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* Named *Elachura hæplonota* in the text.

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Conroy, A.	Bombay.
Coode, J. M.	Nagpur, C. P.
Cooke, Dr. T....	Poona.
Cooper, Arthur	Bombay.
Cooper, C. P....	Bombay.
Cornforth, J. P.	Bombay.
Cotton, G.	Bombay.
Cowasji Dady Limji	Bombay.
Cox, A. F. (M.C.S.)	Bombay.
Crawford, Leslie	Bombay.
Crawley-Boevey, A. (C.S.)	Dharwar.
Creagh, Capt. B. P. (I.M.)	Madras.
Crofts, Dr.	Gwalior.
Cuffe, T. W.	Bombay.
Cumberley, N. R.	*Europe.*
Curjel, H.	*Europe.*
Curreembhoy Ebrahim...	Bombay.
Cursetjee, C. M.	Bombay.
Cutch, H. H. the Rao of	Bhuj, Cutch.
Dadina, Dr. Ratanji Rustamji	Kalyan.
Dady, Homejee C. Dadysett	Bombay.
Dalby, C. J.	Sambulpur.
Dalgado, Dr. D. G.	Sawantwady.
Davidson, J. (C.S.)	Bijapur.
Davies, C. A. W.	Berars.
Davies, Harry S. (C.E.)	Ghadechi.
Deane, H. H. (C.E.)	Bombay.
Dempster, F. E.	Bombay.
Denso, Max	Bombay.
Dhanjishaw, Manaksha, (B.A.)	Thana.
Dharampur, H. H. Prince Baldeoji... ...	Dharampur.
Dhargalker Luxmon, Doctor...	Bombay.
Ditmas, A. R....	Bombay.
Dobbs, Major G. C.	Kamptee, C. P.
Dodgson, C. G. (C.S.)...	Khandeish.
Doig, S. B. (C.E.)	Poona.
Dormer, Lord	*Europe.*
Douglas, Mrs....	Bombay.
Dreckmann, Rev. F. (S.J.)	Bombay.
Dubash, Sorabjee D....	Bombay.
Duigan, S. A.	Bombay.
Dumayne, F. G.	Bombay.
Dunlop, H. H. G.	Poona.
Dunn, G. O. W.	Malegaon.
Dunsterville, J. H. C....	Thana.
Duthie, J. F.	Simla.

Dymock, Dr. W.	...Bombay
Ebden, E. J. (C.S.)	Thana.
Edgelow, F.	Bombay.
Edulji Dinshaw	Karachi.
Elliott, A.	Yeotmal.
Elliott, C. F.	Quetta.
Elsworthy, E. H.	Bombay.
Eunson, H. J. (C.E.)	Vizianagram.
Evatt, C. B.	Dongargarh, C.P.
Ewart, E. M.	Ambassamudrum.
Fairbank, Rev. S. B....	Ahmednagar.
Fairclough, J.	Bombay.
Farquharson E. G. (R. E.)	Bombay
Fenton, Major L. L.	Rajkot.
Ferguson, Dr. A. F.	Poona.
Ferguson, H. S.	Travancore.
Fernandez, E. E.	Baroda.
Fernandez, T. R.	Surat.
Field, Frank, ...	Behar.
Fletcher, F. E...	Tellicherry.
Fletcher, F. W. F.	Madras.
Fletcher, W. M.	Poona.
Fleming, W. N.	Bombay.
Flower, F. M....	Bombay.
Forbes, C. H. B.	Bombay.
Forel, Professor Aug. (*Hon. Cor. Member*)	Switzerland.
Forrest, Hon'ble Mr. L. R. W.	Bombay.
Fowler, F. D.	Bombay.
Fox, C. E.	Bombay.
Framji Nussurvanji Patell	Bombay.
Francis, Capt. J. C.	Bombay.
Franke, A.	Bombay.
Fraser, S. M. (C.S.)	Dharwar.
Frost, C. E. (C.S.)	Ahmedabad.
Fry, T. D.	Thana.
Fuller, J. B. (C.S.)	Nagpur, C.P.
Fulton, E. (C.S.)	Rangoon.
Furdoonji Jamsetji	Bombay.
Gaddum, F.	*Europe.*
Gama, Dr. A. da	Bombay.
Gamble, J. Sykes (M.A., F.L.S.)	Dehra Dun.
Gaye, W.	Secunderabad.
Gell, H. G.	Bombay.
George, C. P....	Secunderabad.
George, D.	Bijapur.

Gibbs, H. M.	Nasik.
Gibbs, R. T.	Jhansi.
Gilbert, Reg.	Bombay.
Giles, E.	Ahmedabad.
Gimlette, Dr. G. H. S.	Sutna.
Glazebrook, N. S.	Bombay.
Gleadow, F.	Thana.
Goldsmid, F.	Poona.
Gompertz, Rev. J. F. W.	Kampti.
Gompertz, R....	Yercaud.
Gonne, H.	Karachi.
Gonsalves, Dr. J. F.	Bandora.
Goodenough, Lieut. H. L.	Erinpura.
Goodfellow, Col. G. R.	*Europe.*
Gostling, D.	Bombay.
Goverdhundass K. Muckunji	Bombay.
Graham, W. D.	Bombay.
Grant, Dr. D. St. J.	Dharamsala.
Gray, Cecil	Bombay.
Gray, Chas.	Coonoor, Nilgiris.
Gray, Dr. Wellington...	Bombay.
Græme, Col. R. C.	*Europe.*
Greany, Dr. J. P.	Belgaum.
Greaves, W.	Bombay.
Green, Dr. J. S.	Kampti.
Greenwood, E....	Bombay.
Grieves, Rev. A. C.	*Europe.*
Griffiths, J.	Bombay.
Gunthorpe, Lieut.-Col. E. J....	Amraoti.
Gwyn, Captain A. (I.M.)	Bombay.
Hall, Rev. E. S.	Bombay.
Hallen, J. H. B. (A.V.D.)	Simla.
Hamilton, Capt. A. R. Cole...	Secunderabad.
Hamilton, W. R.	Bombay.
Hare, R. D.	Yeotmal.
Hargrave, H. J. B.	Bombay.
Harris, H. E. Lord	Bombay.
Hart, G. H. R.	*Europe.*
Hart, W. E.	*Europe.*
Harvey, W. (C.S.)	Bombay.
Haslam, A. J. (A.V.D.)	Secunderabad.
Hatch, H. F.	Poona.
Hatch, Dr. W. K.	Bombay.
Hawkins, C. R.	Parel.
Heeckerenez, Le Baron von (*Hon. Member*)	Java.
Hemming, H. J. R.	Bombay.
Henderson, Dr. H.	Ahmednagar.

Hervey, H. L. (C.S.)	Bijapur.
Hexton, W.S.	Karachi Dist.
Hibbert, Capt. E.	Mount Abu.
Hibbert, Col. J.	Poona.
Hogg, A. J.	Hubli.
Hill, F. J. A.	Bombay.
Hole, A. E.	Sylhet, Assam.
Holland, W. J....	Khandeish.
Horbury, G. F.	Bombay.
Hore, Lieut.-Col. W. S.	Nusseerabad.
Hornidge, S. (C.E.)	Sholapur.
Hudson, C. W. M. (C.S.)	Karwar.
Hughes, Col. C. F.	Bombay.
Hughes, W. C.	Bombay.
Hunter, H. C. V.	*Europe.*
Hussey, Col. C. E.	Deolali.
Hutchinson, F. R.	Bombay.
Indore, H. H. the Maharaja Holkar... ...	Indore.
Inverarity, J. D.	Bombay.
Jackson, Col. F. H.	Baroda.
James, H. E. M. (C.S.)	Ahmedabad.
Jamsetjee, C. Jamsetjee	Bombay.
Jardine, Mrs. J.	Bombay.
Jardine, James	Bombay.
Jeejeebhoy, Sir Jamsetjee, Bart.	Bombay.
Jeejeebhoy, Pherozshaw M.	Bombay.
Jenkins, J. L. (B.A., C.S.)	*Europe.*
Jenkins, R. A....	Bombay.
Jeyker, Dr. A. S. G.	Muscat.
John, Harry	Bombay.
Johnson, J. R. Kirby	*Europe.*
Johnston, Andrew	Coorg.
Jones, Capt. G. Sutton	Deoli.
Jones, H. H.	Bombay.
Kabraji, Kaikhushro N.	Bombay.
Kama, K. R.	Bombay.
Kane, C. E.	Bombay.
Kantak, Dr. Shantaram	Bombay.
Kay, Dr. W.	Bombay.
Kennedy, Major. W. P.	Cambay.
Ker, L. B.	Bombay.
Kerkhoven, E. J. (*Hon. Member*)	Java.
Keys, H. W.	Godhra.
Kharegat, M. P. (C.S.)	Broach.
King, Alfred	Bombay.

Kirtikar, Dr. K. R.	Thana.
Kittredge, G. A.	Bombay.
Knight, D.	Bombay.
Knyvitt, Ross	*Europe.*
Lancester, Dr. A.	Amritsar.
Lang, F. (C.E.)	Nagpur, C. P.
Lang, Walter	Bombay.
Langley, Dr.	Bombay.
Latham, The Hon'ble Mr. F. L.	Bombay.
Lathi, H. H. the Thakore Saheb of ...	Lathi.
LaTouche, Brig.-Genl. C. D.	Colombo, Ceylon.
LaTouche, C. B.	Punch Mahals.
Lawder, Dr. E. J.	Hyderabad.
Lawley, Capt. the Hon'ble R. T. ...	Madras.
Leask, J.	Bombay.
Lee-Warner, W. (C.S.)	Poona.
Lely, F. S. P. (C.S.)	Surat.
Leslie, A.	Bombay.
Lester, Lieut. C. D.	Bhuj, Cutch.
Lester, C. F. G.	Ahmedabad.
Lewis, Rev. A. Goldwyer	*Europe.*
Léveillé, Mon. H.	*Europe.*
Light, Lieut. R. H.	*Europe.*
Lindesay, Capt. E....	Kamptee.
Lingard, Dr. Alfred	Poona.
Lisboa, Dr. J. C.	Bombay.
Litchfield, E.	Dehra Dun.
Little, F. A.	Bombay.
Little, T. D. (C.E.)...	Bombay.
Littledale, H.	Baroda.
Loam, Mathew	Vizagapatam.
Loch, Capt. G. H.	Cachar.
Loch, Major W. W.	Jodhpur.
Logan, R. (B.C.S.)	Bombay.
Lovell, E. C. F.	Bombay.
Luard, E. S.	Bombay.
Lynch, C. B.	Bombay.
Lynn, G. R. (C.E.)	Baroda.
Lyon, Dr. I. B.	*Europe.*
Macaulay, Capt. K.	Bombay.
Macaulay, L. A.	Baroda.
Macaulay, R. H.	Bombay.
MacCartie, Dr. F.	Bombay.
Macdonald, Miss (M.D.)	Bombay.
Macdonald, Dr. D.	Bombay.
Macdonald, J.	Bombay.

Macdonald, W. M.	*Europe.*
Mackenzie, J. Muir (C.S.)	Belgaum.
Mackenzie, Col. Kenneth	Amraoti.
Mackenzie, M. D.	Kurachi.
Mackenzie, T. D. (C.S.)	Bombay.
Mackinnon, P. W.	Masuri.
Macleod, Norman C.	Bombay.
Macnaghten, Chester	Rajkot.
Maconachie, Dr. G. A.	Bombay.
Macpherson, Major T. R. M.	Poona.
Mahomed, Doctor Esmail Jan., L.M.S. ...	Bombay.
Mair, A.	Bombay.
Maistry, Dosabhai B.	Bombay.
Major, Col. F. W.	Bombay.
Mallins, Dr. C.	Hingoli.
Maneckshaw, Dr. Dhunjishaw	Bombay.
Mangles, Lieut. W. S.	Ahmednagar.
Manser, Dr. R.	Bombay.
Mant, R. N.	Bombay.
Maries, Chas. (F.Z.S.)	Gwalior.
Martin, Major G.	Bombay.
Mason, Geo. E.	London.
Masson, David P.	Lahore.
McCalman, Dr. Hugh	Dharwar.
McCann, W. H.	Bombay.
McClelland, W. S. (M.I.C.E.)	Jamnuggur.
McCorkell, G. (C.S.)	Ahmedabad.
McKenzie, Alex.	Bombay.
McLaren, Mrs. G.	*Europe.*
McMullen, G. C.	Karachi.
Meade, Capt. M. J.	Bhopal.
Mehta, P. R.	Khandeish.
Melvin, W. F.	Montrose, N.B.
Menezes, Anthony P.	Bombay.
Mercer, F.	Burma.
Meredith, Richard	Bombay.
Merewether, Col. G. (R.E.)	Bombay.
Merriman, Col. W. (R.E., C.I.E.)	Bombay.
Messent, P. G.	Bombay.
Meyer, Dr. C. H. L.	Bombay.
Middleton, T. H.	Baroda.
Middleton, W. H.	Poona.
Millard, W. S.	Bombay.
Miller, E.	Bombay.
Miller, N.	Giridhi.
Millett, G. P.	Thana.
Mills, Vet. Capt. Jas.	Bombay.
Minter, Capt. J. S.	Karachi.

Mirza Abbas Ali Baig (C.S.)	Thana.
Modi, Bomanji Edulji	Broach.
Modi, Jivanji Jamsetji	Bombay.
Monie, H.	Bombay.
Monk, Capt. R. P.	*Europe.*
Monks, Dr.	Aden.
Monod, E. C.	Bombay.
Monro, A. V.	Multan.
Monté, Rev. Dr. B. de	Bombay.
Monté, Dr. D. A. de	Bandora.
Moos, Dr. Framroz Ardasir	Thana.
Morris, A. W. (F.Z.S.)	Yercaud.
Morris, D.	Bombay.
Morrison, A.	*Europe.*
Moscardi, E. H. (C.S.)	Sholapur.
Moulvi, Syed Alli Belgrami	HyderabadDeccan.
Murray, A.	Bombay.
Murray, W....	Bombay.
Meyer, O.	Bombay.
Nairne, Rev. A. K. (*Hon. Cor. Member*)	*Europe.*
Nazar, M. H.	Bombay.
Newborn, C.	Bombay.
Newman, Dr. I. H.	Ajmir.
Newnham, Capt. A. (F.Z.S.)	Satara.
Nicéville, L. de (*Hon. Cor. Member.*) ...	Calcutta.
Nicholls, G. I. (B.C.S.)	Benares.
Nicholson, C.	Bhosawal.
Nicholson, E. F.	Bombay.
Nutt, Col. H. L.	Sawantwady.
Oates, E. W. (*Hon. Cor. Member.*) ...	Tonghoo, Burma.
O'Brien, the Honorable W. T.	Bombay.
O'Callaghan, I.	*Europe.*
O'Connell, J.	*Europe.*
Oliver, E. G.	Khandeish.
Oliver, G.	Calcutta.
Olivier, Major H. D.	Ahmedabad.
Ollivant, E. C. K. (C.S.)	Rajkote.
Ommaney, H. T. (C.S.)	Godra.
Opiumwalla, Dor'b. E.	Bombay.
Ormiston, Geo. E. (C.S.)	*Europe.*
O'Shea, F. Bernard	*Europe.*
Osman, C. W.	Poona.
Owen, W. S.	*Europe.*
Oxenham, Professor R. G.	Bombay.
Ozanne, E. C. (C.S.)	Poona.

Parker, J. C. ... ... Calcutta.
Palliser, H. G. ... ... Dharwar.
Parmenides, A. C. ... ... *Europe.*
Parmenides, J. ... ... Tuticorin.
Parsons, The Hon'ble Mr. Justice ... Bombay.
Parry, Capt. L. H. (R.A.) ... ... Bombay.
Parulkh, Ruttonji Jamsetji F. ... ... Hingoli.
Pawsila, Jamsetji Cursetji ... ... Bombay.
Pateol, N. M. ... ... Bombay.
Pearson, Mrs. H. ... ... Kharaghora.
Pearson, T. W. ... ... Bombay.
Pechey-Phipson, Mrs. E. (M.D.)... ... Bombay.
Penny, Mrs. L. ... ... Bombay.
Pentland, Capt. R. C. ... ... Karachi.
Penton, John E. ... ... Jacobabad.
Pestonji Jewanji ... ... Nulgunda.
Peters, Dr. C. T. ... ... Bijapur.
Peterson, Dr. P. ... ... Bombay.
Petit, Bomanji Dinshaw ... ... Bombay.
Petit, F. D. ... ... Bombay.
Petit, P. C. ... ... Bombay.
Peyton, Major-General W. ... ... Dharwar.
Phipson, H. M. (C.M.Z.S.)... ... ... Bombay.
Pilcher, Geo. E. ... ... Bombay.
Pinhey, Lieut. A. F. ... ... Neemuch.
Plinston, G. C. ... ... Bombay.
Porebunder, H. H. Prince Kumar Shri Bhao Singji ... ... Rajkot.
Porter, Capt. G. M. (R.E.) ... ... Bombay.
Portman, Col. A. B. ... ... *Europe.*
Pottinger, Major-Genl. B. H. ... ... Poona.
Prall, Dr. S. E. ... ... Deesa.
Pratt, E. M. ... ... Bandora.
Preston, F. J. ... ... Bhosawal.
Prickett, L. G. ... ... Sambulpur.
Proctor, H. E. ... ... Bombay.
Pyrke, Capt. R. D. ... ... Bombay.

