original descriptions, the insect apparently not being known to the authors. It is unknown to me.

GASTROXIDES, Saunders.

Trans. Entom. Soc. London, iii, p. 59 (1841).
Ditylomyia, Bigot, Rev. et Mag. Zool. (2), xi, p. 305 (1859).

This last genus was formed for one species from Ceylon, which, however, on examination proves to be a specimen of *Gastroxides*, Saunders, a genus in the division Pangoninae : see Ricardo, Ann. Mag. Nat. Hist. (7), viii, pp. 289, 297 (1901). (*G. ater*, ♀, Saunders, *l.c.*, pl. v, fig. 4; ♂, Saunders, *l.c.*, etc., should read thus, not as printed on page 298.)

Ricardo, Ann. Mag. Nat. Hist. (7), xiv, p. 372.

Gastroxides ater, ♂ ♀, Saunders.

(Plate xvi, fig. 9.)

Trans. Ent. Soc. London, iii, p. 59, pl. v, fig. 4, ♀ (1841); et iv, p. 23, pl. xiv, fig. 3, ♂ (1847); Loew, Dipt. Südafrik, p. 15 (1860); Ricardo, Ann. Mag. Nat. Hist. (7), viii, p. 298 (1901); et (7), xiv, p. 372 (1904).

Head transverse, with three ocelli placed in an equilateral triangle on vertex; proboscis straight, inclined downwards, about as long as the head. Antennae rather longer than the head, three-jointed : first joint cylindrical, twice as long as the second, which is longer than broad; third joint a little longer than the two first, with four distinct rings dividing the joint into five divisions, the first of which is as long as the four following, and produced at the bases on the superior part into an acute spine pointing forwards, the four last divisions equal in length. Thorax oval, rather broader than the head. Abdomen seven-jointed, ovato-conical, terminating in an acute point. Legs long and slender.

♀. Coal-black, hairy; the wings of a black-brown, with a yellowish irregularly oval spot crossing the middle of the disk, and a smaller spot of the same nature towards the apex. Expansion 1 inch, length ½ inch. From Central India. In my own collection.

Obs.—This genus approaches nearest to *Tabanus* but differs in having ocelli, in the antennae, and in the shape of abdomen. Its approach to other genera of the family Tabanidae is also evident, but it differs from all the genera I am acquainted with, and therefore I have made it the type of a new sub-genus under the name of *Gastroxides*, in allusion to the shape of the abdomen, which is unusual in the family to which the insect belongs. Saunders, Trans. Ent. Soc. London, iii, p. 59.

♂. Differs from the female in having the second joint of the abdomen rufous, and the eyes large and contiguous vertically.

Head broader than the thorax, semicircular. *Face* yellowish brown, with a large, elevated, shining chestnut-brown tubercle in the centre, extending from the mouth to the base of the antennae. *Region of the mouth* black, hairy. *Proboscis* about the length of the head. *Eyes* dark rufous brown, large and meeting on the vertex. *Antennae* black, rather more slender than in the female, and having the spine at the base of the terminal joint not so prominent. *Thorax* orbicular, black, hairy. *Wings* marked as in the female. *Abdomen* black, with the posterior margin of the first joint, the whole of the second joint, and the anterior margin of the third joint, bright rufous. *Legs* black.

Length ½ inch, expansion of wings 1 inch. From Northern India. In the collection of Col. Hearsey. Saunders, *l. c.*, iv, p. 233, pl. xiv, fig. 3.

One male from Barrackpore, Calcutta (Rothney), 82, 15; one male from India (Saunders coll.), 54, 13; one female from Bengal (Campbell), 42, 25; one male (Saunders coll.), 68, 4.

Saunders described and figured both the sexes; the male type he mentions as belonging to a Colonel Hearsey, so that it seems probable that the Museum does not possess the male type, and certainly not the female type. There are said to be three specimens labelled Saunders coll. in the Oxford Museum, which may perhaps include the types. Ricardo, Ann. Mag. Nat. Hist. (7), viii, p. 298.

This species is easily distinguished by the presence of a prolongation on the third joint of antennae at base. The male is black, with basal segments of abdomen bright rufous, the female wholly black, both with blackish brown wings in which two pale spots are very distinct, the lower one situated at base of second submarginal cell, extending across the apex of the first basal cell and base of first posterior cell, occupying the basal half of discal cell, and the apex of second basal cell and bases of fourth and fifth posterior cells; the upper one is on the second submarginal cell round the base of fork of third longitudinal vein extending into the first posterior cell. There are two females in the Indian Museum from Calcutta and locality not specified.

Gastroxides ornatus, ♀, Bigot.

Rev. et Mag. Zool. (2), xi, p. 305 (1859). [*Ditylomyia.*]
Ricardo, Ann. Mag. Nat. Hist. (7), xiv, p. 372 (1904).

The type, by the markings of the wings and the general shape of the abdomen, bears a general resemblance to *Gastroxides ater* (Saunders), the only heretofore known species of the genus. Bigot mentions the presence of ocelli, but did not note the spines on the hind tibiae, these two characters dividing the division Pangoninae from Tabaninae. The antennae have only five rings on the third joint, not eight or nine as he supposes. In the shape of the head, the insertion of the antennae, and the presence of the tubercles on the forehead it resembles *G. ater*, but is larger and of different colouring.

Black, with lighter hind borders to the segments of the abdomen.

Face blackish, with grey tomentum, the tumid triangular projection in the middle shining red-brown; the *palpi* large, flat, as long as the proboscis, dark brown with black hairs. *Forehead* black, shining, with two prominent tubercles, one situated near the antennae, the other about in the middle of the forehead, neither reaching the sides; vertex reddish; the yellow ocelli are placed on a brownish, not very prominent tubercle bordered with grey which is continued along the sides of the forehead. *Antennae* longer than the head, red-brown, the long spine or tooth brighter red; the first joint stout, long, the second only half as long, both with black pubescence; the third joint twice as long as the first, its first ring as long as the remaining four together, stout, bearing the long spine at its base, the second ring is the smallest, the third and fourth about equal, the fifth as long as the last two together. The hairs below the head are blackish. *Thorax* reddish brown, with indistinct grey tomentum and two yellowish stripes; the *scutellum* yellowish red; the breast reddish, with brown tomentum and black pubescence. *Abdomen* black, long and pointed; the second segment widest, the first and third with yellow, the second and fourth with grey hind borders, the remaining segments black with some red on the sides; under side black. *Legs* reddish brown with black pubescence, the fore femora stout. *Wings* dark brown with clear base; a clear band in the middle crossing the base of the discal cell and extending to the fifth posterior cell, another on the apex crossing the fork of the third longitudinal vein; there is also a clear space in the anal cell, and the axillary part of the wing is clear.

Length 18 mm.

Through the kindness of Mr. Verrall this species is now placed in the British Museum collection with the species for which the genus *Gastroxides* was formed. Ricardo, Ann. Mag. Nat. Hist. (7), xiv, p. 372.

♂. A male in the Indian Museum coll. from Colombo, and another in the Brit. Mus. coll. from Henaratgoda, Ceylon (Yerbury), are apparently males of this species, though the antennal third joint in both is wanting The colouring of abdomen is different from that of the female, being reddish with black spots, only black at the apex. *Face* with the same tumid red-brown shining middle, not so protuberant however and confined to middle of face; the *palpi* shorter than proboscis, club-shaped. Frontal triangle reddish. *Eyes* with the large facettes reaching the base of antennae, bordered posteriorly by a narrow band of the small facettes. *Thorax* and *scutellum* reddish brown, the latter more red on its posterior border, sides of thorax with black hairs. *Abdomen* reddish, shining, on the first three segments, with a median black spot on each, the second segment narrowly black at sides, the third segment with a black spot at each side, the fourth segment black, dull yellow on its posterior border, the remaining ones

black, sides with black hairs; under side red on basal segments, then deep black, the abdomen has a flat appearance with a pointed apex. *Legs* reddish brown, the femora darker. *Wings* as in female. Length 16 mm.

MYCTEROMYIA, Philippi.

Verh. zool.-bot. Ges. Wien, xv, p 712 (1865).

This genus was established by the author for *Pangonia conica*, Bigot, from Chili, and Bigot later added other species from Brazil, Cape of Good Hope and one from India. Philippi gives the chief characteristics as: Head narrower than thorax, elongated in front. Eyes naked. Ocelli present. Antennal joints rather longer and narrower than in *Pangonia*. Palpi biarticulate, the first joint short, the second elongated, compressed, narrow, the apex rounded. Legs slender. Wings with first posterior cell closed. Dr. Lutz in Zool. Jahrb., Suppl. x, 4, p. 62, 5 (1909), remarks that the genus can only be retained for the Chilian species with naked eyes, the four Brazilian species described by Bigot having eyes distinctly pubescent. The description of the Indian species is too short and incomplete to enable anyone to judge to what genus it belongs, and I have seen no specimen from India at all resembling the original description.

Mycteromyia nigrifacies, ♀, Bigot.

Mem. Soc. Zool. France, v, p. 607 (1892); Ricardo, Ann. Mag. Nat. Hist. (7), v, p. 99 (1900).

♀. Length 20 mm. (without proboscis).

Proboscis and antennae (incomplete) black; palpi black; forehead dull black, face shining black, beard greyish white; thorax and scutellum dull black; abdomen shining black; squamae and halteres black; legs black; wings blackish, no appendix to the fork of third vein. India. One specimen. Bigot, Mem. Soc. Zool. France, v, p. 607.

SILVIUS, Meigen.

Syst. Beschreib., ii, p. 27 (1820).

Ectenopsis, Macq., Dipt. exot. i, p. 115 (1838).

Mesomyia, Macq., Dipt. exot. Suppl. iv, p. 341 (1850).

Veprius, Rondani, Archiv. per la Zool. Modena, iii, p. 83 (1863).

This genus, characterized by the short first and second joints of antennae, the second one shorter than the first, and by the usually hyaline wings, has not hitherto been represented in the Oriental Region, but a female specimen in the Indian Museum from Bhura, Naini Tal district, United Provinces, India, is no doubt a species of *Silvius* not unlike in general appearance to the European species *Silvius vituli*, Fabr., but distinct.

Silvius indianus, ♀, n. sp.

A small reddish yellow species, antennae and face, frontal callus, palpi and legs yellowish. Wings hyaline, with the fore border narrowly dark brown. Length 9 mm.

Face greyish yellow, convex in the middle, the sides of this middle part are shining reddish yellow with a greyish yellow rather tomentose median stripe, foveae on cheeks distinct, lower part of face with short white pubescence, some black hairs near the eyes. Proboscis short. *Palpi* reddish yellow, the first joint short, the second about four times as long, slightly curved, flat, ending in a point, with some very short black pubescence. *Antennae* reddish yellow, the first two joints yellowish with black pubescence, the first joint twice as long as the second one, the third long and slender, very slightly wider at base, blackish on the last four annulations. *Forehead* greyish yellow, the frontal callus shining reddish yellow, heart-shaped, not reaching the eyes, ocelli at vertex placed on a blackish spot. *Thorax* blackish but densely covered with greyish yellow tomentum and pubescence, appearing yellowish. *Scutellum* identical. *Abdomen* more reddish yellow, with a median short black stripe on the first two segments reaching to the third segment, pubescence chiefly consists of very short black hairs; under side the same. *Legs* reddish yellow, the apex of fore tibiae and all tarsi blackish. *Wings* hyaline, the costal cell wholly yellowish brown, the marginal cell the same at its base with a slight shading at its apex on fore border, the stigma large, dark brown, the first longitudinal vein thickened, dark brown, the others pale yellow, all cells open except the apical cell, appendix hardly visible.

CHRYSOPS, Meigen.

Nouvelle Classification, p. 23 (1800); Illiger's Magazine, ii, p. 267 (1803).

The species of this genus of the subfamily Pangoninae are easily recognized by the wings being usually ornamented with a dark median cross-band, by the shining black tubercles on the face and forehead, with three ocelli on the vertex, and by the long antennae, the second joint usually as long or nearly as long as the first joint. The species are small in size and are not very numerous; in Ann. Mag. Nat. Hist. (7), ix, p. 372 (1902), I brought the number up to 20, now reduced by discovery of further synonyms to 16 with 1 new species described, making the total 17. The following is a list of all the described species and synonyms :—

CHRYSOPS alter, Rondani.
bifasciata, Macquart = dispar, Fabr.
cincta, Bigot.
clavicrus, Thomson ? = cincta Bigot.
designata, sp. n.
dispar, Fabricius.

fasciata, Wiedemann.
fixissima, Walker.
flaviventris, Macquart.
flavocincta, Ricardo.
impar, Rondani = dispar, Fabricius.
indiana, Ricardo.
iranensis, Bigot = mlokosiewiczi, Bigot.
ligata, Walker = dispar, Fabricius.
lunata, Grey (Haematopota) = dispar, Fabricius.
manilensis, Schiner.
mlokosiewiczi, Bigot.
pellucidus, Fabricius.
rufitarsis, Macquart.
semicircula, Walker = dispar, Fabricius.
signifer, Walker.
sinensis, Walker.
stimulans, Walker.
striata, V. d. Wulp (nomen bis lectum) = mlokosiewiczi, Bigot.
terminalis, Walker = dispar, Fabricius.
translucens, Macquart.
unizonata, Rondani = fixissima, Walker.

Table of species.

1.	Wings with a dark transverse band and an apical spot	2
	Wings with a dark transverse band but no apical spot	11
2.	Wings with a hyaline sinus on the posterior part of the band, in the fifth posterior cell	3
	Wings with no hyaline sinus on the posterior part of the band, in the fifth posterior cell	7
3.	Abdomen blackish, yellow at apex, with grey bands on the first two segments and a grey median stripe ..	*manilensis*, Schiner.
	Abdomen yellowish with black stripes	4
	Abdomen black, whitish or yellowish at base	6
4.	Discal cell hyaline. Abdomen with four long black stripes ..	*mlokosiewiczi*, Bigot.
	Discal cell not hyaline	5
5.	Abdomen with a short black bifid stripe on the second segment, often extending to the third or fourth segment ..	*dispar*, Fabr.

	Abdomen with a bifid stripe on the second segment and a network of black markings on the third segment, leaving only three yellow spots free ..	*designata*, n. sp.
6.	Abdomen whitish on the first four segments, apex black ..	*rufitarsis*, Macq.
	Abdomen black, the first two segments largely yellow, the second and third segments with small median yellow spots. Face yellowish. Apical border of band of wing straight concave	*translucens*, Macq.
	Abdomen black, the second segment yellowish on fore border. Face blackish. Apical border of band of wing straight ..	*pellucida*, Fabr.
	Small species, abdomen blackish, the first two segments yellow anteriorly. Face black ..	*alter*, Rondani.
	Large robust species. Abdomen blackish with paler median spots, largely yellow on the basal segments. Face yellowish. Apical border of wing irregular	*sinensis*, Walker.
7.	Wings with a clear spot in the discal cell, first joint of antennae slightly incrassate. Abdomen blackish with pale spots	*stimulans*, Walker.
	Wings with no clear spot in discal cell	8
8.	Band of wing broad throughout. Abdomen yellow with a black bifid stripe in the second segment	*indiana*, Ricardo.
	Abdomen yellowish with a black band in the middle	9
	Abdomen yellowish with two distinct black bands	10
9.	Abdomen with blackish legs and face	*fasciata*, Wied.
	Abdomen with yellowish brown legs and face	*fixissima*, Walker.
10.	Abdomen with the black bands narrow	*signifer*, Walker.
	Abdomen darker, the black bands broader	*cincta*, Bigot.

11. Abdomen black with a yellowish band on the second segment. Small species .. .. *flavocincta*, Ricardo.

NOTE.—*Chrysops flaviventris*, Macquart, is not included owing to the insufficient description. The only species of *Chrysops* recorded from New Guinea is *Chrysops albicinctus*, V. d. Wulp (Tijd. Ent. xi, p. 103, 1868), which Osten Sacken in Ann. Mus. Civ. Genova xvi, p. 418 (1882), remarks may be the same as *C. pellucida*, Fabr., but if V d. Wulp's figure of the wing is correct it is quite distinct from any species of the Oriental Region, the whole apex of the wing being brownish grey, bearing between it and the transverse dark band a hyaline streak.

Chrysops manilensis, ♀, Schiner.

Reise Novara Diptera, p. 104 (1868); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 373 (1902).

Thorax and scutellum black, with slaty grey tomentum, the former with two other indistinct contiguous pale grey stripes and on each side a rusty yellow spot; in front of the scutellum appears a conspicuous band of golden yellow hairs; similar hairs appear on the rusty yellow spots (perhaps in well-preserved specimens they are spread over the whole thorax). Breast sides blackish, a yellow callus beneath the base of wings. Abdomen black with an oblique grey band at the bases of the first two segments, the second and third segments with a similar coloured median line, the following segments rusty yellow, the under side chiefly yellow on the middle, blackish at the base and *apex* ("mitte" is given in the original, probably an error). The abdomen is somewhat compressed in both specimens, it may therefore be somewhat different in design in well-preserved specimens. Head black, the face with golden yellow pubescence on each side and in the middle, so that the shining black tubercle takes the shape of a Latin V. Forehead with yellowish grey tomentum, with a large convex shining black callus above the antennae, impressed in the middle, and a shining black spot at vertex. Antennae unusually long and very slender, the joints almost equal in length, the two basal joints yellowish, the third brown. Palpi bright red-yellow. Legs red-yellow, the femora at their extreme bases, and the posterior ones almost wholly, brown. Tarsi blackish on the last joints. Fore tibiae a little curved. Wings hyaline, the fore border and a median band pale brown, the outer border of the latter concave, posteriorly with a bluntly triangular hyaline incision. The lower margin of the brown fore border is paler on the other side of the median band. Two females from Manila. Length 3 lines.

The species could only be compared with *Chrysops bifasciatus*, Macq., but this species has a reddish yellow scutellum and the markings of the under side of abdomen are different; there can be

no question of its identity with *Chrysops costatus*, W., which Walker takes to be identical with *Chrysops bifasciatus*, Macq. *Chrysops costatus* is distinguished from both species by the wholly grey apex of wing. Till now no species of *Chrysops* has been known from Manila, and in general few from the continents lying to our east. Schiner, Reise Novara Diptera, p. 104.

The allusion to Walker's identification of *Chrysops costatus* with the Macquart species is to be found in List Dipt. Brit. Mus. v, Suppl. i, p. 288, and may be disregarded; *Chrysops costatus* is a South American species. As I believe *Chrysops bifasciatus*, Macq., to be a synonym of *Chrysops dispar*, Fabr., this species is probably identical in the wing-markings with this latter, but can hardly be the same, judging from Schiner's description of the abdomen. The species is unknown to me.

Chrysops mlokosiewiczi, ♀, Bigot.

Ann. Soc. Entom. France (5), x, p. 146 (1880); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 378 (1902).

Chrysops striatus, ♀, V. d. Wulp, Notes Leyden Museum, vii, p. 79 (1885).

Chrysops iranensis, ♀, Bigot, Mem. Soc. Zool. France, v, p. 602 (1891).

Thorax ashy grey with three brown stripes: abdomen ochraceous with four black stripes, head yellowish with a shining black frontal callus, the facial calli shining testaceous; antennae, palpi and legs red; apex of antennae black; wings hyaline; with the base, the costal border to the apex, and the median band which does not reach the posterior border, brown. ♀. Length 6 mm.

Antennae one and a half as long as the head, almost bare, reddish yellow, black towards the end; second joint shorter than the first; the third one about as long as the other two together. Front with yellowish grey dust; the ocellar triangle darker; above the antennae a large, shining black knob; face rather prominent on account of the two large knobs, which are testaceous, very shining and coherent; cheeks with yellowish grey dust. Rostrum fuscous; palpi reddish yellow. Thorax yellowish cinereous, with three very distinct fuscous stripes; scutellum coloured like the thorax. Abdomen ochraceous, with two black longitudinal bands, which are interrupted at the segmentations, and moreover with a less distinct lateral row of blackish spots; under surface of the abdomen uniform ochraceous, darker towards the end. Legs reddish yellow; posterior coxae cinereous; tarsi brown; the tibiae not dilated. Halteres yellowish brown. Wings hyaline, the base, the costal border and the usual cross-band brown; the latter extends till half the breadth of the wing, surrounds the discal cell, the centre of which remains hyaline, and goes along

the posterior cross-vein and the apical portion of the postical vein. A female specimen from Amoy, China (Buddingh). V. d. Wulp, Notes Leyden Museum, vii, p. 79.

In Brit. Mus. coll a male and female from Tygosan, Chusan Archipelago, 1892 (Walker); and a series from Japan, 1909 (Dr. Myajima).

A well-marked species easily distinguished by the four narrow black stripes on the yellow *abdomen* and by the cross-band of *wing* not reaching beyond the fifth longitudinal vein, the posterior cross-vein and apical portion of the sixth longitudinal vein being shaded with brown only, the centre of the discal cell is hyaline. The *face* is covered with yellowish tomentum, the sides with shining testaceous tubercles, and the centre of face over the oral opening is the same colour; a transverse black shining spot is present on the lower part of each cheek, not attaining the oral opening. *Forehead* with greyish tomentum, darker at vertex, the frontal callus convex, black and shining, not reaching the eyes. Under side of *abdomen* often with medium black markings besides being darker at the apex. Length of specimens 8-10 mm.

Among the types kindly lent me by Mr Verrall there is one (? female) specimen with the head wanting, labelled as above and from the Caucasus, but the specific name is crossed out and "*iranensis*" scribbled underneath; there is another female specimen only labelled "N. Persia." Bigot described one female as *C. mlokosiewiczi*, from N. Persia or Caucasus, and later two females from N. Persia as *C. iranensis*: apparently he concluded finally that all were one species, which certainly seems likely judging from the descriptions: in this case the name *mlokosiewiczi* would have priority; it seems nearly related, if not identical, with a species described by Wulp from Amoy, China, and named by him *C. striatus*. On comparison of the two specimens of his species in the British Museum collection with the Bigot specimens, the only difference to be seen is the colour of the tubercle above the antennae, which is nearly wholly reddish in the specimen from N. Persia, not shining black, as Wulp describes; they are exactly similar in the wing; the headless specimen has the colouring of the abdomen more greyish than ochraceous, as in *C. striatus*. Considering the distance between the localities, it is perhaps preferable to keep the species apart for the present, placing, however, the Bigot species among those of the Oriental Region. Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 378 (1902).

There can now be little doubt that the two Bigot species are the same as Wulp's species "*striatus*," as in the series lately received from Japan there is one female with the tubercle reddish yellow. As the name *striatus* is preoccupied by a species so named by Osten Sacken from N. America in 1876, the species must henceforth be known as *Chrysops mlokosiewiczi*, and belongs to both the Palaearctic and Oriental Regions, ranging apparently from east to west of the Continent.

Chrysops dispar, ♂ ♀, Fabricius.

(Plate xv, fig. 3.)

Ent. Syst. Suppl. 567 (*Tabanus*) (1798); *id.*, Syst. Antl., p. 112, 5 (1805); Wied., Dipt. exot., p. 102, 1 (1821); *id.*, Auss. zweifl. Ins., i, p. 196 (1828); Macq., Dipt. exot., i (1), p. 163 (1838); *id.*, Suppl. iii, p. 174 (1848); V. d. Wulp, Sumatra Exped. Dipt., p. 19 (1881); Ost. Sack, Ann. Mus. Civ. Genova, xvi, p. 418 (1882); *id.*, Berlin. Ent. Zeitschr., xxvi, p. 97 (1882); Röder, Ent. Nachricht, xix, p. 234 (1893); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 374 (1902).

Haematopota lunata, ♀, Gray, in Griffith's Cuvier Anim. Kingdom, xv, p. 696, pl. cxiv, fig. 4 (1832).

Chrysops bifasciata, ♀, Macquart, Dipt. exot. (1), i, p. 161 (1838).

Chrysops ligatus, ♀, Walker, List Dipt. Brit. Mus., i, p. 195 (1848).

Chrysops semicirculus, ♀, Walker, List Dipt. Brit. Mus., i, p. 196 (1848); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 375 (1902).

Chrysops terminalis, ♀, Walker, List. Dipt. Brit. Mus., i, p. 195 (1848).

Chrysops impar, ♀, Rondani, Ann. Mus Civ Genova, vii, p. 460 (1875).

Abdomen with the first segment pale; with a black half-moon, wings white: with a black band. Antennae testaceous, the apex dark. Head below the antennae yellow with two large, raised, ovate, testaceous spots, above the antennae pale, with a large transverse raised black spot. Thorax ashy grey with sides yellow. Abdomen brown with the first segment pale, the middle half-moon-shaped spot brown. Wings white, the costal border and wide middle band black, the latter at the margin paler with an ovate white spot. Male with eyes joined, abdomen testaceous, the first segment however pale with a half-moon-shaped brown spot.

Habitat.—E. India. Fabr., Ent. Syst. Suppl. 567 (*Tabanus*).

Abdomen with the second segment pale; with a black half-moon. Wings white with a black band. Habitat in East India. Fabr. Syst. Antl., p. 112, 5.

Antennae ochre brownish with a blackish brown apex. Face rusty brownish with a paler middle line; cheeks light rusty yellow with a smooth brown spot; forehead yellowish; in the female with a blackish brown transverse oval tubercle. Thorax brown with two mouldy grey stripes only separated by a brown line, with golden yellow pubescence: breast sides brown with a golden stripe under the base of wings. Scutellum rusty yellow. Abdomen of the male rusty yellow, the first segment brown in the middle, the second segment pale, with two brown spots united towards the base of the segment in a somewhat rounded angle, not resting on the base

itself, continued as far as the base of the third segment; sides of abdomen brown, in the middle of the under side of abdomen an abbreviated brown band. Abdomen of the female more brownish, the first segment pale, the second paler still, almost whitish anteriorly, the spots as in the male, but not continued to the third segment. All segmentations broadly paler, the first brown in the middle. Wings perfectly hyaline, on the fore border from the base to the apex, brown, below the cross-veins at the base is a somewhat oblique small inconspicuous band; the larger band has a deep incision on the inner border. Legs bright rusty yellow. In Fabricius's, Westermann's and my own collection. Wiedemann, Auss. zweifl. Ins., i, p. 196.

A female specimen from Java in the collection of M. Serville differs from Wiedemann's description by the shining blackness of the face, with a grey spot on each side; by the grey forehead with two black calli, by the posterior border of thorax with golden yellow hairs, by the black scutellum, by the fawn-coloured legs with black coxae, and also the posterior femora. Macquart, Dipt. exot. i (1), p. 163.

According to Wiedemann the spot or rather the brown bifid stripe of the abdomen extends over the second and third segment of the male, it does not extend beyond the second one in the female. We have observed five females and two males in which the stripe is equally present on the second and third segments. From Java. M. Payen's collection. Macquart, Dipt. exot. Suppl. iii, p. 174.

Seven females from Buitenzorg, Java (1875) (Ferrari). The identification is certain, although there are discrepancies, especially in the description of the face. Macquart notices the same differences in Dipt. exot. i, p. 163. Osten Sacken, Ann. Mus. Civ. Genova, xvi, p. 418. Röder, Ent. Nachricht, p. 234, records the species from Ceylon.

Six females from different places (in Sumatra). The above specimens differ from the description and from most specimens from Java by their darker colour, especially by the black scutellum and the black-brown posterior femora. The posterior tibiae in this species are broader in their whole length, and each side with a short fine fringe of hairs. The face is very shining. V. d. Wulp, Dipt. Sumatra, p. 19.

The figure of *Haematopota lunata* is evidently that of a specimen of *Chrysops dispar*. No description is given. *Chrysops ligatus*, Wlk., from Bengal is only a rather pale-coloured specimen with some lighter spaces in the wing-cells. *Chrysops semicirculus*, a female in very bad condition, is, I now believe, only a poor specimen of this species with the black markings of the abdomen obsolete or almost so. *Chrysops terminalis*, Wlk., is a pale-coloured specimen with the black bifid stripe not reaching beyond the second segment, as in Wiedemann's original description of *Chrysops dispar*. Walker identified several specimens as Wiedemann's species and then described his two new species, placing

them directly after *Chrysops dispar* in his Catalogue, but I can see no differences sufficiently marked to justify them being made distinct species. *Chrysops impar*, Osten Sacken believed to be the same as the Wiedemann species, after seeing the type (see Berlin. Ent. Zeit., xxvi, p. 97), an opinion with which I agree, having also seen the type, which has the abdomen however entirely black after the third segment, and the frontal callus is deeply incised posteriorly a peculiarity I have not seen in any other specimens, but there are very few specimens in the collections I have had access to, from Borneo whence Rondani's came.

The type of *Chrysops bifasciata*, Macquart, I have seen in the Paris Museum and believe it to be a specimen of *Chrysops dispar* though the black stripes on abdomen are of unusual length, extending to the end of the abdomen, which I have not observed in any other specimens from India or elsewhere. Macquart's type is from Bengal. His description of the antennae is incorrect, they are almost wholly yellowish, a little darker on the second and third joints, not "black, red at the base."

The species varies a little, chiefly in the colour of the *scutellum* which ranges from reddish to reddish brown or nearly black. The *legs* are usually testaceous or yellowish but the posterior femora are sometimes brownish or blackish, the coxae are also darker in some specimens The *forehead* is greyish or yellowish. The abdominal stripe beginning on the second segment is continued to the base of the segment or to the base of the third and occasionally reaches the fourth segment. It is an easily distinguished species, with a yellowish *abdomen*, the bifid stripe always distinct, and a dark narrow band on the posterior border of the first segment. The *thorax* in well-preserved specimens has golden yellow pubescence at the sides and base. The *face* and cheeks yellowish brownish in the centre with the exception of a narrow yellow line and with two black stripe-like spots on the lower part of cheeks. *Wings* with a brown fore border and transverse band, chiefly incised on its outer border. Length from 8—11 mm.

In the British Museum are specimens from Ceylon (Yerbury, Green); Nepal (Hardwicke bequest); Bangalore (Watson); Moulmein, E. India (Clark); Singapore and Penang (Ridley); Rangoon; Annam; Hongkong (Bowring); Java; Sumatra.

In Indian Museum coll. from Balighai, near Puri, Orissa; Kulattupuzha, W. base of W. Ghats, Travancore; Nedumangad, 10 miles N. E. of Trivandrum, Travancore; Morapai, S. Bengal; Bukit Besar, Patani States, Siam; I have also identified specimens from Formosa. On one of the specimens from Ceylon Col. Yerbury has the following note: "Common and generally distributed. Torments cattle The scutellum and pilose stripe on the pleurae in life bright gamboge yellow."

[Flies of this common species conceal themselves during the day on the lower surface of the leaves of shrubs, becoming active towards evening. I found the species exceedingly common at Balighai in October.—N. ANNANDALE.]

Chrysops designata, ♀ ♂, sp. n.

(Plate xv, fig. 1.)

Type female from Sarah, Nepal, 24-xi-08, in Indian Museum coll. and another from Yunnan, W. China; type male from Jaulasal, Naini Tal district.

♀. Abdomen yellowish, marked with black on the first three segments, bearing only three yellow spots on the third segment. Wings with cross-band and apical spot, the former with a well-marked sinus on posterior border, its outer border irregular. Antennae long, cylindrical. Length 9 mm.

Face yellowish, the facial tubercles shining, blackish brown, reaching the oral opening but bearing a large yellow stripe in the centre of face, lower part of cheeks black, with yellow hairs. *Palpi* reddish yellow with scanty yellowish pubescence. *Antennae* long, cylindrical, the first joint a little longer than the second one, reddish yellow with black pubescence, the second and third blackish, the second with black pubescence, the third joint the longest of the three but barely as long as the first two joints together. *Forehead* same colour as face with yellow pubescence, the frontal callus shining, blackish brown, transverse, not reaching the eyes, with an impressed line in the centre and slightly produced toward the antennae, ocelli visible at vertex which is not darker in colour. *Thorax* blackish brown, with a very broad yellowish grey tomentose median stripe divided in two by a narrow brown line, sides yellowish clothed with bright yellow pubescence, which is also present on the dorsum as short scanty pubescence. *Scutellum* yellowish grey, blackish in the centre but probably this is due to denudation, with darker pubescence. *Abdomen* yellowish, paler yellow on the first two segments, on the following segments more reddish yellow, with the apical slightly darker, pubescence yellowish, thick on the apical segments; the black markings consist of a narrow band on the posterior border of first segment widening in the centre into a broad median spot reaching the anterior border, with concave sides, on the second segment of the ordinary chevron-like black spots meeting on the anterior border, with likewise a narrow band on the posterior border, on the third segment the black chevron-like spots are present but broader, not meeting on the anterior border, the sides and posterior border have black bands, so that the yellow colour remains as three large spots, the middle one irregularly triangular, the side ones oblong, large, on the fourth segment two small black triangular spots with their apices pointing downwards are present on the anterior border which is also blackish at the sides; under side wholly yellow. *Legs* reddish yellow, the coxae, femora and apical joints of tarsi blackish. *Wings* hyaline with brown fore border reaching the apex, at base extending slightly into the basal cells, and with a brown cross-band which reaches the anal cell; the fifth posterior cell is largely hyaline, the lower border of band almost straight not extending into the basal cells, its upper border

irregular, produced towards the base of fork of third longitudinal vein and again at the fourth posterior cell; the apical spot is narrow, the same width throughout, reaching exactly to the centre of apex of wing.

♂. Smaller than the female, measuring 8 mm.

Palpi blackish. First joint of *antennae* nearly the same length as the second, both darker in colour. *Eyes* join between the frontal triangle and the ocelligerous tubercle. *Thorax* with a wide median black stripe bordered by a yellow stripe, black beyond: sides yellow with a black stripe, pubescence yellow, golden yellow on the sides. *Scutellum* black. *Abdomen* similar to that of female with the exception of the first segment which is wholly black, only pale yellow on the sides, the black spots on second segment are larger and leave only a small yellow dot in their centre, the middle yellow spot on the two following segments is smaller; under side yellow, black at apex. *Legs* black, only the middle femora and first joint of middle and posterior tarsi pale yellow.

Chrysops rufitarsis, ♂, Macquart.

Dipt. exot Suppl. iii, p. 174 (1847); Ricardo, Ann. Mag. Nat Hist. (7). ix. p. 373 (1902).

Thorax black. Abdomen white, at the base and apex black. Wings at the base, costal border and band brown. Length 4 lines, ♂.

Palpi brown. Face yellowish white with two shining black callosities. Forehead black. Antennae slender; first joint hairy, dark testaceous; the two others black. Thorax with blue reflections, a spot of yellowish white hairs in front of the wings; scutellum black. Abdomen: first segment black, yellowish white on its posterior border, second and third the same white colour; the second with a small triangular spot resting on the anterior border; the fourth on the anterior part white, sinuous, and posteriorly black, the fifth, sixth and seventh black; under side as the dorsum. Legs black; tibiae dilated, a little rounded on the outside, the posterior ones lightly ciliated; tarsi fawn coloured, the anterior ones black; the two last joints of the intermediate and posterior pair black. Wings hyaline; the cross-band hollowed out on its interior border; veins pale, normal. From Java. Monsieur Payen's collection. Macquart, Dipt. exot. Suppl. iii, p. 174.

This type is unknown to me, but there is a male from Burma in the Brit. Mus. coll. which may perhaps belong to this species though there is no sign of a black spot on the second segment, the *abdomen* being almost silvery white or very pale yellow, black at base and apex. The colouring of the large facial tubercles is reddish brown, of the *antennae* chiefly reddish yellow, of the *legs* more reddish brown than black; the tibiae are all incrassate. *Wings* with a faint large hyaline sinus on posterior border, apical spot reaching apex uniform in width, apical border of band slightly concave.

Chrysops translucens, ♀, Macquart.

Dipt. exot. (1), i, p. 162 (1838); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 375 (1902).

Black. Abdomen with the first and second segment white pellucid at the base. Femora brown, red below; tarsi red. Wings with a black band, excised on the interior border. Length 4 lines.

Palpi brownish. Face pale fawn coloured, shining; sides and cheeks shining black, with a spot of grey tomentum at the border of the eyes. Forehead denuded, entirely shining black. Antennae: first joint bare, pale fawn coloured, of ordinary length; the second bare, same length as the first, brownish fawn coloured; the third wanting. Thorax denuded, shining black; a triangular spot of golden yellow hairs in front of the wings. Abdomen: first segment transparent white, black on its posterior border, a little narrowed in the middle, reduced to nothing on the outer borders; second silvery white with a large triangular black spot on the posterior border in the middle of which is a small dorsal white spot, transparent and triangular; the third shining black with a small dorsal white band, following that of the second segment, the others shining black; under side: the first two segments transparent white, the second black on its outer borders. Femora brownish black above, posterior ones black; tibiae brown, rather stout; anterior tarsi brown; base of the first joint fawn coloured, intermediate and posterior ones fawn coloured; the last joints brown. Halteres black. Wings hyaline; the outer border narrow, reaching the apex; a little spot near the base and a cross-band brown; this latter hollowed out in the middle of the fifth posterior cell. From Java. Monsieur Serville's collection. This species is nearly related to *Chrysops pellucidus*, Fabr. and Wied., of which perhaps it is only a variety, but the latter differs in particular by the antennae being 1½ lines long (though the third joint is wanting in *C. translucens*, they could not attain this length), by the abdomen and by the black legs. Macquart, Dipt. exot. (1), i, p. 162.

One female from Kuala Lumpur (H. C. Pratt). Presented to Brit. Mus. coll. by London School Tropical Medicine.

From a comparison of this specimen with the male and female specimens of *Chrysops pellucida*, Fabr., in Brit. Mus. coll. the distinctions between the two species *translucens*, Macq., and *pellucida*, Fabr., appear well marked. The *face* in *Chrysops translucens* is yellowish with a black spot on each side below antennae, the sides of face bordering the median line yellowish brown shining, becoming blackish over the oral opening, base of cheeks black. *Forehead* black, with broad band of grey tomentum below the frontal callus, which appears transverse, its anterior border sinuous, reaching the eyes. *Antennae* yellowish, not bare, the second one browner and the dark pubescence thicker. *Abdomen* distinguished at once from the Fabrician species by the white base of the first segment, and by the presence of the whitish or yellowish spots on second and third segment, as described by Macquart, conspicuous in the

middle of the black colouring. *Legs* brownish, the anterior femora yellowish, the anterior tibiae curved and slightly incrassate, the posterior ones broad, all with short fringes of black pubescence, most conspicuous on the hind pair, tarsi pale yellowish on first joint and at base of other joints. *Wings* similar to those of *Chrysops pellucida*. Length about 8 mm.

Chrysops pellucida, Fabr.

(Plate xv, fig. 2.)

Syst. Antl., 113, 11 (1805); Wied., Dipt. exot., 107, 8 (1821); *id.*, Auss. zweifl. Ins., i, p. 206 (1828); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 373 (1902).

Black, with the second segment of the abdomen at its base white, pellucid. Wings white: band black. Habitat Tranquebar (S. E. India).