Quicke, Dr. W. H. ... ... Kaira.
Quin, H. O. (C.S.) ... ... Ahmedabd.

Radcliffe, Major G. B. E. ... ... Bombay.
Raghunath Muckund ... ... Bombay.
Rahimtoola Khairaz ... ... Bombay.
Raikes, E. B. ... ... Bombay.
Raja Murli Manohur, Bahadoor ... ... Hyderabad, Deccan.
Rand, W. C. (C.S.)... ... ... Bijapur.
Rawlins, Col. A. M. (R.A.) ... ... Poona.

Rayment, Vety. Surgn.-Captn. G. J. ...	Babugurh.
Readymoney, N. J....	Bombay.
Rean, T. Rogers	Bombay.
Reddie, F.	Bombay.
Reid, G. B. (C.S.)	Ahmedabad.
Rennick, Col. H. de P.	Yeotmal.
Reynolds, P. (C.E.)...	*Europe.*
Richardson, F. G.	Travancore.
Richardson, Capt. W. St. John	Madras.
Rimington, F. C.	Bombay.
Rippon, Lieut. G.	Burma.
Ritchie, A. M.	Hyderabad, Sind.
Rivett-Carnac, L.	Bombay.
Robb, Dr.	*Europe.*
Roberts, R.	Secunderabad.
Robertson, B. (C.S.)	Nagpur, C. P.
Robertson, Col. D....	Sutna.
Robinson, Mrs.	*Europe.*
Robinson, G. P.	Bombay.
Rogers, Chas. G.	Dehra, N. W. P.
Rogers, Thos.	Bombay.
Rose, F.	Jabalpur.
Russell, B. B.	*Europe.*
Russell, L. P.	Bombay.
Rustomje, H. J.	Karachi.
Rutlam, H. H. the Maharaja of	Rutlam.
Ryrie, J. M.	Bombay.
Sada, Monsieur A....	Pondicherry.
Sage, Major C. A. R. (S.C.)	Dharamsala.
Samut Singji, H. H. Prince	Bombay.
Sansom, T. E.	Japan.
Sassoon, Mrs.	Bombay.
Savile, P. B.	Bombay.
Scarborough, Earl of	*Europe.*
Scott, The Hon'ble Mr. Justice	Cairo.
Scott, M. H. (C.S.)	Dhulia.
Scott, Col. Wm.	Palanpur.
Scully, Dr. J.	Calcutta.
Selby, Major H. O. (R.E.)...	Bombay.
Servai, Cursetji N.	Bombay.
Sewell, R. A. D.	Bombay.
Sharp, Professor W. H.	Bombay.
Shipp, W. (C.E.)	Jabalpur.
Shopland, Capt. E. R.	Bombay.
Shrimant Hanmantrao Gopalrao Nimbalkar	Kolhapur.
Shuttleworth, A. E.	Cachar.
Silcock, H. F. (C.S.)	Ahmednuggur.

Simkins, A. R. M....	Bombay.
Simpson, A. F.	Bombay.
Sims, Ernest	Bhownuggur.
Sims, Proctor	Bhownuggur.
Sinclair, W. F. (C.S.)	Thana.
Sladen, J. (C.S.)	Viramgaum.
Slater, D. McLauchlan	Bombay.
Slater, E. M.	Bombay.
Sly, F. G. (B.C.S.)	Raipur, C.P.
Smith, Mrs. Yorke	Bombay.
Smyth, R. Bateman (C.S.)	Madras.
Soane, G. de	Bombay.
Spalding, C. S.	Bhownuggur.
Spence, L. H.	Kaira.
Spencer, F. A.	Bombay.
Squire, W. W. (C.E.)	Bombay.
Squires, Mrs. R. A.	*Europe.*
Starling, M. H.	Bombay.
St. Clair, Capt. W. (R.E.)	*Europe.*
Stewart, R. B. (C.S.)	Ahmednuggur.
Stiven, J.	Bombay.
Stone, S. J.	*Europe.*
Straw, R. A.	*Europe.*
Street, Dr. A. W. F.	*Europe.*
Street, Capt. H. A. (I.N.)	Madras.
Stuart, M. Scott	*Europe.*
Sukhia, Dr. Nadirshaw H. E.	Bombay.
Sukhtankar, Sitaram V.	Bombay.
Summers, Thos.	Bombay.
Surveyor, N. F.	Bombay.
Sutherland, W.	Bombay.
Swan, H. H.	Bombay.
Swinhoe, Colonel C.	*Europe.*
Syers, Capt. H. C.	Malay Peninsula.
Sykes, C.	Cutch Mandvi.
Symington, J. H.	*Europe.*
Symons, H. S.	Bombay.
Symons, J. L.	Bombay.
Symons, N. S.	Bombay.
Talyarkhan, Maneckshaw J.	Bombay.
Tata, Dorab, J.	Bombay.
Taylor, A.	Bombay.
Taylor, Chas.	Bombay.
Taylor, James H.	Khorda.
Taylor, W. C.	Khorda.
Temulji, Dr. B. N.	Bombay.
Terrell, Rev. Chas. D.	Sehore.

Terry, G. W. ... ... Bombay.
Thacker, W. ... ... Bombay.
Thatcher, Capt. J. F. ... ... Deolali.
Thomas, Col. R. M. ... ... Chanda, C. P.
Thompson, B. W. O. ... ... Thana.
Thomason, R. M. ... ... Sheogarh.
Thompson, P. ... ... Rewari.
Thompson, R. H. E. ... ... Nagpur.
Thompson, Mrs. ... ... Bombay.
Tod, F. H.... ... ... Hubli.
Tomlinson, S. (M.I.C.E.) ... ... Bombay.
Traill, John ... ... Vizagapatam.
Traill, W. H. ... ... Jhansi.
Tudball, Chas. (C.E.) ... ... Rutlam.
Tudball, W. (B.C.S.) ... ... Bareilly.
Tufnell, Capt. H. R. ... ... Neemuch.
Turner, Mrs. A. F. ... ... Bombay.
Turner, M. C. ... ... Bombay.

Uloth, H. W. ... ... Bombay.

Vaidya, Dewan Bhahadoor Luxumonrao Jagonath ... ... Bombay.
Vandravandas Purushotumdas ... ... Bombay.
Vidal, G. W. (C.S.) ... ... *Europe.*
Vinayekrao R. Luxumonji ... ... Bombay.

Wadia, The Hon'ble Mr. N. N. ... ... Bombay.
Walker, A. C. ... ... Bombay.
Walker, T.... ... ... Bombay.
Wallace, James ... ... *Europe.*
Wallace, John (C.E.) ... ... Cawnpore.
Wallace, L. A. ... ... Bombay.
Waller, Lieut. F. C. L. ... ... Sehore.
Walton, Rienzi (C.E.) ... ... Bombay.
Wapshare, H. ... ... Nilgiris.
Ward, Lieut. C. H. ... ... Fyzabad.
Wasey, Geo. R. ... ... Goa.
Watson, E. Y. ... ... *Europe.*
Webb, W. ... ... Bombay.
Weir, Dr. T. S. ... ... Bombay.
Welch, Dr. John L. (M.A., M.B.)... ... Malay Peninsula.
Wells-Coles, Lieut. H. ... ... Bombay.
Welter, F .... Bombay.
Wenden, H. (C.E.)... ... ... Bombay.
Westall, J. ... ... Bombay.
Westropp, Lieut. J. G. ... ... Rajkot.
Westmacott, Col. R. ... ...Poona.

Westropp, Lieut. S. H.	Bombay.
White, G. Gilbert	Nagpur, C. P.
White, T. C. H.	Thana.
White, W. H. (C.E.)	Ghadechi.
Whitehouse, Lieut. B. (R.N.)	*Europe.*
Whitworth, G. C. (C.S.)	Nasik.
Whyte, Lieut. T. C.	*Europe.*
Wild, A. E.	Lahore.
Williams, Lieut. E. G.	Rawal Pindi.
Willis, R. A.	Bombay.
Wilmott, J. Eardly...	Naini Tal.
Wilson, W. G.	Bombay.
Wimbridge, E.	Bombay.
Wise, H. S.	*Europe.*
Wodehouse, Lieut. F. W.	Kirkee.
Wolff, W. H. (C.E.)	Ahmedabad.
Wolf-Murray, O. (M.C.S.)	Cuddapah.
Wood, W. G.	Naini Tal.
Woodrow, W. R.	Sirsi.
Wright, Fred.	Ellichpur.
Wright, H. C.	Bombay.
Wroughton, R. C.	Poona.
Wylie, R.	Gadechi.
Yeld, Dr. H.	Calcutta.
Yeo, Edwin W.	Bombay.
Yerbury, Major E. Y.	*Europe.*
Young, A. P.	Poona.
Young, G. S.	*Europe.*
Young, W.	Bombay.
Younghusband, A. D. (C.S.)	Nandod.
Yule, Major J. H.	Burma.

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W. C. S. Baker del.

BLYTH'S BULBUL
(Xanthixus [illegible] avescens.)
NORTH [illegible] CACHAR.

Minterri Bros. Chromo Lith. London.

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THE BULBULS OF NORTH CACHAR.

By E. C. Stuart Baker.

Part I.

(With 2 Plates.)

(Read before the Bombay Natural History Society on 5th April, 1892.)

Zanthixus flavescens.

Blyth's Bulbul.

Oates' "Avifauna of B. India," No. 287., Vol. I., p. 275. id., B.B.B., Vol. I., p. 193. Murray's "Avifauna," Vol. II., p. 39. Hume, Cat. No. 452 bis.

Description.—Forehead and crown dark brown, the feathers edged olive-yellow and sub-edged grey. Upper plumage olive-brown, tinged flavescent on the rump. Wings olive-brown, edges of quill-feathers olive-green. Tail olive-brown, shafts rather darker brown. Lores black, short supercelium from base of upper mandible yellowish white; cheeks and ear-coverts greenish-grey; chin pale grey; throat, breast, and flanks grey, more or less suffused with yellow; centre of abdomen flavescent; under tail-coverts bright yellow. Bill and legs black; irides dark brown.

Length 8·2 in.; tail 4 in.; wing 3·3 in.; bill at front ·4 in., and from gape ·65 in.; tarsus ·8 in.

The feathers of the tail are rather strongly graduated, the centre pair exceeding the outermost by rather more than three-quarters of an inch.

NIDIFICATION.—The nest is very much like that of the common bul-bul (*P. pygæus*); but on an average I think it is proportionately shallower. The first I ever saw was composed outwardly entirely of very dark-coloured materials, the only light thing about it being one small yellow leaf woven into the base amongst the other materials; these consisted of black fern roots, dark brown twigs, and tendrils of climbing plants. The lining was composed of the ends of some grass denuded of the seeds, which in colour was a bright tan. Another nest, obtained later on, was composed largely of dead leaves and twigs interwoven with, and bound together by, roots, further strengthened here and there with a few cobwebs. The lining was of the same flowering grass ends as in the other. I do not know the name of the particular kind of grass from which it is taken, but when a quantity is put together it has exactly the appearance of "khus-khus." Of five other nests which I have taken, three were much like the one first mentioned, and two others were of an intermediate type between that and the other one. All seven nests are rather dark, even such leaves as are used in their construction are generally of a dark brown or dead green shade, rather than of the commoner colours, yellows and reds. In shape, as already mentioned, they are shallow cups, very neatly and firmly made. The majority of those I have taken were placed in between *several* upright twigs, these being only partly brought into the sides of the nest by the circumscribing materials. The average of five of the nests was rather less than four inches in diameter; in depth none exceed 1·5 in., varying between that and 1·2 in. The internal measurements are about 3·2 in., by ·8 in. depth. All the nests were taken from low bushes close to the ground. The highest was found at about five feet, the majority between two and three and-a-half feet. The birds take great pains to conceal them well, and it often requires careful searching before they can be found. The parent bird, moreover, generally leaves the nest very silently, and at once quits the neighbourhood. On one occasion only—and

then there were young—did the birds at all assist me in finding their nest by hovering about in its vicinity. Of the seven nests two contained three eggs each and one contained only two. Of the others one nest had but a single egg in it and the remaining two were empty. My nine eggs average in size ·96 in. by ·58 in. They vary in length between ·93 in. and 1·00 in., and in breadth between ·56 in. and ·60 in.

The ground-colour is a faint, very delicate cream, and they are freckled with specks and tiny irregular blotches of brownish-pink and with others again, subordinate to these, of pinky-grey, appearing as if below the shell. The markings form a very distinct ring in the greater number at the larger end, and here too there is a dull purplish tint caused by very indistinct, cloudy markings of pale neutral tint. In about half the eggs, also confined to the larger end, there are a few exceedingly fine, short, hair-like marks, the colour of clotted blood or of dark brown.

Of all bulbuls' eggs these are, I think, the most elongated, but at the same time they are obtuse rather than pointed. The shell is very fragile and soft in texture, the surface is smooth but quite glossless.

During the cold weather I have seen this rare bulbul as low down as 1,500 feet, but after April they appear all to ascend above three thousand feet, and many go to the highest peaks, nearly 7,000 feet high. They keep to much the same sort of ground as *Otocompsa flaviventris*, and like them assemble in flocks from September to April. The flocks appear to differ much in their proportions; I have seen over thirty collected together, and again I have observed flocks consisting of only half a dozen individuals. They are rather silent birds, when not quarreling (a vice they are rather given to), and they do not seem to have any song worthy of the name; and most of their other notes resemble the conversational notes of *O. pygæus* and *burmannicus* very closely, though they are distinguishable by any one who has studied the different bulbuls' voices.

They are shy birds and impatient of close observation. They are quite impartial as to their feeding grounds, visiting high trees and low bushes alike.

They breed, as far as I know, in June and July, but a wide

knowledge of their habits will probably show that they also breed in May.

They do not break up their flocks until very late in April, so that it is unlikely that they will be found building in that month.

They eat both fruits and insects, but principally the latter.

Criniger Flaveolus.

The White-Throated Bulbul.

Jerdon B. of In., Vol. II., p. 83. Oates' Fauna of India, Vol. I., p. 255. id. Hume's Nests and Eggs, Vol. I., p. 162. Murray's Avifauna, Vol. II., p. 84. Hume, Cat. No. 451.

Description.—Forehead, lores and cheeks and a supercilium greyish-white; ear-coverts grey, varying very much in depth; chin and throat white; remainder of head light olive-brown, the feathers all more or less edged with yellowish-green; whole upper plumage and lesser wing-coverts olive-green, remainder of wings brown, the quills edged with olive yellow on the outer webs; lower plumage bright, light *King's* yellow; tail rufescent-brown.

Bill pale greyish-blue, gape and mouth still paler; irides deep red; legs greyish-horny, pale bluish-horny or fleshy-grey.

Length 8·7 in.; tail 3·3 in.; wing 3·7 in.; tarsus ·75 in.; bill at front ·68 in. and from gape ·9 in.

Oates makes no mention of any white supercilium, but I find some trace of this in all the birds obtained in these Hills. In the majority it is well developed and very strongly defined, but in others it is much less distinct though always perfectly apparent. The grey of the ear-coverts, as above mentioned, varies very much; in a few specimens it is no darker than the lores and cheeks, whilst in some it is sufficiently dark to make a decided contrast with those parts.

Nidification.—The nests, of which I have taken some thirty, are all much of the same type, and are made as follows:—The outside of the nest is composed of dead leaves and bamboo spates *rather* strongly fastened together with a few hair-like fern roots and a number of elastic stems of weeds; inside the outer shell, which can be stripped off without damaging the remainder of the nest, there are a few more dead leaves *very* strongly bound together by innu-

E. C. S. Baker del.

Mintern Bros. Chromo lith. London.

THE WHITE-THROATED BULBUL
(Criniger flaveolus.)
NORTH CACHAR.

merable fern roots, all of the finest description, and, also, all black, so firm is this part of the nest that if the outer part and the lining be taken away, a strong and perfect cup remains capable of withstanding considerable force. The true lining is composed entirely of coarse fern roots, very rarely of fine twigs. These three portions of the nest as a rule shew three distinct shades of colour, the outermost part, in the material of which dead leaves predominate, is of a yellow or light reddish, the fine fern roots cause the central part to appear of a dead, dull black, whilst the innermost is nearly always of a dark reddish-brown. In shape the nest is a rather shallow cup, averaging, in internal diameter about 2·6," and in depth a little over an inch. The outer dimensions of course depend much on the amount of materials used and the compactness with which they are fastened together. The greater number of nests will be found to somewhat exceed 4·5" by 2·5," and very few will be taken smaller than this. Oates states that "they build in small trees at heights never above 10 feet from the ground; amongst the large number of nests that I have personally taken, I have never seen one above four feet from the ground, and many are placed within a few inches of it, or amongst roots and herbage, and practically, if not actually, on it. From its position the nest is more often than not very wet and heavy, but so well is it made that the lining keeps beautifully dry and warm. The eggs are very beautiful In character they shew but little variation, though much in the *extent* of their markings: the ground-colour varies from a pale to a warm deep pink, always rather bright in tint; the primary markings consist of irregular lines, specks, spots and small blotches of different shades of blood and maroon-red, the majority dark, some light, and a very few quite pale; the secondary markings, which are usually very few in number and often absent altogether, consist of specks and freckles of grey and purple-greys; I do not remember ever having seen any lines of this colour. The markings usually tend to form a ring at the larger end, the spots and lines here running into one another and being rather blurred, elsewhere the spots are very few; in a few eggs they form an ill-defined cap, and in a very few they are fairly equally distributed over the whole surface of the egg. I have two or three clutches in which the character of the markings is very smudgy, and they are

also more numerous—much as in the eggs of *Pycnorhis*—and a couple of other clutches in which the markings consist almost entirely of lines. In nine out of ten eggs many of the spots will be found to be in the shape of tiny horse shoes.

The eggs are very glossy, the shell is compact and smooth, and decidedly stronger than the majority of bulbuls' eggs.

In shape they are typically rather long, obtuse ovals, though frequently rather drawn out towards the smaller end. Abnormal specimens are rare, and, such as there are, are generally of a broader, more obtuse shape.

In length my eggs range between 8·9″ and 1·1,″ and in breadth between ·68″ and ·74″. The average length of 35 eggs is ·99″ × ·72″. In number they are generally two, very rarely three; never, that I know of, four.

I have only taken the eggs of this bulbul in May and June, the earliest date I have recorded amongst my notes being the 4th of May last year, 1891, and the latest the 24th of June, 1883. I have, however, found young, unfledged, in August, and I also once found a nest containing young ones on the 2nd of May. They do not often seem to breed in these Hills below 3,000 feet, and I have found most of my nests above 5,000 feet.

This bird, like the greater number of species of this sub-family, is gregarious throughout the cold weather, but is never found in very large flocks; as a rule they number some eight or nine individuals, often only four or five and never more than twelve or fourteen; they keep very much to the smaller trees and bushes, the cause of this doubtless being the fact that they are more exclusively fruit eaters than most bulbuls, and find their food more plentiful and easily obtained in such situations, for, they will ascend very lofty trees, when these are in bearing, to feed on the berries.

It is wonderful what enormous things these birds contrive to swallow whole: I took from the stomach of a bird, a short time ago, two large berries of a babool-like tree, *Phyllanthus emlica*, which completely filled it, extending the walls to their utmost limit; these berries are of a sort very common in these hills, acid to the taste, and in colour pale green; they form a favourite article of diet with monkeys, deer, squirrels, etc., and many kinds of birds.

I have never heard this bird uttering any song, indeed most of its cries are very harsh and loud, though it has one rather sweet loud note which it frequently uses, unfortunately nearly always in conjunction with many others far less pleasant.

Its flight, for a bulbul's, is strong and very direct, but it seems seldom to make use of its wings for any distance at a time. It is found principally on the outskirts of heavy and in the interior of light forest, generally selecting ground with a considerable amount of undergowth.

I have never seen it below 2,500 feet except in the cold weather; it appears to be most common between three and four thousand feet at that season, ascending higher during the breeding time, when it may be obtained on the very highest peaks.

Flemixus flavala.

Brown-eared Bulbul.

Jerdon B. of In. No. 448, Vol I., p. 80. Oates' B. B. B. No. 272, Vol. I, p. 175; id. Avifauna of B. I.; Vol I., p. 263. Murray's Avifauna of B. I., Vol II., p. 20.

Description.—Head grey, the feathers centred darker; remainder of upper plumage, lesser and median wing-coverts dark grey; in some birds the upper tail-coverts are tinged with olive-yellow but in most they are quite plain grey; greater wing-coverts dark grey with nearly the whole of the outer webs olive-yellow; primaries brown, all but the first three narrowly edged with olive-yellow, secondaries the same but with the yellow margins broader, whilst in the inner secondaries the greater portion of the outer webs are of this colour. The tail is of a rather lighter brown than the wing, the feathers being margined with yellow in the same way as the wing quills. Lores and cheeks velvety-black; ear-coverts golden-hair-brown; chin and upper throat white; breast and flanks grey, of a paler shade than the back and fading to white on the abdomen; under tail-coverts white.

Some birds have the under parts tinged with flavescent during the cold weather, it is always, though, extremely faint.

The female, though not much shorter, is a much more slender bird, and the crest, also, never appears to be so well developed.

Bill black, irides dull crimson or reddish-brown; the legs vary much between horny-brown and dark plumbeous, in a few specimens being almost black.

Male, length 8·4″; tail 3·4″; wing 3·9″; tarsus ·72″; bill at front ·6″ and from gape ·98″.

Female, length 8·1″; tail 3·2″; wing 3·8″.

NIDIFICATION.—The nest is a rather deep cup composed outwardly of grass stems and dead leaves, and lined with coarse grass stems.

The general appearance of the nest is a bright tan-brown and it looks as if made of "kus-kus" or some similar material. Occasionally the whole nest is constructed entirely of grass stems, but at other times a good many bamboo leaves are used as well as coarse grasses and a few fine twigs, and, in one nest, I also found a few fern roots and a scrap or two of moss. It is a very compact, strongly built nest; externally they average about 3·5″ by 2·5,″ and inwardly the diameter is about 3″ or rather less, and the depth from 1·6″ to ·2″. The nest is almost invariably placed close to the ground, generally at about three or four feet from it, and never, to my knowledge, above five feet. Most of my nests were taken from wild lemon trees growing at a place over 6,000 feet high, but I have found one nest below 2,300 feet, and have seen many birds at about that elevation during the breeding season. All the nests were taken from scrub jungle with one exception, and that one was found *almost* on the ground by a hill path passing through forest. This last nest was very beautifully hidden in an overhanging bunch of creepers being half supported by them and half by a bunch of coarse grass. I should never have found it but for the assistance of the parent birds, who kept hovering about and *swearing* loudly whenever I approached too close.

My eggs are all of one type; the ground-colour a lovely pale pink, covered with numerous spots and freckles of pinky-red which are slightly more numerous at the larger end.

I have one or two eggs of *O. flaviventris* which resemble them in all but size, and a clutch of eggs of *Spizixos canifrons* which are quite undistinguishable from them.

The average size of twelve eggs is ·93″ × ·71″.

The greatest and least length is ·96″ and ·88″, and the greatest and least breadth ·73″ and ·69″.

There is the full complement of eggs, rarely only two, never I think, four. In shape th y are rather long regular ovals, in texture typical bulbul's. This bird is fairly common throughout the district, descending during the cold weather far into the plains and ascending to the highest peaks during the hot weather and rains. In the former season, during which time it assembles in flocks, it frequents fairly open country, roadsides, and the edges of patches of cultivated land. It keeps exclusively neither to high trees nor to low bushes, visiting either the one or the other as the chances of obtaining food present themselves. The flocks are very large and I have *counted* over thirty in one; as in addition to this, their numerical strength, they are exceedingly noisy, it is by no means easy to overlook them. I was once at a place on the banks of a big stream where there were several large trees, then in bearing, to which these birds came to feed every morning and evening. From daylight until about 9 a. m. they were industriously feeding and keeping up a continuous loud chuckling and chattering, giving every now and then a clear whistle. After 9 o'clock the whole flock flew away, retiring to some deep, shady forest close by, from which they returned to feed at about half-past three or four p. m.

They shewed themselves to be very amiable characters, refusing to fight with any of the other species of birds engaged in feeding on the same trees, and at once gave up their perch to any other bulbul or barbet who chose to take it.

I noticed that they were the earliest of all the birds to retire; they went away some time before sunset and began to settle themselves in a clump of bamboos where they are accustomed to roost.

The flocks must break up very early as I have never seen any after the first few days of March, though I constantly meet with single birds much later on in the year.

About the middle or end of April they ascend to higher elevations where they remain during the breeding season. At this time much less is seen of the birds, as they withdraw to deeper forest, keeping in a great measure to nullahs and ravines, more especially to those through which water runs.

They have a pleasant but rather jerky song which they sing all the year through, as well as in the breeding season. I have heard it

repeatedly in December, January and February during which latter month the birds are still collected together.

These birds have a very peculiar habit of seating themselves at the extreme end of a thin overhanging bamboo and swinging with the breeze. The small solitary bamboo, *Bambusa vulgaris*, when still young, is exactly like an extremely pliant fishing rod, and the end of one of these forms a very favourite perch with this bulbul. I have often seen a pair of them thus seated, close together and evidently enjoying the motion of swaying backwards and forward sin the wind. They are not exactly shy birds, but they will not allow nearly as close an approach as *Iole* does, unless they are in trees with very thick foliage when they trust to escape being seen. If any one approaches such a tree in which a flock of these birds are feeding, and of course also chattering, a dead silence ensues directly they see him, and until the undesired presence is withdrawn, no more conversation is carried on.

During the breeding season they become more wild, and it is then often rather difficult even to get within shot of them.

Spizixus Canifrons.

The Finch Billed Bulbul.

Oates' Fauna of India, Birds, Vol. I., p. 280, id, Hume's Nests and Eggs, Vol I., p. 184. Hume, Cat. No. 453 bis. Murray's Avifauna of B. I., Vol II., p. 48.

Description.—Forehead, running up in a point into the crown grey; lores mixed grey and black, crown and round the eye b. chin and cheeks, mixed grey and black; ear-coverts grey tinged with hair-brown on the upper part, nape and sides of neck grey, chin dark brownish-grey. Whole upper plumage bright olive-green, lightest on the rump and upper tail-coverts, and darkest on the scapularies and interscapularies; wing-coverts the same tinged with brown on the inner webs of the greater coverts; primaries and secondaries dark brown on the inner and yellowish-green on the outer webs, inner secondaries green on both, but more or less tinged with brown on the inner webs. Tail yellowish-green, with a band, an inch wide, of dark brown at the tips. Lower plumage dull greenish-yellow, brightening to yellow on the belly and under tail-coverts. Bill very

pale straw-white, legs and feet dull deep flesh-colour, iris red-brown to pure vandyke-brown.

Length 8·4″; wing 3·7″, tail 3·9″; bill at front 5·4″ and from gape 7·5″; tarsus 7·5″.

The woodcut representing the head of this bird in the Blandford series Avifauna, makes the crest too bushy and the feathers not long enough or sufficiently pointed. The crest is more like that depicted in the woodcut of *Hypsipetes psaraides*. The hairs springing from the nape are rather numerous in this species, the nostrils are almost concealed.

NIDIFICATION.—The nests that I have taken of this bird differ from those of any other bulbul. The material of which they are made consists almost entirely of coarse and strong tendrils with perhaps a few fine elastic twigs added here and there. There is seldom any lining beyond a few scraps of withered bracken; but I have noticed that the tendrils used for the inner portion of the nest are generally finer than those used for the outer portion; another peculiarity is that the inner tendrils are usually of a reddish colour, whilst those of the outside are of different shades of brown, pale enough to contrast with the former. The nests are fairly strong, but by no means tidy, the tendrils hanging in festoons all about them. A nest, now before me and taken on the 5th May this year, measures internally about 2·7″ in diameter by 1″ in depth. It is an exact miniature of nests of the genus *Ianthocincla*, especially *rufogularis*. All the nests I have taken have been placed in scraggy bushes and saplings at heights varying from five to ten feet from the ground; they are generally fixed in between several upright twigs, sometimes in a stoutish fork.

I have never taken a nest below 4,000 feet, and the majority have been found at over 5,400; they breed in considerable numbers on the Hungrum peak.

The earliest date on which I have taken eggs was on the 30th April this year (1891); my latest dates recorded are the 16th June 1890, and 16th June, 1888. The eggs vary very greatly in colour, but the type most often found is as follows:—Ground-colour pale pink freckled all over with primary spots of dull reddish and underlying ones of pale dusky and purplish: these markings generally tend

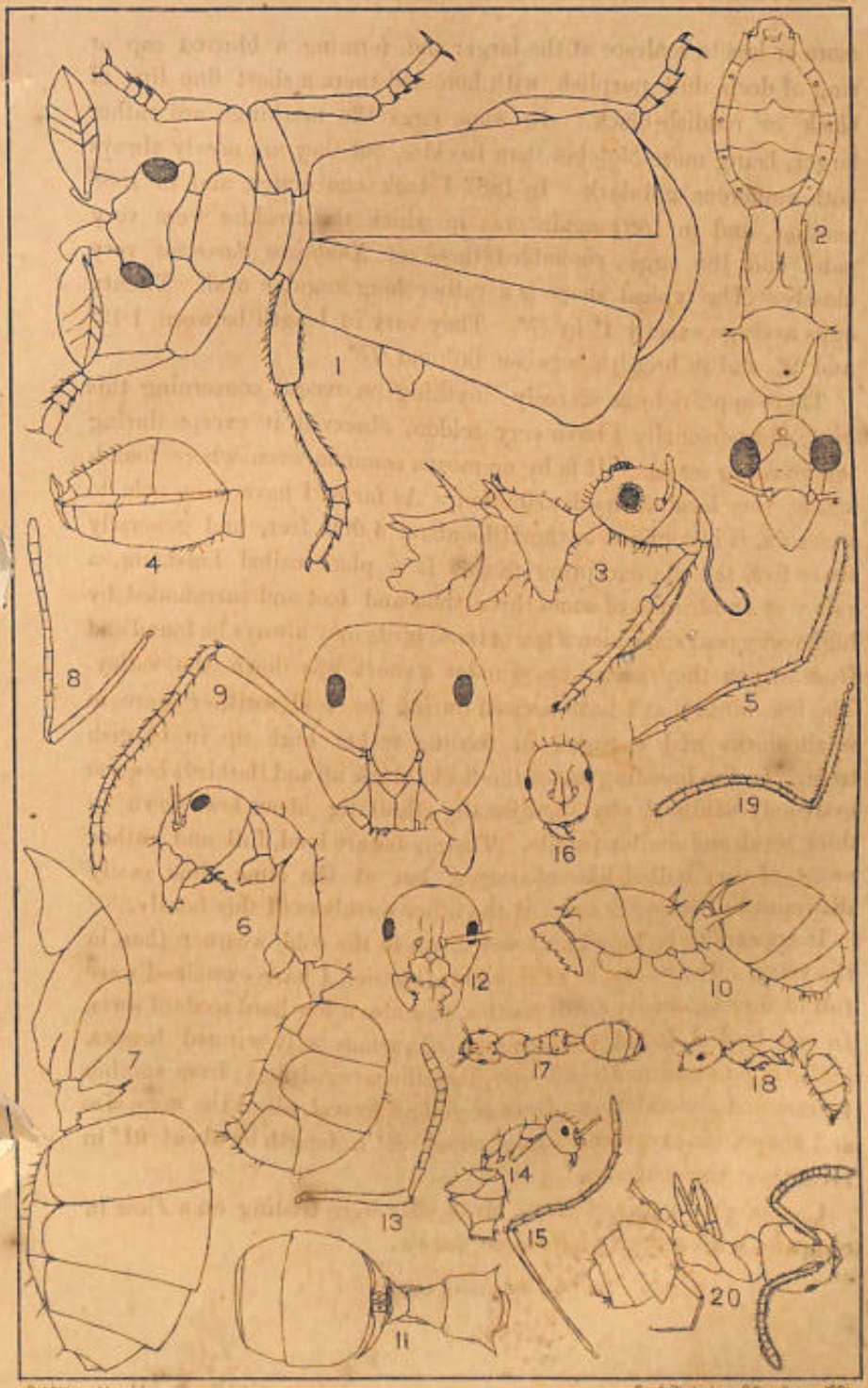
more or less to coalesce at the larger end, forming a blurred cap or ring of deep dull purplish, with here and there a short fine line of black or reddish-black. In some eggs the markings are rather larger, being more blotches than freckles, but they are nearly always both numerous and dark. In 1887 I took one clutch, and in 1888 another, and in 1891 again one, in which the freckles were very pale and the eggs resembled those of *Xanthixos flavescens* very closely. The typical shape is a rather long regular oval. Twenty eggs average exactly 1″ by ·7″. They vary in length between 1·12″ and ·9″, and in breadth between ·66″ and ·73″.