In size and general appearance related to *Chrysops dispar*, of which it is perhaps only a variety. Antennae cylindrical, black, almost as long as the body. Head and thorax black, unspotted. Abdomen black, with the second segment at the base white, pellucid, which colour extends to the sides. Wings white; the wide middle cross-band black, paler at the border with a white spot. Legs black, tibiae compressed. Fabr., Syst. Antl., p. 113.

Black, the second segment of the abdomen white pellucid; wings with a black band, excised on the interior margin. 3 lines, ♀.

Undoubtedly a distinct species from *Chrysops dispar*. Antennae yellowish at the base; their length hardly more than 1½ lines, and therefore the Fabrician text is hardly to be understood, unless he intended not to include the head. Head grey haired. Calli black. Thorax black, with golden yellow haired sides; breast sides blackish, with a golden yellow stripe under the root of wings. The transparent white part of the second segment of abdomen slopes downwards on both sides almost to the hind border, so that a black triangular spot remains. The outer border of the wings black to the apex. In the legs the knees and base of tarsi are yellowish. In the Royal Museum and also a mutilated specimen in the Fabrician collection. Wied., Auss. zweifl. Ins., i, p. 206.

In the Indian Museum coll. there is a male from Trichinopoly, S. E. India, which exactly fits the above description. The length of antennae given by Fabricius as nearly equal to that of the body must be an error.

♂. *Eyes* brown with some blackish markings. Ocelligerous tubercle very prominent, blackish. Frontal triangle black covered with grey tomentum. *Face* black covered with dense grey tomentum, in the middle below the antennae is a large shining black tubercle and a small black spot on each side, the lower part of face below also black; pubescence in lower part of face whitish. *Palpi* small, blackish, with black hairs. *Antennae* long, slender,

about as long as the head and thorax together, first joint yellowish with pale hairs, its extreme apex and the second joint are obscure reddish with darker hairs, both joints about the same length, the third joint a little longer and blackish. *Thorax* black with some golden yellow hairs on its posterior borders, and a stripe of the same coloured hairs running across the root of wings at sides; breast black with some grey tomentum. *Scutellum* black, shining. *Abdomen* black, the second segment pellucid, whitish, on its anterior border, the black posterior border produced in the middle as a triangular spot which attains the posterior border of first segment; under side yellowish on first two segments, then black. *Legs* black, the first two joints and part of the third one of middle and posterior tarsi pale yellow, all the tibiae slightly incrassate, pubescence black. *Wings* hyaline, brown at base, and a long fore border to the apex, the transverse brown band deeply incised in posterior margin, so that the fifth posterior cell is almost hyaline. Length 8 mm.

There is a female in the Brit. Mus. coll. from unknown locality very much damaged which however is no doubt a specimen of this species.

Chrysops alter, ♀, Rondani.

Ann. Mus. Civ. Genova, vii, p. 44 (1875); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 373 (1902).

Female length 5 mm. From Sarawak, Borneo.

Antennae with the first joint reddish, the two following dusky black. Forehead in the middle narrowly greyish, with a very large anterior callus which is subrotund, shining black, taking up almost the whole width of forehead. Palpi reddish. Face shining black, at the sides narrowly and under the antennae pale pollinose. Thorax with scutellum black, the sides and the pleurae under the root of the wings yellow haired. Calyptra and halteres black. Wings with the base luteous; the costal border brown, the apex with a paler expanded brown colour; the blackish band is beyond the middle of wing, posteriorly narrower. Legs: the anterior legs blackish, with the exception of the base of femora which are pale testaceous, the intermediate femora, the extreme apex of tibiae and the tarsi pale testaceous, the tibiae blackish; the posterior legs black, with a subapical ring of the femora, the apex of the tibiae and the tarsi luteous testaceous. Rondani, Ann. Mus. Civ. Genova, vii, p. 44.

Type ♀ in Genoa Museum was seen by me. It is a small species, the *face* wholly black, shining, convex, the frontal callus black, large, reaching the eyes, a narrow grey band divides it from the vertex. *Antennae* yellow. *Abdomen* which is in a bad state appears black, the first segment yellow anteriorly, and the second segment has a yellow band on its anterior border. *Wings* with one band, and the apex narrowly dark.

Length 5½ mm.

This species must be nearly allied to *Chrysops pellucida*, with the face black, and to *Chrysops translucens*, with the first segment yellow anteriorly. Rondani omitted to describe the abdomen, which is now hard to distinguish as to colouring.

Chrysops sinensis, ♀ ♂, Walker.

(Plate xv, fig. 6.)

Dipt. Saund., i, p. 453 (1856); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 377 (1902).

In Brit. Mus. coll.

Type (female) labelled "China." Male from Haining, Chekiang, China, 1893 (Walker).

In Indian Museum coll. females from Hankow, China.

Specimens from Formosa were sent me some time ago by Dr. Kertesz for identification and proved to be this species, which is distinct from any species belonging to the Palaearctic Region and so far has not been found north of the Oriental Region boundary.

A large robust-looking blackish species with the first two segments of abdomen largely yellow, and sometimes the remaining segments appear more yellow than black, with black median oblique spots, or the abdomen appears blackish with median grey triangular spots. Thorax black with distinct yellowish stripes. Wings with a cross-band and apical spot, the former irregular on its outer border becoming narrower as it approaches the fifth posterior cell. Face, legs and antennae yellowish. Length type and others 10—11 mm.

♀. *Face* yellowish, the facial callosities reaching the oral opening are shining, tawny, cheeks with a small black spot on lower part near eyes and below blackish. *Palpi* tawny, rather bare and shining. *Antennae* tawny, the third joint blackish, the first two joints about equal in length, with very few yellowish hairs, the first joint slightly incrassate, the third as long as the first two joints together. *Forehead* covered with greyish yellow tomentum, the frontal callus large, protuberant, transverse, not reaching the eyes, vertex with the three ocelli blackish. *Thorax* black, somewhat shining, with two well-marked median grey tomentose stripes, sides with greyish yellow tomentum, breast black with some grey tomentum. *Scutellum* black. *Abdomen* in this species appears variable in colouring, in the type blackish, the first two segments largely yellow, the second segment with only two chevron-like black spots not quite joining above, their bases resting on the posterior border, the remaining segments blackish with narrow yellowish or yellowish grey borders expanding in the middle to triangular spots, and with traces of a yellow spot on each side of the third segment; in another specimen the yellow colour is more greyish and on the posterior segments is more extended leaving only black spots very similar to those in the

second segment but not converging so much towards each other, the scattered pubescence on all the specimens yellowish. *Legs* reddish yellow, knees darker, base of hind femora blackish. *Wings* with the usual band and apical spot; the shape of the former is somewhat peculiar, projecting on its outer border towards, but not attaining, the fork of the third vein; in the first posterior cell it becomes concave, then slightly convex till it reaches the fifth posterior cell, where the sinus is not very marked, and follows the fifth vein; it is narrow in width, only filling the discal cell, not encroaching on the basal cells at all, and filling the fourth posterior about half-way up; the basal cells have only dark shading at their extreme base; the apical spot is the same width throughout, only crossing the anterior branch of the third vein at its apex.

♂. Similar. *Eyes* with the upper half composed of larger facets. *Abdomen* in one specimen has the first segment almost entirely black, and the rest of abdomen reddish yellow with black oblique spots on each side, surrounding the grey triangular spots. *Wings* similar, centre of discal cell sometimes paler.

Chrysops stimulans, ♂, Walker.

(Plate xv, fig. 5.)

Dipt. Saund., i, p. 73 (1850); *id.*, List. Dipt. v, Suppl. i, p. 265 (1854); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 376 (1902).

Type (male) from East India, Saunders coll.; two males and one female from Pusa, Bengal, in Mr. Howlett's coll.

A small blackish species, the female lighter in colouring, easily distinguished by the markings of the wings, having a round clear spot in the discal cell in the middle of the dark cross-band and a narrow apical spot in the inner border of which is a clear small oblong spot reaching the anterior branch of the third vein. Male with a black abdomen, marked with three spots on each of the anterior segments, the female with the abdomen greyish and two median united spots on the second and third segments. Length of males 6—8 mm., female 8 mm.

♂. *Face* covered with grey tomentum, the facial tubercles black shining, reaching the oral opening leaving the centre of the face with a broad grey stripe, a black, narrow spot on each lower cheek reaching from the eyes to the oral opening, pubescence below pale yellow. *Palpi* yellowish brown with black pubescence. *Antennae* blackish brown, the first joint slightly incrassate with black pubescence, the second and third joints cylindrical, with less pubescence, the first two joints are about equal in length, the third a little longer than either. Frontal triangle grey, subtriangular. *Eyes* only meeting at one point beyond, vertex large with the ocelli distinct. *Thorax* blackish with grey tomentum sometimes appearing as stripes and with black pubescence.

Scutellum black. *Abdomen* black, on the second segment appears a large pale yellowish almost square spot and a minute triangular greyish spot in centre on posterior border, on third and fourth segments appear three small triangular greyish spots situated on the posterior borders of segments; under side black with yellow spots. *Legs* black, the middle tibiae yellow, black at extreme apex, pubescence of legs black. *Wings* hyaline with a dark brown base, costal border reaching to the apex, and a median band, the brown colouring at base extends beyond the middle of both basal cells, leaving a narrow hyaline band between them and the cross-band which is broad extending into the apical cell, becoming paler in the fifth posterior cell, its upper border irregular, at the base of branches of third vein it is produced, reaching towards the apical spot and thus giving rise to the clear spot or incision mentioned above; the apical spot extends over the anterior branch of third vein.

♀. Facial black tubercles are smaller. *Forehead* covered with grey tomentum, the frontal tubercle black, transverse, but small, not reaching eyes. *Thorax* grey with three very distinct black stripes. *Scutellum* identical. *Abdomen* greyish, the two black spots uniting in centre on first and second segments well marked, on third segment appears a zigzag black band on its anterior border, and on following segments a small ill-defined black spot on each side of median line; the abdomen of the only female specimen is not in very good preservation; under side greyish with black markings. *Legs* yellow, knees and tarsi blackish. *Wings* similar to those of male.

The male from Persian Gulf mentioned in Ann. Mag. Nat. Hist. (7), ix, p. 376, appears a different species, the abdomen having only median grey spots; it is probably a new species.

This Walker species bears a strong resemblance to the Palaearctic species *Chrysops punctifera*, Loew, recorded from Syria, in the wing-markings and in the abdominal markings, especially of the male, but it is distinguished by the slightly incrassate first joint of antennae, and larger frontal triangle in the male, and also in the female by the more greyish colour of the abdomen.

Chrysops indiana, ♂ ♀, Ricardo.

Ann. Mag. Nat. Hist. (7), ix, p. 379 (1902).

One male from Nilghiri Hills, 88, 112 (Hampson).

One female from Khasi Hills district, India, 96, 135 (Chennell, 1878).

A species allied to *C. dispar*, Fabr., but in the wing approaching *C. fasciatus*, Wied.; it is larger and more robust than *C. dispar*, Fabr.

Yellow, with a black bifid stripe on the second segment, enclosing a small, almost round, yellow spot, but the black does not join on the posterior border.

♂ ♀ (types). *Face* yellow, with yellow hairs on the central stripe and at the sides. *Antennae* long and slender, nearly equal in length to the head and thorax, all the joints about equal in length; yellow, the third joint darker, the first clothed with long black hairs, the second with shorter ones, the third bare. *Palpi* yellow. *Thorax* and *scutellum* brownish, with yellow pubescence, thicker at the sides, the breast the same colour. *Abdomen* light yellow, the second segment paler; the first segment with a narrow black band on the posterior border, the second with a black stripe which begins in the centre and then divides, sending out a branch on each side reaching to the hind border, and there extending outwards till it ends in a point; a small, yellow, oblong spot is thus left in the middle, surrounded by the black, excepting on its posterior border; the black stripes are continued very faintly on the third segment; the sides of abdomen have short black pubescence; the under side yellow, with three faint brown stripes on the third segment. *Legs* yellowish brown, with short black pubescence; the tibiae dilated, especially the anterior and middle pairs. *Wings* clear, with brown colouring at the extreme base only filling the basal cells one-third of their length, continued along the fore border to the apex, and as a transverse band which attains the posterior border just contiguous to the anal cell; it is a little fainter in colouring in the fifth posterior cell; its apical border is straight, also the inner one as far as the anal cell.

Length 11½ mm.

The female is identical.

Chrysops fasciata, ♀, Wiedemann.

(Plate xv, fig. 7.)

Dipt. exot., i, p. 103 (1821); *id.*, Auss. zweifl. Ins., i, p. 198 (1828); Doles., Natuurkund. Tijd. Nederl. Ind., xvii, p. 84 (1858); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 375 (1902).

Thorax black; abdomen at the base white, in the middle black, with the apex ochraceous; wings at the base, costal border and band brown. 4¼ lines. ♀. from Java.

Antennae brown, the last joint deep black at apex; face golden yellow with a brownish black triangular tubercle. Thorax with golden yellow tomentum; breast sides with thick golden yellow silky pubescence. Abdomen with the first two segments white, the last one black on its posterior border, the third black with ochre-brown median and side spots, which do not attain the side border, the fourth and fifth ochre-brown with black side borders, the sixth and seventh wholly ochre-brown. Wings very hyaline, the usual band hardly incised in the inner border. Legs brown, femora darker, the tarsal joints at base very pale, the fore tibiae and tarsal joints at base blackish; the posterior tibiae fringed with black hairs. In Westermann's collection. Wiedemann, Auss. zweifl. Ins., i, p. 198.

Doleschall records this species from Amboina. In Brit. Mus. coll. a female from Malay States (H. C. Pratt), presented by London School of Tropical Medicine; and two females from Ross Island, Andaman Islands, May 1904 (Col. Bingham). In Indian Museum coll. a female from Assam and another from Sibsagar, Assam.

In London School of Tropical Medicine coll. a female from Sarawak, Borneo (A. R. Wellington).

A species with the *abdomen* pale yellow at base, black in the middle and reddish yellow at apex. *Legs* and *face* blackish. *Wings* with the dark cross-band hardly incised on inner border though sometimes paler.

Length 8½—12 mm.

Face yellowish or golden yellow, with the middle of face shining black having only a short yellow median stripe below the antennae, base of cheeks shining black. Beard yellow. *Palpi* yellowish red, smooth, long and pointed with some black hairs. Antennae yellowish, cylindrical, the second joint browner with thicker pubescence, the third joint black except at base, longer. *Forehead* black with a broad band of yellow or grey tomentum, the frontal callus large, reaching eyes, protuberant. *Thorax* black, with golden yellow pubescence at sides and on posterior border, and with pale yellow appressed pubescence on dorsum. *Scutellum* blackish.

Abdomen with the first two segments pale yellowish, the first segment black beneath the scutellum, the second segment with a narrow posterior black border, the third segment blackish sometimes with obscure yellowish or reddish markings, the remaining segments reddish yellow. *Legs* blackish brown, the fore tibiae black, swollen, the middle and posterior tibiae almost wholly pale yellow, the posterior femora incrassate with fringes of black hairs, pubescence of legs wholly black. *Wings* with a large broad transverse band, broadly brown on costal border to apex and at base brown, the band with almost straight borders, not incised on posterior border though sometimes paler in the fifth posterior cell, reaching to the anal cell, the apex of which it entirely fills.

Chrysops fixissima, ♀, Walker.

Proc. Linn. Soc., i, p. 112 (1856); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 376 (1902).

Chrysops unizonatus, Rondani, Ann. Mus. Civ. Genova, vii, p. 459 (1873); Ost. Sacken, Berlin. Ent. Zeit., xxvi, p. 97 (1882).

The type is not to be found in the British Museum collection, but only the variety. Colonel Yerbury has a note on one of the specimens to the effect that the species is "*Rare*."

Type (var., female) from Sarawak, 68, 4 (Saunders).

Two from Sandakan, Brit. N. Borneo, 98, 38 (D. Cator), and one, from same locality, 95, 134; one from Singapore, 96, 114

(Flower); one from Sarawak, 56, 14 (Saunders); two from Trincomalee, 2, 10 90—10, 9, 91 (Yerbury).

Walker describes the var. "with two bands, one black, the other brown." I should rather describe it as having one black band only, on the posterior border of the second segment. It is related to *C. fasciata*, but distinguished from it by the facial tubercle being yellowish brown, becoming black only at its upper corners; the legs are also paler. The species described by Rondani as *C. unizonatus* is a synonym of this, and not of *C. signifer*, Walker, as suggested by Osten Sacken, who states that the face in the Rondani species is yellow, which agrees with the colouring of the face of this species (see Osten Sacken, in Berlin. Ent. Zeit., xxvi, p. 97). Ricardo, Ann. Mag. Nat. Hist (7), ix, p. 376.

Length of type 11 mm., of others 9—11½ mm.

When further material is available, this species may prove to be only a subform or identical with *Chrysops fasciata*, Wied., the abdomen with only one black band on the posterior border of second segment and the more largely yellow colouring of the face appearing the only differences.

Chrysops signifer, ♂, Walker.

Proc. Linn. Soc. London, v, p. 276, 1861; Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 376 (1902).

There is only the type, a male, in Brit. Mus. coll. from Batchian, but Osten Sacken records males and females from the Philippines and states they vary very much in size. Ost. Sacken, Berlin. Ent. Zeit., xxvi, p. 97, 1882.

The species is distinguished from *Chrysops fixissima* and *fasciata* by the shape of the second band on the third segment, which is not present in *Chrysops fixissima* and *Chrysops fasciata*, in this species it is concave in the middle, neither of the bands reach the sides, but the third and fourth segments are bordered with a narrow black stripe. Legs in the type are yellowish brown, the hind pair darker, tibiae slightly incrassate. Wings as in *Chrysops fasciata*.

Length of type 9½ mm.

Chrysops cincta, Bigot.

Mem. Soc. Zool. France, v, p. 602 (1892); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 378 (1902).

? *Chrysops clavicrus*, Thomson, Eugen. Resa, Dipt., p. 452 (1868); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 373 (1902).

Antennae as long as the head and thorax together, black, the first segment (joint) pale yellow, the second the same length, palpi whitish yellow; face and forehead covered with a yellowish tomentum, under the antennae a heart-shaped spot, an oval callus at base of forehead, another transverse one at vertex, all shining black; thorax black, a little yellowish down at the sides;

scutellum black; abdomen black, the segments very narrowly bordered with yellowish white, a large band of the same colour at base of second segment; coxae black, femora reddish, the posterior ones black exteriorly, tibiae dilated, reddish, blackish exteriorly, tarsi reddish with the apex blackish; squamae greyish, club of halteres brown; wings whitish, blackish exteriorly, from the base to the apex included, with a large median cross-band of the same colour. Philippine Islands. One specimen. Bigot, Mem. Soc. Zool. France, v, p. 602.

I have examined the type (female) from the Philippines lent me by Mr. Verrall; it is darker than the three other species with black bands, and the yellow colour of the abdomen is not diaphanous; it is nearly allied to *C. fasciatus*, Wied., and *C. signifer*, Wlk., but the abdomen is darker and the black bands broader.

I believe it to be the same as *C. clavicrus*, Thomson, from Malacca; and if this proves to be correct, Bigot's name must be sunk.

The original description may be amended thus:—

Face black, yellow at the sides, and with a central short yellow stripe. *Abdomen* with the first segment pale yellow and a narrow black posterior border; the second is pale yellow on its anterior border; the black band posteriorly is nearly equal in width to the yellow colour; the third segment is almost wholly black, with only a narrow yellow border anteriorly; the two black bands join at the sides, but the second band is entirely straight on its posterior border, thus differing from *C. signifer*, Wlk., which is deeply indented in the centre; the fourth, fifth, sixth and seventh segments are reddish yellow, with obscure black square spots in the centre of the fourth and fifth. The *wings* are clear, dark at the base and along the fore border to the apex, and with the usual transverse band which extends to the posterior border. Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 378.

Black. Antennae, head and palpi yellow, legs brown, anterior femora and tarsi testaceous, anterior tibiae club-shaped, fusiform; wings hyaline, with the marginal border and an oblique median band brown. Abdomen at apex brownish, at base honey-yellow, pellucid, with black median band.

♀. Length 10 mm. Malacca.

Related to *Chrysops rufitarsis*, Macquart, Dipt. exot. Suppl. iii, p. 174, with the anterior tibiae club-shaped, but in the colouring of the abdomen and with the median band of wing not incised, distinct. Head almost hemispherical, the width of thorax, the large eyes bare, ocelli placed on a triangular callus, forehead golden haired, with a large shining callus above the antennae; face golden haired, the facial tubercle sub-protuberant, heart-shaped, shining, the cheeks golden haired, proboscis deflexed, length of the head brown-black; palpi yellowish, deflexed, conical, awl-shaped. Antennae as long as the head and thorax, porrect, filiform, with very short black hairs, separated at the base, black,

the first joint yellow, the second equal in length, lineal, the third one and a half longer than the second, 5 ringed. Thorax subglabrous, golden haired at sides and beneath wings; black, at the base above scutellum golden haired, scutellum large, transverse-triangular. Halteres dull yellow, the large club black. Wings with the fore border widely brown, and the band brown, narrower before the base, elsewhere wide, transverse, passing behind the middle of discal cell.

Abdomen with fine yellow pubescence, subopaque, the first segment pellucid yellow with a narrow band before the apex, the second yellow, denuded, posteriorly black, the third with the black part wider, with a narrow yellow basal part, fourth, fifth and sixth brown, the fourth with an obsolete discal brown spot; under side brown, at the base yellow, the fourth segment with a brown median spot. Breast black, a little shining, with fine scanty pubescence. Legs with fine short brown pubescence, anterior coxae dull testaceous, brown at apex, the posterior ones black, femora brown, the anterior pair dull testaceous, anterior tibiae stout, club-shaped, brown, the intermediate ones less stout, dull testaceous, brown in the middle, posterior femora brown, tarsi yellow with the apex brown. Thomson, Eugen. Resa, Diptera, p. 452.

This latter description is given here with a few unnecessary particulars omitted, as I believe it to be the same species as Bigot described.

Chrysops flavocincta, ♀, Ricardo.

(Plate xv, fig. 4.)

Ann. Mag. Nat. Hist. (7), ix, p. 380 (1902).

Type (female) and another female from Khasi Hills, Assam, 97, 82 (Heyne); two females from North Khasi Hills, lower ranges, 96, 135 (1878, Chennell); one female from Sarawak, 56, 44 (Wallace); one female from Trincomalee, 54 (Yerbury).

Black. Abdomen with a yellow band on the anterior half of the second segment.

Face black, shining, with a grey tomentose stripe just below the antennae and an obscure yellowish spot where the usual stripe begins; a line of grey tomentum divides the cheeks from the upper part of the face; *forehead* with the usual black tubercles, which are large, a narrow band of grey tomentum divides them. *Antennae* rather long, yellow, the second and third joints darker; the first two joints pubescent, the third bare. *Palpi* yellow. *Thorax* black and shining, with traces of a broad grey stripe, some white pubescence on the dorsum and on the posterior border, and yellow hairs at the sides. *Scutellum* black. *Abdomen* black, with some white pubescence, with a yellow band on the anterior half of the first two segments; that on the second is widest and

concave in the middle, becoming broader at the sides; the under side yellow at the base and black on the apex. *Legs* black, the anterior and middle femora and the middle and posterior tarsi yellow. *Wings* clear, the dark colouring hardly perceptible at the extreme base; along the fore border it is narrow and only reaches the band, the apex being quite clear; the band hardly attains the hind border and becomes paler in the fourth posterior cell, only just continuing into the fifth; in some of the specimens it does not reach beyond the fourth and never attains the anal cell; it is straight on both its borders.

Length 8½ mm.

One of the specimens from Borneo does not measure more than 6½ mm. Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 380.

In Indian Museum coll. are females of this pretty little species from Pallode, 20 miles N. E. of Trivandrum, Maddathorai, west base of W. Ghats, all in Travancore. The greyish stripe or band below the antennae and a narrow border between the eyes and the facial tubercles are in some of these specimens almost golden yellow. The species is easily recognized by the long cylindrical antennae, all the joints about equal in length, the black shining face, and the attenuated band of wings usually not attaining the fifth posterior cell, its outer border is rather concave in these specimens.

[This species, which is very common on the west side of the W. Ghats in Travancore in November, resembles *C. dispar* (p. 382) in habits.—N. Annandale.]

Chrysops flaviventris, ♀, Macquart.

Dipt. exot. Suppl. i, p. 172 (1845); Ricardo, Ann. Mag. Nat. Hist. (7), ix, p. 373 (1902).

Thorax black. Abdomen yellow with a spot and the apex black. Legs red. Wings with margin and band brown. Length 3½ lines, ♀.

Related to *C. translucens*. Face shining black, the upper part fawn coloured. Forehead brownish black, shining. Antennae wanting. Thorax shining black, with a large spot of fawn-coloured tomentum in front of the wings and prolonged below; scutellum black, bordered with testaceous colour. Abdomen pale yellow, the second segment with a blackish chevron, the last one black. Posterior femora brown. Wings on posterior border and the cross incised band brownish. From India. M. Bigot's collection. Macquart, Dipt. exot. i, p. 172.

This type is unknown to me. From the description it is not clear whether an apical spot is present on the wing, but as it is said to be related to *C. translucens*, Fabr., which possesses one, it may be assumed to have one. From the description it might possibly be a specimen of *Chrysops dispar*, Fabr., with the black stripe almost obsolete. It is not included in the table.

Chrysops flavipes, Meig.

Klass., i, p. 159, pl. ix, fig. 13 (1804); Villen, Ann. Soc. Entom. France, lxxiv, p. 310 (1905).

Chrysops perspicillaris, Loew, Neue Beitr., iv, p. 25 (1856); *id.*, Verh. zool.-bot. Ges. Wien, viii, p. 633 (1858); Schiner, Fauna Aust. Dipt., i, p. 41 (1862); Gobert, Mem. Soc. Linn. Nord France, 1881, p. 48 (1881); Pand., Revue d'Entom., ii, p. 226 (1883); Griff., Boll. Mus. Zool. et Anat. comp. Torino, x, No. 218 (1895); Ricardo, Ann. Mag. Nat. Hist. (7), ix, pp. 426, 430 (1902).

One female from Baluchistan in Indian Museum coll. rather pale in colouring but identical with the species described by Loew, now stated by Villen to be identical with the Meigen type of *C. flavipes* seen by him in the Paris Museum. The species is widely distributed, being recorded from Central and South Europe, N. Africa and Asia Minor.

INDEX.

	Page
Chrysops, Meig. ..	365, 374
alter, Roud. ..	387
cincta, Bigot ..	393
designata, Ric. ..	383
dispar, Fabr. ..	380
fasciata, Wied. ..	391
fixissima, Wlk. ..	392
flavipes, Meig. ..	397
flaviventris, Macq. ..	396
flavocincta, Ric. ..	395
indiana, Ric. ..	390
manilensis, Schiner ..	377
mlokosiewiczi, Bigot	378
pellucida, Fabr. ..	386
rufitarsis, Macq. ..	384
signifer, Wlk. ..	393
sinensis, Wlk. ..	388
stimulans, Wlk. ..	389
translucens, Macq. ..	385
Corizoneura, Rond.	364, 365
longirostris, Hardw.	365
taprobanes, Wlk. ..	367
varipes subsp., Ric.	367
Diachlorus, Macq. ..	321, 364
flavipennis, Macq. ..	364
Diatomineura, Rond.	364, 365
Gastroxides, Saund.	365, 370
ater, Saund. ..	370
ornatus, Bigot ..	371
Haematopota, Meig. ..	321
annandalei, Ric.	335
assamensis, Ric.	343
atomaria, Wlk. ..	332
bilineata, Ric. ..	350
borneana, Rond.	329
brevis, Ric. ..	349
cana, Wlk. ..	330
cilipes, Bigot ..	360
cingalensis, Ric.	351
cingulata, Wied.	326
dissimilis, Ric. ..	331
fasciata, Ric. ..	358
fuscifrons, Austen	357
immaculata, Ric.	359
inconspicua, Ric.	358
indiana, Bigot ..	328
irrorata, Macq. ..	352
javana, Wied. ..	340
lata, Ric. ..	344
latifascia, Ric. ..	356
limbata, Bigot ..	325
lunulata, Macq.	354
marginata, Ric.	347
pachycera, Bigot	336
punctifera, Bigot	327
roralis, Fabr. ..	323
rubida, Ric. ..	338
sinensis, Ric. ..	345
singularis, Ric. ..	339
tessellata, Ric. ..	348
unizonata, Ric. ..	332
validicornis, Ric.	333
Mycteromyia, Phil. ..	365, 373
nigrifacies, Bigot	373
Neotabanus, Ric. ..	321, 363
ceylonicus, Ric. ..	363
Pangonia, Latr.	365
amboinensis, Fabr. ..	368
Rhinomyza, Wied. ..	365, 369
fusca, Wied. ..	369
Silvius, Meig. ..	365, 373
indianus, Ric. ..	374
Udenocera, Ric. ..	321, 361
brunnea, Ric. ..	362

IX. CONTRIBUTIONS TO THE FAUNA OF YUNNAN BASED ON COLLECTIONS MADE BY J. COGGIN BROWN, B.Sc., 1909—1910.[1]

PART VII.—TABANIDAE.

By GERTRUDE RICARDO.

The Tabanidae sent me for identification by Dr. Annandale are few in number, comprising the following species:—

TABANUS, Linné

Tabanus orientis, Walker. Two females from Man Hsien.

Tabanus monotaeniatus, Bigot. Two females from the same locality, rather smaller in size than usual, the abdomen being narrower, and reddish in colour.

HAEMATOPOTA, Meigen.

Haematopota lata, Ricardo. Four females from Man Hsien.

CHRYSOPS, Meigen.

Chrysops mlokosiewiczi, Bigot (*Chrysops striatus*, Wulp). A series of females from between Tengyueh and Tali Fu (J. Coggin Brown). The frontal callus is reddish-yellow, not black. This species has a wide distribution in the Palaearctic and Oriental Regions, being recorded from China, Japan and Persia.

Chrysops designata, Ricardo (p. 383, *antea*). One female.

For references to these species see *Rec. Ind. Mus.*, vol. iv, No. vi, 1911, containing a revision of the species of *Tabanus* from the Oriental Region, and the same publication, vol. iv, No. viii, for species of *Chrysops* and other genera of Tabanidae.

---

1 The previous papers of this series appeared in *Rec. Ind. Mus.*, v, p. 193 (1910), and vi, pp. 13 and 215 (1911).

EXPLANATION OF PLATE XV.

FIG. 1.—*Chrysops designata.*
" 2.— " *pellucida.*
" 3.— " *dispar.*
" 4.— " *flavocincta.*
" 5.— " *stimulans.*
" 6.— " *sinensis.*
" 7.— " *fasciata.*

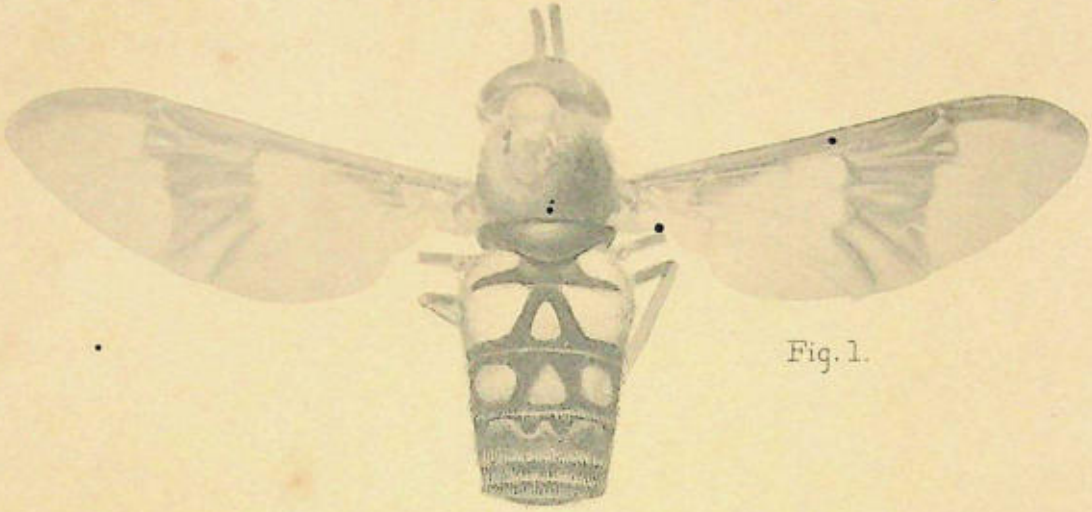


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

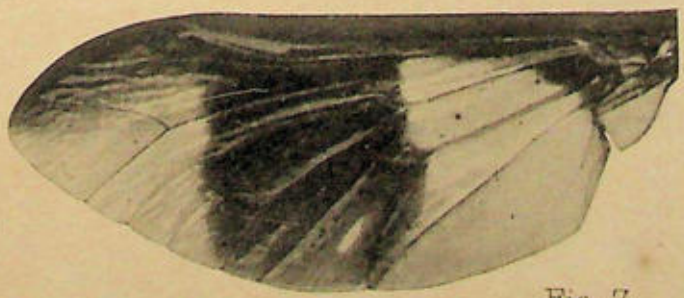


Fig. 7.

CHRYSOPS.

H. G. Herring. Benrose, Ltd. Derby.

EXPLANATION OF PLATE XVI.

FIG. 8.—*Udenocera brunnea.*
,, 9.—*Gastroxides ater.*
,, 10.—*Haematopota latifascia.*
,, 11.— ,, *atomaria.*
,, 12.— ,, *unizonata*, ♂.
,, 13.— ,, *unizonata*, ♀.
,, 14.— ,, *tessellata.*
,, 15.— ,, *cingalensis.*
,, 16.— ,, *brevis.*

EXPLANATION OF PLATE XVII.

FIG. 17.—*Haematopota fuscifrons.*
,, 18.— ,, *rubida.*
,, 19.— ,, *indiana.*
,, 20.— ,, *punctifera.*
,, 21.— ,, *annandalei.*
,, 22.— ,, *dissimilis.*
,, 23.— ,, *validicornis.*
,, 24.— ,, *roralis.*
,, 25.— ,, *javana.*
,, 26.— ,, *lata.*

Fig. 17.

Fig 18.

Fig. 19.

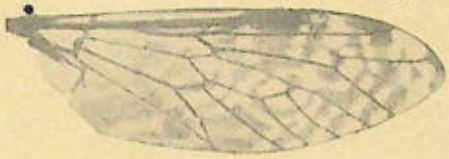


Fig. 20.

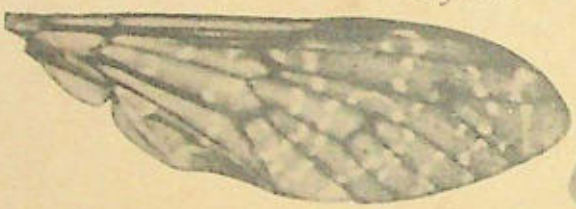


Fig. 21.

Fig. 22.

Fig. 23.

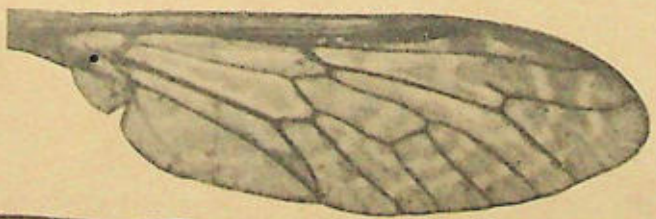


Fig. 24.

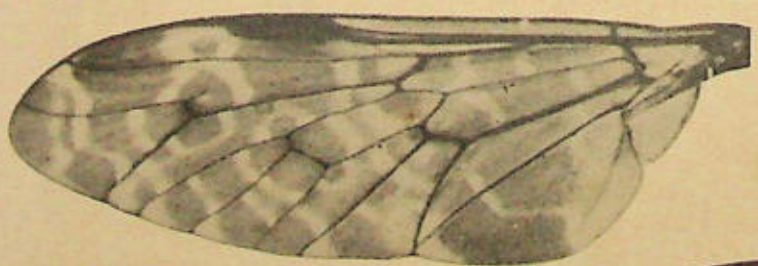


Fig. 25

Fig. 26.

HAEMATOPOTA.

J. G. Herring

Bemrose Ltd. Derby

EXPLANATION OF PLATE XVIII.

FIG. 27.—*Haematopota singularis.*
,, 28.— ,, *sinensis.*
,, 29.— ,, *assamensis.*
,, 30.— ,, *irrorata.*
,, 31.— ,, *inconspicua.*
,, 32.— ,, *marginata.*
,, 33.— ,, *immaculata.*
,, 34.— ,, *bilineata.*

Fig. 27.

Fig. 28.

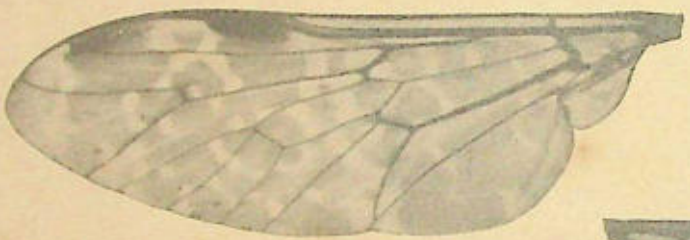


Fig. 29.

Fig. 30.

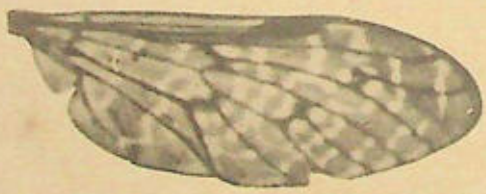


Fig. 31.

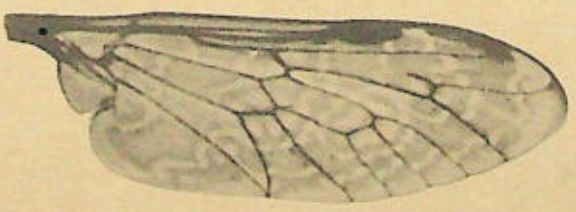


Fig. 32.

Fig. 33.

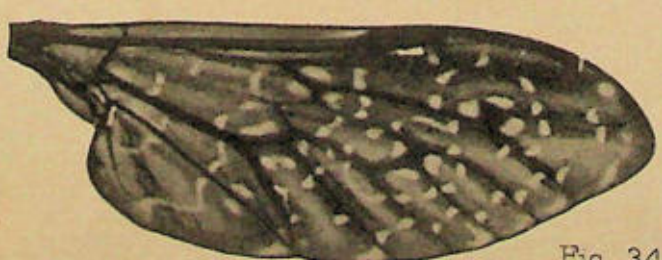


Fig 34.

HAEMATOPOTA.

X. ANNOTATED CATALOGUE OF ORIENTAL CULICIDAE—SUPPLEMENT.

By E. BRUNETTI.