There appears to be scarcely anything on record concerning this bird, and personally I have very seldom observed it except during the breeding season. It is by no means common even where found, and is very local in its distribution. As far as I have been able to ascertain, it is confined to the Hills above 4,000 feet, and generally above five, the one exception to this is a place called Laishang, a valley at an altitude of some three thousand feet and surrounded by high rocky peaks on which a few of these birds may always be found and from which they sometimes wander a short way down the valley. The few birds that I have noticed during the cold weather were in small flocks and engaged in feeding rather high up in biggish trees. In the breeding season the flocks break up and the birds become extremely wild and shy, continually skulking about low down in thick scrub and similar jungle. Their notes are loud, full and rather sweet, of very bulbul-like character, but at the same time easily distinguished from the cries of the other members of this family.

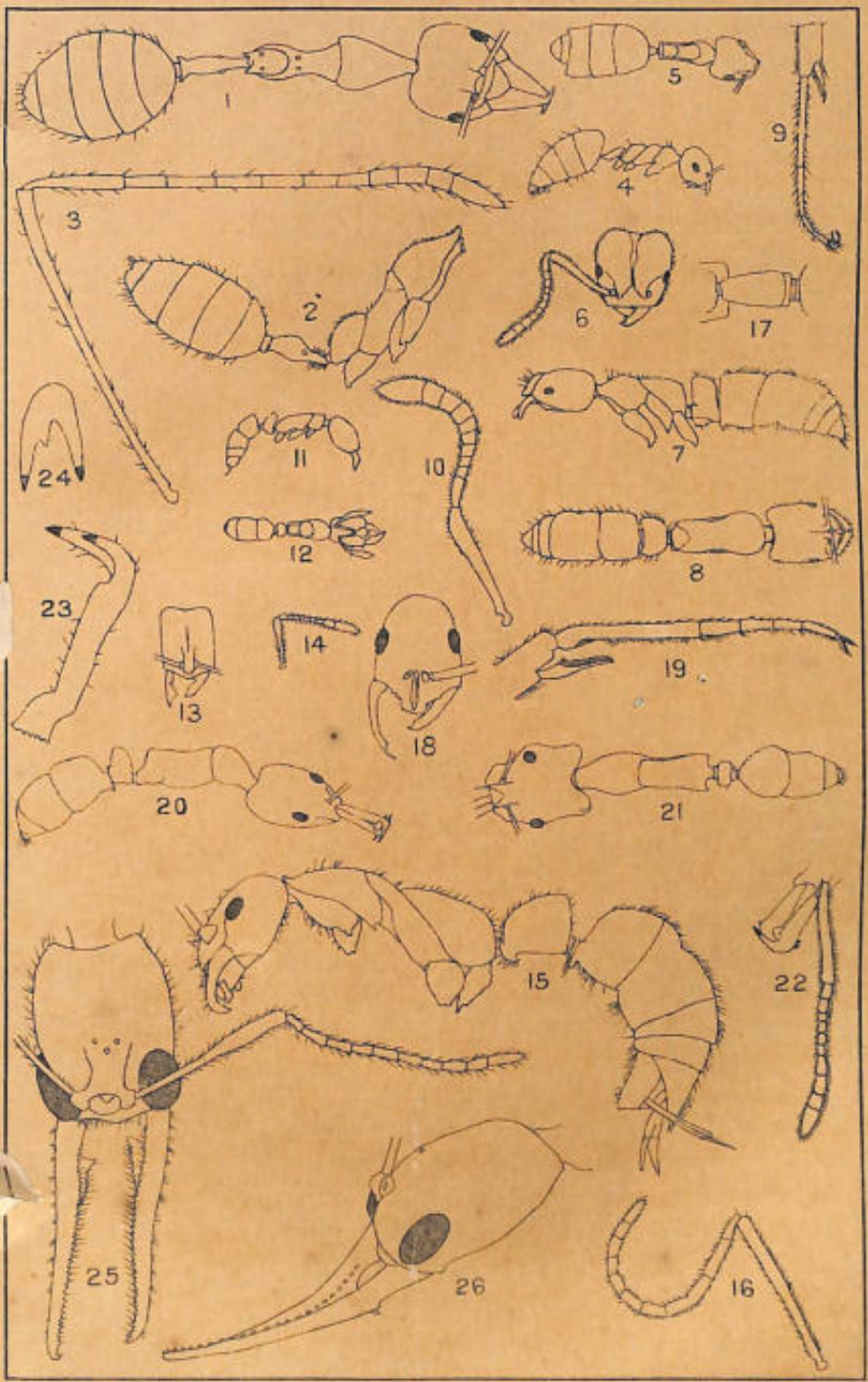
It appears to be found no lower down in the cold weather than in the rains. The stomachs of those birds which I have examined were full of insects, chiefly small beetles, and also a few hard seeds of sorts. In one bird I found the remains of various soft winged insects, including a small moth and many metallic winged-flies; from another I extracted several tiny pieces of yellow gravel, all of the same size and shape, *viz.*, regular ovals of about ·05″ in length by about ·01″ in breadth at the centre.

I once shot a pair of these birds who were feeding on a *Ficus* in company with a flock of *Hemixus flavala*.

(*To be continued.*)



Robt Wroughton del. Govt Photozinco Office, Poona 1891



Rob' Wroughton, del. Govt Photozinco: Office Poona 1891.

OUR ANTS.

By Robert Charles Wroughton, F.E.S., Deputy Conservator of Forests, Poona.

Part I.

With Plates A and B.

(*Read before the Bombay Natural History Society, 5th April, 1891.*)

I have only come across two papers treating of the manners and customs of 'our' ants (if I except a very short and very inaccurate paper which appeared in "Science Gossip" many years ago). One of these by Mr. Rothney has been reprinted in this Journal, and the other will be found in "Tribes on my Frontier." In the latter E. H. A. has drawn a humorous but life-like picture of a few of the commoner species. The colonizing ant of his Bath-Room is a *Dorylus;* its black enemy is *Camponotus compressus.* The "red ant of Matheran" is of course *Œcophylla smaragdina;* the lively black bungalow ant is certainly *Prenolepis longicornis,* and the 'brown' ant almost as certainly *Monomorium basale* (= *vastator*) though the name given is a libel, for *basale* is really a handsome yellow with a black abdomen. His agricultural ant is a *Holcomyrmex,* and finally his hunting ant is a *Poneride,* and most likely a *Lobopelta,* but there is less detail than usual in the notice of this species. The facility with which I have been able to recognize these species, from E. H. A.'s descriptions, has emboldened me to think that a record of the manners and customs, which have come under my notice in the last few years, during which I have been paying special attention to the ants, would not be without value. I am glad to know that Dr. Forel, who has been so kind in identifying and, where necessary, describing and naming my specimens for me, intends to publish in this Journal the result of his labours. I propose therefore to avoid all technical descriptions. I shall try, however, wherever possible, to record any characteristic feature which may help to the recognition of any species. In the following notes my facts are facts, or have presented themselves to me as such, but my generalizations must be taken *cum grano salis.* No one is better aware than myself how many-sided is the psychology of an ant; how differently is her

brain constituted from ours and, consequently, how dangerous to generalize from insufficient data. However "working hypotheses" are a necessity, and I have tried to "put myself in *her* place "(I have always tried to remember that ants are practically all females and 'advanced' females at that) and have enunciated wherever possible a theory. I shall be only too glad if others will collect and record facts enough to upset one or all of them. I propose to do so myself, if I can.*

The Order *Hymenoptera*, of the sub-kingdom *Insecta*, was divided by Latreille into two primary sections, which are still retained. Kirby in his "Elementary Text Book of Entomology" writes, "It "(*i.e.*, the Order *Hymenoptera*) is primarily divided into *Hymenoptera* "*terebrantia*, in which the ovipositor is used as a borer, and the "*Hymenoptra aculeata*, in which it is modified into a sting." The ants are usually ranked as the first Family of the *aculeata* which, considering their social organization, so closely resembling, and even surpassing to some extent, that of the Bees and Wasps(for these latter have in no case a 'soldier' caste or form) seems surprising. The reason probably is that in one whole sub-family of the ants, viz.:— the *Formicidæ*, the sting, the distinguishing feature of the *aculeata*, is wanting. Dr. Dewitz maintains that the sting in the *Formicidæ* is undeveloped, but Sir J. Lubbock holds, that it is "a case of retrogression contingent upon disuse" on the ground that it is "difficult to suppose that organs—so complex and yet so similar—as the stings of ants, bees and wasps should have been developed independently." He declines, however, to hazard an opinion as to whether the sting is or is not a modified ovipositor. The whole question is evidently a most difficult one to resolve, but I would note that Lubbock's argument quoted above, and which he states is, in his eyes, "conclusive" might, with the change of a few words, be used to prove that the *Termites*

* I have mentioned three papers on ants as only having come under my notice., I should however record that there is another one of old date by Dr. Jerdon. In this a certain number of species are described and named, but I have not been able to obtain it for study. Some references to it, however, which I have come across, seem to show that the manners and customs incidentally recorded therein are truly described. The descriptions, however, were very imperfect, and the types having been lost, the Doctor's species are consequently also lost.

(or white ants) are also ants; for they, too, have a social organization with modified female forms constituting 'workers' and 'soldiers.' Yet nothing can be more certain than that they (the *Termites*) belong to an Order, viz.:—the *Neuroptera* in no way allied even to the *Hymenoptera*.

The ants, like the Wasps and Bees, are social. The Queen (♀) has wings (there are exceptions) which however drop off when she has been fecundated. The Male (♂) is winged for life (with only one or two known exceptions of apterous ♂). Every species of ant (again with only one or two known exceptions) has, in addition to these, at least one other and sometimes two other forms. The 'Worker' (☿), that is, the apterous insect commonly known as the 'ant', like the ♀, has a sting (or its modification). She is in fact a ♀ in which the generative organs have totally, or partially, aborted, exactly corresponding so far with the worker bee or wasp. In some species, however, all the ☿ are not alike in form. The ☿ minor is comparatively small and, also, comparatively speaking, is normal in shape, *i.e.*, resembles the ♀. While the ☿ major is usually a grotesque looking insect, considerably larger than the ☿ minor, with a monstrous head. Very often, as in the common large black ant of our bungalows, all the intermediate gradations between these two forms may be found in the same community. In some species, however, only the two extreme forms are represented, they are then usually known as 'Worker' (☿) and 'Soldier' respectively. Lubbock believes that this is related, in some way, to the division of labour, but I confess I have never seen any proof of this. If a road along which *Holcomyrmex* is harvesting grain be watched, it will be seen that the individual ☿ vary in size from $\frac{1}{16}$ to fully $\frac{1}{2}$ of an inch in length, and the biggest by no means carry the biggest loads or work hardest. That the ☿ and soldier (☿) however have different duties is certain; for instance, the latter will never be seen carrying grain, or doing manual labour; probably it is beneath her dignity, or possibly contrary to the military regulations.

The ants resemble the wasps, and differ from the bees, in having more than one ♀ in each nest. For a very long time it was taken for granted that a ♀ did not outlive the year in which she was born, and on this misconception many theories were based. Sir J. Lubbock

however has amply proved that a ♀ not only can live 7 or 8 years, but that her fecundity remains unimpaired. The ☿ too, he has shown, lives equally long, in this, assimilating to the bees rather than the wasps, whose communities, in Europe at any rate, are annual ones.

The body of an ant consists of 3 parts—Head, Thorax, and Abdomen. The thorax however is not joined directly to the abdomen, but is connected with it by a 'pedicle,' the shape of which is of considerable importance in classification. The antennæ in the ♀ and ☿ consist of a long shaft (1st joint) known as the 'scape,' and a 'flagellum' of from 6 to 11 short segments, the apical ones, usually, forming a sort of club. The number of segments is usually different in the ♀ and ♂. The antennæ of the latter may contain as many as 17 joints, and the first joint is usually not appreciably longer than the rest, and the club shape is wanting. The eyes of ants are compound, consisting of many facets, varying from 1 to 1,200 or 1,500. Some species, however, are quite blind. In addition to these compound eyes, ants have also ocelli, usually 3 in number, arranged in a triangle, with the apex in front, on the top of the head, though sometimes the anterior ocellus alone is present. Usually the ☿ are without ocelli, which, however, are always present in the ♀ and ♂. The pupa among the ants is sometimes naked, and sometimes enclosed in a cocoon. It has even been recorded that in the same species and even in the same community the pupa is sometimes naked and sometimes not. The abdomen, in the ♀ and ☿ consists of 6 segments, in the ♂ of 7.

Four main sub-divisions of the ants have hitherto usually been recognized:—

1. *Formicidæ*:—having one node in the pedicle, destitute of sting, pupæ naked or enclosed in a cocoon.
2. *Ponerida*:—having one node in the pedicle, the second segment of the abdomen constricted, armed with a sting, pupæ enclosed in a cocoon.
3. *Dorylidæ*:—pedicle and abdomen sometimes as in the *Ponerida*, sometimes as in the *Myrmicidæ*.
4. *Myrmicidæ*:—having two nodes in the pedicle, armed with a sting, pupæ naked.

Dr. Forel, of Zürich, to whose works, and kind assistance, I am indebted for most of the technical information contained in this

paper, and especially for the identification of the species, substitutes for the *Formicidæ*, two sub-divisions, based mainly on the form of the gizzard, viz. :—

Camponotidæ:—pupæ ordinarily enclosed in a cocoon.

Dolichoderidæ :—pupæ always naked.

I may be fanciful, but I have thought that I could trace degrees, or rather phases, of 'civilization', among the ants, corresponding very fairly with the above classification. Among the *Formicidæ* we have *Prenolepis*, the gipsy without any settled home, or at any rate so little attached to it as to be ready to shift on the smallest provocation, at one end of the scale, while at the other, *Camponotus* is found in large permanent communities, keeping cattle, and living on their produce. *Œcophylla* makes a nest of leaves, joined together with a silky material, but this is the wigwam of branches of the savage, and these nests are often constructed over and round aphides, etc., and are in fact 'byres.' *Polyrachis* has pushed farthest the practise of nest-building (*spinigera* actually spins a complete bag of silk to line her subterranean nest), still they are a timid retiring folk, living from hand to mouth, on vegetable juices, and possibly on the produce of their cattle, though I have never ascertained this last. The *Poneridæ* are unequivocally in the hunting stage of civilization. Lubbock says: "Our English hunting ants generally forage alone. In warmer climates, however, they hunt in packs and even in armies." According to my experience, this is not quite correct. Among the *Poneridæ*, the social instinct is limited to domestic affairs, and to occasional predatory raids. All the species, as a rule, and *Ponera* (and perhaps others) always, forage singly. Should one of them find a prey, she will struggle with it single-handed, and even abandon it, but it will never enter her head to seek help. Indeed, I have often fancied, I noticed a movement of impatience (unfit to be recorded, I fear, even if it could be translated, and certainly unladylike) when a stray ♀ finding a sister struggling with a prey beyond her powers has proffered assistance.* Among those species which do organize raids, such as *Lobopelta*, when a ♀ finds, not a single edible article, no matter how large, but a collection of titbits,

* Mr. Rothney tells me that this exactly accords with his experience.

which must be secured, working against time—such a find may be, for instance, a dead branch lying on the ground covered with white ant galleries, if by any chance these galleries have been broken open—then the lucky finder seizes a termite, and starts for home at a 'wolf's trot,' and very shortly, a column of ants 4 or 5 abreast and several yards long is making for the spot at the double.* The *Dorylidæ* are a mysterious folk, living deep in the bowels of the earth, and nocturnal in their habits. Of the manners and customs of *Dorylus* (or 'ponerine branch' as I may call them) I know practically nothing. *Œnictus* (=myrmicine branch) is a disciplined *Lobopelta*, and bears the same relation to the *Ponerida*, as the Zulu to the ordinary African negro. No individual foraging is undertaken, all is done, as Lubbock puts it," in armies." The formation is usually wider than among the *Ponerida*. *Œnictus*, though belonging to the 'Myrmicine branch,' has retained the very characteristic ponerine method of carrying the prey, beneath the thorax and abdomen, her legs straddling over it; a method unknown to the other Families.† The *Myrmicidæ*, in part at least, have reached the agricultural stage. Species which carry home food they have found, in their stomachs, are comparatively the exception. The lowest in the scale would seem to habitually carry home vegetable products, though some do not seem to store them. The harvester *par excellence* is *Pheidole*, who is run very close however by *Holcomyrmex* and *Solenopsis*, both these latter, handicapped by their short legs, so unsuited for cross-country work, have evolved the road-making instinct (finding that course easier perhaps than evolving longer legs). *Pheidole*, nothing behind however in engineering genius, practises a system of embankment against floods, fit to make a Hollander green with envy. *Cataulacus* has lagged somewhat, she seems to store no grain (though she certainly brings home vegetable products), she keeps cattle, however, in the nest. *Crematogaster*, while only exceptionally using roads and omitting altogether to store,

† That *Lobopelta* does not always follow this routine, however, is shown in an interesting Note by Mr. Aitken on *L. chinensis*, which will be found further on, and which shows them adopting pure *Dorylus* tactics.