Almost immediately after the publication of my "Annotated Catalogue of Oriental Culicidae" [1] I obtained access to a copy of the fourth volume of Mr. Theobald's Monograph on this family, and to Mons. Blanchard's copious work, "Les Moustiques." Subsequent to these is a very lengthy and valuable paper on the Culicidae of the Malay States by Dr. G. F. Leicester (with a preface by Mr. C. W Daniels, Director of the Institute for Medical Research) published by that Institution.[2] Also a long paper by Mr. Theobald ("2nd Report on the Indian Museum Culicidae").[3]

I have also received a copy from Miss Ludlow of her thesis on the mosquitoes of the Philippines. The very considerable list of additions and corrections of importance relating to Oriental species gleaned even from these five works alone render a supplement to my catalogue imperative, and the information contained in the present paper is mainly derived from these sources with the inclusion of the 5th volume of Theobald's Monograph recently issued.

The splitting of genera and species still continues to such extremes as to invoke the severe deprecation of more than one systematic dipterologist, more especially in the case of groups higher than genera, of which, none of those recently erected in this family approach in zoological value groups of similar rank in the other families of Diptera.

I have dealt elsewhere [4] with the question of taxonomic values in Culicidae, and therefore need not recapitulate here any observations that apply only to nomenclature. In that paper was mentioned that in addition to the vast accessions in generic rank proposed by the new school of culicid students, new methods were adopted in presenting to others the results of their labours, and though I feel ill fitted to condemn or criticize, it does not seem entirely out of place to suggest that, in as many particulars as possible, the generally accepted rules of zoological literature should be adhered to.

Mr. Theobald's method in his Monograph of placing the author's name *after* the quotation instead of *before* it, renders it rather awkward to follow the data presented in this unusual

---

[1] Rec Ind. Mus., i. 297—377 (1907).
[2] Studies from the Institute for Medical Research, Federated Malay States, vol. iii.
[3] Rec. Ind. Mus., iv, 1—33 (1910).
[4] "Taxonomic values in Culicidae." Rec. Ind. Mus., iv, 53 (1910).

manner. Another serious inconvenience in referring to this author's work is the index, where the genera themselves are alphabetically arranged, all the species of each genus forming a separate alphabetical list under each generic name This plan is still retained even in the fifth volume. So, unless the student knows to which genus this author refers each species, he has to search the whole index. A single alphabetical list of specific names as is given in the valuable Catalogue of Diptera by Kertesz would have much facilitated reference, and the genus of each could have been entered in a second column.

In Blanchard's otherwise admirable work he adopts a very laborious method of quoting merely a reference date and letter (1901a, 1902a, 1902b, etc.) for each paper of each author, thus necessitating an examination of his list of papers (given at the end of the book) *every* time a quotation is desired. The amount of additional and unnecessary labour entailed by this double reference is enormous.

The habit of authors on Culicidae of allowing the female to take precedence of the male is in absolute defiance of zoological rule, and it is to be regretted that Dr. Leicester in his great paper on the Malay species, has continued this practice, even though he had before him males of the greater number of the species dealt with.

In connection with this question it is well to mention the case of the Anopheline mosquito known as *culicifacies*, Giles.

Giles originally described under that name, what afterwards proved to be two distinct species (namely, his ♂ is now known as *turkhudi*, Liston, and his ♀ as *culicifacies*, Giles).

Now, in accordance with the strict rules of zoological literature, as I have always understood them, in such a case the name of the species is invariably retained for the ♂, and a new name provided for the ♀. This being so, the name *culicifacies* should have been retained for the male (now called *turkhudi*), and the *female* (still known as *culicifacies*) renamed. However, to avoid further confusion the synonymy was not altered in my catalogue nor in the present supplement, but it seems advisable to call attention to the fact and to protest against the ♀ taking precedence of the ♂ in such cases.

A brief review of the recently published works on Culicidae may now be made.

Mr. Theobald's 4th volume (Monog. Culicidae World) contains notes (p. 1) on the growing of *Lemna minor*, *L. arrhiza* and other duckweeds, on the surface of all unavoidable collections of water as a preventive against the breeding of mosquitoes. Mr. Green notes that they breed freely in the flowers of *Heliconia brasiliensis*.

On p. 3 Mr. Theobald gives a list of the species that are known to be agents of infection. On p. 6 he gives Prof. Felt's table for the identification of culicid larvae; on p. 11, Dr. Dyar's grouping and formation of genera by ♂ genitalia. As a criticism on the classification by larvae, Mr. Theobald remarks (referring to

Messrs. Dyar and Knab's paper, in which only 3 sub-families are recognized,—Anophelinae, Culicinae and Sabethinae), "all other genera of Anophelinae are sunk as synonyms of *Anopheles*, but the authors raise one species—*barberi* of Coquillett, a species so close to *bifurcatus* that it is hardly separable—to generic rank, calling it *Coelodiazesis*."

Mr. Theobald mentions their plates of portions of the larvae as being valuable for future work. On p. 14 Theobald mentions Coquillett's classification of the family on adult characters, on p. 15 the proposed separation of *Corethra* and *Mochlonyx* from Culicidae, to form a separate family. Dr. Lutz's classification is given on p. 15 followed by a modification of it by Theobald on p. 17; the latter writer being in favour of the separation of *Corethra*. The further notes of interest in Mr. Theobald's work are mentioned under the genera and species to which they apply.

In the 5th volume of his Monograph of the Culicidae Mr. Theobald reviews all the species included in the previous volumes. It is a huge work of over 600 pages, illustrated by 261 text-figures and six plates of wings, and contains descriptions of 21 new genera and 392 new species.

It contains apparently lists of all known species in each genus (except those purposely excluded for given reasons) and presents them in tabular form.

It is satisfactory to see the author deploring the brief nature of some authors' description of their species, "wholly inadequate for correct diagnosis," and as certainly leading to much confusion and increased synonymy. He also, rightly enough, objects to new genera and species being created on larvae of which the adult forms are unknown, and he emphasizes this objection by ignoring the species thus erected by Messrs. Dyar and Knab on American and West Indian forms.

It is curious that Theobald makes no reference either to the voluminous monograph on the Malayan Culicidae published by Dr. Leicester, nor does he apparently notice any of that author's very numerous new species, mostly described from bred specimens.

In one or two cases he quotes verbatim descriptions of species by other authors without notifying from which region of the globe they come.

Blanchard in his "Moustiques" (1905) devotes chap. i to the position of the Culicidae, chap. ii to the morphology and anatomy of the family, and chap. iii to their metamorphoses and habits. Notes on mosquito parasites occur on pp. 132-135. A long chapter of nearly 300 pages, illustrated by 120 figures, is devoted to the systematic description of genera and species. Chapter v treats of the medical aspect, chap. vi of methods of prevention of attack and of extermination, and chap. vii of their collection, preservation, breeding and mounting. An appendix giving recently described species a very complete bibliographical catalogue, and a copious index to the whole work completes the volume, which totals 673 pages. On p. 390 he gives a key to the new genera

contained in the 3rd volume of Theobald's Monograph which appeared whilst Blanchard's work was in the press.

Miss Ludlow's paper on the connection between malaria and the occurrence of various species of mosquitoes in the Philippines contains very extensive information respecting their distribution.

Many of the species appear widely distributed, *Myzomyia ludlowii* being reported from no less than 42 different localities in these Islands, *M. indefinita* from 26, *M. rossii*, *vanus*, *pseudobarbirostris*, *funestus* and *barbirostris* from ten or more localities each, besides other species from a lesser number of localities each.

She notes that it is probable that some species may pass through the dry season as adults, hibernating amongst the dry vegetation, and also notes that in localities where the rainy season advances gradually, the Anophelinae are more numerous and exist in considerable numbers throughout a good part of the dry season, whereas in localities where the rainy season is introduced by very excessive and constant deluges they are markedly less in numbers, presumably by the breeding places of the insects in their earlier stages being washed away.

"Four Anophelinae, *funesta*, *barbirostris*, *juliginosus*, and *ludlowii* . . . seem likely to be acting as hosts for the malarial parasite in the Philippines, and concerning *Stegomyia calopus* Mg.(= *S. fasciata* F.), *Culex fatigans* W., and *Mansonia uniformis* Theob., there are too few data to judge if they be carriers of disease" (Ludlow). Regarding *Stegomyia fasciata*, the acknowledged sole carrier of yellow fever, this author significantly remarks: "Yellow fever has so far never been present in the Philippines. The wide distribution of *S. calopus* (= *S. fasciata* F.) is, however, very suggestive taken in connection with the building of the Panama Canal, as to the result likely to follow, should yellow-fever-infected mosquitoes or patients in the proper stage of the disease reach the Islands."

Mr. G. F. Leicester, in his important and extensive paper on "The Culicidae of Malaya" devotes over 250 pages to fully redescribing the mosquitoes of this region, including nearly a hundred new species. In his preface he notes that the 3rd volume of Theobald's Monograph appeared just before the publication of his own work and that an appendix will be necessary, involving some changes of nomenclature, and that a further paper on the larval characters may eventually follow.

In this paper he devotes 14 pages to the breeding grounds of mosquitoes with some notes on collecting and preserving them, but although he seems to have bred a great number of the species and fully described numbers of them from long series of fresh specimens he gives no definite dates of appearance.

A further report by Theobald on the Indian Museum Culicidae (the 2nd) has recently been issued [1] in which four new genera and twenty-one new species are described. It has appeared

[1] Rec. Ind. Mus., iv. 1—33 (1910).

unnecessary to copy the whole of the data supplied in this author's paper (which is easily accessible) in cases of very common or widely distributed species, especially if the localities therein given are already in my Catalogue.

In such cases the species are reported in this paper as "common throughout India," etc., as easy reference can be made to exact details.

Major S. P. James in "A new arrangement of the Indian Anophelinae" (Rec. Ind. Mus., iv, 95—109) criticizes the evanescent nature of Anopheline genera, noting that if *maculipennis*, Mg., be the type of *Anopheles*, s. s., there is no Indian species of the genus. He divides the Indian Anophelina into two groups, those with, and those without abdominal scales. Of the 1st group he admits 4 genera—*Neostethopheles*, gen. nov. (pl. i), with *aitkeni*, James, as type; *Myzomyia*, Blanch. (pl. i), with *culicifacies*, Giles, as type; *Patagiamyia*, gen. nov. (pl. i), type *gigas*, Giles; and *Pyretophorus*, Blanch. (pl. i), with *palestinensis*, Theob., as "type example."[1]

In the 2nd group he gives these genera: *Nyssorhynchus*, Blanch. (pl. ii), type *maculatus*, Theob.; *Myzorhynchus*, Blanch. (pl iv), type *barbirostris*, V. Wulp; *Cellia*, Theob (pl. iii), type *pulcherrima*. Theob.; *Neocellia*, Theob. (pl. iii), type *indica*, Theob.; *Aldrichia*, Theob., type *error*, Theob.; *Nyssomyzomyia*, gen. nov. (pl. ii), type *rossii*, Giles; *Christophersia*, gen. nov. (pl. iv), type *hallii*.

The two new genera proposed, *Neostethopheles* and *Patagiamyia*, are not admitted in the present Catalogue, as my manuscript was practically completed when these genera were set up, and also because it is quite evident that the workers in mosquitoes are further off than ever from any definite agreement amongst themselves as to either the number or the limits of the genera to be recognized.[2] The third genus proposed by James—*Christophersia*—is acknowledged here as it comprises one species only, which has not previously been located in any other genus.

In the 2nd edition of Messrs. James and Liston's "A Monograph of the Anopheline Mosquitoes of India" a good deal of additional matter is introduced. Their classification into Megarhinae, Limatinae, Anophelinae, Aedinae and Culicinae need not be criticised here. Their suggestion (p. 15) to make use of the botanical terms to describe the different shapes of the scales seems an excellent one, as the terms now used are ambiguous and have not the same meaning for every author. Collecting and mounting are detailed, but it is certainly time that the method of using

---

[1] The true generic type is *costalis* but has not been seen by James, and, as he remarks, the thoracic scales may be different. In any case however *costalis* must still remain the type of the genus.

[2] In the "Bulletin of Entomological Research" for May 1911 Mr J. W. W. Stephens calmly announces that "A careful examination with a pocket lens (!) should enable you to state almost with certainty whether or no all the Anophelines you have caught are of the same species." Yet those who have studied them for years are, as stated, still very much at variance as to specific limits.

cardboard discs should be abolished and neatly cut blocks of pith be substituted.[1]

The authors' suggestion (p. 17) to ignore the legitimate claims of priority, cannot, of course, be sustained. One feature of this work is that the descriptions are drawn up without reference to sex, applying presumably to both, except where, here and there, a character is noted as present in one sex only.

It is extraordinary how specialists in mosquitoes continue to wrongly name the veins, and especially what they call "cross-veins."

In James and Liston's work, the longitudinal veins are correctly designated, but they speak of the short basal section of the 2nd longitudinal vein (before it takes its longitudinal course) as a cross-vein (the "marginal"). It is nothing of the sort, the marginal cross-vein not being present in the Culicidae at all: and in those families in which it does occur it is always in the distal half of the wing.

Again, James and Liston's "supernumerary cross vein" is merely the basal section of the 3rd longitudinal vein, and certainly not a cross-vein at all.

Their "mid cross-vein" may be thus called though "anterior" cross-vein is the more correct term; and the posterior cross-vein they have happily correctly recognized.

The subcostal cross-vein of James and Liston is not this vein at all, but the *humeral* cross-vein, the subcostal cross-vein not being present in the Culicidae, and in those families in which it does occur it joins the auxiliary and 1st longitudinal veins. There are only three cross-veins in Culicidae—the humeral, anterior and posterior.

In speaking of the cells, James and Liston say that the "areas enclosed between these branches" (*i.e.*, of the forked longitudinal veins, the 2nd and 4th) "have received names" (mentioning only the 1st submarginal, 2nd posterior and "anal" cells) but continue by cheerfully ignoring all the other cells as "for our present purpose they need not be mentioned"!

Moreover, they are wrong again in their "anal" cell, which is really the "4th posterior" cell. The anal cell is always *behind* or *posterior* to the 5th longitudinal vein, or the hinder branch of it when this vein is forked.

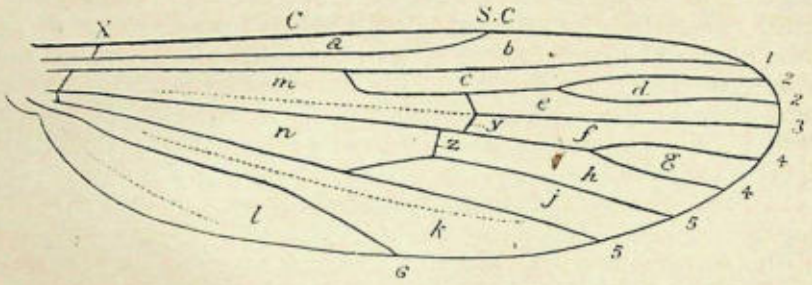
Perhaps Theobald is most to blame for these errors, as being the pioneer of a false terminology. This author's "supernumerary cross-vein" is merely the basal section of the 3rd longitudinal vein. He also figures the somewhat similar section of the 2nd longitudinal vein as a cross-vein, but gives it no title, either in

[1] The method I adopt for mounting all very small Diptera is to thrust the minute pin through the right side of the thorax, immediately below the dorsum, at such an angle that the point emerges from the left side immediately above or between the legs. It is then possible to view the greater part of both the dorsal and side surfaces without removing the specimen from the cabinet.

the explanation of the figure (Monog., i, p. 18) or in the accompanying letter-press.

In the hope that it may be of service to those who have not sufficiently mastered the terminology of the veins in Diptera the present figure is offered, with the correct names of the veins appended.

Colonel A. Alcock has recently published a paper on the classification of the Culicidae,[1] in which he deplores the undue rank apportioned to mere groups of species in this family, and recognizes Corethrinae as certainly belonging here, but follows



Terminology of venation in Culicidae.

C	costa.	a	costal cell.
S.C	sub-costal or auxiliary vein.	b	sub-costal cell.
1	1st longitudinal vein.	c	marginal cell.
2	2nd do.	d	1st sub-marginal cell.
	The two branches are termed the anterior (or upper) and posterior (or lower) branch respectively.	e	2nd do.
		f	1st posterior cell.
		g	2nd do.
3	3rd longitudinal vein.	h	3rd do.
4	4th do.	j	4th do.
	(The branches named as in the 2nd vein.)	k	anal cell.
		l	axillary cell.
5	5th longitudinal vein.	m	1st basal cell.
	(The branches named as in the 2nd and 4th veins.)	n	2nd do.
6	6th longitudinal vein.		
x	humeral cross-vein.		
y	anterior (or "mid," or "small") cross-vein.[2]		
z	posterior (or "hinder" or "large") cross-vein.[2]		

the practice of other authors in instituting new terms by proposing the establishment of four sections: (1) Megalorhini (=the Megarhinae of Theobald), (2) *Epialurgi* (evolved from "ague fever" and "work," this group representing the Anophelinae of authors), (3) Culicales (= Culicinae, Heptaphlebomyinae, Dinoceratinae, Aedinae and Uranotaeniinae of Theobald), (4) Metanototricha

[1] "Remarks on the classification of the Culicidae, with particular reference to the constitution of the genus *Anopheles*," Ann. Mag. Nat. Hist. (8), viii, No. 44, p. 24 (August 1911).

[2] All three sets of terms have been used by good dipterologists but anterior and posterior are eminently the best fitted for permanent adoption since these relative positions are constant in all wings in which both cross-veins are present, whereas the other terms are sometimes inappropriate.

(= Trichoprosoponinae, Dendromyinae, Limatinae of Theobald), "this group being entirely conventional." [1]

One of the most valuable points in the paper is the recognition of most of the so-called "genera" as sub-genera only.

I have endeavoured to retain the sequence of genera as near as possible to that followed in my Catalogue, for there is as yet, apparently no uniform agreement as to the disposition of many of the genera, even into the so called sub-families.

Several genera admittedly hold intermediate positions, which clearly supports the contention that the less the number of genera in Culicidae, the more zoologically correct the classification. Respecting the value of the so-called species the present writer offers no opinion, but as authors are already speaking of "*Culex* so-and-so, and its allies," it is reasonable to conclude that considerable doubt exists still as to specific limits, and that the opinion expressed four years ago in the introduction to my Catalogue that "a few more years careful study of the family is more likely to result in the reduction than otherwise of the total number of what today are regarded as distinct species" seems within possibility of realization.

Four new "generic" names are proposed in the present paper for names already preoccupied, and it is significant as showing how little culicidologists concern themselves with dipterological literature, that three out of these five names should have been previously used in the order Diptera itself! [2]

Other names are so similar to long previously established ones that confusion is at least probable. Such are *Popea*, Ludlow, closely resembling *Poppea*, Stal. (1867), in Hemiptera; whilst two other recently established genera (non-Oriental) bear names remarkably similar to others long established in other divisions of the animal kingdom. These are *Carrollia*, Lutz, practically preoccupied by *Carollia*, Gray (1838), in Mammalia, and by *Carolia*, Cantr. (1837), in Mollusca; also *Ankylorhynchus*, Lutz, preoccupied by *Ancylorhynchus*, Schonh. (1836), in Coleoptera.

Miss Ludlow has emended her generic name *Calvertia* to *Calvertina* (Can. Ent., xli, 234), it being preoccupied by Warren in Lepidoptera.

There also exist two other very similarly named genera *Calvertius*, Sharp, in Coleoptera and *Calveria*, Carp., in Echinodermata.

During two tours made by me, one round the Punjab and north-western part of India in 1905 and one round the far east in 1906, I collected a certain number of Culicidae but paid no especial attention to their capture or preservation, with the result that the condition of the specimens renders them practically

[1] Col. Alcock now accepts for these groups the more appropriate names "Megalorhinina," "Anophelina," "Culicina" and "Metanototrichina" (Bull Ent. Res., ii, p. 241, 1911).

[2] A fifth instance was included in the original MS of this paper – *Aldrichia*, Theob. (preoccupied in Bombylidae by Coquillett)—but in his last volume Theobald alters it to *Aldrichinella*. This genus (*Aldrichia*) made another instance of ignored preoccupation in Diptera!

valueless for the cabinet. Mr. Theobald, however, most generously looked through them and suggested the identity of a certain number of the more easily recognized species, and the data referring to these are included in the present paper, mainly for the sake of recording the localities. These species are *Myzomyia rossii*, Giles; *Myzorhynchus sinensis*, Wied.; *Desvoidya obturbans*, Wlk.; *Theobaldiomyia* (nom. nov. for *Leucomyia*) *gelidus*, Theob.; *Culex fatigans*, Wied.; *concolor*, R. Des.; *tigripes*, Grandpré; *impellens*, Wlk.; *microannulatus*, Theob.; *sericeus*, Theob.; *Mansonia annulipes*, Wlk.; and *Stegomyia fasciata*, Fab.

ADDITIONS TO THE LIST OF LITERATURE ON ORIENTAL CULICIDAE.

Adie, Major, 1904. Indian Medical Gazette, xxxix, June, No. 6.

Aitken, E. H., 1902 "Notes on a Tour in the North Canara District of India in search of Mosquitoes," Journ. Trop. Med., v, 325—327; 341—343.

Alcock, Col. A., 1911 (August). "Remarks on the classification of the Culicidae, with particular reference to the genus *Anopheles*," Ann. Mag. Nat. Hist. (8), viii, No. 44, p. 240.

Annandale, Dr. N., 1911. "A new genus of short-beaked Gnats from Ceylon," Spol. Zeyl., vii, 187.

Blanchard, R., 1905. "Les Moustiques; historie naturelle et medicale" (673 pp.). (Contains a very complete bibliography.)

Brunetti, E., 1909. "Oriental Culicidae" (reply to criticism of my catalogue), Can. Ent., xli, 121.

Id., 1910. "Taxonomic values in Culicidae," Rec. Ind. Mus., iv, 53.

Id., 1911. "Synonymy in Corethrinae," *loc. cit.*, iv, 317.

Id., 1911. "Further notes on Synonymy in Corethrinae," *loc. cit.*, vi, 227.

Dyar, Dr., 1905. A paper on the grouping of genera by the ♂ genitalia, in Proc. Ent. Soc. Wash., vii, No 1.

Dyar and Knab, 1906. "The larvae of Culicidae classified as independent organisms," Journ. New York Ent. Soc., xiv, 169—230.

Id., 1907. "On the classification of the Mosquitoes," Can. Ent., xxxix, 47.

Id., 1908. "Notes on Mosquito work," Can. Ent., xl, 309. (This is a short critical article on classification.)

Eysell, Dr. Adolf, 1905. "Sind die Culiciden eine Familie?" Archiv. fur Schiffs und Tropen Hygiene, ix 51—55.

Felt, Prof., 1905. Bull. 97, Entom. 24, Divis. Entom. New York State Mus., 445.

Ficalbi, 1896. The "Revisione," etc., quoted in my catalogue is from the Boll. d. Soc. Ent. Ital., vol. xxi, *et seq.* (1888 *et seq.*), 300 pp., 4 plates.

Giles, G. M., 1900. "Species of *Anopheles* in Shanghai and Java," Brit. Med. Journ., i, 485.

Giles, G. M., 1901. "Notes on Indian Mosquitoes," Journ. Trop. Med., iv, 159.

Id., 1901. "A plea for the collective investigation of Indian Culicidae," Journ. Bom. Nat. His. Soc., xiii, 592.

Id., 1903. "Note on *Mansonia anopheloides*," Journ. Trop. Med., vi, 329.

Id., 1904. "A revision of the Anophelinae," being the 1st Supp. to the 2nd Ed. of "A Handbook of Gnats or Mosquitoes." London, 47 pp., 8vo.

Id., 1904 (Dec.). "Notes on some collections of mosquitoes, etc., received from the Philippine Islands and Angola, with some incidental remarks upon classification."

Id., 1904 (Dec.). "Notes on some collections of mosquitoes received from abroad," Journ. Trop. Med., vii, 365—369.

Grünberg, K., 1907. "Die Blutsaugenden Dipteren." Jena.

James, S. P., 1910 (Nov. 18th). "A new arrangement of the Indian Anophelinae," Rec. Ind. Mus., iv, 95.

James and Liston, 1911. "A Monograph of the Anopheline Mosquitoes of India." Calcutta.

Knab, F., 1907. "Culicid characters," Can. Ent., xxxix, 349.

Laveran, 1901. "Sur les culicides provenant de Hanoi" (Tonkin), Comp. Rend., liii, 991.

Id., 1901. "Sur les culicides provenant de Haut-Tonkin," *loc. cit.*, 993.

Lebredo, M., 1904. "Some observations on the anatomy of mosquitoes," Revista de medicine tropicale. Havana.

Leicester, G. F., 1908. "Notes on the Culicidae of Malaya," published in Studies from the Institute of Medical Research, Kuala Lumpur, vol. iii, with prefatory notes by C. W. Daniels, and followed by (in the same volume, which contains papers by other authors bearing on the malarial aspect) another paper by Daniels containing notes on the mosquitoes on the eastern side of the Malay Peninsula.

Liston, W. G., 1901. "The distribution of *Anopheles* in Ellichpur Cantonment, State of Berar," Ind. Med. Gaz., xxxvi, 129—132, and Journ. Trop. Med., iv, 164.

Id., 1901. "A year's experience of the habits of *Anopheles* in Ellichpur," Ind. Med. Gaz., xxxvi, 361—366 and 441—443.

Id., 1902. "Classification of *Anopheles* in India," Journ. Trop. Med., v, 146.

Ludlow, 1902 (Aug. 23rd). "Description of a new *Anopheles*," Journ. Am. Med. Assoc.

Id., 1902 (Sept.). "Two Philippine mosquitoes," Journ. New York Ent. Soc., x, 127.

Id., 1902 (Sept.). "Notes on *Culex annulatus*," Journ. N.Y. Ent. Soc.

Id., 1905. "Mosquito Notes," No. 3, Can Ent., xxxvii, 94 and 129; No. 4, *loc. cit.*, 385, and (1906) xxxviii, 132 (concluded).

Id., 1906. *Id.*, No. 5, *loc. cit.*, xxxviii, 367, and (1907) xxxix, 129 (continued), and 413 (concluded).

Ludlow, 1908. "Mosquito Notes," No. 6, *loc. cit.*, xl, 32, 50, 331.
Id., 1908 (Nov.). "The Mosquitoes of the Philippine Islands." Washington University.
Id., 1909. "Mosquito comment," Can. Ent., xli, 21.
Id., *id.* "New Philippine Mosquitoes." *loc. cit.*, 97.
Id., *id.* "Mosquito observations," *loc. cit.*, 233.
Id., *id.* "*Anopheles perplexens*," *loc. cit.*, 293.
Lutz, 1904. "Mosquitos do Brazil."
Mitchell, Miss Evelyn Groesbeeck, 1907. "The classification of the Culicidae," Can. Ent., xxxix, 198.
Page, H., 1906. "Malaria and Mosquitoes at Lucena Barracks, Philippine Is," Journ. Assoc. Milit. Surg., xix, 65—76.
Peryassa, Dr. Antonio Goncalves, 1908. "Os Culicideos do Brazil." Rio de Janeiro, 400 pp., 26 plates.
Ross, Major Ronald, 1899. "Life history of the parasites of malaria," Nature, lx, 322—324.
Id., 1900 (Mar. 29). "Malaria and Mosquitoes," *loc. cit.*, lxi, 522—527.
Theobald, F. V., 1905. "New Culicidae from India, Africa, British Guiana and Australia," Journ. Econ. Biol., i, pl. i.
Id., 1907. "Monograph of the Culicidae," iv, Brit. Mus., London.
Id., 1908. "First report on the collection of Culicidae and Corethridae in the Indian Museum, Calcutta, with descriptions of new genera and species," Rec. Ind. Mus., ii, 287—302.
Id., 1909. "Second report, *id. id. id.*," Rec. Ind. Mus., iv, 1—33.
Id., 1910. "Monograph of the Culicidae," vol. v, 646 pp., 5 plates, British Museum, London.
Williston, S. W., 1906. "The classification of the Culicidae," Can. Ent., xxxviii, 384.[1]

N.B.—To my catalogue, the following addition should be made on p. 302, line 13, after the word "sufficient":—

"Coquillett in 1906 (Tech. Sc., ii, Bureau of Entom. U. S. Dept. Agric.) sinks Aedeomyinae and Haemagoginae in Culicinae, retaining Anophelinae, Megarhininae, Psorophorinae, Culicinae, Deinoceratinae, Uranotaeniinae and Trichoprosoponinae."

ADDITIONS TO LIST OF LOCALITIES.

Berars	..	Central India.
Bukit Kutu	..	3,400 ft., Federated Malay States.
Chittagong	..	Eastern Bengal.
Cochin State	..	South India.
Deccan	..	India.
Deesa	..	West Central India.
Dehra Dun	..	Foot of Mussoorie Hills (W. Himalayas).
Jugra	..	On the Langat River, on a solitary hill (1,000 ft.), Federated Malay States.
Kangra Valley	..	4,500—4,800 ft., Punjab (W. Himalayas).

[1] Not relating to Oriental species, but a severe criticism of present-day taxonomy in this family.

Kawkareik	..	Base of Dawna Hills, Tenasserim, Lower Burma.
Klang	..	On the Klang River, Federated Malay States.
Kumaon	..	In Western Himalayas, embracing Naini Tal and Bhim Tal.
Laguna	..	One of the Philippines.
Lake Chilka	..	Orissa, east coast India.
Luzon	..	The principal island in the Philippines, containing Manila.
Maddathorai	..	Travancore State, South India.
Mandalay	..	Upper Burma.
Manipur	..	6,400 ft., Assam.
Mindanao	..	One of the Philippines.
Moulmein	..	Tenasserim, Lower Burma.
Pallode	..	Travancore State, South India.
Pangkor Laut	..	Malay Peninsula.
Phagu	..	9,000 ft., near Simla.
Port Swettenham		Selangor, Federated Malay States.
Puri	..	Coast town in Orissa.
Raub	..	Federated Malay States (Pahang).
Rizal	..	One of the Philippines.
Shasthancotta	..	Travancore State, South India.
Shencotta	..	Travancore State, South India.
Soerabaya	..	City at eastern extremity of Java.
Sukwani	..	Nepal near Bengal frontier.
Tayabas	..	One of the Philippines.
Thaumaspur	..	Nepal (Terai, base of Himalayas).
"The Gap"	..	Pass between Selangor and Pahang, Federated Malay States.
Theog	..	Near Simla.
Travancore	..	State in South India.
Trivandrum	..	Capital of Travancore State, South India.
Ukhrul	..	6,400 ft., Manipur State, Assam.
Ulu Gombak	..	13 miles from Kuala Lumpur, Selangor.
Ulu Klang	..	Near Kuala Lumpur.

CATALOGUE.

CULICIDAE.

ADDITIONAL REFERENCES.—Blanch., Moust., 151 (tab. gen. in Culicidae).

Sub-Family *ANOPHELINAE.*

ADD. REF.—Blanch., Moust., 157 (sub-fam. chars.).
Theob., Monog. Culic., iv, 22 (tab. genera), 24 (list of known spp.—16+1 uncertain), 25 (tab. known spp.).
Leices., Culic. Malaya, 18 (tab. genera).

ANOPHELES, Meig.

ADD. REF.—Leices., Culic. Malaya, 19.
James and Liston, Monog. Anoph. Mosq. Ind., 2nd Ed., 40.

N.B.—Col. Alcock recognizes seven groups—which he regards as sub-genera only—covering all the species of the Anophelinae, which according to him should all be comprised in a single genus. These sub-genera are, *Christya*, *Arribalzagia*, *Myzomyia*, *Anopheles*, *Myzorhynchus*, *Nyssorhynchus* and *Chagasia*. Two quotations *verbatim* appear advisable: "For the sake of convenience the species that compose the genus may be grouped in sub-genera according to the following table; but the groups, though they can be defined with sufficient precision, grade into one another." . . . . "All these considerations justify the conclusion that the so-called 'genera' of the proposed 'sub-family' Anophelinae cannot be separately focussed as distinct generic conceptions, but must all be merged in one generalization." In the sub-genus *Anopheles*, Alcock includes *Stethomyia*, Theob., *Neostethopheles*, James, *Patagiamyia*, James, and *Cyclolepidopteron grabhamii*, Theob.

A. aconita, Don. (*aconitus*).

Removed here from *Myzomyia* by Theobold (Monog., v) saying that Donitz says (Zeits. fur Hygiene, xliii, 233) that *A. formosaensis*, Tsuzuki, from North Formosa is only a variety of *aconita*, and proposes to change the name (unnecessarily) to *cohaesa*. It transmits malaria. James and Liston put it in their new genus *Neostethopheles*.

A. aitkenii, James in Theob.

ADDITIONAL LOCALITY.—Meenglas, Dooars, Jalpaiguri, 9-viii-07 [*Wallich*], a ♂ and ♀ in Indian Museum the only specimens seen by Theobald since describing the species.

A. barianensis, James, 1911.

Monog. Anoph. Mosq. Ind., 2nd Ed., 76.

LOC.—Murree Hills, Punjab (7,000 ft.). Taken by Assistant Surgeon J. L. Wredden.

A. dthali, Patton.

Now referred by Theobald to *Myzomyia*.

A. formosaensis, Tsuzuki, 1902.

Archiv. f. Schiffs u. Tropen Hygiene, vi, 289.

I am still in doubt as to what is meant by this specific name, not being able to consult the original descriptions. Apparently

there are two species of the same name by the same author from North and South Formosa respectively, the former being synonymous with *aconita*, Don. (according to Donitz himself, who suggests renaming it var. *cohaesa*), and the latter being apparently specifically distinct, as Theobald (Monog., v, 84) quotes it as "*formosaensis* II," though he is unable to place it generically.

A. formosus, Ludl., 1909.

Can. Ent., xli, 22, ♀.

Theob., Monog., Culic., v, 8, ♀.

Miss Ludlow notes (Mosq. Phil. Is., 10) the above species as shortly to be described, the description appearing in due course as quoted above. She says it is the only species in the Philippines belonging to *Anopheles* (*s. str.*). Theobald has not seen it and suggests it may *not* be *Anopheles*.

From Benguet, Ph. Is., March 1908.

A. gigas, Giles.

Add. Ref.—Blanch., Moust., 184 (*Myzomyia id.*).

Add. Loc.—Ceylon [*E. E. Green*]; Deesa, W. Centr. India [*Maj. Nurse*].

N.B. —This is made the type of James and Liston's new genus *Patagiamyia*.

A. immaculatus, Theob.

Type in British Museum.

A. lindsayi, Giles.

Add. Ref.—Blanch., Moust., 169.

Add. Loc.—Dehra Dun (Mussoorie Hills, foot) [*Thomson*]; Ferozepore (Punjab) [*Maj. Nurse*].

Type in British Museum.

var. **maculata**, Theob., 1910.

Rec. Ind. Mus., iv, 1.

"A very distinct variety." Kurseong (5,000 ft.), 5-vii-08, a perfect ♀ [*Annandale*]. *Type* in Indian Museum.

A. simlensis, James and Liston, 1911.

Monog. Anoph. Mosq. India, 2nd Ed., 41.

This species, with *gigas*, Giles, and *lindesavi*, Giles, is placed by the authors in their new genus *Patagiamyia*, but as this genus is not admitted in this Catalogue, *simlensis* is referred to *Anopheles*.

A. treacherii, Leices., 1908.

Culic. Malaya, 19, ♂ ♀.

N.B.—Described from a series bred from larvae taken in hill-side streams in jungle. Amongst the notes the author says: "This species is widely distributed in the Peninsula. . . . It is a blood sucker; it will not breed in captivity, and the larvae, unless mature, usually die."

A. wellcomei, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 33 ♀.
Described from several ♀ ♀, all slightly damaged.
Type in British Museum.

PATAGIAMYIA, James, 1910.

Rec. Ind. Mus., iv, 98.

James and Liston, Monog. Anoph. Mosq. India, 2nd Ed., 41.

This genus is not adopted in the present Catalogue. James and Liston make *gigas*, Giles, the type species, the other Indian species being *lindsayi*, Giles, and *simlensis*, James, all herein referred to *Anopheles*.

NEOMYZOMYIA, Theob., 1910.

Monog. Culic., v, 29.

N. elegans, James in Theob.

Anopheles elegans, James and Liston, Anoph. Mosq. Ind., 82.
Myzomyia id., Theob., Monog. Culic., iii, 51.
Pyretophorus id., *id.*, *op. cit.*, iv, 77.

Theobald redescribes the species in vol. v, 30, ♂ ♀ with two figs. of the ♀ wing, giving other details.

LOCS.—Karwar (Bombay Presid.) [*Coghill*]; Andaman Is. [*Ray White*]; Meenglas, Jalpaiguri [*Wallich*].

N. leucophyrus, Don.

Nyssorhynchus id., Blanch., Moust., 213, ♀.
Myzomyia id., Leices., Culic. Malaya, 28, ♂ ♀.

N.B.—The latter author describes both sexes (the ♂ for the first time) from a large series bred from larvae from water in open bamboos in jungle. The species is wholly sylvan, and is removed to this genus by Theobald (Monog., v, 44).

MYZOMYIA, Blanch.

ADD. REFS.—Theob., Monog. Culic., iv, 41 (list of known species—20), 42 (table of spp.).

Leices., Culic. Malaya, 23, ♂ ♀.
James and Liston, Monog. Anoph. Mosq. India, 2nd Ed., 40.

N.B.—Col. Alcock sinks *Neomyzomyia*, Theob., *Pyretophorus*, Blanch., and *Nyssomyzomyia*, James, in *Myzomyia*.

M. albirostris, Theob.

Add. Ref.—Leices., Culic. Malaya, 23, ♂ ♀.
Type in British Museum.

N.B.—Leicester says that the larva occurs in small running streams with grassy edges. It is a blood sucker, and is easily identified when fresh by the parti-coloured proboscis.
In bungalows, Kuala Lumpur.

M. annularis, Wulp.

I can glean no further information about this species, the type of which, described from Java, should be in the Leyden Museum.
Theobald does not mention it in his 5th volume.

M. azriki, Patton.

Add. Ref.—Theob., Monog. Culic., v, 27, ♂ ♀, figs. ♂ ♀ palpi and palmate hair.

M. christophersi, Theob.

Admitted as a good species by this author (Monog., v) who adds the following localities: Sylhet, 2-v-5 [*Hall*]; Kangra Valley; Meenglas, Jalpaiguri, 13-vii-07 [*Wallich*]; Calcutta, 2 ♀ ♀ [*Alcock*].

M. culicifacies, Giles.

Add. Ref.—Blanch., Moust., 182, ♀.
Theob., Monog. Culic., ii, 309; iii, 39; iv, 51; v, 25.

Add. Locs.—Mandalay, ♂ ♀ in bathroom, 13—14-iii-08 [*Annandale*]; Lucknow, 21-i-08 [*Hodgart*]; Deesa [*Nurse*]; Ennur, Goa, Bombay, Secunderabad, Aurangabad (Hyderabad State), Deccan (all in India and all *t. Theobald*).
Type in British Museum.

N.B.—This varies greatly in size. I do not know what Blanchard's ♂ of this species is. In the introduction to this paper some remarks are made as to the name of this species.