‡ It is curious that, in Europe, *Polyergus*, a genus of the *Formicidæ*, and the chief 'slave dealer', has adopted this peculiar method of transport.

food, has carried the art of nest-building to perfection. In some species at any rate, as testified to me by Mr. Aitken and by Mr. Taylor (Orissa), she still habitually keeps cattle, often enclosing them in 'byres,' specially built over them.*

Cattle.—Ant cattle are usually *Aphidæ* or *Cocci*, some species however tend various other species of *Hemiptera*, among which may be named *Leptocentrus taurus* and *Diaphorina guttulata*. Larvæ of the *Lycænidæ*, among the butterflies, also furnish a considerable contingent of cattle. The following ants are recorded by de Nicéville in his "Butterflies of India," as tending lycænid larvæ, viz.:—

FORMICIÆ:—

Camponotus rubripes (*Drury*).
Camponotus mitis (*Smith*).
Formica nigra (*??=Camponotus sp*).
Œcophylla smaragdina (*Fab.*).
Prenolepis longicornis (*Latr.*).
Prenolepis clandestina (*Mayr.*).
Tapinoma melanocephalum (*Fab.*).

MYRMICIDÆ:—

Monomorium speculare (*Mayr.*).
Monomorium latinode (*Mayr.*).
Cremastogaster Nicévillei, MS. (*Forel*).
Pheidole quadrispinosa (*Jerdon*).
Pheidole latinoda (*Roger*).

Mr. de Nicéville does not say what he understands by 'tending cattle,' and though most of the above very likely do tend cattle, I can scarcely believe that *Pheidole latinoda* does so habitually. Of course any ant, even a *Ponera*, will stop to lick sugar when she comes across it.

Pets.—It is very difficult to say where the line between pets and cattle, on the one hand, and pets and fellow-lodgers, on the other,

* Though *Cremastogaster* does not store grain, I have seen *perelegans*, lie in wait for *Holcomyrmex*, returning home, laden with grain, and by threats, rob her of her load, on her own private road; and this manœuvre was executed, not by stray individuals, but by a considerable portion of the whole community. Surely this is the acme of civilization.

should be drawn. That *Aphidæ*, *Cocci*, and lycænid larvæ are distinctly cattle, there can be no doubt But in almost every ant's nest (or to speak more correctly in the immediate neighbourhood of it) may almost always be found a crowd of *Invertebrata*. Thus one and the same stone may cover a colony of *Prenolepis longicornis*, and the entrance to the nest of a *Pheidole*, and even possibly to that of a third species, and besides this, may be found to shelter "wood-lice" (*Oniscus*), "Fish insects" (*Lepisma*), *Chelifera*, and true insects, of widely different families, as beetles, bugs, cockroaches, crickets, &c., &c. It is impossible, as a rule, however, to say whether there is any connexion between these and the ants, and, still more so, to define the relation between them. That there is sometimes a connexion between *Lepisma* and certain species (curiously enough usually *Ponerida*) is shown by the observations on *Anochetus*, which I have recorded further on, but even in that case, I failed to make out what the relation was. The only case of 'pets' I have met with is recorded in my notice of *Pheidole Wroughtoni*, and even in that case it remains doubtful whether these beetles (*Paussus sp.*) should not rather be regarded as cattle. The fact that beetles, of this same genus, are in other countries, also found domesticated in ant's-nests, seems to me to indicate, that they really are 'cattle', rather than mere platonic 'pets.'

The crickets found by Mr. Aitken in the nest of *Plagiolepis longipes*, would seem to be 'parasites' rather than 'pets'; they apparently lived where they were found, for their own convenience and not for the ants' pleasure.

Mimicry.—If imitation is the sincerest flattery, then the ants are in danger of having their heads turned, so widespread and marked is the imitation of them, by spiders and other insects. What, however, is the cause or object of this mimicry, I have, in no case, been able to make out. Is it a case of the 'sheep in wolf's clothing,' or the reverse? Amongst the most persistent of the ants' flatterers are the spiders. Mr. Rothney has already recorded in his paper that certain spiders take the form of *Sima rufo-nigra* (Jerd.) and *Sima nigra* (Jerd.) Besides these, I have found several specimens of a spider, which, at a short distance, is almost indistinguishable from a ♀ of *Camponotus opaciventris*, whose mode of progression by a series of

rushes and pauses he copied closely. In the neighbourhood of almost every strong colony of *Cremastogaster contenta* (Mayr), a mimicking spider may be found, moving about at a jog trot, and waving his abdomen in the air, exactly like *Cremastogaster*. Among insects, I have taken a good many specimens of a bug, which has achieved a very fair imitation of *Polyrachis spinigera* (under the same stone with which it may often be found), even to the extent of evolving a pedicle and spines, on what, were it an ant, would be its metanotum. Curiously enough, however, these spines are apparently not alike, in any two specimens. Is it, that this bug is still waiting for one of its race to accidentally sport spines, more like those of *P. spinigera*, and thus to set the ball of evolution rolling afresh? or, is it, that the present rough copy of the spines of *spinigera*, is found sufficient to deceive, such a short-sighted, or rather, such an 'indistinctly seeing' creature, as an ant, even at the shortest distance? In life, this bug 'humps' his back in exact imitation of *Polyrachis*, and it is astonishing how the loss of this gibbous outline, after the death of the bug, detracts from its likeness to *Spinigera*, as far as the human eye is concerned. Another, rather common, species of *hemipteron* has not taken the trouble to change his shape. It is of the ordinary shape of the 'wild' bug, but, by the evolution of judicious patches of white, which are practically invisible, the remaining dark portion of his body simulates, very closely, the outline of a small ant, pedicle, and all complete. I have often collected these nuisances (after an exciting chase) for, what I hoped was, a new species of ant. The fact that, at any rate in this case, the mimicry* is only effective from above, seems distinctly to point to protective coloration. There is no accounting for tastes, yet, from the narrow human point of view, it does seem astonishing, that any creature should exist, with so depraved a taste, as to prefer this foul-smelling mouthful to an ant, even though the formic acid of the latter, might make it taste rather 'hot i' the mouth.' The only other unmistakable case of mimicry I have met is by an *Ampulex* (one of the *Aculeata*, and therefore a comparatively near relation of the ants). Mr. Rothney has recorded this mimicking insect in his paper, and I have noted my observations on it further

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on, in writing of *Sima rufo-nigra*, of which species it is an 'understudy.' On one occasion, with some trouble, I captured a rather peculiar-looking specimen of *Camponotus*, and, it was only on close examination, I found that my *Camponotus* had filiform antennæ, over an inch long, and was, in fact, a cricket. This occasion is, however, the only time I have come across this insect, and I scarcely like to claim it as a mimic, on such meagre evidence. Finally, I must note, that certain black *Mantidæ*, in their earlier stages of development, may easily be mistaken, at first sight, for a *Camponotus* ♀ minor. The resemblance is, however, only a general one, the insect retaining the normal shape of a *Mantis*, so the resemblance may be merely an accidental (!) one.

Grain, &c., harvested.—As may be supposed, the harvesting ants only bring home single grains, consequently, it is very difficult to identify the species harvested. I believe, that all kinds of grass seed are collected by one species, in one place or another. With great trouble, I have been able to trace the two principal grasses, whose seeds are commonly harvested in the Dekhan, and these, Dr. Lisboa has most kindly identified for me as *Tragus racemosus*=*Sappago aliena* (Dalz and Gibson)=*Sappago biflora* (Roxb.), and *Eleusine mucronata*. I have also seen the cultivated 'nachni' or 'nagli' (*Eleusine corocana*) being carried home. Mr. James Taylor informs me, that he has seen rice also harvested, by ants, in Orissa. The seeds are usually brought into the nest intact, there, they are husked, and the chaff brought out, and strewn round the entrance. Dr. Lisboa suggests that, perhaps, this accumulation of chaff serves as a fortification, for which purpose, as he points out, the "muricated spikelets of *Tragus* and the pointed awns of *E. mucronata* are well adapted." This is very possible for some species of ants, and, *Meranoplus bicolor* (Guér.) and *Triglyphothrix Walshi* (Forel), the entrance to whose nests are very narrow, only bring home clean grain. Curiously enough, these same species (or at any rate *Meranoplus*) harvest a small purple flower, and, in that case, they bring home the whole flower, and strew the petals round the entrance, exactly as *Pheidole*, and the others, do the chaff of the grass seed.

Slavery.—I believe our Indian ants are above anything of the sort. I can certainly say I have never been able to find the faintest

trace or indication of it. Mr. Rothney tells me, that the late Frederick Smith, specially called his attention to the possible practise of slavery, by *Myrmecocystus viaticus* (who is known to practise it elsewhere). However, Mr. Rothney wishes to record, as the result of twelve years' observation of ant habits in India, that his experience exactly agrees with mine, and that he totally failed to find any "trace of slavery among Indian ants." Similar testimony is borne by Major Yerbury and Messrs. Aitken and Taylor.

Nothing has struck me more than the activity and energy of 'our ants,' as compared with those of Europe, contrasting so strongly, as it does, with the "limpness" of the human natives of this country.

Nests.—The ants are very impatient of drought (Lubbock, Forel, and all who have studied ants in confinement, mention the difficulty of preventing evaporation, from the artificial nests). This, no doubt, influences the form and situation of the nests, adopted by them, in their natural state. The form of nest, so common in Europe, represented by a heap of pine-needles, leaves, twigs, &c., is never seen out here. The vast majority of nests, here, are subterranean, indeed, the proportion is so large that this may be said to be the normal situation. Almost all the rest are found in hollows in trees, such as those of *Cataulacus*, *Sima*, some species of *Pheidole* and of *Cremastogaster*. A few species habitually fix their headquarters in leaf-blisters, galls, &c., *i. e.*, in cavities in the living tissues of trees; these are rare, and the only *bonâ fide* case I can mention is the *Cardiocondyla Wroughtoni* (Forel), which lives in blisters on the leaf of the Jambhul.* Finally, a few species construct nests, more or less elaborate, such are *Œcophylla* and some species of *Polyrachis* (which construct nests by joining together growing leaves with some silky material) and *Cremastogaster Rogenhoferi* and *C. ebeninus*, and perhaps some other species, which build nests of a material which looks like cow-dung, but which is, probably, a sort of coarse brown paper, manufactured from vegetable tissues, and suspend them from the branches of trees, like wasps' nests. The normal situation for the nest of a species is, however, not always strictly adhered to. I have noticed that, on the Ghâts, with a heavy rainfall and abundance of

* Even this species I have found living underground.

large trees, there is a tendency, with subterranean species, to become quasi-arboreal, while in the dry, treeless country of the Eastern Dekhan, the tendency is the other way. Moreover, I thought, when I was in Thana in 1884, that I detected several cases of change of locality with the seasons, which would be easily accounted for by the very heavy rainfall of the Konkan. Unfortunately, however, I did not record any notes, so that my conjecture is of little value, except as a hint for future observers. Amongst the species which nest in the ground, there is a great difference in the form of the nest. Among the *Formicidæ*, the normal plan of the nest would seem to be a main shaft (often branching near the surface to more than one opening, especially when the entrance is under a stone), which runs down obliquely, to a main chamber, which is surrounded, on the same plane, by a maze of passages, widening in places into subsidiary chambers. The depth, below the surface, of this main floor, is seldom very great. With the *Poneridæ*, there is usually a maze of passages and chambers, close to the surface (*at* the surface when the nest is under a stone) with a main vertical shaft, going to a considerable depth, and ending in a main chamber. I have had to dig 4 feet to reach the main chamber of a nest of *Bothroponera sulcata*. I know nothing of the nesting of the *Dorylidæ*; it has never been my good fortune to find a nest, but I live in hope. The nests I have heard of have always been in the foundations of a bungalow; as, for instance, the flight of ♂, from the floor of his bathroom, recorded by E. H. A. Should I ever find a nest, I can only hope, it may be in some one else's bungalow, for I have got to dig that nest. With the *Myrmicidæ*, the normal plan, is a vertical shaft, ending below in a main chamber, with numerous subsidiary chambers or landings (formed by the widening of the main shaft) at frequent intervals. From each of these landings, horizontal passages (1, 2, or 3) run out a short distance, and end in a chamber. The main chamber is very deep as a rule; with such a minute species as *Triglyphothrix Walshi*, I have had to dig 3 feet to reach it. I do not of course pretend to maintain that this normal plan is always strictly adhered to; on the contrary, I imagine it is the very rare exception. There are differences of taste in architecture amongst ants, no doubt, as amongst humans, and, moreover, the nature of the soil must

often make the construction, on the strictly normal plan, an impossibility.

Origin and maintenance of Communities.—The question as to how communities are formed, is a most interesting one, and its solution is not without importance. For instance, Wallace, in an argument, leans a good deal on the distribution of ants, treating them as 'apterous insects.' If however the ♀ can, unaided, found a colony, the argument becomes useless, for then, the 'ant' ceases, for his purpose, to be an 'apterous insect.' There would seem to be three ways in which a nest might conceivably be founded, *viz.*:—

1. By a colony being, in some way, cut off from the parent nest.
2. By a few (or many) ♂ joining themselves to a fecund ♀, and starting a new nest.
3. By a fecund ♀ originating a nest single-handed.

At one time, it was generally held that the 2nd was the ordinary method, that the 1st was very rare, and that the 3rd was quite exceptional, or indeed impossible. Later observations have quite upset this view.

Dr. Forel has such an interesting paper in his "Etudes Myrmecologiques," 1884, that I cannot refrain from making a few extracts. After noting that Lubbock has discovered, and proved, the longevity of ants, which, before, were supposed to live only for one year, or less, he continues: "Another point of the greatest "importance is, that Lubbock has succeeded in seeing isolated ♀ of "*M. ruginodis*, rear, single-handed, from the egg, larvæ, pupæ, and "perfect ♂ * * * Fritz Müller has arrived at the same result "for the *Termites*, in so far that, he has shown, that the king and "queen undoubtedly live several years. It is no longer necessary "therefore to hold Hüber's opinion, viz.:—that a new fecund ♀ is "required, each year, to continue the community. Hüber saw fecund ♀ "retained by the ♂, who stripped them of their wings; I have myself "seen this occur, though very rarely, with *Lasius flavus*, but never "with any other species." After pointing out the extreme desirability of discovering how long a ♀ retains her fecundity, *i. e.*, "her power of producing ♂ and ♀, and not merely ♂, which last, as is well known, can be produced by parthenogenesis," he says: "We are "thus led to believe that, probably, all the individuals of a community

" are the issue of the one or more ♀, who originally founded the " community. The individuals of a community are not, therefore, " as I once thought, the lineal descendants of a foundress ♀, but " actually her children. This would explain how 'racial,' and even " 'varietal,' characteristics, are so unchangingly maintained, in a com- " munity. It follows from this that, when the one or more ♀ of a com- " munity die, or lose their fecundity, through old age, the community " dies out also. The case of a community, formed by the separa- " tion of a colony from the parent nest is, therefore, exceptional, and " cannot extend its duration. The possibility, that wandering ♂ " attach themselves to a fecund ♀, and assist her (as conjectured by " Lepeletier and myself) remains, and is admitted, even by Lubbock." Further, Dr. Forel, in a letter to myself, writes: " Blochmann " has resolved the question in a manner absolutely definitive. It is " the fecund ♀ sola, who founds the new nest, or at least an associa- " tion of fecund ♀." I confess I have always been so convinced, that the ordinary method was No. 2, that I have been always on the look out for facts such as the observations of Mr. Taylor and Major Yerbury, on *Œcophylla smaragdina*, showing that it was possible for a ♀ sola to found a community, believing that method to be exceptional. Mr. Rothney, whom I have consulted, assures me he has always held the same view and, consequently, has never specially recorded any observations, showing " foundation" by the 2nd method. However, his note on *Polyrachis lævissima*, would seem to show that communities are sometimes originated in this way. The theory that a nest never adopts a new ♀, but that the duration of a nest depends absolutely on the existence of the foundress ♀, as a producer of ♂, is strongly supported by (if it does not directly follow from) the abandonment of the view that the fecund ♀ is, ordinarily assisted by ♂ in the task of founding the nest. I would point out to members how valuable would be any observations, which they may be able to make and record bearing on this question, of the manner in which ant communities are founded and maintained. A nest formed, by scission from a parent nest, is undoubtedly exceptional, for a cataclysm (from an ant's point of view) of sufficient magnitude, to abruptly and completely stop all communication between a colony, and the parent nest, must be of very rare occurrence.

The senses of ants. This is a most interesting subject, and one on which a good deal has been written; but I have, so far, gleaned little that throws any light on the many vexed questions involved in it in connection with 'our' ants. I can only refer any member interested in the matter to Sir J. Lubbock's "The Senses of Animals," as containing the most easily available summary of the question. There is one point in that work, however, on which I am able to offer an 'experience.' Lubbock records that a *Mutilla* (a genus closely allied to the ants) "makes, when alarmed, a rather sharp noise by rubbing one of the abdominal rings against the other;" a similar organ has been found in the genus *Ponera*, "which, in the structure of its abdomen, nearly resembles *Mutilla*," and finally, in the 'true ants,' has been found "a similar rasp-like organ in the same situation." He adds, however, "that ants produce no sounds which are audible to us." I am almost certain, however, that I have heard such sounds. When one of the large 'brown paper' nests of *Cremastogaster Rogenhoferi* is violently, and suddenly, disturbed, the ants swarm out in thousands, 'wagging' their abdomens, in the manner so characteristic of *Cremastogaster* when excited; at such times a distinct hissing sound is audible, as if a red-hot cinder had been plunged into water. I had always accounted for this by supposing it was caused by the material of the nest under the feet of the ants, and a similar, though fainter, sound, which may be heard when a large nest of *Camponotus*, or *Polyrachis spinigera*, is disturbed, by the rubbing together of the bodies of the ants, who are all in violent movement at once. The passage from Lubbock quoted above, however, leads me to think that this is not so, but that the audible noise is the sum of the individual stridulations of countless ants. The 'tail wagging' of *Cremastogaster* would account for the sound made by them being louder, though they are so much smaller than *Camponotus* or *Polyrachis*. I had asked Mr. Aitken to make some experiments to check the results I thought I had obtained. Members will no doubt recognize his hand in the following characteristic note which fully supports my contention. "I do not need to experiment. The roar raised by a squadron of "*Lobopelta*, if you poke at them with a straw, does not require "to be listened for with your hand to your ear. I should like,

" however, to know something about the 'organs' by which it is " produced. Military drums! I should think."*

The following is a catalogue of the species of ants which have come under my notice, or have been sent to me, with short notes of such manners and customs as have struck myself, or my correspondents, as worth recording. Almost all the species recorded have been identified, or named, by Dr. Forel, to whom I cannot sufficiently express my gratitude: I must record here, as a caution, however, that all these names cannot be guaranteed correct. They are sufficiently so to act as pegs, on which to hang the few notes I have collected; and I trust that Dr. Forel will, in due course, publish, in detail, the result of his final examination, in this Journal. I have decided not to delay the publication of these notes, in the hope that some member may be sufficiently interested by them, to decide to lend a hand, by collecting notes and specimens. The latter are especially wanted *now, at once.* The greater the number of specimens, from different localities, submitted for examination to Dr. Forel, the more thorough and 'pucka,' will be the results he will be able to give us, in the pages of our Journal. In view of Dr. Forel's promised papers, I have carefully avoided all technical descriptions, save only a few, fairly obvious characteristics, which I have gleaned from the works of Messrs. Mayr, Emery and Roger, and which, I hope, will enable members to make a rough guess at the genus. I offer the plates in fear and trembling; draughtsmanship has no part in my constitution, alas! If they are any way presentable, it is due to Mr. Tom Le Mesurier's artistic powers; had they been altogether his, they would certainly have been better. I must also record my obligations and thanks to my most patient teacher in myrmecology and very good friend, Dr. Forel, and to all the gentlemen who have so kindly helped me by sending me notes and specimens. May their number increase!

FORMICIDÆ.

A. CAMPONOTIDÆ.

In the *Camponitidæ*, the cloacal orifice is small, circular, apical

* Since the above was written, Dr Forel has called my attention to the fact that he had long ago recorded that some European species of *Camponotus* make an audible noise when their nest is disturbed.

and ciliate. In the insect, seen from above, all the segments of the abdomen are visible, the fifth being conical and apical.

Gen. 1. CAMPONOTUS (Mayr).

The genus *Camponotus* may be recognized by the trapeziform epistome. It is, however, easily distinguished from the next, by the two first segments of the abdomen being sub-equal in length. There are two forms of ☿, differing immensely in size and shape, but connected by a series of intermediate forms. The genus is best represented by the large black ant, so common about our bungalows, the species of which varies with the locality. (In Northern India it seems to be replaced by another genus, *viz.*,—*Myrmecocystus.*) Wherever *Camponotus* is found, a search, more or less protracted, will often disclose, that she has a colony of 'cattle' somewhere. These 'cattle' are usually either lycænid larvæ or some species of homopteron. In the eastern part of the Poona District nearly every babhul tree (*Acacia Arabica*) will be found covered with *Camponotus*, the ascending individuals, sleek and black, the descending, bloated, and showing whitish rings between the segments of the monstrously distended abdomen. I have never been able to decide whether they had 'cattle' up aloft, or were extracting, directly, the vegetable juices, with which they were evidently distended. Mr. Aitken, who is a close observer, and to whom I propounded the problem, wrote to me: "I have come to the "conclusion, that one of the most important sources of 'food supply,' "which ants have, is the sacchariferous glands, to be found at the "bases of so many leaves. The Banian (*Ficus Indica*) leaf, in "January and February, has a smear of sweets, just at the junction "of the leaf and its stem, which is in great request, even among "parrots and squirrels (you will see the latter rushing about the tree, "giving a lick to each leaf in turn). How much more ants!" I must confess that my observations corroborate this view. The marriage flight takes place, as recorded in his paper by Mr. Rothney, and by Jerdon, in June, after the first monsoon showers, usually in the evening or at night, though on cloudy, drizzling mornings, I have seen the exodus of ♀ and ♂ continue up to 8, or even 10 A. M. The genus, I believe, is normally crepuscular, and during the hot weather there is very little activity displayed, but, as soon as

the rain falls, and the skies are clouded, the whole community swarms to the surface, and ☿ may everywhere be found, seizing and carrying off the dead and dying ♂, of their own, and other species, evidently as food, so that their regimen is not always strictly limited to pastoral products. Probably, at this time of the year, their cattle are immature, and vegetable juices are not easily available. They are great wanderers, and I scarcely ever remember to have commenced digging a nest of *Pheidole, Holcomyrmex,* or any other species, without ☿ of some species of *Camponotus* turning up apparently in a terrible hurry, and evidently attracted by the concussion, caused by the blows of my pick. When larvæ or pupæ were turned up, each individual seized on one, and made off in the same excited, hurried way, in which she arrived.

1. *C. maculatus* (Fab.) race:—*compressus* (Fab.)
   Poona Districts ..... (☿ ♀ ♂ in June).
   Kanara.....E. H. Aitken.
   C. Provinces .....J. A. Betham.
   Salem, Madras .....A. Burroughs Sharpe
   Sunderbuns ....Robt. Ellis.
   Bengal, Madras. G. A. J. Rothney, (♀ ♂ in May and June).
   Dharmsala, Punjab.....Major Sage.
   Rai Bareilli, Oudh.....Dr. Simpson.
   Kondmals, Orissa .....Jas. Taylor.
   Trincomalee, Ceylon .....Major Yerbury.

This is a very common species, distributed, more or less, all over India. I have often found it 'herding' *Leptocentrus taurus.* Mr. Cotes, of the Indian Museum, Calcutta, who kindly identified this bug for me, wrote: "I saw this species in Dehra Dun last year, "on the branches of a tree, attended by a lot of large black ants, "which I took to be the common *C. sylvaticus.*"* I did not observe "them very carefully however. Mr. Wood-Mason also notices, that he "has seen a similar insect attended by ants in Calcutta." I have also found it tending a species of *Psyllid,* which, through the kindness of Mr. Cotes, has been identified, by M. Lethierry, as a new species of *Diaphorina,* and named, and described by him, in the Journal of

* *C. sylvaticus* (Oliv.) is a synonym of this species.

the Asiatic Society of Bengal, under the name of *guttulata*. Mr. de Nicéville records this, or a closely allied race, as tending larvæ of the following *Lycænidæ*, viz.:—1 *Chilades laius* (Cramer), 2 *Catochrysops cnejus* (Fab), 3 *Tarucus theophrastus* (Fab.), 4 *Polyommatus bæticus* (Lin.),

2. *C. maculatus* (Fab.), race:— *Taylori*, (Forel in MS.).

Bombay.
Coonoor, Madras .....R. W. Daly.
Kondmals, Orissa.....Jas. Taylor (type).

I found a few specimens of this species, on the side of the high road, at the back of Treacher's shop, close to the University Gardens, in Bombay.

3. *C. maculatus* (Fab.) race:—*mitis* (Smith.)

Poona Districts.
Kanara .....E. H. Aitken.
Coonoor, Madras .....R. W. Daly.
Mt. Abu, Rajputana.....F. Gleadow.
Kondmals, Orissa.....Jas. Taylor.
Myingyan, Burma .....E. Y. Watson.
Trincomalee, Ceylon .....Major Yerbury.

Not a rare species, but on the Bombay side, the next seems to be the common form. In forwarding specimens from Ceylon, Major Yerbury wrote: "In great numbers on the 'bher' trees below Fort Frederick (17-1-91 to 17-2-91). It is apparently in attendance "on a species of homopteron.* I searched round the bher trees "for a nest, but could find none. In addition to attending on the "homoptera as above, I have seen this ant in attendance on a "coccus on a bher tree and another coccus on a jungle creeper. "On 17-1-91 I found on a bher tree a lycænid pupa from which "*Spalgis epius* ♂ emerged; there was a single ant in attendance "on it. Since then I have found three lycænid larvæ feeding on the "bher berries, but only on one occasion saw an ant in attendance. "This species of ant is therefore pastoral and attends on several "insects of diverse genera." Mr. de Nicéville found it attending "the lycænid larva of *Lampides ælianus*

* The insect referred to is identical with, or very closely related to, *Leptocentrus taurus* mentioned above.

4. *C. mitis* (Smith) var. *fusci-thorax* (Forel).
Poona Districts.
Kanara.....E. H. Aitken.
Coonoor, Madras .....R. W. Daly.
Trincomalee, Ceylon .....Major Yerbury.
Calcutta.....G. A. J. Rothney.

This seems to be the common Bombay form of the last. It is rarely found outside the nest. It is pale coloured.

5. *C. mitis* (Smith) var. *crassinodis* (Forel in MS.).
Papun, Burma .....Major Bingham. (6-91 ♂ ♀)

Major Bingham took this variety with the winged sexes in June, 1891.

6. *C. maculatus* (Fab.) race—*dichrous* (Forel) var. *Kattensis* (Forel in MS.).
Dharmsala, Punjab.....Major Sage.
Mussoori, N.-W. P.....G. A. J. Rothney.

This is the Indian representative of the European species *C. dichrous*, and probably exclusively Himalayan.

7. *C. maculatus* (Fab.) race—*infuscus* (Forel in MS.).
Ceylon.....Major Yerbury (5-91 ♂).

8. *C. maculatus* (Fab.) race—*junctus* (Forel in MS.).
Barrackpore .....G. A. J. Rothney.

9. *C. invidus*. (Forel in MS.)
Koudmals, Orissa... ..... Jas. Taylor.

10. *C. angusticollis* (Jerdon).
Poona .....6-91 ♀).
Thana Dists.....F. Gleadow.
Kanara .....E. H. Aitken.

I have never found a nest of this species in Poona, but have taken the ♀ in June: Mr. Gleadow sent me some ♀ and one or two from Thana.

11. *C. radiatus* (Forel in MS.).
Kanara.....E. H. Aitken.
Thana .....F. Gleadow.

12. *C. doryeus* (Smith). race—*carin* (Emery).
Bombay.

I took a single specimen, in May, 1890, but I have no record of the exact locality. I have a suspicion it was in Bombay. The type, described by Emery, came from Tenasserim.

13. *C. Nicobarensis.* var: *exiguoguttatus* (Forel).
Burma.....Major Bingham and E. Y. Watson.

This seems to be a common species in Burma, but is not found I think in the Bombay Presidency. Mr. Aitken, however, some years ago, sent me a specimen from Kanara, very closely allied to this species, but has never been able to obtain any more for me.

14. *C. micans* (Nyl).
Poona Districts.
Calcutta, Bengal.....G. A. J. Rothney.

This is not a common species in India, where it is represented by the next.

15. *C. micans* (Nyl). race: *paria* (Emery).
Poona Districts.
Kanara.....E. H. Aitken.
Coonoor, Madras.....R. W. Daly.
Dharmsala, Punjab.....Major Sage.
Tunghoo, Burma .....E. Y. Watson.
Travancore .....H. S. Ferguson (a variety).
Calcutta; Benares; Mussoori...G. A. J. Rothney.
Madras; Colombo .....G. A. J. Rothney.

16. *C. micans* (Nyl). race: *rufoglaucus* (Jerd).
Ceylon.....Major Yerbury.

C. micans (Nyl). race: *dolendus* (Forel in MS.)
Dharmsala, Punjab .....Major Sage.

17. *C. sericeus* (Fab). var: *opaciventris* (Mayr).
Poona Districts
Kanara.....E. H. Aitken and T. R. D. Bell.
Salem, Madras .....A. Burroughs Sharpe.
Travancore.....H. S. Ferguson.
Thana Districts .....F. Gleadow.
Bengal.....G. A. J. Rothney (type).
Dharmsala, Punjab .....Major Sage.

Kondmals, Orissa .....Jas. Taylor.
Trincomalee, Ceylon .....Major Yerbury.
Madras; Colombo .....G. A. J. Rothney.

A wide-spread and common species but timid and retiring. At first sight, it looks more like a *Polyrachis* than a *Camponotus*. The communities are usually small, and the ♀ do not seem to differ so much in form, as in other species, or perhaps it is that the ♀ major are rare. The nest is subterranean, and not always easy to find; it is generally furnished with a built-up tubular entrance, rising less than an inch above the surface; this porch is built of minute pieces of grass, worked up with mud, and, to my mind, seems to foreshadow the building genius of the next genus. Mr. Aitken writes to me of this species. "Found crossing dusty roads singly, and "apparently without object. Nest, a hole in open sandy plains; "cannot be dug up, because the loose sand rolls down, and "obliterates everything; the ants must plaster the inside, or line "it with silk. They bring out the sand, one grain at a time, "working in great haste. The entrance is a very small hole. "This is one of the commonest ants in Kanara, but I never saw it "carrying anything, and fancy it lives on vegetable juices, or "aphides."

18. *C. camelinus* (Smith). var: *singularis* (Smith).
Burma.....Major Bingham.
Major Bingham took this species in the Pegu Hills in April, 1889.

19. *C. Buddhæ*. (Forel in M S.)
Lahoul, Thibet .....Major Sage.
Major Sage brought back a single specimen from Lahoul.

Gen. 2. Calobopsis (Mayr).

In contradistinction to the trapeziform epistome of *Camponotus*, this genus has the borders of the epistome practically parallel; it is moreover characterized by the peculiar truncate appearance of the fore part of the head, this peculiarity is especially noticeable in the ♀ major.

20. *Col. pubescens* (Mayr).
Moulmain, Burma .....Major Bingham.
Major Bingham writes: "Emits an acrid white froth when seized like *Bothroponera rufipes*."

Gen. 3. Polyrachis (Shuckard).