M. deceptor, Don.

Theobald removes it here from its vague position in "*Anopheles*" (Monog. Culic., v) and adds Trincomalee, Ceylon [*Green*], as a locality.

M. dthali, Patton.

Also referred here from "*Anopheles*" by Theobald (Monog., v).

M. elegans, James.

Referred to *Neomyzomyia*.

M. funesta, Giles.

ADD. REF.—Blanch., Moust., 180, ♂ ♀.

N.B.—In his 4th volume Mr. Theobald definitely confirms *kumasii*, Chalmers, as synonymous with *M. funesta*, Giles, and remarks that it has not yet been found in India.

Miss Ludlow records this species from Samar, Laguna, Pangasinan, Pampanga, Tayabas, Mindanao, Sciassi, Rizal, and other localities in the Philippine Islands, where it appears to occur all the year round except during March and April.

"A proven host of the malarial parasite in Africa, with a moderate distribution in the Philippines; is always taken where malaria is present or prevalent" (Ludlow).

The *types* of the varieties *umbrosa* and *sub-umbrosa* are in the British Museum.

M. indefinita, Ludl., 1904.

M. rossii var. *indefinita*, Ludl., Can. Ent., xxxvi, 299.

ADD. REF.—Theob., Monog. Culic., iv, 47.

N.B.—Now accepted as a good species, although at one time considered intermediate between *rossii* and *ludlowii*. Miss Ludlow records it from all parts (26 different localities) of the Philippines, where it occurs all the year round. This author says, "Never the subject of experiment, though widely distributed, taken in large numbers, and present during malarial outbreaks; does not occur alone in a sufficient number of stations to be indicative, and its ability as host must be left in doubt."

Type in Army Medical Museum, Washington.

M. jehafi, Patton.

ADD. REF.—Theob., Monog. Culic., v, 22, figs. of ♂ ♀ palpi and palmate hair.

M. leptomeres, Theob.

Giles, in his "Revision of the Anophelina" (1904), thinks this = *Anopheles pictus*, Lw. (1845), but Theobald (Monog., iv, 124, and v, 29) says that his (Theobald's) species is nothing like Loew's description.

Type in British Museum.

M. leucophyrus, Don.

Removed to *Neomyzomyia*.

M. listoni, Liston.

ADD. REF.—*Myzomyia christophersi*, Theob. Blanch., Moust., 183.

ADD. LOC.—Kangra Valley (Punjab, 4,800 ft.), May, June, July [*Dudgeon*]; Berars (Centr. India); Ceylon [*Green*].

Under the name *christophersi*, Theob., Mr. Theobald (Rec. Ind. Mus., iv, 2) gives the localities Sylhet, 2-v-05 [*Hall*]; and Jalpaiguri, 13-viii-07 [*Wallich*].

N.B.—Mr. Theobald (Monog., iv, 51) sinks this name for his own *christophersi*, and remarks, "The name *listoni* was used by Giles for a large variety of *culicifacies*, so Liston's name cannot stand."

Even if the *variety* referred to is sufficiently distinct to be considered as such, and constant enough to be accorded a name (and Mr. Theobald does not rank it as such), there is no reason why the name should not be given elsewhere to a distinct species.

Liston's description holds priority. In describing the species, I take it that he considered he was describing the species named after him by Giles (*listoni*, Giles, 1901, Ent. Month. Mag., xxxvii, 197); therefore now that the error is discovered, and it is known to be a different species, the name should surely be retained, Capt. Liston's mistake absolving him from being considered to have purposely named the species after himself.

M. ludlowi, Theob.

Apparently occurs all the year round all over the Philippines from the long list of dates and localities afforded by Miss Ludlow, who records it from forty different places in these Islands. Also found in the Malay States. "Never a subject of experiment, appears coincident with malaria in the Philippines, and seems likely to be connected with its transmission" (Ludlow).

However, in a footnote (Mosq. Phil. Is., p. 30) she adds that since writing her paper, two articles have appeared, by Capt. Ashburn and Lieut. Craig, and by C. S. Banks, the results of the investigation of the first authors being against the probability of malaria being actually spread by this insect; whilst the last author proves at least its capability by actual experiments of transmitting the disease.

James and Liston desire to place this species in their new genus *Nyssomyzomyia*.

Type in British Museum.

M. punctulata, Don.

Removed by Theobald to *Cellia*.

M. punctulata, James and List.

This is not claimed to be a new species, and the only inference is that it is Donitz's species redescribed, though why these authors relegate the name to themselves is certainly not obvious.

M. rosisi, Giles.

ADD. REF.—Blanch., Moust., 178, ♂ ♀, fig. 162, wing; 163, transverse veins.

Leices., Culic. Malaya, 25, ♂ ♀.

N.B.—In Monog., iv, *errata*, Mr. Theobald says "This species has been found on recent microscopic examination to belong to a distinct genus from *Myzomyia*, owing to the peculiar squamose characters of the thorax. The genus is being described by Mr. Rothnell as *Pseudomyzomyia*."

I have seen no description anywhere of this proposed genus *Pseudomyzomyia* and Theobald does not mention it in his Monog., vol. v. James and Liston (Monog. Anoph. Mosq. India, 2nd Ed., 44) propose to erect the name *Nyssomyzomyia* in its place, for the reception of *rossii*, *ludlowi*, Theob., and *punctulata*, "James and List.," but for reasons previously stated the genus is not recognized here. Anyway, should *Pseudomyzomyia* actually have been published anywhere and cover the same set of species it is impossible to throw out the genus at James and Liston's desire for the purpose of adopting a new name of their own.

Theobald, in his "1st Rep. Ind. Mus. Coll. Culic." (Rec. Ind. Mus., ii, 287), retains the species in *Myzomyia* without comment and in his 2nd Report does so also.

Leicester (Culic. Malaya) says the larvae occur in any small collections of stagnant water near houses, giving as localities, Kuala Lumpur, Singapore, Penang, Klang, and notes that its only affinity in Malaya is *albirostris*.

Miss Ludlow records it from the Philippines nearly all the year round, saying "Doubted as a host in India; has a moderate distribution, is taken infrequently and in small numbers in the Philippines, and its connection with malaria is not indicated."

ADD. LOCS.—Laguna, Mindanao, Albay, Pangasinan, Tayabas, Pampanga, Batangas, Bulacan, Bataan, Cavite, Rizal [all Phil. Is. *t. Ludlow*]. Calcutta apparently all the year round; I have taken it there in April, June, July and August.

In the Indian Museum collection [*t.* Theob.] from Puri, Ganjam lake district, Travancore State (several localities, taken by Dr. Annandale, 5—25-xi-08); Ferozepore, Chittagong [*Hall*], and on board ship ten miles off Coconada, Madras coast, 17-iv-08 [*Paiva*]; Lucknow, 4-ix-05 [*Brunetti*].

Theobald adds "one example from Calcutta, quite typical, was labelled stating that it was determined by Giles as *Anopheles costalis*, he does not mention this in his handbook."

Mr. Green says this species is probably the malaria carrier in parts of Ceylon, especially the Batticaloa district.

In his last volume Mr. Theobald gives a long list of localities from Indian Museum specimens, showing it to be found in India practically all the year round, rarest in February and March, occurring frequently in houses and public conveyances.

He adds as localities: Trincomalee, Ceylon, 14—28-i-07; 1-ii-07; 1-x-07 [all *Green*]; Phrapatoon, Siam, 18—29-i-07; 19—29-iii-07; viii and ix-06 [all *Dr. P. G. Woolley*]; Chittagong, 19-ix-08; 21-ix-08; 5-vii; 8-viii [all *Hall*].

Type in British Museum.

M. tessellata, Theob.

Type in British Museum.

M. thorntoni, Ludlow.

Add. Loc.—Philippines (August, *t. Theob.*); Mindanao, Pangasinan, Tayabas, Pampanga, Samar, Rizal (all Phil. Is., Feb. and May to November, *t. Ludlow*).

M. turkhudi, Liston.

Add. Ref.—Blanch., Moust., 183.

Add. Loc.—Aurangabad (Hyderabad State, India).

N.B.—*Type* in British Museum.

Mr. Theobald's description of the ♂ was drawn up from Giles's type, which at that time was considered to be the ♂ of *culicifacies*, Giles, and which was first described as such by both Giles and by Theobald.

Vide note in introduction on *Myzomyia culicifacies*.

NYSSOMYZOMYIA, James.

Rec. Ind. Mus., iv, 101.

James and Liston, Anoph. Mosq. India, 2nd Ed., 43.

Proposed by the above authors for the three species *rossii*, Giles, *ludlowi*, Theob., and *punctulata*, "James and List.," and their suggestion is that it takes the place of the genus *Pseudomyzomyia*, a genus spoken of by Mr. Theobald, but apparently never described.

The three species in question are retained here under *Myzomyia* (I presume their *punctulata* is identical with Donitz's species).

NEOSTETHOPHELES, James, 1910.

Rec. Ind. Mus., iv, 98.

James and Liston, Monog. Anoph. Mosq. India, 2nd Ed., 40.

I have not adopted this genus, with others erected in the above work, but these authors place two species only in it, *aitkeni*, James, and *culiciformis*, James and Liston.

STETHOMYIA, Theob.

ADD. REF.—Theob., Monog. Culic , iv, 59, and v, 35 (tab. of 4 known spp.).

N.B.—Messrs. James and Liston in their latest work suggest the abolition of this genus.[1]

S. culiciformis, James and Liston.

ADD. REF.—Theob., Monog. Culic., iv, 62 (J. and L.'s descr. copied).

N.B.—He doubtfully retains (even in vol. v) the species in this genus. The ♂ is mentioned once or twice in the description, but it is not definitely stated that this description applies to both sexes.

Placed in their new genus *Neostethopheles* by James and Liston.

S. fragilis, Theob.

Type in British Museum.

S. pallida, Ludlow.

Recorded by this author from Pampanga (Phil. Is.), Sept. 1905.

PYRETOPHORUS, Blanch.

ADD. REF.—Theob., Monog. Culic., iv, 63 (list of species), 64 (tab. of spp.).
Leices., Culic. Malaya, 37.
James and Liston, Monog. Anoph. Mosq. India, 2nd Ed., 41.

N.B.—In vol. v Theobald quotes *Howardina*, not *Howardia*, as his reference in Journ. Trop. Med., v, 181. I cannot say which is correct.

P. elegans, James.

Removed to *Neomyzomyia*.

P. freerae, Banks.

Theobald (Monog., v, 43) thinks from the description that this may be a *Nyssorhynchus*. Only the imperfect type specimen seems known.

P. minimus, Theob.

ADD. REF.—Blanch., Moust., 188, ♀ , fig. 169 (wing and transverse veins).

---

1 Monog. Anoph. Mosq. India, 2nd Ed., p. 39.

N.B.—Its place in this genus is uncertain, owing to the bad condition of the type. Giles places it here; Blanchard says, "near *Myzomyia funesta*."

P. nigrifasciatus, Theob., 1907.

Monog. Culic., iv, 65, ♀.

From India, taken by Major Nurse at Peshin in April. Resembles *Myzomyia turkhudi*, Liston. Also occurs in Cyprus. *Type* in British Museum.

P. nursei, Theob., 1907.

Monog. Culic., iv, 66, ♀.

Taken by Major Nurse at Quetta in November, a unique specimen resembling *nigrifasciatus*.
Type in British Museum.

P. watsonii, Leices., 1908.

Culic. Malaya, 38, ♀.

A single ♀ taken by Dr. Watson in jungle a few miles from Klang.

MYZORHYNCHUS, Blanch.

ADD. REF.—Theob., Monog. Culic., iv, 81 (list and table of the 16 known species).

Leices., Culic. Malaya, 29.

N.B.—Theobald thinks it probable that malaria contracted in the open is generally accountable to species of this genus.
One Japanese species (*sinensis*) has been shown by Tsuzuki to carry malarial parasites in Japan. Col. Alcock embodies *Lophoscelomyia*, Theob., in *Myzorhynchus*.

M. albotaeniatus, Theob.

ADD. REF.—*alboannulatus*, James and Liston, Anoph. Mosq. Ind., 81.
ADD. SYN.—Leices., Culic. Malaya, 34, ♀.

N.B.—Larvae in pools near Kuala Lumpur, and in pools at Port Swettenham within tidal influence, and with a salinity of 2·8 per 1,000.
Type in British Museum.

M. barbirostris, V. Wulp.

ADD. REF.—Blanch., Moust., 107.

Leices., Culic. Malaya, 33, ♂ ♀.

ADD. LOCS.—Calcutta, December, 1 ♀ [Ind. Mus. coll.]; Pampasinan, Daraga, Tayabas; Mindanao, Bataan, Nueva Ecija, Rizal, Siassi, Pampanga (all Phil Is., Feb., March, June to December) [*t. Ludlow*]; Kuala Lumpur (in bungalows), Klang (in jungle) [*t. Leicester*]; Phrapatoon, Siam, 24-iii-07 [*Dr. Woolley*]; Nedumangad, 10 miles N.E. of Trivandrum, S. India, 14-xi-08 [*Annandale*]; Assam, 15-i-07 [*Hall*]; Chittagong, 15-viii-08 [*Hall*]; Andaman Is. (1908) [*Ray White*]; Digoel (in Amsterdam Museum), and taken on the New Guinea Expedition [all *t. Theob.*].

Type in Leyden Museum.

N.B.—Dr. Leicester says the larva can be found in any large open water, and adds, "The larva described by Theobald in vol. iii is, in my opinion, the larva *sinensis* and not *barbirostris*." Theobald says malarial parasites can develop in this species but rarely do so in nature. The larvae of the true form live in dark pools of all depths, with or without vegetation.

M. minutus, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 87.

ADD. SYN.—*Anoph. nigerrimus*, Giles, in James and Liston's (1900) Anoph. Mosq. India, 79, ♀, col. pl. iii (full insect).

ADD. LOC.—Kuala Lumpur [*Durham*].

Type in British Museum according to Theobald's 5th volume, but he previously informed me that it was lost.

N.B.—"The larvae are usually found in deep shady pools, containing grass and water-weed, at some distance from habitations, and the adults are seldom met with in houses" (James and Liston).

The larval characters given by these authors (*loc. cit.*, p. 81) refer to the present species and not to the true *nigerrimus*, Giles, a species which is quite distinct, but which has been confused with *minutus*.

The embryos of *Filaria bancrofti* can develop in this species.

M. nigerrimus, Giles.

ADD. REF.—Blanch., Moust., 197.

Type in British Museum.

M. peditaeniatus, Leices., 1908.

Culic. Malaya, 31, ♂ ♀.

Described from a large series bred from larvae, which occur in any large collection of water, if not very stagnant, in the Malay Peninsula.

M. philippinensis, Ludl.

Removed to *Nyssorhynchus*.

M. pseudobarbirostris, Ludlow.

Add. Ref.—Theob., Monog. Culic., iv, 83, ♀.

N.B.—*Type* in Army Medical Museum, Washington.

Closely allied to *barbirostris*, Wulp.

Miss Ludlow records it from Marinduque, Mindanao, Ambos Camarines, Pangasinan, Bulacan, Tayabas, Cavite and Rizal, all in the Philippines, appearing apparently from May to October.

M. separatus, Leices., 1908.

Culic. Malaya, 36 (sex not mentioned).

Bred by the author from larvae from large collections of water in the open near Kuala Lumpur. "It may be a variety of *sinensis*."

M. sinensis, W.

Add. Ref.—Blanch., Moust., 190, ♀, fig. 170 (wing scales).
Leices., Culic. Malaya, 30, ♂ ♀.

Add. Syn.—*Anoph. plumiger*, Don., Ins. Borse, Jan. 1901.
Anoph. jesoensis, Tsuzuki, 1902, Centr. für Bakteriol., xxxi, 763.

Add. Locs.—Hong-Kong, Malacca, Java, Sumatra [all *t. Blanchard*]; Calcutta, vi, vii, viii, 1908, in bathrooms at Museum [*Annandale*]; at light on board steamers at Damukdia Ghat, R. Ganges [*Annandale*]; Sylhet, i, ii, v, vi, vii [*Hall*]; Manipur (6,400 ft.), viii-08 [*Pettigrew*]; Ferozepore [*Adie*]; Maddathorai, 18-ix-09 [*Annandale*] (all in Ind. Mus. coll., identified by Theobald); Jolo (September) and Rizal (August), Phil. Is. [*t. Ludlow*]; Shanghai, 8—10-v-06, in ditch [*Brunetti*].

Theobald adds the following localities in his vol. v: Phrapatoon, Siam, viii, ix [*Dr. Woolley*]; Pampanga, Angeles, Ph. Is. [*Whitmore*]; West Lake, Hankow [*Cornford*]; Ukhrul, Manipur (6,400 ft.), viii-08, 20—26-i-03, 23-ii-05, 27-v-00, 4—7-vi-05 [*Pettigrew*]; Sylhet, 13-i-03, 13-i-04, 24-vii-08 [*Hall*]; Ferozepore [*Adie*]; Calcutta, 9-vi-08, viii-08, 28-vii and 9-vi-08 [*Annandale*]; Maddathorai, S. India, 18-ix-08 [*Annandale*].

N.B.—Dr. Leicester says, "larvae taken in ponds and roadside ditches, both in town and country."

Miss Ludlow reports, "a proven host in India; has been taken at too few stations to show that it affects markedly the malarial conditions of the Islands" (Philippines). Dr. Leicester includes under this specific name, *vanus*, Wlk.

Respecting *pseudopictus*, Grassi (a European species), Theobald still (Monog., iv, 87) considered it distinct from *sinensis*, W.,

with *pictus*, Ficalbi, for a synonym, but in vol. v he suppresses this synonym. Amongst the uncertain species ranked under "Anopheles" he places "*pictus*, Lw." He gives no further information about his *Myzomyia indiensis*.

M. sinensis has been studied in Japan, where it has been found to transmit malaria. It is very variable.

M. umbrosus, Theob.

ADD. REF.—Leices., Culic. Malaya, 35, ♀.

He notes only one example, from jungle near Kuala Lumpur, "very like *barbirostris*."

Type in British Museum.

M. vanus, Wlk.

ADD. REF.—Blanch., Moust., 196, ♂ ♀.

ADD. LOCS.—China [*t. Theobald*]; Celebes [*t. Walker*]; Java, Malacca [*t. Blanchard*]; Calcutta, Oct., Nov., Dec., common in last two months; Port Canning [*t. Theob.*, Ind. Mus. coll.]; Albay, Laguna, Pangasinan, Bulacan, Tayabas, Manila, Cavite, Bataan, Nueva Ecija, Rizal (all Phil. Is., April, and from June to January) [*t. Ludlow*]; Dondra, Ceylon, 4-xii-07 [*Green*]; Galle, Ceylon, 8 xii-07 [*Green*].

Type in British Museum.

N.B.—Dr. Leicester considers *vanus* synonymous with *sinensis*, W., but Theobald in his latest volume keeps them distinct.

LOPHOSCELOMYIA, Theob.

ADD. REF.—Giles, 1904, Journ. Trop. Med., vii, 366 (*Lophomyia*).
Blanch., 1905, Moust., 635.
Theob., 1907, Monog., iv, 91, ♂ ♀.
Leices., 1908, Culic. Malaya, 21.

N.B.—In his monograph (iv, 92) Mr. Theobald redescribes, and says that the name was spelt correctly at the erection of the genus (Entom., Jan., 1904). In the Genera Insectorum (Fasc. 26) he spells it *Lophocelomyia*.

L. asiatica, Leices.

ADD. REF.—Theob., Monog. Culic., iv, 92, ♂ ♀.

Leices., Culic. Malaya, 21, ♂ ♀.

"*Lophomyia asiatica* Theob. MS.," in Giles (1904), Jour. Trop. Med., vii, 366.

ADD. LOCS.—Malaysia, according to Leicester, who says it breeds exclusively in pools of water in bamboo, adding that those bred in captivity will not bite.

NYSSORHYNCHUS, Blanch.

Add. Ref.—Blanch., Moust., 202.
Leices., Culic. Malaya, 39.
James and List., Monog. Anoph. Mosq. India, 2nd Ed., 43.
Laverania, Theob., 1902 Journ. Trop. Med., ii, 181.

N.B.—In this genus Col. Alcock sinks *Neocellia*, Theob., *Cellia*, Theob., *Calvertina*, Ludl., and *Christophersia*, James.

N. fuliginosus, Giles.

Add. Ref.—Blanch., Moust., 205, fig. 179*a*, normal wing, 179*b*, wing of var. *pallida*.

Add. Locs.—Calcutta, 15-vii-08, 12-viii-08, at light in house [*Annandale*]; Balighai, near Puri, 23—24-x-08, "numerous in old wells, resting by day" [*Annandale*]; Ferozepore, numerous [*Adie*]; Deesa [*Nurse*]; Ceylon [*Green, Major Manders, Chalmers*]; Ellichpur in April, Calcutta, December, at light; Bombay, Java, Sumatra [all *t. Blanchard*]; Pangasinan, Tayabas, Guimaris Is., Albay, Rizal, Cavite, all Phil. Is. [*t. Ludlow*].

N.B.—Capt. James has found that tertian, quartan and malignant tertian parasites will develop in this species artificially, but says it has not yet been found naturally infected (*v.* James, Sci. Mem. Ind., new. ser., No. 2, p. 39).

Major Adie has found the sporozoits in wild *fuliginosus* (Ind. Med. Gaz., xxxviii, July 7, 1903).

Theobald (Monog., iv, 99) notes a variety from Chingelput (S. India).

Miss Ludlow says, "Questioned as a host in India; has a moderate distribution taken infrequently in small numbers in the Philippines, and its connection with malaria is not indicated."

This species appears to have several varieties, a form occurring in the Punjab all the winter (Adie, Ind. Med. Gaz., xxxviii, July 7, 1903 and Jan. 4, 1905); this variety flourishing from the middle of November till the end of April, whereas in that part of India, the typical form flourishes from the middle of March to the beginning of June.

Theobald's variety *pallida* has been considered a good species by Giles, but the former author states that it is not so (Monog., iv, 100).

N. indiensis, Theob., 1903.

Monog. Culic., iii, 99.

Anoph. id., James and Liston (*non* Giles), Anoph. Mosq. Ind., 95, plate 2, figs.

This form, previously regarded as a variety of *maculipalpis*, Giles, is raised by Theobald (Monog. Culic., iv, 98) to the rank of a species (*vide N. maculipalpis, post.*).

Type in British Museum.

N.B.—Theobald (Monog., v) restricts the localities of this form to the Central Provinces of India, Nagpur, Goa, Karwar, Travancore.

N. jamesii, Theob.

ADD. REF.—Blanch., Moust., 206.

ADD. LOCS.—Calcutta, 5-viii-08 [*Annandale*]; Shamnagar, Bengal, 3-viii-05 [*Gourlay*].

Type in British Museum.

N. karwari, James in Theob.

ADD. REF.—Leices., Culic. Malaya, 39, ♂ ♀.

N.B.—Larvae taken at Jugra and near Kuala Lumpur, in the grassy edges of slowly flowing streams.

Type in British Museum.

N. maculatus, Theob.

ADD. REF.—Blanch., Moust., 207, ♂ ♀, fig. 180 (wing).
Leices., Culic. Malaya, 41, ♂ ♀ (copies Theobald's description, not having seen the species).

ADD. LOCS.—Nara Ghat, Nepal, near Bengal frontier, 25—26-ii-08; Thamaspur, Bengal frontier, 18 and 20-ii-08, ♂ ♀.

N.B.—This species is the type of the genus and the type was described as in Dr. Rees's collection, but Mr. Theobald informs me that it is in the British Museum.

N. maculipalpis, Theob.

N.B.—The variety *indiensis* is now raised to the rank of a species (*vide supra*). In my catalogue, therefore, *delete* the localities Nagpur, Karwar, Goa and Travancore, all of which relate to *indiensis*.

N. nivipes, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 101, ♀.
Leices., Culic. Malaya, 44, ♂ ♀.

N.B.—Bred from larvae in small collections of water in the open near Kuala Lumpur, Klang, etc. Dr. Leicester describes the species from a long series of both sexes.

Type in British Museum.

N. philippinensis, Ludl.

ADD. REF.—Theob., Monog. Culic., iv, 103, ♀.

ADD. LOCS.—Pangasinan, Tayabas, Abra, Rizal, Pampanga (all Phil. Is.), where it occurs all the year round except from February to May.

Type in Army Medical Museum, Washington.

N.B.—Theobald says (Monog., iv, 104), allied to *nivipes*, Theob., may be a variety of it. The species has been referred by Giles to *Pyretophorus* but Theobald (*loc. cit.*, v, 63) retains it here.

N. pseudowillmori, Theob., 1910.

Monog. Culic., v, 65, ♀.

From Meenglas, Jalpaiguri, 13-vii-07 [*Wallich*].

Type in Indian Museum. Perhaps a var. of *willmori*

N. stephensi, Liston.

ADD. REF.—Blanch., Moust., 210.

ADD. LOCS.—Calcutta (Museum gardens), 15-vii-08 [*Annandale*]; Phil. Is. (*t.* Miss Ludlow in Can. Ent , xli, 234).

This was removed to *Neocellia* but Theobald replaces it here in his vol. v, where see p. 20 for notes.

N. theobaldi, Giles.

Erratum.—Correct p. 300 to 299 in my reference to Giles' Handb., 2nd Ed.

ADD. REF.—Blanch., Moust., 210.

ADD. LOCS.—Benguet (Phil. Is.), March, April, November.

N.B.—Miss Ludlow says "a proven host in India; has been taken at only one station (referring to the Philippines), and cannot be held responsible for much of the transmission of malaria."

N. willmori, James.

ADD. REF.—Leices., Culic. Malaya, 42, ♂ ♀.

Has been placed in *Neocellia* but Theobald (Monog., v) again refers it here, and adds Ceylon, Pundaluoya, July—"known as the instep-biting mosquito" [*Green*]; Malay States and Meenglas, Jalpaiguri, 13-vii-07 [*Wallich*], to the localities.

N.B.—Dr. Leicester says the larvae live in hill streams in jungle near Kuala Lumpur, Jugra and elsewhere, and only records the adult from a hut in Ula Gombak.

Type in the Central Research Institute, Kasauli, India.

KERTESZIA, Theob., 1905.

Ann. Mus. Hung., iii, 66.

Monog. Culic., iv, 117.

Intermediate between *Nyssorhynchus* and *Cellia*.

N.B.—Col. Alcock sinks *Kerteszia* in *Arribalzagia*, Theob.

K. mcgregori, Banks, 1910.

Phil. Journ. Sci., iv, 548, ♂.

LOC.—Basilan, Ph. Is. (Type No. 6666), Entomological Collection, Bureau of Science, Manila.

CHRISTOPHERSIA, James.

Paludism, vol. i, 33 (July 1910) (*nom. nud.*). Rec. Ind. Mus., iv, 103 (descr.).

C. halli, James, 1910.

Paludism, vol. i, 33. Plate: figs. of palpi, thorax (dorsal and lateral), abdomen (dorsal, lateral and ventral) and hind leg.

James and List., Monog. Anoph. Mosq. India, 2nd Ed., 123.

LOC.—Sylhet (Assam), February, June, July and December [*Lt.-Col. Hall*].

Type in Indian Museum.

CELLIA, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 104, 105 (list and tab. known spp.).
Blanch., Moust., 214.
Leices., Culic. Malaya, 46.

C. flava, Ludlow, 1908.

Can. Ent., xl, 32, ♂ ♀.

Described from four examples from Tayabas (Phil. Is.), September 1907; incorrectly quoted Tayubar in original description, corrected by author, *loc. cit.*, 52.

Type in Army Medical Museum, Washington.

C. kochi, Don

ADD. REF.—Blanch., Moust. 208 (*Nyssorhynchus*).
Leices., Culic. Malaya, 46, ♂ ♀.

ADD. LOCS.—Kuala Lumpur, xii, 1902 [*Durham*]; Singapore.

N.B.—Widely distributed in the Malay Peninsula, more abundant in the vicinity of houses, breeding in roadside puddles or any pool of water in the open.

C. pulcherrima, Theob.

ADD. REF.—Blanch., Moust., 215, ♀.
ADD. LOC.—Kokand (Turkestan) [*t. Univ. Coll. Helsingfors*]; Lahore.
Type ♀ in British Museum, ♂ apparently still unknown.

C. punctulata, Don.

Anopheles id.; *Myzomyia id.*; auct.
Nyssorhynchus id, Blanch., Moust., 208.
Anoph. tessellatum, Theob., Monog. Culic., I, 175 (*nom. nud*).
ADD. REF.—Leices., Culic. Malaya, 27, ♂ ♀.
ADD. LOCS.—Kuala Lumpur, Klang (at both places in bungalow).[*t. Leicester*]; Sumatra, Borneo, Taiping, Papua.

N.B.—"It proves to be a *Cellia* and not a *Myzomyia*, as it appeared from Donitz's description. Blanchard erroneously placed it in *Nyssorhynchus*" (Theob., Monog., iv, 109).

James and Liston (Monog. Anoph. Mosq. India, 2nd Ed.) describe and figure parts of a "*punctulata* James and Liston," under their proposed new genus *Nyssomyzomyia* without any reference to Donitz's species of this name. The species cannot be taken from Donitz's credit if the two are identical, and, if not, two species with the same name cannot co-exist in the same genus.

NEOCELLIA, Theob.

Monog. Culic., iv, 111, ♂ ♀.

N. dudgeoni, Theob., 1907.

Monog. Culic., iv, 112, ♀.

LOC.—Kangra Valley (4,500 ft.), June, July [*Dudgeon*].
Described from several ♀ ♀.
Type in British Museum.

N. indica, Theob., 1907.

Monog. Culic., iv, 111, ♂ ♀.

LOC.—Dehra Dun (foot of Mussoorie Hills), February, March.
Described from 1 ♂ and 3 ♀ ♀.
Type in British Museum.

N. intermedia, Rothwell, 1907.

Entomologist, Feb. 1907, ♀.

Theob., Monog. Culic., iv, 115, ♀; v, 73, ♂ ♀, fig. 29, wing ♂.
LOC.—Deesa (W. Centr. India), January, August.
Type in British Museum.

The ♂ described by Theobald (v, 73) from Ferozepore, India (18 ♂♂ and 109 ♀♀ taken by Adie).

ALDRICHINELLA, Theob., 1910.

Monog. Culic., v, 77, nom. nov. for
Aldrichia, Theob., 1903.

Aldrichia has been preoccupied by Coquillett in *Bombylidae* since 1894 (Trans. Amer. Ent. Soc., xxi, 93), so Theobald has just forestalled me in renaming it by proposing *Aldrichinella*.

In James and Liston's new edition the correction is not made.

The type (*A. error*, a unique specimen) was in the British Museum, but has subsequently been broken. Col. Alcock, however, says it is not a good species at all, being a *Myzomyia rossii*, Giles, with the abdomen of some different species attached.

BIRONELLA, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 120, ♂; fig. ♂ wing, p. 122.

B. gracilis, Theob.

N.B.—The ♂ being unknown, Mr. Theobald judges this genus to belong to the Anophelina, but some details of its characteristics make him uncertain as to which subfamily should really include it.

Type in Hungarian Museum.

CALVERTINA, Ludlow, 1909.

Can. Ent., xli, 234, emen. from *Calvertia*, Ludl., *loc. cit.*, 22.

C. lineata, Ludlow, 1908.

Can. Ent., xl, 50 (*Chagasia id.*).

Calvertia lineata, Ludl.
Calvertina id., Theob., Monog. Culic., v, 77.

N.B.—Described first under *Chagasia*, *Calvertia* was erected for it, but this is preoccupied by Warren in Lepidoptera and by *Calvertius*, Sharp, in Coleoptera; there is also a *Calveria*, Carp., in Echinoderma.

The species described from a single perfect specimen of which the author does not state the sex. From Pangasinan (Phil. Is.) in August. Its position here is uncertain, and it may be better placed near *Pyretophorus*.

"ANOPHELES," *sensu lato.*

"Anopheles" arabiensis, Patton.

Add. Ref.—Theob., Monog. Culic., v, 81, ♂ ♀, fig. 34, ♂ ♀ palpi.

N.B.—Theobald seems vague in his opinion on this. From damaged ♀ ♀ sent him by the author of the species, he considered them identical with *A. wellcomei*, Theob., but Patton had already sent the species to Dr. Stephens, who compared it with the type of *wellcomei* and pronounced them distinct. In vol. v, 82, Theobald says: "it is certainly not an *Anopheles*," and immediately after he says a damaged specimen sent him by Patton could not be separated from *wellcomei*, Theob. In his last volume he puts the species under "*Anopheles*."

"Anopheles" culiciformis, Cogill.

Theobald confesses inability to trace this species.

"Anopheles" deceptor, Don.

Removed to *Myzomyia*.

"Anopheles" pictus, Lw., 1845.

Dipt. Beit., Posen, p. 4.

Theobald still (Monog. Culic., iv) thinks this the same as Grassi's *pseudopictus*, but defers a definite opinion until he can compare specimens from Rhodes (Asia Minor). Dr. Thin records it from Haut Tonkin and Harioi. "In both cases *M. sinensis* is evidently referred to as an allied species" (Theob., Monog. Culic., iv, 124). Theobald also says here that Giles is wrong in considering *Myzomyia leptomeres*, Theob., as a synonym of *pictus*.

"Anopheles" subpictus, Grassi.

This species cannot be traced.

"Anopheles" vincenti, Laveran.

Erratum.—My "correction" of Theobald's quotation of date and volume (1901 and liii) is an error, as both his references are correct; yet in vol. v, 84, he perpetuates my previous error as regards the volume by quoting xxiii.

"Sub-Family *MEGARHININAE*."

Add. Ref.—Blanch., Moust., 218, figs. 184-185.

Dr. Leicester (Culic. Malaya, 48) is averse to the subdivision of this "sub-family" of Theobald, and observes that though

the Culicidae may be divided into four sub-families, principally on the comparative length of the palpi in the sexes, the division is an arbitrary and not a natural one, and from his observations I entirely agree with him. Blanchard (Moust., 218-219, figs. 184-185) gives an extensive account of the characters of this group.

MEGARHINUS, Rob. Desv.

ADD. REF.—Blanch., Moust., 220, 221 (tab. of all spp.).
Theob., Monog. Culic., iv, 128 (tab. of spp.); v, 96 (tab. of spp.).

N.B.—Theobald says (*loc. cit.*, v, 95) the genus is not Oriental, being only found in North and South America and the West Indies.

M. amboinensis, Dol.

M. lewaldii, Ludlow.

M. minimus, Theob.

M. splendens, W.

The first two are definitely referred to *Toxorhynchites*, the last two probably belong there also.

TOXORHYNCHITES, Theob.

Type of genus. T. brevipalpis, Theob., from Natal.
ADD. REF.—Leices., Culic. Malaya, 59.

T. amboinensis, Dol. (*Megarhinus*).

ADD. REF.—Blanch., Moust., 266, ♂ ♀.

T. argenteotarsis, Ludlow, 1906.

Can. Ent., xxxviii, 367, ♀.

Theob., Monog. Culic., v, 100, ♀.
Type in Army Medical Museum, Washington.
Described from 5 ♀ ♀ from Margosatubig, Mindanao, Phil. Is., June and July. Is near *speciosus*, Skuse, and *marshalli*, Theob.

T. gilesii, Theob.

Monog. Culic., i, 227, ♂ ♀; note *op. cit.*, v, 99.
Described originally as distinct, it was relegated to a synonym of *immisericors*, but is reinstated.
LOCS.—Sikhim, Sylhet, 7-vi-05; 13-vii-05 [*Hall*]; Calcutta, Ceylon, Upper Burma, Singapore [*Finlayson*].

T. immisericors, Wlk.

ADD. REF.—Theob., Monog. Culic., iv, 4, ♀; v, 97.
Blanch., Moust., 230, ♂.

ADD. LOCS.—Calcutta (Museum gardens and zoological gardens), i, vi, vii, viii; Bhim Tal (W. Himal.), 19—22-x-06 [all *Annandale*]; Aijal (3,600 ft.), Lushai Hills, 24-iv-04; Sylhet, 5-v-05; Chittagong, 3-ix-08; Peradeniya, Ceylon (1,600 ft.), 24-xii-07, botanical gardens, not uncommon, and Pundaluoya, Ceylon (4,000 ft.) [*Green* and *Bainbrigge Fletcher*]; Andaman Is., 19-vi-08, 8-vii-08 [*Ray White*].

Also from Sikhim, Burma, Malacca, Trincomalee Hot Wells, Macassar, Mysore, North Ceram, Waigiou.

N.B.—Theobald says that his figure of the pupa (Monog. Culic., iii, 123, fig. 67) is not quite correct. He also describes the ♀ (Rec. Ind. Mus., iv, 4), and says that the type (♂) in the British Mus. is in bad condition.

Mr. E. E. Green gives the life-history (with a plate) of this species (Spol. Zeyl., ii, pt. viii, 159 to 164) (1905). He says the larvae prey first on those of their own race before proceeding to devour those of other species, and that he does not know of the adult biting. Females were kept alive for eleven days on sliced bananas.

Mr. C. A. Paiva gives a very interesting account of the habits of the larva (Rec. Ind. Mus., v, 187) from personal observations and experiments. It is common in the outskirts of Calcutta during June and July in earthen pots. He finds that the larva will devour that of any other species if present before attacking those of its own kind, whereas Mr. E. E. Green thought it ate its own species first. They are sluggish and remain at the surface of the water, seizing other larvae as they come within reach. A curious thing is that the larvae of other species actually attack the *immisericors* larvae, seizing their abdominal bristles from behind. *Stegomyia fasciata* the carrier of yellow fever is greedily devoured by *T. immisericors* larva, which renders it a valuable ally in destroying the former in the event of that disease being introduced into India, the more so as the adult is not known to bite man.

N.B.—*Megarhinus gilesii*, Theob., and *subulifer*, Dol., to be eliminated from synonymy, as both are now regarded as good species belonging to *Toxorhynchites*.

T. inornatus, Wlk.

ADD. REF.—Blanch., Moust., 223, ♂ ♀.
Type ♂ ♀ in British Museum.
LOC.—Papua.

T. javaensis, Theob., 1911.

Tijd. v. Ent. liv, 233 ♀.

Java, a unique ♀. *Type* in Amsterdam Museum.

T. leicesteri, Theob.

Erratum.—1804 is given for 1904 in my catalogue, p. 325.

ADD. REF.—Theob., Monog. Culic., iv, 142, ♂ ♀.
Leices., Culic. Malaya, 59, ♂ ♀.

ADD. LOCS.—Papua.

N.B.—Leicester says that the colours fade so much after death as to make identification very difficult, and says the larvae are found in bamboos.

T. lewaldii, Ludlow (*Megarhinus*).

ADD. REF.—Theob., Monog. Culic., iv, 139, ♂ (Miss Ludlow's description copied), adding "may be a *Toxorhynchites.*"

Type in Army Medical Museum, Washington.

N.B.—Larvae taken on April 1st hatched on the 10th.

T. metallicus, Leices.

Erratum.—In my catalogue correct *metallica* to *metallicus.*

ADD. REF.—Leices., Culic. Malaya, 61, ♂ ♀.

N.B.—Leicester says it is bred from bamboo and also that in the adult the colours fade quickly. "I have not taken the adult of this mosquito; it is entirely sylvan and fairly widely distributed in the Peninsula" (Leicester).

Theobald also notes the rapid fading of colours after death, especially in the abdominal bands of the ♀.

T. minimus, Theob. (*Megarhinus*).

ADD. REF.—Theob., Monog. Culic., iv, 138, ♂ (full description).

The author originally suggested it might be a *Toxorhynchites*, and noted its small size.

Type in British Museum.

T. splendens, W. (*Megarhinus*).

ADD. REF.—Blanch., Moust., 225 (*Megarhinus*).

N.B.—I expect one of the more recently described species will eventually prove to be synonymous with this.

T. subulifer, Dol., 1857.

Nat. Tijd. Ned. Ind., xiv, 382 (*Megarhinus*).

Theob., Monog. Culic., i, 242.

Amboina. For a time considered synonymous with *immisericors*, in which case Doleschall's name has the priority over Walker's.

TEROMYIA, Leices., 1908.

Culic. Malaya, 49.

Leicester says in the above reference "nov. gen.," yet adds "In Theobald's Monograph it is stated that in members of this genus there are no upright scales on the head."

He adds, "Five species are here described, and they are all apparently new species, though *quasiferox* may prove to be merely a variety of *M. ferox*, or *immisericors*."

T. acaudata, Leices., 1908.

Loc. cit., 49, ♂ ♀.

The examples from which this species was described were obtained by Dr. Finlayson of Singapore, all of them being bred from larvae found in pitcher plants in the neighbourhood of Singapore. The author notes that the colours fade very considerably after death.

T. ater, Daniels, 1908.

Studies from Instit for Medic. Research (Fed. Malay States), iii, 265, ♂ ♀.

"Notes on the Mosquitoes on the river and coast district of the Eastern side of the Peninsula."

N.B.—This is issued as a succeeding paper to Dr. Leicester's elaborate Monograph on the "Culicidae of Malaya," with continuous pagination.

Bred from larvae found in the pitcher plant *Nepenthes rafflesiana*, on the east coast of Pahang.

T. funestus, Leices., 1908.

Culic. Malaya, 58, ♂.

"Described from one ♂ bred from a pupa taken in a bamboo jungle 6 miles from Kuala Lumpur. A very funereal looking mosquito; some of the more beautiful colours are only seen with a lens" (Leicester).

T. magnificus, Leices., 1908.

Culic. Malaya, 54, ♂ ♀.

"Bred from larvae obtained from the water collected in living bamboos, which had been pierced by an insect borer, the only entrance to the water being through the small hole thus made." Leicester compares his new species with *splendens* and notes minor differences, but it must be remembered that at the time Wiedemann wrote, the limited number of known species made unnecessary the lengthy and detailed descriptions required in the present state of our knowledge.

T. quasiferox, Leices., 1908.

Culic. Malaya, 51, ♂ ♀.

It seems advisable here to quote the author.

"Mr. Theobald, to whom a specimen of this mosquito was sent, suggests that it is probably *Megarhinus immisericors*, first described by Walker, and in his recently published vol. iii, he has placed *M. immisericors* in the genus *Toxorhynchites*.

"He does not seem to have described the female.

"If this is *immisericors*, I am at a loss to understand how it can be placed in the genus *Toxorhynchites*, as the palpi are distinctly five-jointed. As mentioned in the remarks on the generic characters, I do not think the separation of *Toxorhynchites* from *Megarhinus* is based merely on the palpi, though this is the only character given by Theobald, but even on that ground alone, this mosquito would be excluded. It now comes in *Teromyia*."

Leicester adds that it probably breeds in the pitcher plant.

T. raris, Leices., 1908.

Culic. Malaya, 56, ♂.

"Described from a ♂ bred from a white larva taken in water collected in a bamboo in the jungle at Ula Klang. . . . It is a very distinct species" (Leicester).

Apparently rare and very near *magnificus*.

WORCESTERIA, Banks.

Theobald (Monog. Culic., v, 110) says this genus, erected on minute difference in the palpi, is not valid and comes within reach of *Toxorhynchites*.

Sub-Family *CULICINAE*.

ADD. REFS.—Mr. Theobald (Monog. Culic., iv, 147) tabulates 63 genera, mentioning that others have been subsequently described.

Blanchard (Moust., 231) gives the sub-family characteristics.

Leicester (Culic. Malaya, 64) includes, after his notes on the sub-family, a table of all the known genera up to 1905, though many of them had not then been found in Malaya.

Col. Alcock divides this sub-family, which he designates *Culicales*, into groups of genera (sub-genera, presumably) as follows: the *Culex*, *Stegomyia*, *Aedes*, *Uranotaenia*, *Psorophora* and *Mucidus* groups. Under these respective headings are given in this catalogue the so-called "genera" embodied in each.

MUCIDUS, Theob.

Add. Ref.—Leices., Culic. Malaya, 69.

Col. Alcock includes under his "genera of the *Mucidus* type" *Mansonia*, Blanch., *Mansonioides*, Theob., *Etorilepidomyia*, Theob. (is this the same as *Etorleptiomyia* ?), *Orthopodomyia*, Theob., *Aedimyia*, Theob., *Finlayia*, Theob. He considers this group of sub-genera or species links the *Culicinae* with the *Anophelinae*.

M. laniger, Wied. (*Culex id.*).

Add. Ref.—Blanch., Moust., 244, ♀.

Type in Wiedemann's collection.

M. mucidus, Karsch.

Add. Ref.—Leices., Culic. Malaya, 69, ♂ ♀.

Redescribed by Leicester from a ♂ and ♀ bred from larva taken in marshy ground near a patch of jungle near Kuala Lumpur.

Banks has recorded it from the Philippines.

M. scatophagoides, Theob.

Add. Ref.—Blanch., Moust., 245, ♀.

Add. Loc.—Bauria, Bengal, 17-viii-07 [*Tyrie*]; Damukdia Ghat, E. Bengal, 22-viii-07; Purnea, 5-viii-07 [*Paiva*]; all in Indian Museum.

Type in British Museum.

EKRINOMYIA, Leices., 1908.

Culic. Malaya, 71.

The author says, "between *Culex* and *Mucidus*, the larva very near *Megarhinus*."

E. aureostriata, Leices., 1908.

Culic. Malaya, 71, ♂ ♀.

Described from 4 ♂♂ and 3 ♀♀ taken as pupae in a small hole in marshy ground at Klang.

BLANCHARDIOMYIA, mihi, nom. nov.

Syn.—*Desvoidya*, Blanch., preoccupied.

Add. Ref.—Theob., Monog. Culic., iv, 163 (table of the 4 known species).

Blanch., Moust., 265.

Leices., Culic. Malaya, 74.

N.B.—"Desvoidya" was a nom. nov. for *Armigeres*, Theob., practically preoccupied by Hartmann in 1840—1842 (*Armiger*) in Mollusca.

Moreover *Desvoidia*, Meade, Ent. Month. Mag., xxviii, 179 (1892), in *Tachinidae* antedates Blanchard's genus, for which I propose the title *Blanchardiomyia*. I should consider it, with other "genera" in this family, at most a sub-genus.

B. apicalis, Theob., 1910.

Rec. Ind. Mus., iv, 5, ♀.

Theob., Monog. Culic., v, 143, ♀.

Described from a single perfect ♀ from Balighai near Puri, Orissa, taken by Dr. Annandale, 24-x-08. In the Indian Museum.

B. aureolineata, Leices., 1908.

Culic. Malaya, 79, ♀.

"A very distinct *Desvoidya*; described from a series bred from larvae found in water collected in the shells of a fruit in jungle at Ampang." Leicester in a footnote says "The description of the ♂ will be found on the slip at the end under *Addenda*." However, in my copy of his work there is no such slip.

B. fusca, Theob.

ADD. REF.—Leices., Culic. Malaya, 78, ♂ ♀, near "*obturbans* and *panalectros*."

ADD. LOCS.—Sylhet, March to June [*Lt.-Col. Hall*]; Lushai Hills, Assam, August [*Macleod*]; Calcutta, May, and August to December [all Indian Museum *t. Theobald*].

Type in British Museum.

N.B.—In vol. v Theobald says that he previously erroneously placed this species as a variety of *obturbans*: in that volume he considers it a good species.

He previously stated, "all variations in colour between the true *obturbans* of Walker, and the *fusca* of Theobald, seen in these specimens, and hence the latter species is sunk as a variety."

B. joloensis, Ludlow.

Mr. Theobald (Monog. Culic., iv, 165) admits this as a good species.

Type in Army Medical Museum, Washington.

B. jugraensis, Leices., 1908.

Culic. Malaya, 77, ♂ ♀.

"Larvae in bamboo in Ampang jungle, and water collected in a fallen leaf in jungle at Jugra; also on the East Coast and

elsewhere. I have received specimens from Borneo " (Leicester). Near *obturbans*, Wlk.

B. obturbans, Wlk.

Erratum.—The reference to Walker's *Culex ventralis* (synonymous with *obturbans*) should be Jour. Linn. Soc., iv, 91 (1860).

Add. Ref.—Blanch., Moust., 266, ♂ ♀.

Leices., Culic. Malaya, 75, ♂ ♀ (with notes on varietal forms).

Locs.—Naini Tal [*Giles*]; Sylhet [*Hall*]; Lushai Hills, Assam; Madras [*Cornwall*]; Travancore [*James*]; Behar, Bengal [*Green*]; Mozufferpur, India; Selangor, 28-x-99 [*Butler*]; Singapore, 25-viii-99; Perak [*Wray*]; Madulsima, Ceylon, 26-ix-07 [*Green*]; Semarang, Java, i, ii, iii, 1904 and viii-05 [*Jacobson*]; Waria Riv., Brit., Papua [*Dr. Fleming Jones*]; Amboina; Celebes; Mysol; Waigiou; North Ceram; Tinghai, Formosa; West lake, Hankow, China, 28-viii-07 [*Cornford*]; Foochow [*Rennie*].

Theobald (Rec. Ind. Mus., iv, 4) gives the following data for this species and " varieties " from specimens in the Indian Museum.

Sukna, 1-viii-08, in deep jungle, Kurseong, 5-vii-08 [both *Annandale*]; Calcutta, i, iii, vii, x, xii, Rajmahal, Bengal, 31-vii-07 [*Hodgart*]; Trivandrum, 14-xi-08 [*Annandale*].

Taken by me in Calcutta, 11—25-iii-08; 12-iv-08; 8-viii-07; all in bedrooms; Meerut, 25-iv-05; Batavia, 27-vi-06 to 9-vii-06.

Type in the British Museum.

N.B.—Mr. Theobald mentions this species being bred in a tumbler of water in the Indian Museum by Mr. Tipper of the Geological Survey of India. Miss Ludlow has recorded it from the Philippines. It breeds freely in the flowers of *Heliconia brasiliensis*. " Bred from large larvae from under overhanging rock, in a deep pool of a clear running stream."

B. panalectros, Giles.

(*Armigeres panalectoros*, Giles, in Theob., Monog., ii, 317.)

Add. Ref.—Blanch., Moust., 266, ♂ (*panalectros*).

Add. Loc.—Semarang, Java, viii-05.

N.B.—Theobald (Rec. Ind. Mus., iv, 5) notes that the cotype " is nothing but an immature, large *Culex fatigans*, Wied., with distinct abdominal banding."

BREVIRHYNCHUS, Theob., 1908.

Rec. Ind. Mus., ii, 293. Monog. Culic., v, 144.

B. annulipalpis, Theob., 1910.

Rec. Ind. Mus., iv, 6, ♀. Monog. Culic., v, 148.

Add. Loc.—Maddathorai, 16-xi-08 [*Annandale*].

Described from a single perfect ♀ in the Indian Museum. Theobald erroneously quotes 1903 as date of capture.

B. apicalis, Theob., 1910.

Rec. Ind. Mus., iv, 7, ♀. Monog. Culic., v, 149.

Described from a single ♀ in the Indian Museum collection from Sylhet, 26-vii-05 [*Lt.-Col. Hall*].

B. magnus, Theob., 1908.

Rec. Ind. Mus., ii, 293, ♂ ♀ : iv, pl. i, wing, pl. iii, wing scales.

Theob., Monog. Culic., v, 145, ♂ ♀, fig. 51 wing, 52 hea side view of abdominal segments.

Types (one ♂ and one ♀ only) in Indian Museum collection. "A most marked and beautiful species; easily told by the quaint proboscis and abdominal markings" (Theobald).

LOCS.—Sylhet, May [*Lt.-Col. Hall*]; Sukna, 1-vii-08, in thick jungle [*Annandale*]; Maddathorai, S. India, 17-xi-08 [*Annandale.*]

QUASISTEGOMYIA, Theob., 1906.

2nd Rep. Gordon Coll. Well. Labs., p. 69.

Theob., Monog. Culic., iv, 165.

Q. gardneri, Ludlow.

Removed here from *Stegomyia* by Theobald (Monog. Culic., iv, 170).

ADD. LOCS.—Pampanga (Phil Is.) [*Whitmore*]; Mindoro, Bulacao, Phil. Is.

N.B.—Miss Ludlow (Mosq. Phil. Is., 10) put this species in *Pseudostegomyia*, admitting subsequently to Theobald that it was a purely clerical error, intending it for *Quasistegomyia*.

Type in Army Medical Museum, Washington.

KINGIA, Theob., 1910.

Monog. Culic., v, 135.

K. annandalei, Theob., 1910.

Rec. Ind. Mus., iv, 10 (*Stegomyia id.*).

One ♀ from Sukna (500 ft.), vii-08 [*Annandale*].

Type in Indian Museum.

STEGOMYIA, Theob.

Theob., Monog. Culic., iv, 170 (list known spp. 19),—171 (table of spp.).

Add. Ref.—Blanch., Moust., 247 (generic characters), fig. 194 (larva), p. 248 (table of species).
Leices., Culic. Malaya, 81, with table of Malayan species.

N.B.—Col. Alcock includes *Brevirhynchus*, Theob., and *Harpagomyia*, Theob., in his "genera of the *Stegomyia* type."

S. albipes, Theob., 1910.

Rec. Ind. Mus., iv, 11, ♀.
Monog. Culic., v, 169, ♀.
Described from a perfect ♀ in the Indian Museum taken by Dr. Annandale at Maddathorai, 17-xi-08.

S. albolateralis, Theob.

Rec. Ind. Mus., ii, 289, ♀; iv, pl. i, wing, pl. iii, wing scales.
Theob., Monog. Culic., v, 179, fig. 67, wing.
Loc.—Sylhet, September [*Hall*]; Lushai Hills, Assam, in July.
Both in the Indian Museum, from five ♀ ♀ in which collection the description was drawn up.
Type in Indian Museum.

S. amesii, Ludlow.

Add. Ref.—Theob., Monog. Culic., iv, 191 (Miss Ludlow's description copied).
Add. Locs.—Oras, Samar, Tacloban, Leyte, Twin Peaks, Banquet Luzon [all t. *Theobald*].
N.B.—*Type* in Army Medical Museum, Washington.

S. annandalei, Theob., 1910.

Rec. Ind. Mus., iv, 10, ♀.

Described from a single perfect ♀ taken by Dr. Annandale at Sukna, vii-08. In Indian Museum. Near *minutissima*.

S. annulirostris, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 173.
Type in British Museum. From Peradeniya, Ceylon.

S. argenteomaculata, Theob., 1907.

Monog. Culic., iv, 184, ♀.

Described from two ♀ ♀ (not in good condition). An easily recognized species.

LOC.—Narcondam Isles (Bay of Bengal), 80 miles from Andamans and Nicobars; taken by G. Rogers.

Type in the British Museum.

S. assamensis, Theob., 1908.

Rec. Ind. Mus., ii, 290, ♀.

Monog. Culic., v, 174, ♀.

Theobald says "described from a single ♀," in the Indian Museum collection, but gives two localities, Sylhet [*Hall*] and Pallode, South India. The former is dated 13-iv-05, the other one 15-xi-08 [*Annandale*].

Type in Indian Museum.

S. aurostriata, Banks, 1906.

Phil. Jour. Sci., i, 995.

No sex is given, either by Banks or Theobald, who (Monog., v, 181) recopies the description with the note that it is clearly a distinct species.

LOC.—Negros Occidental, Phil. Is., Mt. Siya Siya, Canlaon Volcano (760 metres), 24-vi-06.

Type in the entomological collection, Bureau of Science Manila.

S. brevipalpis, Giles.

ADD. REF.—Blanch., Moust., 264, ♂ ♀.

N.B.—This author says the species is "Like a *Simulium*;" which does not agree with Theobald's expression "a typical *Culex*."

S. crassipes, V. Wulp.

ADD. REF.—Blanch., Moust., 250, ♀.

S. desmotes, Giles, 1904.

Journ. Trop. Med., vii, 367, ♀.

Received by Giles from the Philippines: Theobald places it doubtfully here.

Type in British Museum.

S. dissimilis, Leices, 1908.

Culic. Malaya, 91, ♂ ♀.

Described from a series bred from water in the hollow of a tree in Ampang jungle. Distinct from all other Stegomyias by the gold-scaled mesonotum in the ♂.

S. fasciata, F.

ADD. REF.—Leices., Culic. Malaya, 85, ♂ ♀.

ADD. LOCS.—Ceylon [*Green*]; Garvet, Java [*Prof. Marlett*], Soekaboemi, Java; Celebes, Siam, Perak, Malay Ports, Papua, Batavia.

It occurs in Calcutta in January, and from May to October (not so common as *scutellaris*); Lucknow, November; Purnea, August [*Paiva*]; Lushai Hills [*Macleod*]; Puri, 18—19-i-09; Mandalay, 12-iii-08; Rangoon, 25-ii-08, in house, biting by day; common on board ship, Bay of Bengal, between mouth of Hooghly River and Rangoon, 22—23-ii-08. I have taken it in Calcutta, i, vi, vii, viii, ix, in bedrooms and other places and in the hotel at Lucknow, 7-viii-05; Madras Town, 31-x-08 [*Hodgart*]; on board ship off Coconada, 15-iv-08 [*Paiva*], and Bhim Tal (4,500 ft.) in September.

Miss Ludlow records it under the name *calopus*, M. (Mosq. Phil. Is., 33), from a very long series of localities in the Philippines where it occurs all the year round.

N.B.—Although Blanchard and Coquillett assume the synonymy of *calopus*, Mg., Mr. Theobald doubts its identity with *fasciata*, F. (Monog., iv, 177).

Owing to Villiers in 1789 adopting the specific name *fasciata* for a *Culex*, Mr. Theobald fears a change in the name of this well-known species may be necessary. Meigen described a *fasciata* in 1805, which Theobald adds as a synonym.

Meigen's *calopus* (1818) is next on the list, but its identity with *fasciata*, F., appears uncertain. The next name identified with the species is *frater*, Rob. Desv., and Theobald thinks that this is the name that may have to be adopted.

However, as Villiers's description is unintelligible, and the type has long ago ceased to exist, he proposes to abolish Villier's species and retain the name *fasciata*, F., for this species. This, as he says, will save endless confusion.

Anyway if Villiers's description is useless and his type destroyed, there is no reason to assume the species was not a true *Culex*, in which case the question of synonymy drops. Moreover, the Kertesz catalogue does not mention this species of Villiers at all.

This species is the sole carrier of yellow fever.

Mr. Howard says "we may expect to find this species everywhere in the moist tropical zone, or at all events, when introduced at any point within the low moist tropics it may be expected to establish itself."

In Malaysia the species seems to be confined to the ports. Leicester notes that the larvae are found in bathroom tubs in houses at Klang, Singapore, Penang, Pangkor-Haut and other places. He notes the dense scaling on the clypeus, which, he says, no previous writer has noted, and also mentions the variety *luciensis* as occurring in Malaysia.

Should the identity of *fasciata*, F., with *calopus*, Mg., be

proved, the species also occurs in South Europe, North, West and East Africa, Madagascar, Palestine, Tahiti and New Caledonia. Theobald records the typical form from Khartoum, the Nile, Greece and Cyprus.

S. fusca, Leices., 1908.

Culic. Malaya, 92, ♂ ♀.

"A small species bred from larvae from water in leaves of an atap palm in mangrove swamp at Port Swettenham. Adult a blood sucker, and common in jungle where atap palms occur" (Leicester).

S. gardneri, Ludlow.

Removed to *Quasistegomyia* by Theobald (Monog., iv, 170).

S. gracilis, Leices., 1908.

Culic. Malaya, 81, ♂ ♀.

Larva found in water in bamboos. Adults numerous in bamboo jungle.

S. imitator, Leices., 1908.

Culic. Malaya, 89, ♀.

"Described from 2 ♀ ♀ from jungle 5 miles from Kuala Lumpur," which is apparently its only locality.

S. leucomeres, Giles, 1904.

Journ. Trop. Med., vii, 367, ♀.

LOC.—Phil. Is. *Type* in British Museum.

Banks records it from Pampanga, but Theobald says the species is an uncertain one, the type being in bad condition, but probably a *Stegomyia*.

S. mediopunctata, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 187, ♀.

Type in British Museum.

S. microptera, Giles.

ADD. REF.—Blanch., Moust., 263.

This author adds "N. W. Prov. India"; in houses during the rains; at one time referred by Giles to *Wyeomyia*.

Theobald (Monog., v, 607, Appendix) says, "Type appears to be lost."

S. minutissima, Theob., 1910.

Rec. Ind. Mus., iv, 9, ♀ ; v, 168, ♀ , fig. 61, wing.

N.B.—Though the ♂ sign prefaces the description of the species, apparently only the ♀ is known.

Type in Indian Museum.

S. nivea, Ludlow.

Referred to *Scutomyia*.

S. periskelata, Giles.

Add. Ref.—Blanch., Moust., 264.

N.B.—Theobald says (Monog., v, 155) that he does not understand this species, which is placed here provisionally. The type is *not* in the British Museum. Further on (*loc. cit.*, 607, App.) he suggests that the name of the species should be dropped.

S. perplexa, Leices., 1908.

Culic. Malaya, 83, ♂ ♀ .

Described from one ♂ and several ♀ ♀ from jungle near Kuala Lumpur in May, October and November. The author seems uncertain of its true position in this genus as it has affinities with *Scutomyia*, and he suggests it may be a hybrid.

S. pipersalata, Giles.

Add. Ref.—Blanch., Moust., 264, ♂ ♀ .
Theobald (Monog., v, 607, App.) is doubtful if a *Stegomyia*.

Type in British Museum.

S. pseudonivea, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 188, ♀ ; v, 176, ♂ , fig. 64, head.

Type ♂ in British Museum, *type* ♀ in Hungarian Museum. Four of each sex were taken by Lowis in the Andamans.

S. punctolateralis, Theob.

Type in British Museum.

S. scutellaris, Wlk.

Add. Ref.—Blanch., Moust., 257, ♂ .
Leices., Culic. Malaya, 86, ♂ ♀ .

ADD. LOC.—Sylhet, April [*Hall*]; Lushai Hills, May to July [*Macleod*]; Manipur, July [*Gourlay*]; Calcutta, March, July to October, common during the hot weather in the rains, disappearing in winter, active by day; Katihar, N. Bengal, October [*Paiva*]; Purnea, viii, ix [*Paiva*]; near Puri, x-08; Lucknow, 4-iv-05 [*Brunetti*]; Sukna, 1—2-vii-08; Mandalay, ii, iii-08; Bhim Tal, breeds in hollow trees in jungle, ix-06; Trivandrum, 14-xi-08; Maddathorai, 18-x-08 [all *Annandale*]; Madras Town, 30-x-08 [*Hodgart*]; Shahjahanpur [*Giles*]; Victoria gardens, Colombo, 26-iv-08 [*Paiva*]; Singapore, 21-vi-06 [*Brunetti*].

Sarawak, Papua generally, Upper Burma, Foochow, Hankow, 21—28-vi, Seychelles, Mauritius, Pitcairn Is., Honolulu.

All the above specimens identified by Theobald are in the Indian Museum.

I have taken it in Calcutta as late in the year as 10-xi-04.

Type in the British Museum.

N.B.—The species breeds freely in the flowers of *Heliconia brasiliensis*. Dr. Barker says that at Sarawak it is abundant in the neighbouring thick undergrowth, but that it seldom enters houses in the daytime, and not at all at night. Common in Calcutta in hot weather and rains, disappears in winter. Is the most abundant species in Mauritius.

Dr. Leicester notes in his description of the species, one or two points not mentioned by Theobald, adding that the insect breeds as freely in bath tubs as in the jungle.

Sub-species **samarensis**, Ludlow.

Theobold retains this (Monog., iv and v) as a variety of *scutellaris*, Wlk., and disputes Banks's suggestion that possibly intergradations may occur between *scutellaris* and *fasciata*.

Type in Army Medical Museum, Washington.

"S. **albopictus**," Skuse.

Definitely accepted as synonymous with *scutellaris*.

S. **sexlineata**, Theob.

Further corroboration of the identity of the Philippine Island specimens received from Banks, with this species, described from Trinidad.

Type in British Museum.

S. **striocrura**, Giles, 1904.

No sex is mentioned, the *type* is *not* in the British Museum, and Theobald is doubtful of its specific validity.

S. thomsoni, Theob.

ADD. REF.—Monog. Culic., iv, 174.
From N. W. Prov. India. *Type* in British Museum.

S. tripunctata, Theob., 1908.

Rec. Ind. Mus., ii, 288, ♀; iv, pl. i. wing, pl. iii, wing scales; v, 182, fig. 68, wing.

LOC.—Lushai Hills, Assam, 6-vi-04 [*Macleod*].

N.B.—Described from two ♀ ♀, very near *S. amesii*, Ludlow. *Type* in Indian Museum.

S. w-alba, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 180, ♀, fig. 151 (head, thorax, femur).

PSEUDOSKUSEA, Theob., 1907

Monog. Culic., iv, 192, ♂ ♀.

P. multiplex, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 192, ♂.
Removed here by Theobald from *Skusea*.
Type in Hungarian Museum.

P. nigrotarsis, Ludlow, 1908.

Can. Ent., xl, 52, ♀.

LOC.—Infanta, Tayabas (Phil. Is.), October, a unique specimen.

SKUSEA, Theob.

ADD. REF.—Blanch., Moust., 416.

In Monog., iv, 542, Theobald definitely places this genus in Aedinae and retains it there in vol. v, but in view of possible further alterations in the sequence of genera in this family, I prefer to retain the order adopted in my previous catalogue, as near as possible, merely for the sake of convenience.

Leicester (Culic. Malaya, 117) says, "This genus was originally placed in the sub-family Aedeomyinae by Theobald in vol. iii of his Monograph, and my genus *Amauromyia*[1] exactly corresponds to it, but in the Genera Insectorum, Fasc. 26 (1905), Theobald has transferred *Skusea* to the Culicinae, as the ♂♂ have long palpi. The genus is unrepresented in Malaya."

[1] I can find no reference to this genus.

S. culiciformis, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 546, ♀, fig. 251 wing ♀.

S. diurna, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 547, ♀. The type was bred by Dr. Durham in September.

Type in British Museum.

S. funerea, Theob., var. **ornata**, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 542, fig. 248 wing ♀.

Type in Hungarian Museum.

S. mediofasciata, Theob., 1907.

Monog. Culic., iv, 544, ♂ ♀, fig. 249. wing ♀, 250, ♂ genitalia, pl. vii, wing scales ♀, pl. ix, ♂ genitalia.

Syn. *Pseudoskusea mediolineata*, Ludlow (*t.* Ludl., Can. Ent., xl, 332).

LOC.—India [*Christophers*]. Described from 1♂ 3 ♀ ♀. Very near *Skusea funerea*, Theob. Miss Ludlow says it has been received from the Philippines. Theobald does not give *mediolineata* as synonymous with his *mediofasciata* in vol. v.

Type in British Museum.

S. pseudodiurna, Theob., 1910.

Rec. Ind. Mus., iv, 32, ♂.

Theob., Monog. Culic., v, 491, ♂.

A unique specimen; in the Indian Museum, from Sukna, 1-vii-08 [*Annandale*]. Very near *S. diurna*.

S. pseudomediofasciata, Theob., 1910.

Monog. Culic., v, 489, ♂.

From Peradeniya and Hakgala, Ceylon, iii and iv, 1907 [*Green*].

Type in British Museum.

S. uniformis, Theob., 1910.

Rec. Ind. Mus., iv, 33, ♀.

Theob., Monog. Culic., v, 491, ♀.

Type in the Indian Museum: a unique specimen from Pallode, S. India, 15-xi-08 [*Annandale*].

SCUTOMYIA, Theob.

Add. Ref.—Theobald, Monog. Culic., iv, 196, 197 (short description and tabulation of the only known five species).
Leices., Culic. Malaya, 105.

S. albolineata, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 197, ♀.
Leices., Culic. Malaya, 105, ♂ ♀.

N.B.—Nothing is said by Theobald as to Giles's species of this name (*vide* my Catalogue, p. 336).
Type in British Museum.

S. nivea, Ludlow.

Add. Ref.—Leices., Culic. Malaya, 87, ♂ ♀.
Leicester described from a series of adults and some bred from bamboo water in jungle. "Entirely sylvan, although appearing in houses close to jungle, fairly common, and a vicious biter."
Type said to be in the Army Medical Museum, Washington, but Theobald says (Monog., v, 203) it has been given by Miss Ludlow to the British Museum.

S. notoscripta, Skuse.

Add. Ref.—Theob., Monog. Culic., i, 286, ♂ ♀, fig. 84 (wing ♀), fig. 85 (wing scales); iii, 145.
Blanch., Moust., 257, ♂ ♀.

Add. Locs.—Muiria, Seleo, Berlinhafen, Friedrich-Wilhelmshafen (all Papua) and Ins. Graget [all locs. *t.* Biro].
"India" is given by Theobald as doubtful, although Giles reports it from that country.

S. notoscripta, sub-species samarensis, Ludlow.

Also occurs at Kuranda, Queensland, taken by Dr. Bancroft.

S. sugens, W.

Add. Ref.—Blanch., Moust., 256, ♀.

LEICESTERIOMYIA, mihi, nom. nov.[1]

Syn. *Chaetomyia*, Leices., Culic. Malaya, 100, 1908 (preoccupied).

[1] The present name is suggested merely as a substitute for *Chaetomyia*, but it must be understood that I do not consider it as of generic rank, any more than the great majority of the so-called "genera" in this family.

Near "*Desvoidya*" and *Leicesteria*; purely sylvan, and breeds in bamboo water.

N.B.—The generic name *Chaetomyia* being preoccupied in Tachinidae by Brauer and Berganstamm,[1] I propose *Leicesteriomyia* as a nomen novum.

C. flava, Leices., 1908.

Culic. Malaya, 101, ♂ ♀.

Described from a series bred from larvae from bamboo water and in cocoanut shells in jungle in Malaysia. Sylvan, a vicious day biter.

DASYMYIA, Leices., 1908.

Culic. Malaya, 102.

"There is no mosquito this species could possibly be mistaken for," the author adding that it might be found to belong to the Aedeomyina, and notes its affinity to *Mimomyia*.

D. fusca, Leices., 1908.

Culic. Malaya, 102, ♂ ♀.

A ♂ in jungle five miles from Kuala Lumpur, and a ♀ in bungalow at Bukit Kutu. Appears to have affinities with *Stegomyia*, *Scutomyia*, *Uranotaenia*, *Etorleptiomyia* and *Mimomyia*.

CONOPOMYIA, Leices., 1908.

Culic. Malaya, 113.

Copious notes on this genus are given by this author, who is uncertain where to place it, and as to whether it belongs to the Culicinae or Aedeomyinae. I therefore leave it here where he temporarily places it.

C. aurea, Leices., 1908.

Loc. cit., 116, ♂ ♀.

Described from one ♂ (taken in a bungalow in Kuala Lumpur) and one ♀, in jungle at Raub.

C. hybrida, Leices., 1908.

Loc. cit., 115, ♂ ♀.

Described from a series. A ♂ from a bungalow in Kuala Lumpur and other ♂♂ and a ♀ sent to Leicester by Dr. Finlayson of Singapore.

[1] Denk. Ak. Wien., lviii, 311 (1892).

C. metallica, Leices., 1908.

Loc. cit., 113, ♂ ♀.

Described from a series from larvae from marshy ground near Kuala Lumpur and elsewhere.

PSEUDOCARROLLIA, Theob., 1910.

Rec. Ind. Mus., iv, 12, near *Carrollia*, Lutz.

Theob., Monog. Culic., v, 186.

P. lophoventralis, Theob., 1910.

Rec. Ind. Mus., iv, 13, ♀. Monog. Culic., v, 186, ♀.

Described from a single perfect ♀ taken by Mr. Paiva at Purnea, Bengal, 6-viii-07, resting on the under side of a leaf of a lichi tree during the day.

Type in Indian Museum.

LEICESTERIA, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 201.
Leices., Culic. Malaya, 94.

L. annulitarsis, Leices., 1908.

Culic. Malaya, 99, ♂ ♀.

Apparently sylvan and local in jungle 5 miles from Kuala Lumpur; quite a distinct species, a bamboo breeder; only one ♂.

L. apicalis, Theob., 1908.

Rec. Ind. Mus., ii, 291, ♂ ♀; iv, pl. i, wing, pl. iii, wing scales.
Theob., Monog. Culic., v, 213, ♂ ♀, fig. 86, wing.

Described from one ♂ and two ♀ ♀: "two hatched from larvae and one caught." Lushai Hills, Assam (1,500 ft.), May [*Macleod*].

Types in Indian Museum.

L. cingulata, Leices., 1908.

Culic. Malaya, 97, ♀.

Described from three ♀ ♀ (April and June), of which one was bred from a larva from bamboo in jungle five miles from Kuala Lumpur.

A vicious biter, but apparently very local.

L. dolichocephala, Leices., 1908, em. mihi.

Culic. Malaya, 95, ♂ ♀ (*dolicocephala*).

In jungle round Kuala Lumpur and at Bukit Kutu, probably a bamboo breeder, a vicious biter in daytime and at sunset.

L. longipalpis, Leices., in Theob.

ADD. REF.—Theob., Monog. Culic., iv, 201, ♂ ♀.
Leices., Culic. Malaya, 94, ♂ ♀.
Types in British Museum.

HULECOETOMYIA, Theob., 1907.

ADD. REF.—Monog. Culic., iv, 220 (*Hulecoeteomyia*).
Leices., Culic. Malaya, 107.

H. fluviatilis, Leices., 1908.

Culic. Malaya, iii, ♂ ♀.

Very near *jugraensis* and *trilineata*, the larva, however, is quite distinct. Probably rare, as it has only been found in one locality, Ulu Gombak jungle, 13 miles from Kuala Lumpur.

H. jugraensis, Leices., 1908.

Culic. Malaya, 109, ♂ ♀ [*Helecoeteomyia id., lapsus*).

Described from a series bred from water in fallen leaves in jungle at Jugra. Very near *H. trilineata*, Leices., but the larvae are quite different. Leicester adds: "the name *trilineata* is an unfortunate one, as there are really seven distinct lines on *H. trilineata* whereas in *H. jugraensis* there are only three."

H. pseudotaeniata, Giles.

ADD. REF.—Blanch., Moust., 261, ♀.
Theob., Monog. Culic., v, 222, describes ♂ for first time, fig. 89, wing, 90, head ♂, 91, genitalia ♂.

Leicester says it will breed in small collections of rain water near houses. Theobald (Rec. Ind. Mus., ii, 291) mentions 3 ♂ ♂ and 2 ♀ ♀ "hatched 29-viii-04" from Lungleh (?) in the Lushai Hills.

Also recorded from Dehra Dun by Thomson.
Banks records it from the Philippines.

H. trilineata, Leices., in Theob.

ADD. REF.—Theob., Monog. Culic., iv, 220, ♂ ♀.
Leices., Culic. Malaya, 107, ♂ ♀.

Add. Loc.—Kurseong, 3-vii-08 [*Annandale*]; Bukit Kutu (May), Bamboo jungle 5 miles from Kuala Lumpur, April, May, July, October, December; Ulu Gombak, 13 miles from Kuala Lumpur (both *t. Leicester*).

The slightly damaged types came from the former jungle.

Leicester says it is a very distinct species, a bamboo breeder, not common, quite sylvan and a blood sucker.

PHAGOMYIA, Theob.

P. gubernatoris, Giles.

Add. Ref.—Blanch., Moust., 261, ♀ (*Stegomyia*).

HOWARDINA, Theob.

Add. Ref.—Blanch., Moust., 415.

H. chrysolineata, Theob., 1907.

Monog. Culic., iv, 218, ♀, pl. i, wing scales, ♀.

A unique ♀ from Peradeniya, Ceylon [*Green*].
Type in British Museum.

H. greeni, Theob.

Add. Ref.—Blanch., Moust., 416.
Type in British Museum.

H. himalayana, Giles, 1904.

Journ. Trop. Med. (1904), 384, ♀.

Loc.—Naini Tal (in August), bred. Giles puts it doubtfully here and Theobald states that Mr. Carter suggests, after examining the type, that it would be better placed in *Pseudohowardina*.

PSEUDOHOWARDINA, Theob., 1907.

Monog. Culic., iv, 223, ♀.

P. chrysoscuta, Theob., 1907.

Op. cit., v, 228, ♀, fig. 94, wing.

A unique specimen from Peradeniya, iv-07 [*Green*].
Type in British Museum.

CULICIOMYIA, Theob., 1907.

Monog. Culic., iv, 227, ♂ ♀, pl. iii, wing scales ♀.

C. annulata, Theob., 1907.

Op. cit., 230, ♂ ♀, fig. 64, wing ♀, 65, ♂ genitalia; pl. i, wing scales ♀.

LOC.—Kuching, Sarawak [*Dr. Barker*]; taken in company with *C. inornata*, Theob. "Looks like a small *Culex pipiens*."
Type in British Museum.

C. annuloabdominalis, Theob., 1910.

Monog. Culic., v, 236, ♂ ♀, fig. 102, head occiput, 103, head.
LOC.—Peradeniya and Hakgala, Ceylon, i and v-07 [*Green*].
Type in British Museum.

C. ceylonica, Theob., 1907.

Op. cit., 236, ♂ ♀, fig. 70, wing, ♀.

Described from a perfect ♂ and ♀ from Peradeniya and Maskeliya, Ceylon (February and April) [*Green*].
Type in British Museum.

C. inornata, Theob., 1907.

Loc. cit., 227, ♂ ♀, fig. 61, head scales, 62, wing ♀, 63, ♂ genitals.

LOC.—Kuching, Sarawak [*Dr. Barker*], in a house, November.
Type in British Museum.

N.B.—Miss Ludlow records it from the Philippines (Can. Ent., xli, 97).

C. minutissima, Theob., 1907.

Loc. cit., 235, ♀.