In this genus, the first segment of the abdomen is as long as all the rest together, which gives the abdomen a spherical form. There is only one form of ☿, which, moreover, varies very little in size.* All the species are more or less armed with spines. The genus is little developed on this side of India, and especially in the Dekhan, but from Burma some 20 species are recorded. The Bombay species are never found in our bungalows; they are a quiet, timid folk. Though I have frequently watched them, I have never been able to detect their source of food supply. I have noticed that even the arboreal species seem to come to the ground when foraging. The use of a spun material in the nest seems to differentiate it from *Camponotus* in India, though, I believe, this difference does not hold good all over the world, as the two genera are at present divided.

21. *P. lævior* (Roger) race: *debilis* (Emery.)

Poona Districts.

Thana Districts.....F. Gleadow

Kanara .....E. H. Aitken.

This is a comparatively rare species in the Dekhan, where I have only taken it twice, near the Ghâts; but in the moist Konkan, it is fairly common, as it seems to be also in Kanara. It is easily distinguishable from the other Bombay species, by its shiny, polished appearance. It is arboreal, and makes a nest by joining together two leaves, with a band of spun material, more or less adulterated with some vegetable product; both the nests I took were on fig trees (*Ficus glomerata*); and the adulterating material was composed of minute particles, or scales, of the bark. Dr. Forel is inclined to regard this as a synonym of *rastellata*. I must repeat that members must wait for a definite solution of this and similar questions until Dr. Forel's critical study of 'our ants' reaches this genus.

22. *P. lævissima* (Smith).

Moulmain, Burma.....Major Bingham.

Calcutta and Barrackpur .....G. A. J. Rothney.

* (Here and elsewhere where this remark is made it refers to normal ☿; the ☿ of a young nest, i. e., the first born of a ♀, are nearly always undersized.)

Mr. Rothney notes: "Nest on tree trunks, formed of a papyra-"ceous material. Swarms June 15th to July 7th. On one occasion "I had a small colony started in the flap pocket of a leather bag, "hanging in my verandah, at Barrackpur, where an apterous ♀, "and a few ♂, took up their residence, throwing a light silky "web across the open flap."

23. *P. rastellata* (Latr.).

Trincomalee, Ceylon .....Major Yerbury.

In sending me this species, Major Yerbury wrote:—"Nest a "number of leaves, spun together, to form a rough cylinder, and "one end stopped up." He describes this as a very active species.

24. *P. bihamata* (Drury).

Burma .....Major Bingham.

Major Bingham took this species in the Taungyin Valley in January, 1891.

25. *P. armata* (Le Guillow).

Burma.....Major Bingham.

Major Bingham wrote:—"Not uncommon; the variety with "the black abdomen commoner; both varieties found on the same "tree, but never in the same nest. I found, in June, in the "Ataran Valley, a huge nest of the black variety, measuring "4′ 3″ × 2′7″ × 5¼″, made of papery material, against a door, in a "forest rest-house."

26. *P. chalybea* (Smith).

Burma.....Major Bingham.

Taken in the Ataran Valley in February, 1890.

27. *P. bicolor* (Smith).

Ataran Valley, Burma .....Major Bingham.

Calcutta and Barrackpore .....G. A. J. Rothney.

Mr. Rothney writes me of this species: "Habits same as "*P. thrinax*."

28. *P. dives* (Smith).

Pegu Hills, Burma.....Major Bingham.

Tounghoo, Burma .....E. Y. Watson.

Major Bingham writes: "Not common; I found one nest, in Pegu, made round the foot of a little bush."

29. *P. argentea* (Mayr).

Kanara .....E. H. Aitken (6/90 ♂ ♀).
Barrackpore, Bengal.....G. A. J. Rothney.

I have only received this species from Kanara, where it seems to be common; the habitat of the 'type' is given as Manilla. From Mr. Aitken's description, it is apparently very like *P. lævior* in its habits, and makes its nest in the same way.

30. *P. spinigera* (Mayr).

Poona Districts.....(10/90 ♂ ♀).
Rangoon, Burma .....Major Bingham (a variety).
Thana Districts.....F. Gleadow.
Siwaliks, N.-W. P. .....H. M. Phipson.
Calcutta, Bengal .....G. A. J. Rothney (type).
Mussoori, N.-W. P. .....G. A. J. Rothney (♀ ♂ May, 1872).
Trincomalee .....Major Yerbury.

This species is very common in the Dekhan, indeed, in places, scarcely a stone can be turned over without exposing an existing, or deserted, nest; this is formed in a cavity in the soil (under a stone, or close alongside of it), which is lined with material resembling silk forming a bag with only one opening. The texture of this silk is fairly strong, and, with a little care, I have succeeded in digging up the bag intact. Dr. Forel suggested to me the possibility that this nest was not the work of *Polyrachis*, but the deserted dwelling of a *Mygale*, or some allied spider. I have, however, satisfied myself that this is not so. Early in June, 1890, I found in my garden, under a stone, a community of *spinigera*, who, apparently, had lately migrated, for the subterranean cavity was lined, not as usual with a web, but with a silvery varnish only. A week later, however, I found that this varnish had become the normal, pale brown, silky material. Moreover, in raising the stone, at my second vist, I tore the material which had apparently been made to adhere to the stone. I made several inspections at intervals of a week, and on each occasion I tore the material of the nest, to search for ♀ and ♂ specimens, and, on each following visit, I found the rent repaired; so that this material is clearly the handiwork of *spinigera*. *Spinigera* can, however, and does, under changed conditions, change her style

of architecture. In January, 1891, I found a small community, of which all the individuals, save the ♀, were only half the usual size; in this case, the nest was situated at the roots of a bunch of grass; it was in the shape of an inverted thimble, made of the usual silky material, and not covered in any way. Mr. Phipson brought me a nest of this species from the Sivaliks. It was formed by drawing together several living stalks of grass (or reeds), and joining them with the usual silk material, but, in this case, much mixed with bits of dry broken grass, possibly in order to give greater cohesion to the web, and thus better enable it to resist the strain, caused by the tendency of the stalk of grass to fly apart. Mr. Rothney writes: "In Calcutta and Barrackpore the nests are "formed of web-work, binding together a few twigs of a spiny "shrub. The winged sexes are to be found in the end of May." He also notes that the mimicking bug, which I have already mentioned, "also assumes arboreal habits, and can be generally found "on the trunks of trees, in company with the ♀ of this species."

31. *P. furcata* (Smith).
Salween Valley, Burma.....Major Bingham.

Major Bingham writes: "Makes a nest of papery stuff between "two leaves."

32. *P. furcata* (Smith) race: *gracilior* (Forel in MS).
Travancore.....H. S. Ferguson.

33. *P. Jerdoni* (Forel in MS).
Trincomalee .....Major Yerbury.

Major Yerbury writes: "Nest a web on the trunk of a smooth-"barked tree."

34. *P. Indica* (Mayr).
Thana Districts ..... F. Gleadow.
Kanara..... T. R. D. Bell.

I took a nest of this species in Thana in the rains of 1885. The irregularities in the bark of an old mango tree had been roofed over to form the nest. My recollection is that the material used was not the usual silk web, but a kind of mud cement: in a note made at the time I find, "looks like a termite workshop."

35. *P. thrinax* (Roger).

Kanara ..... E. H. Aitken.
Travancore ..... H. S. Ferguson.
Calcutta ..... G. A. J. Rothney.
Ceylon .....Major Yerbury (27/5 and 13/6/90 ♂ ♀).

Mr. Ferguson writes: "Nest in blister of leaf," but he sent no ♀, so it may not have been a true nest. Mr. Rothney describes the nest as "formed by binding together a couple of leaves with a few "silky threads; contains only a few individuals, a rare species." While Mr. Aitken says: "Nest a shell of brown paper on the under-"side of a leaf with three or four orifices." Finally, Major Yerbury records "several small nests on a tree in Peradeniya Gardens "(27-5-91); smaller nests in middle of underside of leaf—larger, "two leaves joined together overlapping about one-third of their "lengths; substance of nest earthy."

36. *P. Sumatrensis* (Smith).

Ataran Valley, Burma.....Major Bingham.

37. *P. Mayri* (Roger).

Travancore.....H. S. Ferguson.
Pegu Hills, Burma .....Major Bingham.
Ceylon ..... Major Yerbury.

38. *P. proxima* (Roger).

Pegu Hills, Burma .....Major Bingham.

39. *P. scissa* (Roger).

Ceylon ..... Major Yerbury.

Major Yerbury sent me a nest which was very small and composed almost entirely of some spun material.

40. *Polyrachis sp.*

Barrackpore ..... G. A. J. Rothney.

Gen. 4. Œcophylla (Smith).

In this genus the ♀, of which there is only one form, varies little in size; the pedicle is very long.

41. *Œc. smaragdina* (Fab.).

Poona Districts.
Kanara ..... E. H. Aitken.
Salem, Madras ..... A. Burroughs Sharpe.

Sunderbuns	R. Ellis.
Travancore	H. S. Ferguson.
Thana Districts	F. Gleadow.
Calcutta	G. A. J. Rothney.
Rai Bareilli, Oudh	Dr. Simpson.
Kondmals, Orissa	Jas. Taylor.
Burma	E. Y. Watson.
Ceylon	Major Yerbury.

This is the well-known vicious 'red' ant about whom Mr. Aitken has contributed such amusing papers to this Journal. The ♀ alone is red (and even she is said to be green in New Guinea); the ☿ which is much larger and stouter is pale green; while the ♂ is very small and black. Sir J. Lubbock claimed for *Œcophylla* that she had a rudimentary sting, but even this small endowment beyond her fellows has been denied, and in fact does not exist. It is certain, however, that she possesses the power of ejecting her venom to an extraordinary distance. When she attacks a human being she uses her jaws, and I never heard any one maintain that that was not enough. *Smaragdina* is found all over India, especially in the moister regions. In the Dekhan she is found only on the Ghât edge, and then only in weak communities. Her architecture has been so minutely and exactly described by Mr. Aitken that any further reference to it would be superfluous. *Smaragdina*, while fully maintaining the formicine reputation as a cattle-keeper, is undoubtedly also largely carnivorous. Many years ago my dog died, during the night, alongside my bed; in the morning his body was hidden from view by a coating of struggling ants. While he was alive he had remained unmolested, nor did they touch me, though my bed was their main thoroughfare on the way to the body. On one occasion I found a bone two inches long in a nest, and to this day cannot imagine how the ants got it there. I have heard Mr. Vidal, C.S., say that he had a young hawk eagle and a young owl killed by *Smaragdina*. Mr. Aitken writes: "I think *Œcophylla* feeds chiefly on the 'milk' of aphides and of butterfly larvæ;" and referring to the case of Mr. Vidal's pets adds, "On the other hand, I have scarcely ever "found the nest of a sun-bird on this coast except on trees swarm-"ing with these ants." Writing to me of this species Mr. Taylor

says:—"About 4 years ago at Khurda I saw some leaves of some "lime trees curled up. On looking, I found in one leaf a large "green ant, entirely covered in with a web on all sides; she seemed "to be sitting on white specks." On further search I found a "second in a similar position. I saw no other ants on the tree." An exactly similar account was sent me from Ceylon by Major Yerbury together with the nest and ♀.* Mr. de Nicéville has recorded the fact that this ant attends the larva of the lycænid butterfly *Lycænesthes emolus*.

Gen. 5. Prenolepis (Mayr).

The absence of ocelli in this and the next genus differentiates them from *Acantholepis*; in all three the insertion of the antennæ is at the lower (or anterior) extremity of the antennal groove. In *Prenolepis* the knot of the petiole is quadrangular or cuneiform; there is only one form of ♀, which varies little in size. The form of the ♂ is of considerable importance in distinguishing the various species of *Prenolepis*.

42. *P. longicornis* (Latr.).

Poona Districts .....(9/60 ♂ ♀).
Kanara.....E. H. Aitken.
C. Provinces .....J. A. Betham.
Burma .....Major Bingham.
Sunderbuns.....Robt. Ellis.
Travancore .....H. S. Ferguson.
Thana Districts .....F. Gleadow.
Kondmals, Orissa.....Jas. Taylor.
Upper Burma .....E. Y. Watson.
Ceylon .....Major Yerbury.
Barrackpore; Madras .....G. A. J. Rothney.

This small, long-legged, black ant is the bungalow ant *par excellence*, though it is also extremely common away from human habitations. As the above list shows, it is found throughout India. Herr Moens, who studied this species in Batavia, records that he found "a small *Blatta*" living with it in its nest; he speaks of it as found "more rarely in houses;" its place as "bungalow ant" being taken by *Plagiolepis longipes* (Jerdon). Its senses are very acute, and it is always the first to find any eatables left about. E. H. A.

* Since the above was written Mr. Aitken has recorded a similar experience in the pages of this Journal.

has a life-like notice of it in "Tribes on my Frontier." My experience is that this species has no very fixed habitation. Wherever dead leaves and rubbish have lodged in the fork of a tree a community of *longicornis* will almost certainly be found; I have also found it under stones, in cavities, &c., &c., and everywhere it was ready to move off to a new site, bag and baggage (or, to speak more correctly, 'larvæ and pupæ') on the smallest provocation. I have seen a whole community start off thus, deserting the nest, on the approach of an army of *Ænictus*, news of which had no doubt been brought in by scouts. At Sholapore, I found it specially affecting, as a nesting place, crevices in the masonry plinths of bungalows; in such positions the entrance to the nest was always strewn with spoils of *Camponotus*; whether these represented dead carcases brought home for food, or whether *Camponotus* had been attacked and killed, I could never discover. As E. H. A. states, *longicornis* is certainly largely carniverous, at any rate, when sharing a bungalow with humans; but she also undoubtedly goes in for dairy produce when available. Mr. de Nicéville records her as attending larvæ of *Catochrysops pandava* (Hors.) She is too nervous and flighty, however, to make a good dairy farmer, and to me has always represented the "gipsy type" in the ant world.

43. *P. clandestina* (Mayr).

Poona Districts
Coonoor, Madras.....R. W. Daly.
Ceylon .....Major Yerbury.
Calcutta; Colombo .....G. A. J. Rothney.

I found several nests, all under stones, each containing an apterous ♀; the communities were all small ones. *Clandestina* is much stouter and less active in her movements than her cousin *longicornis*. Mr. de Nicéville records this species as tending larvæ of *Polyommatus bæticus* (Lin.).

Note.—I have taken two other species in the Poona Districts and have received several more, viz.:—

(1) Mt. Abu.....F. Gleadow.
(2) Burma..... .....E. Y. Watson.
(3) Ceylon.....Major Yerbury.
(4) Ceylon.....Major Yerbury.

But their definite identification has not yet been completed mainly owing to the ♂ form not having been taken.

Gen. 6. ACROPYGA (Roger).

Very like the next, but abdomen is pointed and general shape squatter.

44. *A. acutiventris* (Roger).

Poona Districts.

Ceylon.....Major Yerbury.

I took a single ♀ on the dinner table, but have never come across the ♀.

Gen. 7. PLAGIOLEPIS (Mayr).

This and the next genus are easily distinguished by their 11 jointed antennæ, from *Prenolepis* whose antennæ are 12 jointed (this of course refers to the ♀); moreover, in *Plagiolepis*, the knot is "flat and rounded above."

45. *Pl. longipes* (Jerdon).

Kanara.....E. H. Aitken

Moulmain, Burma .....Major Bingham.

Travancore .....H. S. Ferguson.

Colombo; Calcutta.....G. A. J. Rothney.

Tounghoo, Burma.....E. Y. Watson.

Ceylon .....Major Yerbury.