LOC.—Peradeniya, Ceylon, February [*Green*].
Type in British Museum.

C. nigerrima, Theob., 1910.

Monog. Culic., v, 233, ♀, fig. 100, wing.

A perfect unique specimen from Trincomalee, Ceylon, taken October 1907 by Green.
Type in British Museum.

C. pulla, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 232, fig. 66, head scales.
Removed here from *Culex*.
Type in British Museum.

NEOMACLEAYA, Theob., 1907.

Monog. Culic., iv, 238, ♀.

N. indica, Theob., 1907.

Loc. cit., 238, ♀.

Loc.—India [*Christophers*]. "At first sight resembles *Skusea funerea* Theob." Philippines [*t. Ludlow*]. Woodlands, Ceylon, 9-x-07.

Type in British Museum.

Var. simplex, Theob.

Rec. Ind. Mus., ii, 291, ♀.

Loc.—Sylhet, June [*Hall*]. A single ♀. *Type* in Indian Museum.

DANIELSIA, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 240.
Leices., Culic. Malaya, 117.

N.B.—It may be noted that there is a *Danicla*, Koch, 1891, in Coelenterata.

D. albotaeniata, Leices., in Theob.

Add. Ref.—Theob., Monog. Culic., iv, 241, ♂ ♀, fig. 72 (cephalic and scutellar adornment).
Leices., Culic. Malaya, 117, ♂ ♀.

Leicester describes it in the above work from a series bred from larvae from bamboo water. Sylvan, a vicious day biter.

LEPIDOTOMYIA, Theob., 1905.

Refs.—Gen. Insect., Fasc., 26, p. 22.
Theob., Monog. Culic., iv, 249.
Leices., Culic. Malaya, 132.
Erratum.—Delete line 3, p. 339 of my Catalogue.

N.B.—"An error has occurred here. The *Lepidotomyia* of Theobald, in his paper on the Hungarian Museum Culicidae, referred to the genus *Reedomyia*, Ludlow, to which the species *Lepidotomyia alboscutellata* Theob. belongs. The true *Lepidotomyia* contains only one species, *magna* Theob., and comes very near *Danielsia*" (Theobald).

Leicester, however, in his Culicidae of Malaya (p. 132) retains *alboscutellata* in *Lepidotomyia* without comment.

Type in British Museum.

L. magna, Theob.

ADD. REF.—Theob., Monog. Culic., iv. 250, ♂ ♀.

Described from two perfect specimens; a true *Lepidotomyia*. Recorded from Bombay, 19-viii-02, by James. *Type* in British Museum.

L. taeniata, Leices., 1908.

Culic. Malaya, 133, ♂ ♀.

Described from a large series bred from larvae taken in water collected in ruts in a jungle waggon track. The only time this author has seen the larvae.

THEOBALDIA, Nev. Lemaire.

Theobaldinella, Blanch., 1905, Moust, 390, nom. nov. (gen. chars. given).

N.B.—Blanchard changed the name from *Theobaldia* to *Theobaldinella* on account of *Theobaldius* of Neville in Mollusca; but Mr. Theobald retains the spelling as originally written, which in accordance with zoological rules is permissible.

T. annulata, Schrk.

Beitr. zur. Naturgesch., 97 (1776).

ADD. REF. *Culex annulatus*, Blanch., Moust., 280, ♂ ♀, fig. 206, ungues and genitalia, fig. 207, adult larva.

Apparently a hill species. Blanchard records it from 4,000 ft. (Brianon, France), also from 8,000 feet in Mexico (Durango State).

T. spathipalpis, Rond.

ADD. REF.—Theob., Monog. Culic., iv. 276 (larva described).
Blanch., Moust., 283, ♂ ♀, fig. 209, ungues and genitals.

N.B.—Blanchard says that Ficalbi thinks the adult does not bite, but lives on plant juices. The larva has been found during winter (? in Sardinia). Blanchard thinks it may carry "undulating" fever in Malta, adding that, at least in Gibraltar, where it abounds, it is infested by a microbe closely resembling *Micrococcus melitensis*.

PECOMYIA, Theob.

Geitonomyia, Leices., 1908, Culic. Malaya, 134.

P. caeca, Theob. (*Culex id.*).

ADD. REF.—Blanch., Moust., 305, ♀ (*Culex id.*).
Leices., Culic. Malaya, 135, ♂ ♀ (*Geitonomyia id.*)
ADD. LOCS.—Fed. Malay States (Ipoh-Parak). Philippines

N.B.—Re-described by Leicester from a series bred from larvae in water in pools and waggon tracks at Ulu Klang near Kuala-Lumpur.

"As the scutellar scaling and the palpi are quite distinct from those of a *Culex*, I have no hesitation in placing this mosquito in a separate genus" (Leicester) However, Leicester had probably overlooked Theobald's genus *Pecomyia*, to which the latter author referred this species (Monog. Culic., iv, 268, fig. 86, wing ♀, pl. i, wing scales ♀).

Type in British Museum.

P. maculata, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 266, ♂ ♀; figs. 82, 83, 84, ♀ wings.

Type in British Museum.

PARDOMYIA, Theob., 1907.

Monog. Culic., iv, 280.

P. aurantia, Theob., 1907.

Loc. cit., 280, ♀.

Loc.—Kuching (Sarawak), November [*Dr. Barker*]. Received also from Kuala Lumpur. *Type* in British Museum.

P. quadripunctis, Ludlow.

No reference to the description of this species is given, of which Theobald (Monog., v, 608) copies the original description. It is from Parang, Mindanao (Phil. Is.), Oct. 26.

PSEUDOGRAHAMIA, Theob.

P. aureoventer, Theob., 1910.

Rec. Ind. Mus., iv, 27, ♀.
Monog. Culic., v, 551, ♀.

A unique ♀, at present in the British Museum.
Pallode (Travancore, S. India), 16-xi-08 [*Annandale*].

PSEUDOGRABHAMIA, Theob.

P. maculata, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 314, ♂ ♀, fig. 109 wing ♀.

Id., Journ. Bom. Nat. Hist. Soc., xvi, 244, ♂ ♀.

ADD. LOC.—Madras Town, 30-x-08 [*Hodgart*, Ind. Mus.].
Type in British Museum.

GRABHAMIA, Theob.

ADD. REF.—Theob., Monog. Culic., iv. 284 (list of known sp.), 285 (table of leg bands).
Blanch., Moust., 396, ♂ ♀.

N.B.—*Feltidia*, a genus by Dr. Dyar, for some American species, is an absolute synonym of *Grabhamia*, being founded on *jamaciensis*, the very species which is the type of *Grabhamia*.

G. ambigua, Theob.

Type in British Museum.

G. ochracea, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 300.
Described from two perfect ♀ ♀.
Type in British Museum.

G. spenceri, Theob.

Type in British Museum.

G. sollicitans, Wlk.

ADD. REF.—Theob., Monog. Culic., iv, 291 (life-history notes), figs. 97-98 (larval characters).

N.B.—As in that work Mr. Theobald makes no further mention of the Formosan example, on which the species was introduced into my Catalogue, it should be, *pro tem.*, eliminated from the list of Oriental species.

G. taeniarostris, Theob., 1907.

Monog. Culic., iv. 299, ♀.

LOC.—Peradeniya, January [*Green*].
Type in British Museum.

CULICADA, Felt., 1904.

Mosq. of New York State, App. p. 391b.

Theob., Journ. Econ. Biol. (1905), i. 26
Id., Monog. Culic., iv. 318.

C. eruthrosops, Theob., 1910.

Monog. Culic., v, 299, ♀, fig. 140, wing.

Trincomalee, Ceylon, xi, 1906.
Type in British Museum.

C. minuta, Theob., 1907.

Monog. Culic., iv, 338, ♀.

Loc.—India [*Christophers*]. Described from a perfect ♀.
Type in British Museum.

C. suknaensis, Theob., 1910.

Rec. Ind. Mus., vi, 21, ♀.

Monog. Culic., v, 297, ♀, fig. 139, wing.
Described from four perfect ♀♀ from Sukna, 1—2-vii-08 [*Annandale*]. Near *C. nipponii*, Theob. The specimens were taken in dense jungle, and bit during the day.
Type in Indian Museum.

THEOBALDIOMYIA, mihi, nom. nov.

Syn. *Leucomyia*, Theob., 1907, Monog. Culic., iv, 372, pl. ix, ♂ genitalia.
Type of genus (=*sub-genus t. mihi*). *Culex gelidus*, Theob.

N.B.—*Leucomyia* is preoccupied in 1892 by Brauer and Bergenstamm in Sarcophaginae (Denk. Ak. Wien., lviii, 368). I therefore propose the name *Theobaldiomyia*, with the view that the group represents, at most, a sub-genus

T. argentea, Ludlow.

Taeniorhynchus argenteus, Ludlow.
Id. *id.*, Theob., Monog. Culic., iv, 487, ♀ (copies Miss Ludlow's descr.); v, 426, fig. 191, wing.
Described from several taken by Dr. Whitmore in September at Angeles (Pampanga, Phil. Is.).
Type in Army Medical Museum, Washington.

N.B.—In vol. v Theobald says that Miss Ludlow informs him that it is a *Leucomyia*.

T. gelidus, Theob. (*Leucomyia*).

Add. Ref.—Leices., Culic. Malaya, 147, ♂ ♀ [*Leucomyia*].
Add. Locs.—Calcutta, August; Calcutta, 6-x-04 [*Brunetti*]; Rajshahi, E. Bengal, 1—6-ii-07; Rangoon, 25-ii-08; Travancore and Cochin States, xi-08 [*Annandale*]; Purnea, ix-x [*Paiva*];

Madras Town, 30—31-x-08 [*Hodgart*]; Maskeliya, Ceylon (April) [*Green*].

N.B.—Leicester re-describes the ♀ from a long series bred from pools and taken in bungalows at Kuala Lumpur. He notes that Theobald classes this species with those with an unbanded proboscis instead of with the *banded* ones. He says the ♂ has not before been described, but Theobald did so at the time of establishing *Leucomyia*.

Type in British Museum.

T. gelidus, var. **bipunctata**, Theob., 1907.

Monog. Culic., iv, 374, ♂ (*Leucomyia id. id.*).

LOC.—India [*Maj. Aldrich*]; Sarawak [*Dr. Barker*].

T. gelidus, var. **cuneata**, Theob.

Erratum.—My reference to the original description of this form is incorrect, as it should be, Theob., 1901, Monog. Culic., ii, 22.

ADD. REF.—Blanch., Moust., 316, ♀.

ADD. LOCS.—Balighai, near Puri, 23-x-08, at light; Calcutta, Aug. to Dec., "not uncommon in houses and at light, and in the open, on shrubs and in railway carriages; Travancore State, 5 and 19-xi-08 [all *Annandale*]; Calcutta, 6-x-04 [*Brunetti*]; Katihar, Bhogaon, ix, x; Purnea, viii, x [*Paiva*]; Sylhet (May) [*Hall*]; and between Bolpore and Rampore Haut, Bengal, in August in railway carriage [*Paiva*]; western base of W. Ghats, Travancore, 19-xi-08 [*Annandale*]; Malabar, 4-xi-08 [*Annandale*]; Madras, 30-x-08; Pangasinan (Ph. Is.).

T. sinensis, Theob.

(*L. gelida*, var. *sinensis*, Theob.).

Theobald (Rec. Ind. Mus., iv, 20) raises this variety to specific rank, and adds the locality, Balighai, near Puri, 23-x-08, at light [*Annandale*].

T. (?) whitmorei, Giles.

See *Taeniorhynchus, id.*

LOPHOCERATOMYIA, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 471 (generic notes).
Leices., Culic. Malaya, 119.

L. bicornuta, Theob., 1910.

Rec. Ind. Mus., iv, 25.

Theob., Monog. Culic., v, 412, ♂, fig. 178 antennal organs, 179 wing, 180 genitalia, 181 head, 182 antennal organs in profile.

Type in Indian Museum. A single (dissected) male from Kawkareik, base of Dawna Hills, 4-iii-08 [*Annandale*].

Closely related to *fraudatrix*, Theob.

L. brevipalpis, Theob.

Monog. Culic., iv, 477, ♂, fig. 12 ♂ proboscis, palpus, basal antennal segment, antennal organs, ungues.

ADD. REF.—Leices. Culic. Malaya, 129 (copies Theobald's description, as he has not seen the species in Malaysia).

L. eminentia, Leices., 1908.

Culic. Malaya, 131, ♂.

Described from a single ♂ from jungle near Kuala Lumpur. "Very distinct and easily recognised."

L. fraudatrix, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 474, ♂ ♀, fig. 208 palpi, 209 wing ♀, 210 antennal organs ♂, 211 wings ♂.

Type in Hungarian Museum.

L. mammilifer, Leices., 1908.

Culic. Malaya, 128, ♂ ♀.

Described from a series of ♂ ♂ and one ♀ bred from larvae from pools in jungle near Kuala Lumpur and at Raub.

A somewhat distinct species, according to the author.

L. minor, Leices., 1908.

Loc. cit., 126, ♂ ♀.

Described from a series bred from bamboo water. Sylvan and the smallest of the Malayan species, and dull coloured.

L. niger, Leices., 1908.

Loc. cit., 123, ♂ ♀.

Described from a series from larvae from ponds at Kuala Lumpur.

L. rubithoracis, Leices., 1908.

Loc. cit., 119, ♂ ♀.

Described from a series from ponds in Kuala Lumpur.

Easily known by its brilliant red thorax.

L. sylvestris, Leices., 1908.

Loc. cit., 125, ♂ ♀.

Bred from larvae from still ponds in Malayan jungle.

L. taeniata, Leices., 1908.

Loc. cit., 127. ♂ ♀.

Bred from larvae from ponds in the open near Kuala Lumpur and Klang. A very distinct species.

L. uniformis, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 473, ♂ ♀.
Id., Journ. Bomb. Nat. Hist. Soc., xvi, 245.
Type in British Museum.

L. variata, Leices., 1908.

Culic. Malaya, 121, ♂ ♀.

Described from a large series bred from larvae mostly found in small ponds and puddles in swamps and ponds.

RADIOCULEX, Theob., 1908.

Rec. Ind. Mus., ii, 295.
Theob., Monog. Culic., v, 192.

R. clavipalpus, Theob., 1908.

Rec. Ind. Mus., ii, 295, ♂ ♀. iv, pl. i, wing, pl. ii, head.
Theob., Monog. Culic., v, 193, ♂ ♀.

LOC.—Calcutta, Nov. and Dec.; and one in July; Berhampur (Murshidabad Distr.), Bengal, 1-i-08 [*Lloyd*]; Katihar, 4—5-x-08 [*Paiva*]; Rangoon, 25-ii-08 [*Annandale*]; Vaikam Coast of Travancore State, 5-xi-08 [*Annandale*]. Common in brushwood in the cold weather in Calcutta.

N.B.—"Described from a long series, some taken at light, . . . the marked black shiny thorax with the clear-cut yellow area on it, and the quaint marginal cell will at once identify it" (Theob.).

Type in Indian Museum, *co-types* in British Museum.

CULEX, L.

For sub-division of even the restricted genus *Culex*, *vide* Theobald (Monog. Culic., iv, 387). Blanchard divides the genus into nine sections (Moust., 269) and arranges the groups of species in further analytical tables, one for each section, incorporating

the specific descriptions in the tables. Theobald (vol. v) admits nearly 200.

Leicester also (Culic. Malaya, 138) divides the Malayan species into groups, in an analytical table.

C. albolineatus, Giles.

Type in British Museum.

C. albopleura, Theob., 1907.

Monog. Culic., iv, 456, ♀.

Loc.—India [*Christophers*]. Described from a perfect unique specimen.

Type in British Museum.

C. albus, Leices., 1908.

Culic. Malaya, 148, ♀.

One ♀ from a bungalow at Kuala Lumpur.

C. alis, Theob., 1903.

Monog. Culic., iii, 167, ♂ ♀.

Loc.—Christmas Island.

N.B.—Described from a series bred by Dr. Durham from larvae from salt pools. Miss Ludlow says it occurs in the Philippines.

Type in British Museum.

C. angulatus, Theob. (*angulata emend.*).

Add. Ref.—Blanch., Moust., 362, ♀.

C. annuliferus, Ludlow.

See *ludlowi*, Blanch., nom. nov., *annuliferus* being preoccupied.

C. annulioris, Theob., 1901.

Monog. Culic., i, 371, ♀.

N.B.—Described from a single ♀ from Mashonaland, but it has since been found to occur in the Philippines.

C. annulus, Theob.

Add. Ref.—Blanch., Moust., 293, ♀.

Leices., Culic. Malaya (reproduces Theobald's description of the ♀).

C. arabiensis, Patton, 1905.

Journ. Bomb. Nat. Hist. Soc., xvi, 633, ♂ ♀.

In the crater, Aden.

N.B.—Not, correctly speaking, within the Oriental Region, but included because I included Patton's species from Arabia in my Catalogue.

C. argentinotus, Banks, 1910.

Phil. Journ. Sci., iv, 547, ♂ ♀.

LOC.—Rizal (Phil. Is.). *Types* ♂ ♀ (No. 11,460) in the entomological collection, Bureau of Science, Manila.

L. auratus, Leices., 1908.

Culic. Malaya, 153, ♀.

One of the largest species of *Culex*; a vicious biter; some affinity with *C. occidentalis* and *C. flavifrons*.

C. aureostriatus, Dol.

ADD. REF.—Blanch., Moust., 310 ♀.

N.B.—Blanchard gives Tokio as well as Amboina, "in houses" as localities, but the species is not included as Japanese in the recent Palaearctic catalogue. Theobald in his last volume still retains it doubtfully in *Culex*.

C. biro, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 390, ♂ ♀, fig. 165, wing ♂, 164, wing ♀.

Described from 3 ♂ ♂ and 3 ♀ ♀. *Type* in the Hungarian Museum.

C. caecus, Theob.

Type in British Museum.

C. cantans, Meig.

Erratum.—Delete my note about *C. maculatus*, Mg., in my Catalogue.

C. christophersi, Theob., 1907.

Monog. Culic., iv, 453, ♂ ♀.

LOC.—India [*Christophers*]. Described from 1 ♂ and several ♀ ♀.

Type in British Museum.

C. concolor, R. Desv.

Add. Ref.—Blanch., Moust., 365, ♂ ♀.

Leices., Culic. Malaya, 154, ♂ ♀.

Add. Locs.—Sylhet, ii, iv, v, xi [*Hall*]; Manipur, viii [*Gourlay*]; Calcutta, 1-viii-07; 6-x-04; 4-xi-06 [all *Brunetti*]; iii, vi, vii, viii, ix, x, xi; Port Canning; Purnea, 4—6-viii-07 [*Paiva*]; Damukdia Ghat (N. Bengal), vii; Lucknow, 4-ix-05 *Brunetti*]; Kulattupuzha (Travancore), 19-xi-08, in bungalows [*Annandale*]; Samarang [*Jacobson*]; Phrapatoon, Siam, viii-06 [*Woolley*]; Andaman Is. [*Ray White*]; also in the Straits, Burma, and China.

Leicester says, "Fairly abundant in Malay Peninsula, very variable, larvae in stagnant pools, stable tanks or drainage."

Theobald observes that Giles erroneously refers it ("Journ. Trop. Med.," 1904, p. 383) to *Taeniorhynchus*.

C. fatigans, W.

Add. Syn.—*Desvoidea panalectros*, Giles; *t.* Theob., Rec. Ind. Mus., iv, 5.

Add. Ref.—Theob., Monog. Culic., iv, pl. xvi (larval chars.).

Blanch., Moust., 353, ♂ ♀, fig. 230 ♂ ♀ (as *pungens*), 231 ♀, 232 head ♂ ♀ (*anxifer*), 233 adult larva and nymph (*pungens*), 234 head of larva above and below (*pungens*).

Leices., Culic. Malaya, 157, ♂ ♀.

Add. Locs.—In the Rec. Ind. Mus. (ii, 298) Theobald gives a long list of dates and localities from specimens in the Indian Museum collection, and adds a further list in Rec. Ind. Mus., iv, 17.

Between the two reports nearly all parts of India are represented by this common species, with specimens from Nepal, Mandalay, Rangoon, Moulmein, Manipur; Soerabaya, Java, 16—25-vii-06 [*Brunetti*], Manila, 10—16-iii-06 [*Brunetti*], and at sea between the mouth of the Hooghly River and Rangoon, 22—23-ii-08 [*Annandale*].

Personally, I have taken it in Calcutta in February, March, April, July, October, November and December; Meerut 25-iv-05 (common in bedroom), Lucknow 7-viii-05, 4-ix 05, 2-xii-04, in bedrooms and at the old Residency, Agra 28-iii-05, Rangoon 24-xii-04 to 3-i 05 (common in bedroom), 9-ii-06, Penang 3—8-viii-06, Singapore 21-vi-06, Batavia 27-vi and 9-vii-06, Soerabaya 16—25-vii-06 common, Shanghai 16—25-vii-06, where it was literally swarming in a ditch in front of a hedge facing the west; Hankow 22—26-iv-06, Manila 10—16-iii-06. Nearly all the specimens are in inferior condition, and were named by Mr. Theobald.

Theobald in his 5th volume adds the following localities:—

Phrapatoon, Siam, 10—18-i; 19-iii; 30-xii-07; viii and xi-06 [*Dr. Woolley*]; Sarawak. Outside the East it has a very wide range, Japan, Natal, Mombasa, Pemba Is. (E. Africa); Zanzibar,

Soudan, Egypt, British Central Africa, Senegambia, Mauritius, Seychelles, Australia, Fiji, and the southern part of North America.

N.B.—Both Theobald and Blanchard consider the species identical with *pungens*, W., and this latter name being given first by Wiedemann, although on the same page, should perhaps be adopted. In the absence of absolute certainty of identification and on account of the confusion that would be caused by the change, neither author adopts *pungens*. It is doubtful if the type of *pungens* still exists in any state sufficiently good to decide so close a point of identity.

Moreover, my own personal opinion, not as a culicidologist but as being fairly intimate with the magnificent work done by Wiedemann, is that that author must have had two distinct species before him, for he certainly would not have regarded such minute differences as specific, as are to-day delighted in by the workers in Culicidae.

In a paper just published by Mr. F. W. Edwards [1] *fatigans*, W., is sunk (with some species of Theobald's) as a synonym of *pipiens*, L. If the two are identical it is very strange no previous author has ascertained it.

The species carries Filariasis.

Miss Ludlow's tables show that it is common in all parts of the Philippines all the year round.

Leicester says it occurs in houses all over the Malay Peninsula, the larva breeding in any small collection of water near houses.

C. fatigans, var. trilineatus, Theob.

Admitted as a good species.

C. foochowensis, Theob.

ADD. REF.—Blanch., Moust., 344, ♂ ♀ (*fouchowensis*).
Type in British Museum.

C. fragilis, Ludlow.

ADD. REF.—Theob., Monog. Culic., iv, 424, ♂ ♀.
ADD. LOCS.—Oras (Samar, Phil. Is.), Aug. 6th [*t. Ludlow*].
N.B.—*Type* in Army Medical Museum, Washington.

C. fuscanus, Wied.

ADD. REF.—Blanch., Moust., 275.

C. fuscocephalus, Theob., 1907.

Monog. Culic., iv, 420, ♀.

LOC.—Peradeniya, March and September [*Green*]; Hakgala, Ceylon, 5-xi-07 (*Green*); Pallode, 15-xi-08 [*Annandale*].

[1] Bulletin of Entomological Research, ii, 262 (Oct. 1911).

Described from 2 ♀ ♀.
Type in British Museum.

C. graminis, Leices., 1908.

Culic. Malaya, 158, ♂ ♀.

Described from a large series from larvae from open bamboo in jungle; sylvan species.

C. gnophodes, Theob.

Add. Ref.—Leicester copies Theobald's description, ♀.
Type in British Museum.

C. halifaxii, Theob., 1903.

Placed with uncertainty here, only one specimen known (Theob., Monog. Culic., v, 350). *Type* in British Museum.

C. hirsuteron, Theob.

Type in British Museum.

C. impellens, Wlk.

Add. Ref.—Blanch., Moust., 294, ♀.
Leices., Culic. Malaya, 142 (copies Theobald's description).

Add. Locs.—A long list from specimens in the Indian Museum (Theob., Monog. Culic., iv, 15). Thaumaspur, Nepal, 10—14-ii-08, Sukwani, 15—16-ii-08; Moulmein, Feb.; Mandalay, 11—12-iii-08; Rangoon, 24—25-ii-08; Lucknow, 21-iv-07 [all three *Annandale*]; Chittagong, 26-vii-08 [*Hall*]. Sukna, in deep jungle; Puri, x-08, common; Port Canning, 9-x-08, also several localities in Travancore and Cochin States collected 4—25-xi-08, all taken by Dr. Annandale.

Calcutta, 1-iii-vi to ix; on board ship 5 miles off Alleppey, Malabar Coast, 4-v-08 [*Paiva*]. Also taken by me in Calcutta (bedroom), 1-iv-08; 10-ii-07, June, July: Lucknow, 7-viii-05; Rangoon, 24-xii-04 to 3-i-05, and Batavia, 27-vi-06 to 9-vii-06.

C. imprimens, Wlk.

Add. Ref.—Blanch., Moust., 306.
Type (remnant) in British Museum.

C. infula, Theob.

Add. Ref.—Blanch., Moust., 298, ♀.
Leices., Culic. Malaya, 146 (copies Theobald's description).
Type in British Museum.

C. japonicus, Theob.

Theobald (in vol. v, 391) admits this species from Tokio and Ceylon, making the latter a distinct variety which he terms *ceylonica*. The types of both forms are in the British Museum. He places *ceylonica* doubtfully in *Culex*, eliminates *aureostriatus*, Dol., from the synonymy, placing the latter separately and doubtfully in *Culex*.

C. longifurcatus, Theob.

See *pseudolongifurcatus*, Theob., nom. nov.

C. longipalpis, V. Wulp.

ADD. REF.—Blanch., Moust., 318, ♀.

N.B.—This author correctly notes that although Van der Wulp says the palpi have only two joints, that author shows four in his figure.

C. longipes, Theob.

See *macropus*, Blanch., nom. nov.

C. loricatus, Leices., 1908.

Culic. Malaya, 151, ♀.

One ♀ taken in bungalow at Kuala Lumpur. Very distinct.

C. ludlowi, Blanch., nom. nov.

Syn. *C. annuliferus*, Ludlow, 1903 (Journ. N. Y. Ent. Soc., ii, 141).

ADD. REF.—Theob., Monog. Culic., iv, 388, ♂ ♀.

ADD. LOC.—Mangarin and Dagupan (Phil. Is.), Feb. to April.

N.B.—The species was described from 234 ♂♂ and 28 ♀♀, but many were in bad condition. Blanchard renames the species, *annuliferus* being preoccupied by Em. Blanchard in 1852 for a species from Chili.

C. luteola, Theob., 1910.

Monog. Culic., v, 378, ♀.

Peradeniya, x-1900. A single perfect ♀, in the British Museum. A very distinct species.

C. luteolateralis, Theob.

The genus *Banksiella*, Theob., is established for this species.

C. macropus, Blanch., nom. nov. (1905).

Comp. Rend., liii, 1045.

Blanch., Moust., 327.
For *longipes*, Theob., preoccupied.
Type in British Museum, a unique specimen from Singapore.

C. mediolineatus, Theob.

ADD. REF.—Blanch., Moust., 369, ♀.
Type in British Museum.

C. microannulatus, Theob.

ADD. SYN.—*C. rolandi*, D'Emm. de Ch., Ann. Trop. Med. et Par., ii, No. 3, 259 [1908].
ADD. REF.—Blanch., Moust., 292, ♂ ♀.
Leices., Culic. Malaya, 140, ♂ ♀.
ADD. LOCS.—Calcutta, July to November, common; Purnea, August; Gopkuda Is., Lake Chilka, August; Sylhet, i, ii, iv, v, xi, xii; between Bolpore and Rampore Haut, Bengal, August, in railway carriage [all *t. Theob.* in *Ind. Mus.*].

N.B.—Leicester describes it from a series sent him by Dr. Finlayson from Singapore, mostly taken in houses. I have only taken it once, in Calcutta, 1—10-viii-08. Green has taken it at Trincomalee and Hakgala, Ceylon, 24-viii to 9-ix-07. It occurs in Mauritius.
Type in British Museum.

C. mimeticus, Noë.

ADD. REF.—Blanch., Moust., 271, ♂ ♀.
Leices., Culic. Malaya, 139, ♂ ♀.
ADD. LOC.—Lushai Hills, 1-vi-04, one ♀ [*Macleod*]; Theog, Simla district, 2-v-07, one ♀ [*Annandale*]; Thaumaspur, Nepal, 18—20-ii-08, one ♂; Peradeniya, 17-ix-07 [*Green*].

N.B.—Leicester says he describes the ♂ for the first time, but this is not so. He says it occurs in any roadside pool or marshy ground. Blanchard notes its occurrence in Italy and Palestine, also Malacca.

C. minimus, Leices., 1908.

Culic. Malaya, 160, ♂ ♀.

Described from a series bred from larvae from mud holes full of water, in swampy ground in Kuala Lumpur.

C. minor, Theob., 1908.

Rec. Ind. Mus., ii, 298, ♂ ♀ ; iv, pl. i, wing.

Monog. Culic., v, 363, ♂ ♀, fig. 150, wing.
ADD. LOCS.—Sylhet [*Hall*]; Lushai Hills, June, July [*Macleod*]; Calcutta, December [*Annandale*].

N.B.—Described from 3 ♂ ♂ and 2 ♀ ♀ in the Ind. Mus. coll. "A very small obscure species, easily told by its unbanded abdomen."
Type in Indian Museum.

C. multimaculosus, Leices., 1908.

Culic. Malaya, 155, ♂ ♀

Described partly from jungle examples and partly from larvae from roadside ditches.

C. nigricephalus, Leices., 1908 (emend. mihi).

Culic. Malaya, 149, ♂ ♀ (*nigricephala*).

Bred from paddy swamps near Batu Gajah by Dr. Daniels.

C. pallidostriatus, Theob., 1907.

Monog. Culic., iv, 410, ♂ ♀, fig. 175, wing ♂.

LOC.—Peradeniya, December [*Green*]; India [*Christophers*].
Described from 2 ♂ ♂ and a ♀.
Type in British Museum.

C. pallidothorax, Theob.

Emend. by Theob. in Monog., iv, 446, from *pallidithorax*.
ADD. REF.—Theob., Monog. Culic., iv, 446, ♂ ♀
"Something like *C. fatigans*, Wied."
Type in British Museum.

C. parascelos, Theob., 1910.

Rec. Ind. Mus., iv, 18, ♀.

Theob., Monog. Culic., v, 379.
Described from 2 ♀ ♀ from Madras Town, 30-x-08 [*Hodgart*].
A very marked species.
Type in Indian Museum.

C. perplexus, Leices., 1908.

Culic. Malaya, 150, ♂ ♀.

Bred from larvae from marshy edges of lake near Kuala Lumpur.

C. pettigrewii, Theob., 1910.

Rec. Ind. Mus., iv, 15, ♀.

Theob., Monog. Culic., v, 351, ♀.

A perfect ♀ from Ukhrul, Manipur, viii-08, taken by the Rev. W. P. Pettigrew.

In the Indian Museum.

C. pseudolongifurcatus, Theob., nom. nov., 1910.

Monog. Culic., v, 366.

A new name for his *longifurcatus* (Rec. Ind. Mus., iv, 19, ♂ ♀), that name being preoccupied by Becker in 1903. Described from 1 ♂ and 2 ♀ ♀ from Dahawangahary Hill, Bengal—Nepalese Frontier, 16-ii-08.

Type in the Indian Museum.

C. pseudostenoetrus, Theob., 1910.

Monog. Culic., v, 343, ♀, fig. 154 wing.

Two ♀ ♀ from Hakgala, Ceylon, v and viii, 1907 [*Green*]. Whereabouts of type not mentioned.

C. pulchriventer, Giles.

Add. Ref.—Blanch., Moust., 338, ♂ ♀.

Type in British Museum.

C. pullus, Theob.

Removed to *Culiciomyia*.

C. quasipipiens, Theob.

Add. Ref.—Blanch., Moust., 344, ♀.

Type in British Museum.

C. quasiunivittatus, Theob

Type in British Museum.

C. reesii, Theob.

Add. Ref.—Blanch., Moust., 361, ♂ ♀.

C. rizali, Banks

Theobald (Monog., v, 391) notes on its differences from *japonicus*, to which it is closely allied. He puts it doubtfully here.

C. sepositus, Leices., 1908.

Culic. Malaya, 152, ♀.

A single ♀ from jungle near Kuala Lumpur. Very distinct.

C. sericeus, Theob.

ADD. REF.—Blanch., Moust., 362, ♀

ADD. LOCS.—Taken by me at Meerut, India, 25-iv-05, Lucknow (the Residency), 2 xii-04; Rangoon, 24 xii-04 to 3-i-05, in bedroom; Shanghai, 8—10-v-06, in ditch. The specimens identified by Theobald with some doubt owing to their rubbed condition.

C. sitiens, Wied.

ADD. REF.—Blanch., Moust., 293, ♀.
Leices., Culic. Malaya, 143, ♂ ♀.

ADD. LOCS.—Blanchard adds Sumatra, Celebes, Malacca; Theobald adds Calcutta—Aug. and Sept. Philippines (*t. Ludlow*).

Leicester describes it from a series bred from marshy ground and from adults taken in the bungalows in the Malay Peninsula.

C. stenoetrus, Theob, 1907.

Monog. Culic., iv, 395, ♀.

LOC.—Maskeliya, Ceylon, April [*Green*].
Type in British Museum.

C. taytayensis, Banks, 1910.

Phil. Journ. Sci., iv, 545, ♂ ♀.

LOC.—Rizal (Ph. Is.). *Type* ♂ ♀ in entomological collection, Bureau of Science, Manila. Bred from larvae from the water of the esteros.

C. tigripes, Grand. et Char.

ADD. LOCS.—Manipur (bungalow), August [*Gourlay*]; Sylhet, ii, iv, v-xii-04 [*Hall*]; Mandalay, 11-iii-08 [*Annandale*]; Calcutta, July to November; Damukdia Ghat [Riv. Ganges, E. Bengal), July; Port Canning, Dec.; Kurseong, 4-viii-08. I took it in Calcutta, Aug. 1908 and Dec 1905; Kirindi, 20-xi 08; Weligama, 3-i-08; Dondra, 28-iv-08, and Mandulsima, 14-xii-08 (all four in Ceylon). Also occurs in South, Central and West Africa.

The larvae are carnivorous and cannibalistic. Patton found it at Aden in a tank of rain water feeding on *C. fatigans* larvae.

Theobald describes three varieties, none being Oriental.

C. tipuliformis, Theob.

ADD. LOCS.—Blanch., Moust., 363, ♀.
Type in British Museum.

C. trilineatus, Theob., 1901.

Monog. Culic., ii, 159, ♀.

Blanch., Moust., 330, ♀.

Loc.—Thayetmyo, Upper Burma. First regarded as a variety of *fatigans*. Theobald admits it (Monog., v, 359) as distinct.

Type, a unique specimen, in the British Museum.

C. trimaculatus, Theob.

Type in Hungarian Museum.

C. tritaeniorhynchus, Giles.

Add. Ref.—Blanch., Moust., 294, ♂ ♀.

Type in British Museum, from Madras.

C. uncus, Theob.

Add. Ref.—Blanch., Moust., 350, ♀.

Type in British Museum.

C. uniformis, Leices., 1908.

Culic. Malaya, 159, ♀.

Two ♀ ♀ from marshy ground near Batu Gajah. Very near *C. viridis*.

C. univittatus, Theob.

Add. Ref.—Blanch., Moust., 321, ♀.

Type in British Museum.

C. vagans, Wied.

Add. Ref.—Blanch., Moust., 304, ♀ (Foochow).

Theob., Rec. Ind. Mus., iv, 14 ♂; Monog. Culic. v. 347, ♂.

Theobald describes the ♂ of this species, as the present example referred to (Madras Town, 31-x-08, *Hodgart*) is the only one of this species he has seen. It is in the Indian Museum.

C. viridiventer, Giles.

Add. Ref.—Blanch., Moust., 346, ♂ ♀. The ♀ is said not to bite.

Type in British Museum.

C. vishnui, Theob.

Add. Ref.—Blanch., Moust., 292, ♂ ♀.

Theob., Monog. Culic., iv, 387, ♂, fig. 162, wing ♀; 163, ♂ genitalia; pl. v, wing scales, ♀.

Leices., Culic. Malaya, 141, ♂ ♀ (description of ♂ copied from Theobald).

ADD. LOCS.—Sylhet, Jan. and Feb. [*Hall*]; Port Canning, July; Gopkuda Is., August; Lake Chilka, August: Ferozepore, Punjab (*Adie*).

Leicester has taken one ♀ from jungle near Kuala Lumpur *Type* in British Museum.

BANKSIELLA, Theob., 1907.

Monog. Culic., iv, 468.

B. luteolateralis, Theob., 1901.

Monog. Culic., ii, 71 (*Culex id.*).

ADD. REF.—Blanch., Moust., 278, ♂ ♀.
Leices., Culic. Malaya, 160, ♂ ♀.
Theob., Monog. Culic., iv, 469, ♀.

N.B.—*Banksiella* established for this species, which, originally described from the Soudan, has been recorded by Theobald from Sylhet, 23-xi-04 and 5-x-04, taken by Lieut.-Col. Hall, and now in the Indian Museum. Leicester describes it from larvae from the margins of small pools in grounds of the Institute of Medical Research at Kuala Lumpur. Taken there also in the adult stage. Occurs in several parts of Africa, where it varies considerably.

Type in British Museum.

TRICHOPRONOMYIA, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 479.

T. annulata, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 479 ♂, fig. 213a, apex of proboscis; b, scales; fig. 214, wing ♂.

TRICHORHYNCHOMYIA, mihi., nom. nov.

Syn. *Trichorhynchus*, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 270.

Comes between the Stegomyian group and true *Culex* (Theobald).

N.B.—*Trichorhynchus* was preoccupied as far back as 1887 by Balbiani in Protozoa. The above name is therefore suggested in its place, with the presumption that it only represents a subgenus, at most.

T. fuscus, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 270, ♀.

Erratum.—In my catalogue "a single perfect ♂" is an error for ♀.

Type in British Museum, according to Theobald (*loc. cit.*, vol. v), but in a previous letter to me he says in the "Hungarian Museum."

PSEUDOTHEOBALDIA, Theob., 1907.

Monog. Culic., iv, 271.

P. niveitaea, taai Theob., 1907.

Loc. cit., 272, fig. 87, ♂ genitalia; 88, wing ♂.

Loc.—Dehra Dun, February, March [*Thomson*].
Described from two perfect ♂ ♂.
Theog, Simla district, 2-v-07 [*Annandale*].
Type in British Museum.

TAENIORHYNCHUS, Arrib.

Add. Ref.—Theob., Monog. Culic., iv, 483 generic and egg notes.
Blanch., Moust., 381, fig. 244 generic chars. ♂ ♀; table of spp. p. 383.
Leices., Culic. Malaya, 163 table of six Malay spp.

T. ager, Giles.

Add. Ref.—Blanch., Moust., 385, ♂ ♀.
Leices., Culic Malaya, 168, ♂ ♀. Recorded from Kuala Lumpur, and Westlake, Hankow, 27-vi-07 [*Cornford*].

Add. Locs.—Sylhet, Jan. to May [*Hall*]; Miss Ludlow says it has been recorded from the Philippines. Calcutta, 2-ii-08; Balighai, near Puri, 26-x-08; Mandalay, 12-ii-08; Pallode, S. India, 14-xi-08; Kerumadi (S. end of Vembanaad Lake, Travancore State), 6-xi-08 [all *Annandale*].

N.B.—Leicester describes it from a large series bred from larvae from water at marshy edges of lakes, and entangled in floating green weed at the sides of a running stream.

T. argenteus, Ludlow.

Removed to *Theobaldiomyia*, nom. nov. for *Leucomyia*.

T. (?) aureosquammatus, Ludlow, 1909.

Can Ent., xli, 234, ♀.[1]

Theob., *T* (*?*) *aureosquamata* (*lapsus ?*) Monog., v, 425.
Loc.—Parang, Mindanao (Phil. Is.), December.
Type in Army Medical Museum, Washington

[1] Theobald (Monog., v) erroneously quotes the page as 101.

T. aurites, Theob.

T. brevicellulus, Theob.

Both referred to *Chrysoconops*.
Type of latter in British Museum.

T. confinnis, Arrib., 1891.

Dipt. Argent. La Plata, 49.

Theob., Monog. Culic., iii, 289.
Recorded from Chaca, Formosa, possibly incorrectly, as it is a South American species.

T. conopas, Frnfld.

Referred to *Chrysoconops*.

T. domesticus, Leices., 1908.

Culic. Malaya, 169, ♂ ♀.

Described from a series bred from larvae, and from adults from bungalow at Kuala Lumpur and elsewhere.

T. epidesmus, Theob., 1910.

Rec. Ind. Mus., iv, 22 ♀.

Theob., Monog. Culic., v, 429, ♀.
Described from a single perfect ♀ in the Indian Museum taken by Mr. Paiva at Bhogaon, Bengal, 2-x-08.

T. lineatopennis, Ludlow.

ADD. REF.—Theob., Monog. Culic., iv, 489, ♀.

N.B.—The *types* (in the Army Medical Museum, Washington) were labelled "inside screens of screened houses," Sept. 13, 14.

T. luteoabdominalis, Theob., 1910.

Rec. Ind. Mus., iv, 23 ♀.

Theob., Monog. Culic., v, 423.

A single perfect ♀ from Katihar, Purnea (Bengal), 5-x-08 [*Paiva*]. Very near *T. epidesmus*.
Type in Indian Museum.

T. ochraceus, Theob.

Referred to *Chrysoconops*.

T. pagei, Ludlow, ♂ ♀.

Given in Theobald's vol. v, 618, without reference to author's description, which is copied verbatim.

From Parang, Mindanao, Phil. Is., Oct. 27.

T. tenax, Theob.

Add. Ref.—Blanch., Moust., 386, ♀.
Leices., Culic. Malaya, 167, ♀.

Add. Locs.—Sylhet, March to June [*Hall*]; Manipur, August [*Gourlay*]; Balighai, near Puri, 23-x-08, at light, one ♀ [*Annandale*].

N.B.—Leicester describes from one ♀ taken in a bungalow at Kuala Lumpur.

Type in British Museum.

T. tenax, var. **ocellata**, Theob., 1907.

Monog. Culic., iv, 488, ♀.

Loc.—Kuching (Sarawak, Borneo), November [*Dr. Barker*]. This form apparently also occurs in China (*v.* Theob., Monog., iii, 259).

N.B.—There is a var. *maculipes*, Theob. (Monog., iv, 488), from African localities (White Nile, etc., v, pl iv, wing scales), and one termed *maculipes arabiensis* by Patton found in the Aden Hinterland.

Type in British Museum.

T. whitmorei, Giles.

Theobald says (Monog., v, 431) that Mr. Carter has examined the type and reports it a distinct "*Leucomyia.*" See *Theobaldiomyia*.

Type in British Museum.

CHRYSOCONOPS, Goeldi.

Os. Mosq. no Para, 114.
Theob., Monog. Culic., iv, 491.

C. aurites, Theob.

Removed here from *Taeniorhynchus*.

Add. Loc.—Kuala Lumpur, 10-xi-02 and 25-v-02 [*Durham*].

Miss Ludlow says it has occurred in the Philippines.

Type in British Museum.

C. brevicellulus, Theob.

Removed here from *Taeniorhynchus*.

ADD. REF.—Blanch., Moust., 389, ♂ ♀.
Leices., Culic. Malaya, 163, ♂ ♀.

ADD. LOC.—Ceylon [*Green*]; Sylhet, Saugar, Manipur Haut (Feb., May, June), Manipur, Aug. [*Gourlay*]; Calcutta, August; Philippines (*t. Ludl.*, Can. Ent., xli, 234).

Leicester describes from a large series taken in bungalows at Kuala Lumpur. He says the ♂ is described for the first time, but Blanchard antedates him.

Type in the British Museum.

C. conopas, Frnfld.

ADD. REF.—Blanch., Moust., 387, ♀ (*conopus*).
Leices., Culic. Malaya, 166, ♀.

N.B.—Blanchard spells it *conopus*, but Theobald reverts to the original spelling. Miss Ludlow says it has been recorded from the Philippines. Leicester describes from a single ♀ from Klang jungle, saying it is a very distinct and easily recognized species.

C. ochraceus, Theob.

ADD. REF.—Leices., Culic. Malaya, 164.

Described from specimens taken in bungalows at Kuala Lumpur.

Referred here from *Taeniorhynchus* by Theobald.

Type in British Museum.

C. pygmaeus, Theob., 1908.

Rec. Ind. Mus., ii, 300, ♀.

Loc. cit., iv, 25, ♂ pl. i, wing, pl. iii wing scales: Monog. Culic., v, 435, ♂ ♀, fig. 192 wing, 193 head ♂, 194 genitalia ♂, 195 wing ♀.

Described from a single perfect ♀ from Sylhet [*Hall*].

The ♂ described later, from examples from Purnea, Rajmahal, and Calcutta in July and August.

Type ♂ ♀ in Indian Museum, *co-type* ♂ in British Museum.

Dr. Annandale says the eyes of the ♂ are iridescent in life.

MANSONIA, Blanch.

ADD. REF.—Blanch., Moust., 375, generic chars. ♂♀.
Leices., Culic. Malaya, 171.

M. annulata, Leices., 1908.

Culic. Malaya, 174, ♀.

Described from examples from bungalows at Kuala Lumpur and elsewhere near rivers. Near *uniformis*.

M. annulifera, Theob.

ADD. REF.—Blanch., Moust., 380, ♀.
Leices., Culic. Malaya, 174, ♀ (copies Theobald's description).

ADD. LOCS.—Sylhet, May, June [*Hall*]; Manipur [*Gourlay*]; Calcutta, Aug. and Dec.; Port Canning, Dec. [*Annandale*]; Purneah, Oct.; Bhogaon, 7-viii-09 [both Bengal, and *Paiva*].

N.B.—At one time placed by Theobald in *Mansonioides*.[1]

Type in British Museum.

M. annulipes, Wlk.

ADD. SYN.—*Mansonia nero*, Dol., *t.* Blanch., Moust., 380, ♀.

ADD. REF.—Leices., Culic. Malaya, 172, ♂ ♀.

This latter author describes both sexes from a series taken in jungle near Klang, Kuala Lumpur, Port Swettenham and Jugra.

Very local, troublesome in jungle; probably a river breeder, according to Leicester.

I took one in Calcutta, 6-x-04.

Type in British Museum.

M. arabica, Giles, 1906.

Journ. Trop. Med., May 1906, 130.

Theob., Monog. Culic., v, 451.

LOC.—Isle of Barham, North Arabia.

N.B.—Properly speaking, should not be included in Oriental lists.

M. chrysogona, Knab, 1909 (November).

Entom. News Philad., xx, 386, ♂ ♀.

"*Chrysoconopas aurites*," Ludlow.

Described from one ♂ and two ♀ ♀ from Parang, Mindanao (Phil. Is.), 31-v-06.

Type (cat. No. 12,626) in United States National Museum.

In describing this species Miss Ludlow was under the impression she had *Taeniorhynchus aurites*, Theob., before her (*t. Knab*).

M. seguini, Laveran (*Panoplites id.*).

Blanchard admits this species as a good one (Moust., 380, ♀), from Hanoi, Tonkin, taken in the military hospital during the

1 "First Rep. on Culic. in Ind. Mus. Coll.," Rec. Ind. Mus., ii, 287—302 (1908).

fever season (July to September), where it was found to suck blood. Theobald (Monog. Culic., iv) notes that he has seen no example of the species, and that from the description he considered it identical with *uniformis*.

In the "Genera Insectorum" the name *seguini* is not mentioned. Theobald's latest suggestion is "close to, if not, *uniformis*, Theob."

M. septempunctata, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 494, ♀.
Closely related to *M. annulipes*, Wlk.

M. uniformis, Theob.

ADD. REF.—Blanch, Moust., 379, ♀.
Leices., Culic. Malaya, 171, ♂ ♀.

ADD. LOCS.—Sylhet i, ii, iii, v, vi, vii, xii [*Hall*]; Manipur, June and Sept., in stable and bungalow; Gopkuda Is., Lake Chilka, August: Bhogaon, 30-ix-08 and Oct.; Katihar, Oct. [both *Paiva*]; Balighai, near Puri, 23-x-08; Travancore and Cochin States, 19-xi-08 and 4-xi 08, "very common in bungalows;" Calcutta, 2-vii-07; Rangoon, 25-ii-08 [all *Annandale*]; Kuala Lumpur.

N.B.—Leicester says it is in some parts of Kuala Lumpur the most troublesome mosquito after *C. fatigans*, W. He describes the ♂ for the first time. He has only bred one example of the species; from a larva taken in a swamp.

Very common throughout the Philippines all the year round, according to Miss Ludlow's extensive tables, though she notes it is much more abundant during the winter.

It is recorded from many parts of Africa, also Madagascar and Australia, and it is a very variable species.

Type in British Museum.

MANSONIOIDES, Theob., 1907.

Monog. Culic., iv, 498, "closely related to *Mansonia*."

M. annulifera, Theob.

Replaced in *Mansonia*.

M. septemguttata, Theob., 1907.

Monog. Culic., iv, 499, ♀, figs. 226, 227 wings ♀.

LOC.—Sarawak [*Dr. Barker*].
Type in British Museum.

ETIORLEPTIOMYIA, Theob.

Syn. *O'Reillia*, Ludl., 1905. Can. Ent., xxxvii, 101.
Add. Ref.—Theob., Monog. Culic., iv. 505.
Leices., Culic. Malaya, 178 ("position undetermined").
Spelt *Etorleptiomyia* originally and placed in Corethrinae, but Theobald now considers it "undoubtedly culicid," though the proboscis is characterised as very weak.

E. completiva, Leices., 1908.

Culic. Malaya, 178, ♂.

Leicester thinks that the unique specimen sent him by Dr. Finlayson of Singapore, and from which this description was drawn up, represents the ♂ of some species of this genus. Theobald only describes the ♀ of his genus.

E. luzonensis, Ludl.

Add. Ref —Theob., Monog. Culic., iv, 506, ♀.
Type in Army Medical Museum, Washington.

MELANOCONION, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 507, further generic notes.
Glen Herrick, Ent. News Philad. (1905), p. 282.
Blanch., Moust., 395, ♂ ♀.
Leices., Culic. Malaya, 136.

M. juxtapallidiceps, Theob., 1910.

Monog. Culic., v, 456, ♀.

A single ♀ in the British Museum, from Trincomalee, Ceylon, taken by Green, Oct. 1907.

M. ornatus, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 508 ♀, fig. 231 wing ♀.

M. pallidiceps, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 509 ♂.

M. uniformis, Theob.

Add. Ref.—Leices., Culic. Malaya, 136, ♂ ♀.
Redescribed by Leicester from bred examples from hollow bamboo and other jungle trees. Probably entirely sylvan. Leicester notes that his present description corrects some errors in his

previous one sent to Mr. Theobald for publication in "The Entomologist."

OCULEOMYIA, Theob., 1907.

Monog. Culic., iv, 515.

O. fulleri, Ludl., 1909

Can. Ent., xli, 97, ♀.

Theob., Monog. Culic., v, 478 ♀ (Ludlow's descr. copied).
Loc.—Parang, Mindanao, Phil. Is., October.
N.B.—Miss Ludlow spells the genus *Oculiomyia*.

O. sarawakii, Theob., 1907.

Monog. Culic., iv, 515 ♀, fig. 236, head and ♀ haltere; 237, wing ♀; pl. vi, wing scales ♀.
Loc.—Sarawak [*Dr. Barker*]. Described from a unique specimen.
Type in British Museum.

POPEA, Ludlow.

This genus is now placed by Theobald (Monog., iv) between *Leicesteria* and *Howardina*. It is, by the way, almost preoccupied by *Poppea*, Stal., 1867, in Hemiptera.

P. lutea, Ludlow.

Type in Army Medical Museum, Washington.

RACHIONOTOMYIA, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 518.
In this volume Theobald places this genus next to *Oculeomyia*

R. ceylonensis, Theob

ADD. REF.—Theob., Monog. Culic., iv, 518, ♀.
Type in British Museum.

FINLAYA, Theob.

ADD. REF.—Blanch., Moust., 415.

N.B.—Mr. Theobald (Monog., iv) considers this genus and *Orthopodomyia* as intermediate between Culicinae and Aedinae.

F. aranetana, Banks.

Loc.—Negros Occidental, Phil. Is., 17—24-vi-1906

F. poicilia, Theob.

Add. Ref.—Blanch., Moust., 415.

N.B.—Theobald notes that the figure of wing scales on page 283 (Monog., iii) is slightly incorrect, and shows a corrected wing in vol. iv, 520, fig. 238, with other notes. Papuan specimens differ a little from Malayan ones. The species is recorded from N. Queensland by Dr. Bancroft.

Type in British Museum.

ORTHOPODOMYIA, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 527.
Leices., Culic. Malaya, 175.

Theobald admits this as intermediate between Culicinae and "Aedinae." Leicester (*loc. cit.*) notes its affinities with Aedeomyinae.

O. albipes, Leices. in Theob.

Add. Ref.—Theob., Monog. Culic., iv, 527, ♂ ♀.
Leices., Culic. Malaya, 176, ♂ ♀.

Leicester describes in above work from a long series bred from larvae from bamboos. Sylvan, probably not a blood-sucker.

Type in British Museum.

O. maculata, Theob., 1910.

Rec. Ind. Mus., iv, 29, ♂.

Monog. Culic., v, 473, ♂.

A single ♂: Indian Museum, from Maddathorai, 17-xi-08 [*Annandale*].

O. maculipes, Theob., 1910.

Monog. Culic., v, 470, fig. 208 head ♀, 209 wing, 210 wing ♀ (? error for ♂).

Loc.—Andaman Is., 22-vii-08 [*Lowis* and *Ray White*]; Peradeniya, Ceylon, 5-vii-09 [*Green*]; Maddathorai, S. India, 17-xi-08 [*Annandale*].

Type ♂ Indian Museum, ♀ British Museum.

O. nigritarsis, var.

Leicester notes (Culic. Malaya, 177) a new variety of this species, stating its affinities with *O. albipes*, but I have found no mention of any species of the name of *nigritarsis*.

The specimen was taken in the hollow of a tree on a small island, Pangkor-Haut, by Dr. Daniels.

REEDOMYIA, Ludlow.

Syn. *Lepidotomyia*, Theob., Ann. Mus. Hung, iii, 80.
Add. Ref.—*Reedomyia, id.*, Monog. Culic., iv, 257, ♂ ♀.

N.B.—Theobald (*l.c.*, iv, 249) notes that his *Lepidotomyia* in Ann. Mus. Hung., iii, referred to, and is a synonym of *Reedomyia*.

His second genus under this name stands good, with at present four Oriental species.

R. alboscutellata, Theob.

Removed here from "*Lepidotomyia*."

ADD. REF.—Theob., Monog. Culic., iv, 261 ♀, fig. 80 wing ♀.
Leices, Culic. Malaya, 132. ♂ ♀ (*Lepidotomyia id.*).

The latter author redescribes it from a series of adults from jungle near Kuala Lumpur, and from bred specimens from larvae from a jungle pool. Theobald spells this species *alboscutella* in vol. v, 257; presumably in error.

Type in Hungarian Museum.

R. lowisii, Theob., 1910.

Monog. Culic., v, 257, ♂ ♀; fig. 121 ♀ head, 122 wing, 123 head ♂, 124 wing ♂.

LOC.—Andaman Isles [*Lowis* and *Ray White*]; Galle, Ceylon, 6-iv-07 [*Bainbrigge Fletcher*].

Type in British Museum.

R. niveoscutellata, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 259, ♂ ♀; fig. 79 ♂ fore ungues.

Resembles *Culex pipiens*. Miss Ludlow says it has been recorded from the Philippines.

Type in British Museum.

R. pampangensis, Ludlow.

ADD. REF.—Theob., Monog. Culic., iv, 258, ♀.

Type in Army Medical Museum, Washington.

Sub.-Family *AEDEOMYINAE*.

ADD. REFS.—Aedeinae, Blanch., Moust., 398 (table of genera)
Aedinae, Theob., Monog. Culic., iv, 537.
Aedeomyinae, Leices., Culic. Malaya, 180.

Leicester gives notes on sub-family, also table of genera, in which he includes *Deinocerites*, Theob., *Aedeomyia*, Theob., *Aedes*, Mg., *Aioretomyia*, Leices., gen. nov., *Acalleomyia*, Leices, gen. nov., *Verrallina*, Theob., *Mimomyia*, Theob., *Uranotaenia*, Theob.,[1] *Ficalbia*, Theob., *Hodgesia*, Theob., *Zeugnomyia*, Leices., gen. nov.,

[1] Incorrectly attributed to Theobald instead of Arribalzaga.

Colonemyia, Leices., gen. nov., *Topomyia*, Leices., gen. nov., *Haemagogus*, Theob., *Skeiromyia*, Leices., gen. nov. Several of these genera are not represented in the East.

In his "genera of the *Aedes* type" Col. Alcock sinks *Mimomyia*, Theob., and *Pseudoskusea*, Theob.

SKUSEA, Theob.

By some authors referred to this sub-family, but herein it is retained in its position in my Catalogue.

LEPTOSOMATOMYIA, Theob.

Erratum.—In my reference to this genus (Cat., p. 362) change p. 80 to p. 110.

L. lateralis, Theob.

Add. Ref.—Theob., Monog. Culic., iv, 548 ♂ ; fig. 252, head, scutellum ungues ♂.

The *type* is partly dissected. I am uncertain whether it reposes in the British Museum or the Hungarian Museum.

AEDEOMYIA, Theob.

Add. Ref.—Blanch., Moust., 403, ♂ ♀, fig. 255, var. generic chars.

Leices., Culic. Malaya, 181.

This author says he cannot agree with Theobald in the relationship of this genus to *Aedes*. "Even the ♂ palpi, the only point of agreement, are very different from those in *Aedes*."

A. catasticta, Knab, 1909.

Ent. News Philad., xx (November), 387, ♀.

He only describes the ♀, apparently, but he must have had both sexes present as, in comparing it with *A. squamipenna*, Arrib., he says "the ♂ genitalia of the two species show specific differences."

A. squamipenna, Arrib.

(*Aedeomyia squammipenna*, Theob., Monog., vol. ii, *t.* Leices.)

Add. Ref.—Blanch., Moust., 404, ♀ (*squamipennis*).

Leices., Culic. Malaya, 182, ♂ ♀ (*squammipenna*).

Add. Locs.—Examples taken occasionally during the year in bungalows at Kuala Lumpur; Calcutta, at light, November; base of Dawna Hills, 2-iii-08 [*Annandale*]; at light at sea, 4 miles off Tuticorin, 25-v-08 [*Paiva*].

N.B.—Leicester reverses the correct quotation of this species, making it appear as if Arribalzaga's name was a synonym, whereas the species was first described by him.

PSEUDOGRAHAMIA, Theob., 1910.

Rec. Ind. Mus., iv, 26, near *Grahamia*, Theob.

P. aureoventer, Theob., 1910.[1]

Loc. cit., 27, ♀.

LOC.—Pallode, Travancore State, S. India, 16-xi-08, a single ♀ [*Annandale*].

"A very marked and beautiful species which cannot be confused with any other culicid."

N.B.—Care must be taken to avoid confusion through the similarity of these generic names, *Grahamia*, *Pseudograhamia*, *Grabhamia* and *Pseudograbhamia*.

SQUAMOMYIA, Theob., 1910.

Rec. Ind. Mus., iv, 28.

Theob., Monog. Culic., v, 529.

S. inornata, Theob., 1910.

Rec. Ind. Mus., iv, 28, ♂.

Theob., Monog. Culic., v, 529, ♂.

Described from a single ♂ in the Indian Museum from the Dawna Hills (2—3 000 ft.), 2 or 3-iii-08 [*Annandale*].

AEDES, Mg.

ADD. REF.—Blanch., Moust., 399, ♂ ♀.
Leices., Culic. Malaya, 183.

"This genus is closely related to *Culex* and *Melanoconion* on the one hand, and less so to *Aioretomyia* amongst the Aedeomyinae. In fact, nothing could better show how unscientific is a classification based on palpi, than that genera so closely related as *Culex*, *Melanoconion* and *Aedes* should be placed in different families" (Leicester).

N.B.—Leicester, I *hope*, means "sub-families."

A. butleri, Theob.

N.B.—In his Monog., iii, 295, Theobald created the genus *Verralina* for *Aedes butleri* and two other species; and Blanchard (Moust., 417) retains the genus, but in the "Genera Insectorum" Theobald does not mention it, referring *butleri* to the "uncertain position" section of the species of *Aedes*.

Type in British Museum.

[1] This species has inadvertently been dealt with before, *see* p. 460. The mistake was discovered too late for correction in the text.—*Ed.*

A. malaya, Leices., 1908.

Culic. Malaya, 184, ♀.

Bred from larvae from pond in Kuala Lumpur.

A. nigrescens, Theob., 1907.

Monog. Culic., iv, 540, fig. 246 wing ♀, 247 ♂ genitals, pl. vi, wing scales ♀.

Loc.—Castle Rock (Canara Dist., S.-West India), Jan. to March.

"A very small species, looking like a *Melanoconion*" (Theob.).

Type in British Museum.

AIORETOMYIA, Leices., 1908.

Culic. Malaya, 185. "Near *Verrallina* and *Howardina*."

A. aedes, Leices., 1908.

Loc. cit., 189, ♂.

One ♂ bred from a larva from a pond in Kuala Lumpur, the species doubtfully referred by the author to this genus.

A. ostentatio, Leices., 1908.

Loc cit., 193, ♀.

Described from a series of ♀ ♀, some from larvae from a jungle pool, and some taken as adults. Sylvan species, a vicious day biter.

A. perdita, Leices., 1908.

Loc. cit., 192, ♂.

Description drawn up from recollection from a single ♂ taken at midday in jungle five miles from Kuala Lumpur.

The *type* is lost.

A. singularis, Leices., 1908.

Loc. cit., 188, ♂.

A single ♂ from a bungalow in Kuala Lumpur.

A. taeniata, Leices., 1908.

Loc. cit., 190, ♀.

Two ♀ ♀ only taken at midday in jungle near Kuala Lumpur.

A. varietas, Leices., 1908.

Loc. cit., 185, ♂ ♀.

Fairly common in Malayan jungle, where the ♀ bites viciously. Occurs at Kuala Lumpur, Ulu Gombak, Pangkor Haut and Klang. Leicester only bred one example, a ♂.

ACALLEOMYIA, Leices., 1908.

Loc. cit., 194.

A. obscura, Leices., 1908, emend. mihi.

Loc. cit., 194, ♂ ♀ (*obscurus*).

No notes or dates are given.

VERRALLINA, Theob., 1903.

Monog. Culic., iii, 295.

ADD. REF.—Leices., Culic. Malaya, 196.

V. butleri, Theob.

(*Aedes. id.*) Theob., Monog. Culic., ii, 230

ADD. REF.—Leices., Culic. Malaya, 196, ♂ ♀.

The ♂ described for the first time. The commonest mosquito in the mangrove swamps; not unlike *Stegomyia fusca*, Leices.: larva living in brackish pools in mangrove swamps.

N.B.—Although Theobald created *Verrallina* for this species, he ignores the genus in the "Genera Insectorum," placing *butleri* in the "uncertain position" section of *Aedes*. But in vol. v he replaces it in the present genus

Type in British Museum.

V. fragilis, Leices., 1908.

Culic. Malaya, 199, ♂.

A sylvan species in jungle near Kuala Lumpur.

N.B.—Possibly the same species as *malayi*; if so, the name *fragilis* must stand.

V. imitator, Leices., 1908.

Loc. cit., 201, ♀.

Two ♀ ♀ from jungle five miles from Kuala Lumpur.

Types rather damaged, but distinct.

A. varietas, Leices., 1908.

Loc. cit., 185, ♂ ♀.

Fairly common in Malayan jungle, where the ♀ bites viciously. Occurs at Kuala Lumpur, Ulu Gombak, Pangkor Haut and Klang. Leicester only bred one example, a ♂.

ACALLEOMYIA, Leices., 1908.

Loc. cit., 194.

A. obscura, Leices., 1908, emend. mihi.

Loc. cit., 194, ♂ ♀ (*obscurus*).

No notes or dates are given.

VERRALLINA, Theob., 1903.

Monog. Culic., iii, 295.

ADD. REF.—Leices., Culic. Malaya, 196.

V. butleri, Theob.

(*Aedes. id.*) Theob., Monog. Culic., ii, 230

ADD. REF.—Leices., Culic. Malaya, 196, ♂ ♀.

The ♂ described for the first time. The commonest mosquito in the mangrove swamps; not unlike *Stegomyia fusca*, Leices.: larva living in brackish pools in mangrove swamps.

N.B.—Although Theobald created *Verrallina* for this species, he ignores the genus in the "Genera Insectorum," placing *butleri* in the "uncertain position" section of *Aedes*. But in vol. v he replaces it in the present genus

Type in British Museum.

V. fragilis, Leices., 1908.

Culic. Malaya, 199, ♂.

A sylvan species in jungle near Kuala Lumpur.

N.B.—Possibly the same species as *malayi*; if so, the name *fragilis* must stand.

V. imitator, Leices., 1908.

Loc. cit., 201, ♀.

Two ♀ ♀ from jungle five miles from Kuala Lumpur. *Types* rather damaged, but distinct.

V. indecorabilis, Leices., 1908.

Loc. cit., 200, ♂ ♀.

Bred from larvae from small jungle pool near Kuala Lumpur. Very near *imitator*.

V. malayi, Leices., 1908.

Loc. cit., 198, ♀.

One ♀ in jungle ten miles from Kuala Lumpur.
? ♀ of *fragilis* (Leicester).

V. virilis, Leices., 1908.

Loc. cit., 197, ♂.

One ♂ from jungle a few miles from Kuala Lumpur.
Near *V. malayi*.

BOLBODEOMYIA, Theob., 1910.

Rec. Ind. Mus., iv, 31.

B. complex, Theob., 1910.

Loc. cit., 31, ♂ ♀.

Monog. Culic., v, 581, ♂ ♀, fig. 253 ♂ genitalia, 254 wing ♂, 255 wing ♀.

Loc.—Dawna Hills, 2—3,000 ft., 1—3-iii-08 [*Annandale*].

Types (a unique pair) in Indian Museum.

N.B.—There is a *Bolbodimyia* by Bigot, 1892, in Tabanidae (Wien. Ent. Zeit., xi, 162).

MIMOMYIA, Theob.

Add. Ref.—Blanch., Moust., 419.
Leices., Culic. Malaya, 202; notes, apparently criticising its place in this sub-family.

M. chamberlaini, Ludlow.

Vide *Ludlowia*.

M. minuta, Theob., 1908.

Rec. Ind. Mus., ii, 301, ♂.

Theob., *Loc. cit.*, iv, 30, ♀; pl. i wing, pl. iii wing scales.
Id., Monog. Culic. v, 531, ♂ ♀, fig. 226 wing.
Locs.—Sylhet, 27-xi-04 [*Hall*]; Calcutta, 30-vii and 3 or 4-viii-07 [*Annandale*].
Types in British Museum.

RUNCHOMYIA, Theob.

Syn. *Binotia*, Blanch., 1904 (Archiv. de Parasit., viii, 478). Blanchard's name, suggested, on account of alleged preoccupation (*Rhynchomyia*, R. Des., in Muscinae), cannot stand, the names not being identical.

R. philippinensis, Giles.

ADD. REF.—Theob., Monog. Culic., v, 555 (copies Giles's descr.).

Type in British Museum. Theobald has not seen it, but says that Banks says "this species is identical with *Uranotaenia nitidoventer* Giles, but both are incorrectly placed as to genera." Mr. Carter also thinks the present species neither a *Runchomyia* nor a *Uranotaenia*.

LUDLOWIA, Theob., 1907.

Monog. Culic., iv, 193, ♂.

Established for *Mimomyia chamberlaini*, Ludlow, also to comprise a Soudanese species.

L. chamberlaini, Ludlow.

(*Mimomyia id.*, Ludlow.)

ADD. REF.—Theob., Monog. Culic., iv, 194, ♂ (Miss Ludlow's description copied).

N.B.—This author adds that since vol. iv of his Monograph went to press Miss Ludlow has sent him a description of the ♀.

Type in British Museum.

L. minima, Ludlow, 1907.

Can. Ent., xxxix, 413, ♂ ♀.

Theob., Monog. Culic., v, 191, ♂ ♀ (copies Miss Ludlow's description).

Type in Army Medical Museum, Washington.

ANISOCHELEOMYIA, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 570.

A. alboannulata, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 573. ♂, fig. 267 wing ♂; pl. vii wing scales ♀

N.B.—*Type* (unique) in British Museum. "The species is a very beautiful and marked one, and cannot be confused with any other" (Theob.).

A. albitarsis, Ludlow.

Add. Ref.—Theob., Monog. Culic., iv, 576, ♀ (Miss Ludlow's description copied).

N.B.—*Type* in Army Medical Museum, Washington. Theobald thinks its place in this genus doubtful.

FICALBIA, Theob.

Add. Ref.—Blanch., Moust., 418.
Leices., Culic. Malaya, 228.

F. longirostris, Leices., 1908.

Culic. Malaya, 228, ♂ ♀.

Bred from larvae from stagnant water at Kuala Klang in January; a very distinct species. Apparently slightly aberrant.

F. minima, Theob.

Add. Ref.—Blanch., Moust., 418

N.B.—First placed in *Uranotaenia*, then referred here.

As Theobald (Monog., v) retains a species of this name under both genera, it is left here for the present.

Type in British Museum.

F. simplex, Theob.

Add. Ref.—Blanch., Moust., 418.
Theob., Monog. Culic., v, 541, ♀, fig. 235 wing.

Add. Loc.—Two ♀ ♀ from Trincomalee, xi-1906 [*Green*].

Type in British Museum.

PSEUDOURANOTAENIA, Theob., 1905.

Journ. Econ. Biol., i, 33.

Theob., Monog. Culic., iv, 566, fig. 262 (p. 567) wing ♂.

P. parangensis, Ludl., 1909.

Can. Ent., xli, 24, ♀.

Theob., Monog. Culic., v, 524 (copies Miss Ludlow's description).

Loc.—Parang, Mindanao (Phil. Is.).

P. triangulata, Ludl., 1908.

Can. Ent. xl, 331, ♂.

Theob., Monog. Culic., v, 525 (copies Miss Ludlow's description).

Loc.—Reine Regente, Mindanao (Phil. Is.); February.

URANOTAENIA, Arrib.

ADD. REF.—Blanch., Moust., 406, ♂ ♀ generic chars.
Leices., Culic. Malaya, 203 (genus incorrectly attributed to Theobald).
Table of 18 new Malayan species.

U. argyrotarsis, Leices., 1908.

Culic. Malaya, 214, ♂ ♀.

Described from series bred from larvae from a pool in a patch of jungle five miles from Kuala Lumpur, and one adult on surface of same pool. Very distinct.

U. atra, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 563, ♀.

U. bicolor, Leices., 1908

Culic. Malaya, 225, ♂ ♀.

Bred from larvae from the marshy edges of a jungle stream in Kuala Lumpur. Leicester has not captured the adult, which is the largest Malay species after *maxima*.

U. bimaculata, Leices., 1908.

Loc. cit., 226 ♀.

Fairly common in damp places of jungle at "The Gap," Kuala Lumpur, the only place it seems to occur at.

U. bimaculiala, Leices., 1908.

Loc. cit., 208, ♂ ♀.

The ♂ from Raub jungle; the ♀ described from a series caught over jungle pools (presumably at Kuala Lumpur). Near *unimaculiala*.

U. caeruleocephala, Theob., var. lateralis, Ludlow.

In vol. v Theobald makes it a species.

U. campestris, Leices., 1908.

Culic. Malaya, 21?, ♂ ♀.

Very near *Verrallina pygmaea*, Theob. Captured on swampy ground.

U. cancer, Leices., 1908.

Loc. cit., 215, ♂ ♀.

Abundant in crab holes at Port Swettenham, and among Nepah palms at that place, and Klang. Larvae in crab holes or stagnant pools. Male very distinct.

U. ceylonica, Theob., 1910.

Monog. Culic., v, 503, ♀, fig. 213 wing.

Loc.—Galle, Ceylon, 10-iv-07 [*Bainbrigge Fletcher*].
Type (a unique specimen) in British Museum.

U. fusca, Leices., 1908.

Culic. Malaya, 227, ♂ ♀.

Described from a series bred from larvae from a pool at Sungei Limbing, Malay Peninsula, taken by Dr. Daniels.

U. lateralis, Ludl.

Phil. Journ. Sci., i, 190.
Syn. *U. caeruleocephala*, Th., var. *lateralis*, Ludl. Mosq. Phil. Is., p. 10.

U. longirostris, Leices., 1908.

Loc. cit., 217, ♂.

Only one specimen known, bred from a pupa taken in a pond (presumably at Kuala Lumpur).

U. lutescens, Leices., 1908.

Loc. cit., 222, ♂ ♀.

A bamboo sylvan breeder, Leicester has not taken the adult form. Presumably from Kuala Lumpur.

U. maculipleura, Leices., 1908.

Culic. Malaya, 223, ♀.

Only one specimen known, taken by a jungle stream six miles from Kuala Lumpur.

U. malayi, Theob.

Add. Ref.—Blanch., Moust., 410.
Type in British Museum.

U. maxima, Leices., 1908.

Culic. Malaya, 221, ♀.

Described from specimens taken at "The Gap," Selangor. The largest Malay species. Dr. Leicester possesses a ♂ which may be that of this species.

U. micans, Leices., 1908.

Loc. cit., 206, ♂ ♀.

Described from a series taken on marsh land, Malaysia.

U. minima, Theob.

See *Ficalbia id.*

U. modesta, Leices., 1908.

Culic. Malaya, 218, ♂ ♀.

Described from a series bred from larvae from water in a hollow tree in Ampang jungle.

U. nitidoventer, Giles.

See *Runchomyia philippinensis.*

U. nivea, Leices., 1908.

Loc. cit., 211, ♂.

Only one specimen known, taken by Dr. Leicester in his bungalow at Kuala Lumpur.

U. nivipleura, Leices., 1908.

Loc. cit., 219, ♂♀.

Described from a single pair: ♂ taken by Leicester at "The Gap," Selangor. ♀ sent by Dr. Finlayson, bred from a larva in a pitcher plant at Singapore.

U. powelli, Ludl., 1909

Can. Ent., xli, 235, ♀.

Theob., Monog. Culic., v, 519, ♀.

The locality is given as Yayabas (Phil. Is.), which is probably a misprint for Tayabas. January.

U. testacea, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 560, ♀, fig 258 wing ♀.

ADD. LOC.—Base of Dawna Hills, 4-iii-08 [*Annandale*]; Phil. Is. [*t. Ludlow*].

U. trilineata, Leices., 1908.

Culic Malaya, 204, ♂ ♀

Larvae found in quiet pools, adults in neighbourhood of jungle pools. The only species in Malaysia with a banded proboscis.

U. unilineata, Leices., 1908.

Culic. Malaya, 220, ♂ ♀.

In jungle close to water. Leicester has found females full of blood. Malaysia.

U. unimaculata, Leices., 1908.

Culic. Malaya, 210, ♀.

Near water in jungle, Malaysia. ♂ unknown.

ZEUGNOMYIA, Leices., 1908.

Culic. Malaya, 231.

Links *Uranotaenia* to *Colonemyia* and *Skeiromyia*, and thence to *Wyeomyia*.

Z. gracilis, Leices., 1908.

Culic. Malaya, 232, ♂ ♀.

Fairly common in certain localities, especially October to December; a vicious biter. Occurs all the year sparsely at Jugra and Kuala Lumpur. Larvae in water in fallen leaves, feeding on other larvae. (*Leicester*).

COLONEMYIA, Leices., 1908.

Culic. Malaya, 233.

C. caeruleocephala, Leices., 1908.

Loc. cit., 233, ♂ ♀.

Described from a series of both sexes bred from larvae from bamboo water at Bukit Kutu and Ulu Klang (Malaysia).

C. hybrida, Leices., 1908.

Loc. cit., 237, ♀.

One ♀ at Bukit Kutu; quite distinct.

C. mendacis, Daniels, 1908.

Studies from Instit. for Med. Research (Fed. Malay States), iii, 266, ♂ ♀.

"Notes on the Mosquitoes on the river and coast district of the eastern side of the Peninsula," C. W. Daniels.

N.B.—Sequential to Leicester's paper.

Bred from larvae from pitcher plants on East Coast, Malay Peninsula.

TOPOMYIA, Leices., 1908.

Culic. Malaya, 238.

Very near *Zeugnomyia* and *Colonemyia*.

T. argyropalpis, Leices., 1908.

Loc. cit., 242, ♂ ♀.

A unique ♂ from a stream at "The Gap," Selangor, in April. The unique ♀ by a jungle stream five miles from Kuala Lumpur in March.

T. argyroventralis, Leices., 1908.

Loc. cit., 240, ♂ ♀.

Described from 2 ♂ ♀ and a series of ♀ ♀ from "The Gap," Selangor, near jungle streams. Possibly the two sexes described under this name by Leicester are not of the same species, but *T. tipuliformis* may be the real ♂. (Leicester.)

N.B.—If this should prove the case, the name must stand for the ♂ according to zoological precedent, and "*argyroventralis* ♀" be sunk as the ♀ of "*tipuliformis*;" the present suggested ♂ of *argyroventralis* being either renamed or allowed to retain that specific name.

T. decorabilis, Leices., 1908.

Loc. cit., 239, ♂ ♀.

One ♂ and ♀ at "The Gap," Selangor, in jungle.

T. durbitans, Leices., 1908.

Loc. cit., 246, ♀.

A unique ♀ from "The Gap" in May.

T. gracilis, Leices., 1908.

Loc. cit., 244, ♂ ♀.

"The Gap," Selangor, May.

T. minor, Leices., 1908.

Loc. cit., 238, ♂ ♀.

In jungle near Kuala Lumpur near streams. Both sexes, when settled, have a habit of dancing up and down like certain Tipulidae.

T. nigra, Leices., 1908.

Loc. cit., 245, ♂ ♀.

Near jungle streams at Ampang, six miles from Kuala Lumpur, May.

T. rubithoracis, Leices., 1908.

Loc. cit., 243, ♂ ♀.

Described from two ♂ ♂ and a series of ♀ ♀.

T. tipuliformis, Leices., 1908.

Loc. cit., 247, ♂.

Several ♂ ♂ near a stream in "The Gap" jungle, and in the dried bed of a stream at Raub. Leicester suggests that this may be the ♂ of "*rubithorax*" (? lapsus). He also previously suggests it is the same as *argyroventralis* (*vide* note under *argyroventralis*).

Abdomen very thin, longer proportionately than in any other species of the family, and in general appearance closely resembling several species of Tipulidae.

SKEIROMYIA, Leices., 1908.

Culic. Malaya, 248.

S. fusca, Leices., 1908.

Loc. cit., 248, ♂ ♀.

Leicester has not seen the adult, except when bred, from larvae, which are common in bamboo.

HODGESIA, Theob.

Add. Ref.—Leices., Culic. Malaya, 229.

N.B.—To the generic definition, Leicester proposes to add "antennae pilose in ♂ and ♀."

H. malayi, Leices., 1908.

Culic. Malaya, 231, ♂ ♀.

Described from a series bred from jungle pools near Kuala Lumpur.

H. quasisanguinae, Leices., 1908.

Loc. cit., 230, ♀.

In jungle near Kuala Lumpur; a vicious biter.

H. sanguinea, Theob.

Type in British Museum.

WYEOMYIA, Theob.

ADD. REF.—Leices., Culic. Malaya, 250.

N.B.—Leicester admits a sub-family Wyeomyinae, with the following genera: *Wyeomyia* Theob., *Phoniomyia* Theob., *Dendromyia* Theob., *Runchomyia* Theob., *Sabethes*, *Sabethoides*, *Goeldia*, *Limatus*, *Malaya*, Leices., all gen. nov.; giving a table of them, several however not being Malayan.

W. aranoides, Theob.

ADD. REF.—Blanch., Moust., 425.
Type in British Museum.

W. funerea, Leices., 1908.

Culic. Malaya, 252, ♀.

A unique ♀ from jungle six miles from Kuala Lumpur.

W. greenii, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 596.
Blanch., Moust., 423.
ADD. LOC.—Peradeniya [*Green*].

N.B.—Mr. Theobald omitted this species from the "Genera Insectorum" but mentions it, as above, for a good species.
Type in British Museum.

W. metallica, Leices., 1908.

Culic. Malaya, 251, ♀.

A unique ♀ in bungalow at Bukit Kutu, Malaysia.

W. nepenthicola, Banks, 1910.

Phil. Journ. Sci., iv, 550, ♂ ♀.

LOC.—Benguet, Trinidad (Phil. Is.). Bred from larvae in pitchers of *Nepenthes alata*, Bl.
Type ♂ ♀ (No. 8159) in entomological coll., Bureau of Science, Manila.

PHONIOMYIA, Theob.

Erratum.—"Vol. ii" is a misprint for vol. iii in my Catalogue, p. 365.

ADD. REF.—Blanch., Moust., 425.
Leices., Culic. Malaya, 253.

N.B.—The name of this genus is likely to be confounded with *Phonomyia* established in Tachinidae by Brauer and Bergenstamm in 1894.

P. bimaculipes, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 600, ♀.
"A very distinct and beautiful species" (Theob.).

P. caeruleocephala, Theob., 1910.

Monog. Culic., v, 577, ♂ ♀, fig. 252 wing.

LOC.—Hakgala, Ceylon, iii-07 [*Green*].
Types, a unique pair, in British Museum.

P. indica, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 601, ♂, fig. 275 wing ♀.
Redescribing the species in this volume, the author repeats, "Described from a perfect ♂," and again makes no direct reference to the ♀, yet he figures a wing marked ♀. Is this in error?

In vol. v he says simply that the *type* is from Singapore.

Leicester records a ♂ and two ♀ ♀ from jungle, six miles from Kuala Lumpur.

POLYLEPIDOMYIA, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 625.

P. argenteiventris, Theob.

ADD. REF.—Theob., Monog. Culic., iv, 625, fig. 292 wing ♀.
N.B.—The *types* were taken November and December 1892.

DENDROMYIA, Theob., 1903.

Monog. Culic., iii, 313.

Blanch., Moust., 426.

Leices., Culic. Malaya, 254.

Syn. *Heinzmannia*, Ludlow.

N.B.—*Heinzmannia* is sunk for *Dendromyia*. Mr. Theobald says (Monog., iv, 603) that, due to some error of his in writing to

Miss Ludlow, she founded her genus on a species which is an undoubted *Dendromyia*.

D. achaetae, Leices., 1908.

Culic. Malaya, 257, ♀.

Described from a single example; genitalia very concealed, and sexes very alike in this genus.

D. aureochaeta Leices., 1908.

Loc. cit., 255, ♀.

A series of ♀ ♀ taken by day in jungle near Kuala Lumpur in April and May.

D. communis, Leices., 1908.

Loc. cit., 254, ♀.

Described from one ♂ and a series of ♀ ♀ from "The Gap," Selangor.

D. scintillans, Ludlow.

(*Heinzmannia id., id.*)

This species was described from a perfect ♀, except that the antennae are missing.

Type in Army Medical Museum, Washington.

PHILODENDROMYIA, Theob., 1907.

Monog. Culic., iv, 623.

P. barkeri, Theob., 1907.

Monog. Culic., iv, 623, ♂, fig. 289 head, scutellum, palpus ♂, fig. 290 wing ♂, pl. vii, wing scales ♀.

Loc.—Sarawak, in July [*Dr. Barker*]. Described from two ♂ ♂ taken in a house.

Type in British Museum.

MALAYA, Leices., 1908.

Culic. Malaya, 258.

M. genurostris, Leices., 1908.

Loc. cit., 258, ♂.

Taken by Dr. Daniels in bungalow in Malay Peninsula.

HARPAGOMYIA, Meij., 1909.

Tijd. voor. Ent., lii, 165.

N.B.—The author places this simply in "Aedeinae," without any more definite note as to its exact position, so I place it here at the end of this sub-family.

H. splendens, Meij., 1909.

Tijd. v. Ent., lii, 167, ♂ ♀, pl. x, 1—9 (var. figs.).

Loc.—Java.

N.B.—The author notes that this mosquito is eaten by the widely distributed ant *Crematogaster difformis*, Smith.

Sub-Family *CORETHRINAE.*

Corethra and its allies form a sub-family of Culicidae, and cannot morphologically be separated from this family. The absence of a biting mouth, and the absence of scales on the body are quite secondary characters.

Moreover, the discovery in Ceylon quite recently by Major MacDougall, R.A.M.C., of a new genus which Dr. Annandale has described as *Ramcia*[1] irrevocably links together, on account of its undeniably intermediate nature, the two groups Culicinae and Corethrinae. The short, feeble proboscis and absence of scales on the head, body and legs approximate it to the Corethrinae, the presence of scales on the distal half of all the longitudinal veins connects it with the Culicinae. Two peculiarities of venation distinguish it: the 1st longitudinal vein ends soon after the middle of the wing, running parallel to the auxiliary vein, instead of reaching the distal margin as in both Culicinae and Corethrinae, in this peculiarity resembling *Phlebotomus*; and, secondly, the 2nd longitudinal vein begins almost in a line with the origin of the 3rd and comparatively close to it instead of some distance before it, as in both Culicinae and Corethrinae. Only the male is known, but the larva and pupa were also obtained and from the characters of these Dr. Annandale considers its total affinities lie mainly with the Corethrinae.

Two short papers of mine[2] thoroughly investigate the synonymy of *Corethra*, Mg., *Sayomyia*, Coq., and *Chaoborus*, Lichtenstein, with the result that it is found that no species of *Corethra*, Mg., occurs in the East, the genus being apparently restricted to two or three European species. The genus *Sayomyia* is antedated by Lichtenstein's *Chaoborus*, as admitted by Coquillett himself, and both *asiatica*, Giles, and *cornfordi*, Theob., certainly belong here,

[1] Thus named, by special request of Major MacDougall, after the Royal Army Medical Corps.

[2] "Synonymy in Corethrinae," Rec. Ind. Mus., iv, 317, and vi, 227.

whilst there can be no reasonable doubt that *manilensis*, Sch., is also congeneric.

RAMCIA, Annandale, 1911.

Spolia Zeyl., vii, pt. xxviii, p. 187 (Aug., 1911).

R. inepta, Annandale, 1911.

Spolia Zeyl., vii, pt. xxviii, p. 189, fig. (p. 188) and plate giving larva, pupa, wing, and other characters.
Type in the possession of Major A. J. MacDougall, R.A.M.C.

CHAOBORUS, Lichtenstein, 1800.

Syns. *Sayomyia*, Coq. "*Corethra*" Auct.

C. asiatica, Giles.

ADD. LOCS.—Calcutta Zoological Gardens, May, July, August, "common, resting on damp walls during daytime and flying to light at night" [*Annandale*]; also occurs in Calcutta, September, November and December; Sibpur (near Calcutta), August; Katihar, Purnea District, at light.

INDEX.

		Page
Acalleomyia Leices.	.. ..	491
acaudata Leices.	Teromyia	438
achaetae Leices.	Dendromyia	503
aconita Don. (aconitus)	Anopheles	415
Aedeomyia Theob.	.. .. ..	488
AEDEOMYIINAE Leices.	=AEDINAE	487
aedes Leices.	Aioretomyia	490
Aedes Mg.	.. .. ..	487
AEDINAE Theob.	.. .. ..	487
ager Giles	Taeniorhynchus	478
Aioretomyia Leices.	.. ..	490
aitkenii James in Theob.	Anopheles	415
albipes Leices. in Theob.	Orthopodomyia	486
albipes Theob.	Stegomyia	444
albirostris Theob.	Myzomyia	418
albitarsis Ludl.	Anisocheleomyia	494
alboannulata Theob.	id.	493
alboannulatus James and List.	=Myzorhynchus albotaeniatus Theob.	424
albolateralis Theob.	Stegomyia	444
albolineata Theob.	Scutomyia	452
albolineatus Giles	Culex	466
albopictus Skuse	=Stegomyia scutellaris Wlk. ..	449
albopleura Theob.	Culex	466
alboscutellata Theob.	Reedomyia	487
albotaeniata Leices. in Theob.	Danielsia	458
albotaeniatus Theob.	Myzorhynchus	424
albus Leices.	Culex	466
Aldrichia Theob.	=Aldrichinella	433
Aldrichinella Theob.	.. .. ..	433
alis Theob.	Culex	466
Amauromyia Leices.	.. .. ..	450
ambigua Theob.	Grabhamia	461
amboinensis Doles.	Toxorhynchites	435
amesii Ludl.	Stegomyia	444
angulata Theob.	Culex	466
Anisocheleomyia Theob.	.. .. ..	493
annandalei Theob.	Kingia	443
annandalei Theob.	Stegomyia	444
annularis Wulp	Myzomyia	418
annulata Leices	Mansonia	482
annulata Theob.	Culiciomyia	457
annulata Theob.	Trichopronomyia	477
annulatus Blanch. (Culex)	Theobaldia	459
annulifera Theob.	Mansonia	482
annuliferus Ludl.	Culex	466
annulioris Theob.	Culex	466
annulipalpis Theob.	Brevirhynchus	442
annulipes Wlk.	Mansonia	482
annulirostris Theob.	Stegomyia	444
annulitarsis Leices.	Leicesteria	454
annuloabdominalis Theob.	Culiciomyia	457
annulus Theob.	Culex	466
Anopheles Mg. s. lato.	.. .. ..	434
id. id s. str.	.. .. ..	415
ANOPHELINAE	.. .. ..	414
apicalis Theob.	Blanchardiomyia (Desvoidya) ..	441

		Page
apicalis Theob.	Brevirhynchus	443
apicalis Theob.	Leicesteria	454
arabica Giles	Mansonia	482
arabiensis Patton	"Anopheles"	434
arabiensis Patton	Culex	467
aranetana Banks	Finlaya	485
aranoides Theob.	Wyeomyia	501
argentea Ludl. (Taenio. argenteus)	Theobaldiomyia	462
argenteiventris Theob.	Polylepidomyia	502
argenteomaculata Theob.	Stegomyia	444
argenteotarsis Ludl.	Toxorhynchites	435
argenteus Ludl.	Theobaldiomyia (Leucomyia). argentea	462
argentinotus Banks	Culex	467
argyropalpis Leices.	Topomyia	499
argyrotarsis Leices.	Uranotaenia	495
argyroventralis Leices.	Topomyia	499
Armiger Hartmann	v. Blanchardiomyia	441
Armigeres Theob.	id.	441
asiatica Giles	Chaoborus	505
asiatica Leices.	Lophoscelomyia	427
assamensis Theob.	Stegomyia	445
ater Daniels	Teromyia	438
atra Theob.	Uranotaenia	495
aurantia Theob.	Pardomyia	460
auratus Leices.	Culex.	467
aurea Leices.	Conopomyia	453
aureochaeta Leices.	Dendromyia	503
aureolineata Theob.	Blanchardiomyia (Desvoidya)	441
aureosquammatus Ludl.	Taeniorhynchus	478
aureostriata Leices.	Ekrinomyia	440
aureostriatus Doles.	Culex	467
aureoventer Theob.	Pseudograhamia	460
aurites Ludl. (Chrysoconops)	=Mansonia chrysogona Knab	482
aurites Theob.	Chrysoconops	479
aurostriata Banks	Stegomyia	445
auxifer	=Culex fatigans W.	468
azriki Patton	Myzomyia	418
Banksiella Theob.		477
barbirostris v. Wulp	Myzorhynchus	424
barianensis James	Anopheles	415
barkeri Theob.	Philodendromyia	503
bicolor Leices.	Uranotaenia	495
bicornuta Theob.	Lophoceratomyia	463
bimaculata Leices.	Uranotaenia	495
bimaculiala Leices.	id.	495
bimaculipes Theob.	Phoniomyia	502
Binotia Blanch.	=Runchomyia Theob.	493
bipunctata Theob.	var. Theobaldiomyia (Leucomyia) gelidus	463
biroi Theob.	Culex	467
Bironella Theob.		433
Blanchardiomyia Brun. nom. nov. for Desvoidya.		440
Bolbodeomyia Theob.		492
brevicellulus Theob.	Chrysoconops	481
brevipalpis Giles	Stegomyia.	445
brevipalpis Theob.	Lophoceratomyia	464
brevipalpis Theob.	Toxorhynchites	435
Brevirhynchus Theob.		442
butleri Theob.	Aedes	489
butleri Theob.	Verrallina	491

		Page
caeca Theob.	Pecomyia	459
caecus Theob.	Culex	467
caeruleocephala Leices.	Colonemyia	498
caeruleocephala Theob.	Uranotaenia	495
caeruleocephala Theob.	Phoniomyia	502
calopus Mg.	=Stegomyia fasciata F.	446
Calvertia Ludl.	v. Calvertina	433
Calvertina Ludl.	..	433
campestris Leices.	Uranotaenia	495
cancer Leices.	id.	496
cantans Mg.	Culex ..	467
Carrollia Lutz	..	554
catasticta Knab.	Aedeomyia	488
Cellia Theob.	..	431
ceylonensis Theob.	Rachionotomyia	485
ceylonica Theob	Culiciomyia	457
ceylonica Theob.	Uranotaenia	496
Chaetomyia Leices.	v. Leicesteriomyia	452
Chagasia Cruz	v. Calvertina	433
Chaoborus Lichtenstein.	..	505
chamberlaini Ludl.	Ludlowia	493
christophersi Theob.	Culex ..	467
christophersi Theob.	Myzomyia	418
Christophersia James.	..	431
Chrysoconops Goeldi.	..	480
Chrysoconopas aurites Ludl.	=Mansonia chrysogona Knab	480
chrysogona Knab.	Mansonia.	482
chrysolineata Theob.	Howardina	456
chrysoscuta Theob.	Pseudohowardina	456
cingulata Leices.	Leicesteria	454
clavipalpis Theob.	Radioculex	465
cohaesa	var. Anoph. formosaensis	416
Colonemyia Leices.	..	498
communis Leices.	Dendromyia	503
completiva Leices.	Etorleptiomyia	484
complex Theob.	Bolbodeomyia	492
concolor Rob. Desv.	Culex ..	468
confinis Arrib.	Taeniorhynchus	479
conopas Frnfld.	Chrysoconops	481
Conopomyia Leices.	..	453
Corethra Mg.	..	504
CORETHRINAE.	..	504
crassipes v. Wulp.	Stegomyia	445
Culex L.	..	465
Culicada Felt.	..	461
culicifacies Giles	Myzomyia	418
culiciformis Cogill	"Anopheles"	434
culiciformis James and List.	Stethomyia	423
culiciformis Theob.	Skusea	451
CULICINAE.	..	439
Culiciomyia Theob.	..	456
cuneata Theob.	Var. of Theobaldiomyia (Leucomyia) gelida	463
Danielsia Theob.	..	458
Dasymyia Leices.	..	453
deceptor Don.	Myzomyia	418
decorabilis Leices.	Topomyia	499
Dendromyia Theob.	..	502
desmotes Giles	Stegomyia	445
Desvoidya Blanch.	=Blanchardiomyia nom. nov.	440
dissimilis Leices.	Stegomyia	445
diurna Theob.	Skusea	451
dolichocephala Leices.	Leicesteria	455
domesticus Leices.	Taeniorhynchus	479
dthali Patton ..	Myzomyia	419

		Page
dudgeoni Theob.	Neocellia	432
durbitans Leices.	Topomyia	490
Ekrinomyia Leices.	.. .. ..	440
elegans James	Neomyzomyia	417
eminentia Leices.	Lophoceratomyia	464
epidesmus Theob.	Taeniorhynchus	479
error Theob.	Aldrichinella	433
eruthrosops Theob.	Culicada	462
Etiorleptiomyia Theob.	.. .. ..	484
fasciata F.	Stegomyia	446
fatigans W.	Culex	468
Ficalbia Theob.	.. .. ..	494
Finlaya Theob.	.. .. ..	485
flava Leices.	Leicesteriomyia (Chaetomyia) ..	453
flava Ludl.	Cellia	431
fluviatilis Leices.	Hulecoetomyia	455
foochowensis Theob.	Culex	469
formosaensis Tsuz.	Anopheles	415
formosus Ludl.	Anopheles	416
fragilis Leices.	Verrallina	491
fragilis Ludl.	Culex	469
fragilis Theob	Stethomyia	423
frater R. Desv.	=Steg. fasciata F.	446
fraudatrix Theob	Lophoceratomyia	464
freerae Banks	Pyretophorus	423
fuliginosus Giles	Nyssorhynchus	428
fulleri Ludl.	Oculeomyia	485
funerea Leices.	Wyeomyia	501
funerea Theob. var. ornata Theob. ..	Skusea	451
funesta Giles	Myzomyia	419
funesta Leices.	Teromyia ..	438
fusca Leices.	Dasymyia	423
fusca Leices.	Skeiromyia	500
fusca Leices.	Stegomyia	447
fusca Theob.	Uranotaenia	496
fusca Theob.	Blanchardiomyia (Desvoidya) ..	441
fuscanus W.	Culex	469
fuscocephalus Theob.	Culex	469
fuscus Theob.	Trichorhynchomyia ..	477
gardneri Ludl.	Quasistegomyia	443
Geilonomyia Leices.	=Pecomyia Theob. ..	459
gelidus Theob.	Theobaldiomyia (Leucomyia) ..	462
id. id. var. cuneata Theob. ..	id. id. ..	463
id. id. var. sinensis id. ..	id. id. ..	463
genurostris Leices.	Malaya	503
gigas Giles	Anopheles	416
gilesii Theob.	Toxorhynchites	435
gnophodes Theob.	Culex	470
gracilis Leices.	Stegomyia	447
gracilis Leices.	Topomyia	499
gracilis Leices.	Zeugnomyia	498
gracilis Theob.	Bironella	433
Grabhamia Theob.	.. .. ..	461
graminis Leices.	Culex	470
greenii Theob.	Howardina	456
greenii Theob.	Wyeomyia	501
gubernatoris Giles	Phagomyia	456

		Page
halifaxii Theob.	Culex	470
halli James	Christophersia	431
Harpagomyia Meij.	..	504
Heinzmannia Ludl.	=Dendromyia Theob.	502
himalayana Giles	Howardina	456
hirsuteron Theob.	Culex	470
Hodgesia Theob.	..	500
Howardina Theob.	..	456
Hulecoetomyia Theob.	..	455
hybrida Leices.	Colonemyia	498
hybrida Leices.	Conopomyia	453
imitator Leices.	Stegomyia	447
imitator Leices.	Verrallina	491
immaculatus Theob.	Anopheles	416
immisericors Wlk.	Toxorhynchites	436
impellens Wlk.	Culex	470
imprimens Wlk.	id.	470
indecorabilis Leices.	Verrallina	492
indefinita Ludl.	Myzomyia	419
indica Theob.	Neocellia	432
indica Theob.	Neomacleaya	458
indica Theob. var. simplex Theob.	id.	458
indica Theob.	Phoniomyia	502
indiensis Theob.	Nyssorhynchus	428
inepta Annandale	Ramcia	505
infula Theob.	Culex	470
inornata Theob.	Culiciomyia	457
inornata Theob.	Squamomyia	489
inornatus Wlk.	Toxorhynchites	436
intermedia Rothwell	Neocellia	432
jamesii Theob.	Nyssorhynchus	429
japonicus Theob.	Culex	471
jehafi Patton	Myzomyia	419
joloensis Ludl.	Blanchardiomyia (Desvoidya)	441
jugraensis Leices.	id. id.	441
jugraensis Leices.	Hulecoetomyia	455
juxtapallidiceps Theob.	Melanoconion	484
karwari James	Nyssorhynchus	429
Kerteszia Theob.	..	431
Kingia Theob.	..	443
kochi Don.	Cellia	431
kumasi Chalmers (Anopheles)	=Myzomyia funesta, Giles	419
laniger W.	Mucidus	440
lateralis Ludl.	Uranotaenia	495
lateralis Theob.	Leptosomatomyia	488
Leicesteria Theob.	..	454
leicesteri Theob.	Toxorhynchites	437
Leicesteriomyia Brun. nom. nov.	for *Chactomyia* Leices	452
Lepidotomyia Theob. (I)	= Reedomyia Ludl.	486
Lepidotomyia Theob. (II)	..	458
leptomeres Theob.	Myzomyia	419
Leptosomatomyia Theob.	..	488
leucomeres Giles.	Stegomyia	447
Leucomyia Theob.	=Theobaldiomyia mihi nom. nov.	462
leucophyrus Don.	Neomyzomyia	417
lewaldii Ludl.	Toxorhynchites	437
lindsayi Giles.	Anopheles	416
id. id. var. maculata Theob.	id.	416

		Page
lineata Ludl.	Calvertina	433
lineatopennis Ludl.	Taeniorhynchus	479
listoni List.	Myzomyia	420
longifurcatus Theob.	v. Culex pseudolongifurcatus ..	471
longipalpis Leices. in Theob. ..	Leicesteria	455
longipalpis Wulp.	Culex	471
longipes Theob.	v. Culex macropus Blanch. ..	472
longirostris Leices.	Ficalbia	494
longirostris Leices.	Uranotaenia	496
Lophoceratomyia Theob.	.. .. ..	463
Lophomyia Giles	= Lophoscelomyia Theob. ..	427
Lophoscelomyia Theob.	.. .. ..	427
lophoventralis Theob.	Pseudocarrollia	434
loricatus Leices.	Culex	471
lowisii Theob.	Reedomyia	487
ludlowi Blanch.	nom. nov. for Culex annuliferus Ludl.	471
ludlowi Theob.	Myzomyia	420
Ludlowia Theob.	.. .. ..	493
lutea Ludl.	Popea	485
luteoabdominalis Theob.	Taeniorhynchus	479
luteola Theob.	Culex	471
luteolateralis Theob.	Banksiella	477
luteolateralis Theob.	Culex	471
lutescens Leices.	Uranotaenia	496
luzonensis Ludl.	Etiorleptiomyia	484
macropus Blanch.	nom. nov. for C. longipes Theob.	472
maculata Theob.	Orthopodomyia	486
maculata Theob.	Pecomyia	460
maculata Theob.	Pseudograbhamia	460
maculata Theob.	var. Anoph. lindsayi Giles ..	416
maculatus Theob.	Nyssorhynchus	429
maculipalpis Theob.	id.	429
maculipes Theob.	Orthopodomyia	486
maculipes Theob.	var. Taenio. tenax ..	480
maculipes arabiensis Patton	var. id. id. ..	480
maculipleura Leices.	Uranotaenia	496
magna Theob.	Lepidotomyia	459
magnifica Leices.	Teromyia	438
magnus Theob.	Brevirhynchus	443
Malaya Leices.	.. .. ..	503
malayi Leices.	Aedes	490
malayi Leices.	Hodgesia	500
malayi Leices. ..	Verrallina	492
malayi Theob.	Uranotaenia	496
mammilifer Leices.	Lophoceratomyia	464
Mansonia Blanch.	.. ..	481
Mansonioides Theob.	.. .. ..	483
maxima Leices.	Uranotaenia	497
mcgregori Banks	Kertezia	431
mediofasciata Theob.	Skusea	451
mediolineatus Theob.	Culex	472
mediopunctata Theob.	Stegomyia	447
MEGARHINAE (MEGARHININAE) ..	.. .. ..	434
Megarhinus Rob. Desv.	.. .. ..	435
Melanoconion Theob.	.. .. ..	484
mendacis Daniels.	Colouemyia	499
metallica Leices.	Conopomyia	454
metallica Leices.	Wyeomyia	501
metallicus Leices.	Toxorhynchites	437
micans Leices.	Uranotaenia	497
microannulatus Theob.	Culex	472
microptera Giles	Stegomyia	447
mimeticus Noë	Culex	472
Mimomyia Theob.	.. .. ..	492

		Page
minima Ludl. (Mimomyia)	Ludlowia	493
minima Theob.	Ficalbia	494
minimus Leices.	Culex	472
minimus Theob.	Toxorhynchites	437
minimus Theob.	Pyretophorus	423
minor Leices.	Lophoceratomyia	464
minor Leices.	Topomyia	500
minor Theob.	Culex	473
minuta Theob.	Mimomyia	492
minuta Theob.	Culicada	462
minutissima Theob.	Culiciomyia	457
minutissima Theob.	Stegomyia	448
minutus Theob.	Myzorhynchus	425
modesta Leices.	Uranotaenia	497
Mucidus Theob.	..	440
mucidus Karsch.	Mucidus	440
multimaculosus Leices.	Culex	473
multiplex Theob.	Pseudoskusea	450
Myzomyia Blanch.	..	417
Myzorhynchus Blanch.	..	424
Neocellia Theob.	..	432
Neomacleaya Theob.	..	458
Neomyzomyia Theob.	..	417
Neostethopheles James and List.	..	422
nepenthicola Banks	Wyeomyia	501
nero Doles. (Mansonia)	M. anuulipes Wlk.	482
niger Leices.	Lophoceratomyia	464
nigerrima Theob.	Culiciomyia	457
nigerrimus Giles	Myzorhynchus	425
nigra Leices.	Topomyia	500
nigrescens Theob.	Aedes	490
nigricephalus Leices.	Culex	473
nigrifasciatus Theob.	Pyretophorus	424
nigritarsis (auct. ?) var.	Orthopodomyia	486
nigrotarsis Ludl.	Pseudoskusea	450
nitidoventer Giles	Uranotaenia	497
nivea Leices.	id.	497
nivea Ludl.	Scutomyia	452
niveoscutellata Theob.	Reedomyia	487
niveitaeniata Theob.	Pseudotheobaldia	478
nivipes Theob.	Nyssorhynchus	429
nivipleura Leices.	Uranotaenia	497
notoscripta Skuse	Scutomyia	452
nursei Theob.	Pyretophorus	424
Nyssomyzomyia James	..	422
Nyssorhynchus Blanch	..	428
obscura Leices.	Acalleomyia	491
obturbans Wlk.	Blanchardiomyia (Desvoidya)	442
ocellata Theob.	var. of Taeniorhynchus tenax Theob.	480
ochracea Theob.	Grabhamia	461
ochraceus Theob.	Chrysoconops	481
Oculeomyia Theob.	..	485
O'Keillia Ludl.	= Etiorleptiomyia Theob.	484
ornata Theob.	var. of Skusea funerea Theob.	451
ornatus Theob.	Melanoconion	484
Orthopodomyia Theob.	..	486
ostentatio Leices.	Aioretomyia	490
pagei Ludl.	Taeniorhynchus	480
pallida Ludl.	Stethomyia	423
pallidiceps Theob.	Melanoconion	484

		Page
pallidostriatus Theob.	Culex	473
pallidothorax Theob.	id.	473
pampangensis Ludl.	Reedomyia	487
panalectros Giles (" Desvoidea ")	=Culex fatigans W.	442
parangensis Ludl.	Pseudouranotaenia	494
parascelos Theob.	Culex	473
Pardomyia Theob.		460
Patagiamyia James		417
Pecomyia Theob.		459
peditaeniatus Leices.	Myzorhynchus	425
perdita Leices.	Aioretomyia	490
periskelata Giles	Stegomyia	448
perplexa Leices.	Stegomyia	448
perplexus Leices.	Culex	473
pettigrewii Theob.	Culex	474
Phagomyia Theob.		456
philippinensis Ludl.	Nyssorhynchus	430
philippinensis Giles	Runchomyia	493
Philodendromyia Theob.		503
Phoniomyia Theob.		502
pictus Lw.	" Anopheles "	434
pipersalata Giles	Stegomyia	448
plumiger Don. (Anoph.)	=Myzorhynchus sinensis W.	426
poicilia Theob.	Finlaya	486
Polylepidomyia Theob.		502
Popea Ludl.		485
powelli Ludl.	Uranotaenia	497
pseudobarbirostris Ludl.	Myzorhynchus	426
Pseudocarrollia Theob.		454
pseudodiurna Theob.	Skusea	451
Pseudograbhamia Theob.		460
Pseudograhamia Theob		489
Pseudohowardina Theob.		456
pseudolongifurcatus Theob.	nom. nov. for Culex longifurcatus	474
pseudomediofasciata Theob.	Skusea	451
pseudonivea Theob.	Stegomyia	448
pseudopictus Grassi	Myzorhynchus	426
Pseudoskusea Theob		450
pseudostenoetrus Theob.	Culex	474
pseudotaeniata Giles	Hulecoetomyia	455
Pseudotheobaldia Theob.		478
Pseudouranotaenia Theob.		494
pseudowillmori Theob.	Nyssorhynchus	430
pulcherrima Theob	Cellia	432
pulchriventer Giles	Culex	474
pulla Theob.	Culiciomyia	457
pullus Theob. (Culex)	=Culiciomyia pulla	474
punctolateralis Theob	Stegomyia	448
punctulata Don.	Cellia	432
punctulata " James and List."	Myzomyia	421
pungens R. Desv	= Culex fatigans W.	468
pygmaeus Theob.	Chrysoconops	481
Pyretophorus Blanch.		423
quadripunctis Ludl.	Pardomyia	460
quasiferox Leices.	Teromyia	439
quasipipiens Theob.	Culex	474
quasisanguinae Leices.	Hodgesia	501
Quasistegomyia Theob.		443
quasiunivittatus Theob.	Culex	474
Rachionotomyia Theob.		485
Radioculex Theob.		465
Ramcia Annandale		405
ratis Leices.	Teromyia	439

		Page
Reedomyia Ludl.	.. ..	486
reesii Theob.	Culex	474
rizali Banks	id.	474
rolandi D'Emm d. Ch.	=Culex microannulatus Theob.	472
rossii Giles	Myzomyia	421
rubithoracis Leices.	Lophoceratomyia	464
rubithoracis Leices.	Topomyia	500
Runchomyia Theob.	.. .. ..	493
samarensis Ludl.	sub. sp. Scutomyia notoscripta	452
samarensis Ludl.	sub. sp. Stegomyia scutellaris Wlk.	449
sanguinea Theob.	Hodgesia	501
sarawaki Theob.	Oculeomyia	485
Sayomyia Coq.	.. .. ..	505
scatophagoides Theob.	Mucidus ..	440
scintillans Ludl. (Heinzmannia)	Dendromyia	503
scutellaris Wlk.	Stegomyia	448
Scutomyia Theob	.. .. ..	452
seguini Laveran (Panoplites)	Mansonia	482
separatus Leices.	Myzorhynchus	426
sepositus Leices.	Culex	475
septemguttata Theob.	Mansonioides	483
septempunctata Theob.	Mansonia	483
sericeus Theob.	Culex	475
sexlineata Theob.	Stegomyia	449
simlensis James and List.	Anopheles	416
simplex Theob.	Ficalbia	494
simplex Theob.	var. of Neomacleaya indica Theob.	458
sinensis Wied.	Myzorhynchus ..	426
sinensis Theob.	Theobaldiomyia	463
singularis Leices.	Aioretomyia	490
sitiens Wied.	Culex	475
Skeiromyia Leices	.. .. ..	500
Skusea Theob.	.. .. ..	450
sollicitans Wlk.	Grabhamia	461
spathipalpis Rond.	Theobaldia	459
spenceri Theob.	Grabhamia	461
splendens Meij.	Harpagomyia	504
splendens Wied.	Toxorhynchites	437
squamipenna Arrib.	Aedeomyia	488
Squamomyia Theob.	.. .. ..	489
Stegomyia Theob.	.. ..	443
stenoetrus Theob.	Culex	475
stephensi Liston	Nyssorhynchus ..	430
Stethomyia Theob.	.. .. ..	423
striocrura Giles	Stegomyia	449
subpictus Grassi	"Anopheles" ..	434
subulifer Dol.	Toxorhynchites	437
sugens W.	Scutomyia ..	452
suknaensis Theob.	Culicada	462
sylvestris Leices.	Lophoceratomyia	465
taeniarostris Theob.	Grabhamia	461
taeniata Leices.	Aioretomyia	490
taeniata Leices.	Lepidotomyia	459
taeniata Leices.	Lophoceratomyia ..	465
Taeniorhynchus Arrib	.. .. ..	478
taytayensis Banks	Culex	475
tenax Theob.	Taeniorhynchus	480
id. var. ocellata Theob.	id.	480
Teromyia Leices.	.. .. ..	438
tessellata Theob.	Myzomyia ..	422
tessellatum Theob. (nom. nud.)	=Cellia punctulata Don. ..	432
testacea Theob.	Uranotaenia	497
theobaldi Giles	Nyssorhynchus	430
Theobaldia Nev. Lemaire	.. .. ..	459

		Page
Theobaldinella Blanch.	=Theobaldia	459
Theobaldiomyia Brun. nom. nov. for *Leugomyia*		462
thomsoni Theob.	Stegomyia	450
thorntoni Ludl.	Myzomyia	422
tigripes Grandpré	Culex	475
tipuliformis Leices.	Topomyia	500
tipuliformis Theob.	Culex	475
Topomyia Leices.		499
Toxorhynchites Theob.		435
treacherii Leices.	Anopheles	417
triangulata Ludl.	Pseudouranotaenia	494
Trichopronomyia Theob.		477
Trichorhynchomyia Brun. nom. nov. for *Trichorhynchus*		477
Trichorhynchus Theob.		477
trilineata Leices. in Theob.	Hulecoetomyia	455
trilineata Leices.	Uranotaenia	498
trilineatus Theob.	Culex	476
trimaculatus Theob.	Culex	476
tripunctata Theob.	Stegomyia	450
tritaeniorhynchus Giles	Culex	476
turkhudi Liston	Myzomyia	422
umbrosus Theob.	Myzorhynchus	427
uncus Theob.	Culex	476
uniformis Leices.	Culex	476
uniformis Theob.	Lophoceratomyia	465
uniformis Theob.	Mansonia	483
uniformis Theob.	Melanoconion	484
uniformis Theob.	Skusea	451
unilineata Leices.	Uranotaenia	498
unimaculata Leices.	id.	498
univittatus Theob.	Culex	476
Uranotaenia Arrib.		495
vagans Wied.	Culex	476
vanus Wlk.	Myzorhynchus	427
variata Leices.	Lophoceratomyia	465
varietas Leices.	Aioretomyia	491
Verrallina Theob		491
vincenti Laveran	"Anopheles"	434
viridiventer Giles	Culex	476
virilis Leices.	Verrallina	492
vishnui Theob.	Culex	476
w-alba Theob.	Stegomyia	450
watsoni Leices.	Pyretophorus	424
wellcomei Theob.	Anopheles	417
willmori James in Theob.	Nyssorhynchus	430
Worcesteria Banks		439
Wycomyia Theob.		501
Zeugnomyia Leices.		498

ERRATA.

Page 438, line 10 from bottom. *For* "magnificus" *read* "magnifica" and line 6 from bottom *for* "funestus" *read* "funesta."

Page 487, line 9 from bottom. *For* "Aedeomyinae" *read* "Aedinae."

ADDENDA.

The following species were unfortunately omitted from the foregoing Supplement to my Annotated Catalogue of Oriental Culicidæ:—

DACTYLOMYIA, gen. nov., Newstead and Carter, Ann. Trop. Med. iv. 377. "near *Anopheles*."

D. ceylonica, sp. nov., id. id. loc. cit. 377. Ceylon.

Myzomyia aurirostris, Watson, Ann. Trop. Med iv. 251. Malay States.

Stegomyia nigritia, Ludlow, Can Ent. xlii. 194 ♀. Philippine Islands.

Scutomyia treubi, Meij. Ann. Jard. bot. Buitenzorg (1910) 3rd Supp., p. 922. Java.

Culex aureopunctis, Ludlow, Can. Ent. xlii. 195, ♀, a unique. Philippine Islands.

CYATHOMYIA, gen. nov., near *Finlaya*. Meij. Ann. Jard. bot. Buitenzorg (1910) 3rd Supp., p. 922. Java.

C. jenseni, sp. nov., id. loc. cit. 922. Java.

Popea lutea, Ludl., Can. Ent. xlii. 193, ♀, described from a unique.

Ficalbia tenax, id. loc. cit. 928. Java.

Uranotaenia ascidiicola, id. loc. cit. 925. Java.

3-4-1912.

591.5405
ANN