This is a yellow ant. I have never seen it in the Dekhan, but it is common enough in Bombay, and I have taken it in Bassein Fort. Mr. Aitken has furnished me with the following note:—"The habits "of *Pl. longipes* are exactly the same as those of *Pr. longicornis*. "Both species seem to be alike in being unable to 'gnaw,' hence "their food must be carried home entire. If it is a corpse, they "muster a party and bear it away; if it is anything sweet, they suck "it and take away the juice in their stomachs, which are capable of "being distended like toy balloons. In Kanara this species com- "pletely displaces *Prenolepis* as *the* house ant. Its nest is in holes "in the wall, or roof, or under the foundations, in a box full of old "bears' and hyænas' skulls, or in fact anywhere. It steals no "farinaceous food, but carries off all portable sweet stuffs, and dead, "or dying, animal food of any kind. It wanders about the plants in

"the garden sucking glands, *Aphides* and the larvæ of *Lycænidæ*. "There is a large nest in the house which I examine regularly; "queens have been out for two months, remaining in the nest and "dropping their wings." Mr. Aitken also sent me some specimens of a cricket which he found living in the nest with *Flagiolepis*. These I sent to Herr Wasmann of Vienna for identification. As he has most kindly permitted me to make use of his reply, I cannot do better than record here an extract from his letter. "The "myrmecophilous cricket is a *Myrmecophila*, very near to *Myrm.* "*acervorum* (Panz.), perhaps even identical with it. The torsos, "legs, and antennæ of the 5 specimens seem to belong too "of a *Myrmecophila*, because the sexual organs are not "developed, at least no female ovipositor is to be seen. Male "of *Myrmecophila* seem to be still quite unknown. The sup- "posed ♂ of *Myrm. acervorum*, described in Burmeister's 'Hand- "buch der Entomologie' seems to have been the larva of a ♀. "I myself am *now* not quite sure, whether the ♂ of *Myrm. salamonis*, "described in my 'Ameisengäste von Tunisien,' is indeed a ♂ not "a larva; possibly it may belong as a ♂ or a larva to *Myrm. ochracea* "(Fish.), the ♂ of which is still unknown. According to the recent "essays of Brunner no ♂ of any *Myrmecophila* has yet been described; "the reason of this is that the ♂ cannot be distinguished exteriorly "from the ♀ larvæ. These are the difficulties in connection with "*Myrmecophila* which prevent the description of supposed new "species, unless the specimens are evidently ♀ adults. If Mr. "Aitken can find the adult ♀ of *Myrmecophila* with *Pl. longipes* or "with *larger* ants living in the neighbourhood, the question, whether "this *Myrmecophila* is identical with *acervorum* or new, can be set- "tled. It must be noticed that the larva of *Myrmecophila* sometimes "lives with *small* ants and the imago with *larger* ones. I found last "May (1891), near Mariaschein, in Bohemia, a very small *Myrmeco-* "*phila* (larva or ♂) in the nest of *Tetramorium cæspitum*, in the "vicinity of a nest of *Formica sanguinea* (with slaves, *fusca*) which "contained a considerable number of *Myrmecophila* ♀ adults and one "nearly adult larva (or ♂). The larvæ living in the nest of *Tetra-* "*morium* must have been those of *M. acervorum*, for that is the only "species of *Myrmecophila* found in Northern and Central Europe.

" On the habits of *Myrmecophila acervorum* and her relation to the " ants, I made observations for several months at Prag, by means of " artificial nests. *Acervorum* is amicably *tolerated* by the ants; but " neither *fed* nor *licked* by them, as is the case with *Claviger*, *Lome-* " *chusa*, *Atemeles*, and other 'genuine' guests. I have often " observed her cleansing the abdomen of an ant, who seemed to be " pleased by this treatment just as if it came from an ant. Probably " the nourishment of *Myrmecophila* consists of the excreta of the " ants, or of the *Hypopus* parasites adhering to the ants."

46. *Pl. Jerdoni* (Forel in MS).

Poona Districts.
Kanara.....E. H. Aitken.

A very minute species. I found it in February, 1890; a great number of ♂ were swarming up and down a tree, which was not in flower, and on which the leaf buds were just opening; the descending ants were returning 'filled,' so that there was evidently a source of food-supply at the top of the tree, but whether cattle or glands I failed to discover.

47. *Pl. exigua* (Forel in MS.)

Poona Districts.
Kanara.....E. H. Aitken.

Also a very minute species. It is not uncommon in the Dekhan; the nest is usually under a stone lying on damp ground; I found most nests below the embankments of the Nira Canal, or on the boundaries of irrigated fields. I have never seen specimens outside the nest, nor obtained much insight into their manners and customs. I noted, however, the extraordinarily large number of apterous ♀ to be found in the nests; in some cases they were almost as numerous as the ♂, and this, especially, in the stronger communities.

Gen. 8. ACANTHOLEPIS (Mayr).

The presence of ocelli in ♂ of this genus has already been noted; they are also furnished with a pair of spines on the metathorax and another on the node of the pedicle.

48. *Ac. Frauenfeldi* (Mayr).

Mt. Abu, Rajpootana .....F. Gleadow.
Rai Bareilli, Oadh .....Dr. Simpson.
Calcutta .....G. A. J. Rothney (2 varieties).

49. *Ac. Frauenfeldi* (Mayr) race: *bipartita* (Smith).

Poona Districts
Thana Districts .....F. Gleadow.
C. Provinces .....J. A. Betham.
Dharmsala, Punjab .....Major Sage.

This is a very common ant in the Dekhan, and seems to be distributed without much variation all over India; it is met in the same, or almost the same, form, in Egypt, and along the shores of the Mediterranean. The thorax is very narrow, which makes the abdomen look disproportionately large; this latter has a silky look, which takes away from its jet-black colour; the thorax is reddish. It is usually found in large communities, under stones, without any underground nest to speak of. There is always a large number of fertile ♀, I have counted as many as 20; they are curiously banded with black. Though not quite so unsettled as *Pr. longicornis*, they do not seem to be strongly attached to their home, and change their quarters on small provocation. In this species I have seen the nearest, and indeed the only, approach to the harvesting of the *Myrmicidæ;* though the harvesting was of the most rudimentary character, it is curious to note that this nest was abnormally placed in a burrow in the open.

50. *Ac. Capensis* (Mayr).

Poona Districts.
Mussoori, N.-W. P.....G. A. J. Rothney.

I found only a few stray individuals and failed to trace the nest.

51. *Ac. opaca* (Forel in MS.)

Poona Districts.....
Goa.....E. H. Aitken.

Gen. 9. FORMICA (Lin.).

This genus has the second, third, fourth, and fifth joints of the antennæ as long, or longer, than any of the succeeding ones (except

the last); the knot is large and vertical; the ocelli are distinctly visible. *Formica*, in India, is, I believe, exclusively limited to the Himalayan region.

52. *F. fusca* (Lin.).

Kashmir.....H. Littledale.
Lahoul .....Major Sage.

Mr. Littledale of Baroda sent me, with the specimens of this ant, the following note:—"May 4th, 1890. Took a nest of small black ants "in Ruppell Nala, on the south side of Nanga Parbut, at 12,500 "feet elevation, on a slope above the second glacier. The bigger "ants (*i. e.*, ♀ major) bit severely. Nanga Parbut is an immense "mountain 26,629 feet high. These ants are common on it. The "place where I got the ants was only cleared of its winter snow "two days ago, and the ants, the smaller ones especially, were "running all over the stones, and round the nest." This is the species which in Europe is so commonly kept as slaves by its cousin *F. sanguinea*.

53. *F. sanguinea* (Latr.).
54. *F. fusco-gagates* (Forel.).
55. *F. gagates* (Latr.).
56. *F. rufibarbis* (Fab.).
57. *F. rufibarbis* (Fab.), race *clara*: (Forel).
58. *F. truncicola* (Nyl.).

These seven species (only a ♀ of *truncicola*) were taken by Major Sage during a couple of months' holiday trip to Lahoul; they are all European forms.

Gen. 10. MYRMECOCYSTUS (Wesmael).

The parallel frontal ridges, and compressed abdomen, distinguish this genus from *Formica*.

59. *M. viaticus* (Fab.).

Benares; Allahabad; Agra; Delhi; Lahore; Tirhoot..... } G. A. J. Rothney.
Rai Bareilli, Oudh.....Dr. Simpson.

Mr. Rothney notes: "Winged sexes in May from Tirhoot; the "nearest point to Calcutta that I have taken this ant is Assensole, "where, when the train stops, it may be seen marching about the

"platform; it is not to be found so low down as Burdwan, and I "have not found it at Lucknow. The late Frederick Smith "suspected this ant of practising slavery; but, though it certainly "does send out scouting parties, of twenty or so strong, which "cover the ground at the double, I have never detected any "evidence of slavery." This form is found unchanged in Europe and on the African coast of the Mediterranean.

B. DOLICHODERIDÆ.

In this group the cloacal orifice is large, linear, transverse inferior, and non-ciliate. Seen from above, only 4 segments of the abdomen are visible, the last is hidden from view below the penultimate.

Gen. 11. TECHNOMYRMEX (Mayr).

In this genus the apical segment of the abdomen can be seen looking from above; it is the only exception to the rule.

60. *Tech. albipes* (Smith).

Poona Districts.
Ceylon.....Major Yerbury.

I have only met this species once, viz., at Khandala. It was swarming up and down a tree, to and from some food at the top; what this food was I could not discover.

61. *Tech. bruneipes* (Mayr).

Coonoor, Madras.....R. W. Daly.
Ceylon.....Major Yerbury.

Gen. 12. BOTHRIOMYRMEX (Emery).

The knot is thin and distinctly inclined forward; the first segment of the abdomen is slightly produced towards the petiole— ♀ ♀ ♂ are all the same size.

62. *Both. Wroughtoni* (Forel in MS.).

Poona Districts.

I have only found this microscopic species once, the nest was in a gall on a leaf of Karanj (*Pongamia glabra*); there were more than a score of individuals in the community, yet the gall was scarcely as large as a pea.

63. *Both. meridionalis.*

Poona Districts .....(6-12-91 ♂ ♀).
Coonoor, Madras.....R. W. Daly.

This species, though sensibly larger than the last, is also very minute. I have taken it several times and it would not seem to be a rare species. On the 12th December, 1891, under a stone, I found a large community, including an immense number of ♀ and ♂. On removing the stone a strong smell of roses was emitted, but so mixed with formic acid that, leaning over the nest, I was nearly blinded, and had to pause several times, in the work of collecting specimens, to dry my streaming eyes. The rose smell disappeared from my hands very quickly, leaving only a pungent, acrid odour which it required considerable washing to remove.

Gen. 13. IRIDOMYRMEX (Mayr).

The antennæ are very slightly clavate, and are only very little thicker at the apex than at the base; excluding the scape, the second joint is the longest, and the following ones decrease in length up to the penultimate, than which the terminal joint is rather longer. The ☿ and ♂ are of the same size, the ♀ is much larger.

64. *Irid. glaber* (Mayr).

Poona Districts.
Kanara.....T. R. D. Bell.

I only once took two straying specimens; but Mr. Bell sent me a whole community, including ♀ and ♂.

65. *Irid. excisus* (Mayr).

Benares; Calcutta .....G. A. J. Rothney.
Kondmals, Orissa.....Jas. Taylor.
Myingyan, Burma .....E. Y. Watson.

Gen. 14. TAPINOMA (Foerster).

The knot is flat and quadrangular; the abdomen much widened anteriorly and covering the petiole by its prolongation forward. The ♀ and ♂ are of the same size, and only slightly larger than the ☿.

66. *Tap. melanocephalum* (Fabr.).

Poona Districts.....(11-3-90 ♂).
Kanara .....E. H. Aitken.

Thana.....F. Gleadow.
Orissa.....Jas. Taylor.
Ceylon .....Major Yerbury.
Calcutta .....G. A. J. Rothney.

This is a minute species, but is very easily recognised by the characteristic black head, which, even to the naked eye, contrasts strongly with the almost colourless, semi-transparent abdomen. It is very common in the Dekhan, and may be found, in ascending and descending lines, on almost every flowering tree; it is specially fond of the Waras (*Bignonia quadrilocularis*). On one occasion I found a number of ♀ visiting temporary chambers (they were certainly not permanent nests) underground, at the roots of grass plants; and I found also aphides on the grass roots in these chambers. Mr. de Nicéville records it as tending the larvæ of *Zizera lysimon* (Hübner), and *Polyommatus bæticus* (Lin.). Mr. Aitken notes that "when this ant is crushed it emits a very offensive odour." The nest, which is usually under a stone, when uncovered, gives out a strong odour rendered pungent by the admixture of formic acid.

67. *Tap. minutum* (Mayr).

Poona Districts.

A very minute species. I found a community in a gall on the Saundar (*Prosopis spicigera*).

Gen. 15. Dolichoderus (Lin.).

Metanotum cubic, armed with two 'teeth' at the posterior corners of the dorsal surface; knot thick, cuneiform, strongly inclined forward.

68. *Dol. bituberculatus* (Mayr).

Mergui, Burma.....Major Bingham.

69. *Dol. sulcaticeps* (Mayr).

Burma .....Major Bingham.

Major Bingham writes: "I found this species, in evergreen forest "walking in a long chain, from a hole at the foot of a tree to a "bush near by, on which were a mass of white aphides. I caught "specimen after specimen, with my fingers, and found that they "emitted a strong smell of tube-roses, which hung about my fingers "for the whole day."

70. *Dol. Feæ* (Emery).

Salween Hills (3,000 ft.), Burma.....Major Bingham.

71. *Dol. Feæ* (Emery) race: *fuscus* (Emery).

Salween Hills (3,000 ft.), Burma.....Major Bingham.

72. *Dol. gracilipes* (Mayr).

Bombay.....E. H. Aitken.

Calcutta.....G. A. J. Rothney (20-7-85 ♂).

A nest was sent me by Mr. Aitken in 1885. They seem to depend for food on the white woolly 'coccus' (?) so common in the Konkan; where this occurs they draw the leaves together and form a 'nest.'

PONERIDÆ.

Gen. 16. Odontomachus (Lin.).

The extraordinary, bent, three-pronged jaws differentiate this and the following genus so clearly from all other *Ponerida* that it has been proposed to promote them to a sub-family of their own. In *Odontomachus* the knot is armed with a spine at its apex.

73. *Od. rixosus* (Smith).

Tavoy Plateau (4,000 ft.), Burma.....Major Bingham.

74. *Od. hæmatodes* (Lin.).

Travancore.....H. S. Ferguson.

Ceylon.....Major Yerbury.

Madras; Colombo .....G. A. J. Rothney.

I asked Mr. Ferguson as to the jumping powers of *Odontomachus* and he wrote: "I got some of those which you said were supposed "to jump. I don't think they do, but they can shoot themselves "backwards by bending their heads, pressing their mandibles against "any firm support, and then bringing them together with a click. "I tried them several times, and found that if held by a prelimb, "they always release themselves in this way, using the imprisoned "limb as a fulcrum for the mandibles to work against."

Gen. 17. Anochetus (Mayr).

In *Anochetus* the knot is unarmed. Both these genera are said to be able to jump.

75. *An. punctiventris* (Mayr).

Calcutta; Nuddea, Bengal.....G. A. J. Rothney (type).

76. *An. punctiventris* (Mayr) race: *Punensis* (Forel in MS.)

Poona Districts.

This is probably the Dekhan form. At a first glance it resembles a *Cremastogaster*, and I must confess I collected it as such, on the only occasion on which I met it. I did not notice its jumping powers, but, looking back, with knowledge gained too late, I have more than a strong suspicion that it used those powers; that, at any rate, is the only explanation which occurs to me of the marvellous way in which the crowd of individuals, from among which I was collecting specimens, seemed to melt away, before I had got half as many as I required.

77. *An. Sedilottii* (Emery) race: *Indicus* (Forel in MS.)
Poona District 19-6-90 ♀).

I found my first nest in June, 1890; it contained a winged ♀. The ☿ were engaged in long foraging rambles, from which each returned laden with a *Lepisma*, about her own length (say ½ an inch) carried in the way so characteristic of the Indian *Ponerida*. The *Lepisma* was in no case dead, or apparently injured, so that the reason for its capture is doubtful. I could find none in the nest when I dug it up, but as I had to perform this operation with a penknife I may easily have overlooked them even had they been there. However, I have since seen *Indicus* bringing home termites in the same way, so that I fear the rape of *Lepisma* was due to no more romantic cause than hunger. I have tried every means I could think of to make this species jump, but in vain. On one occasion only one crawled on the forceps I was using and threw itself off. As a jump it was a most insignificant performance, nevertheless it was distinctly something more than a fall. Since receiving Mr. Ferguson's interesting note on the jumping of *O. hæmatodes*, however, I have succeeded easily in making *Anochetus* 'spring' in much the same way; the species is too small to enable the *modus saltandi* to be distinctly seen, but the action is distinctly that of a 'skip-jack' beetle and not that of a grasshopper.

78 *An. Taylori* (Forel in M S.)

Kondmals, Orissa.....Jas. Taylor (type).

Writing of its jumping powers, Mr. Taylor says :—"I do not believe " this ant can jump. When held a short distance from any object " upon which she wished to get, she could not do so unless her " front legs could reach, but fell to the ground in the attempt. I " tried over and over again with several specimens, always with the " same result."

79. *An. Yerburyi* (Forel in MS.)

Ceylon.....Major Yerbury (type).

Gen. 18. ODONTOPONERA (Mayr).

Knot compressed posteriorly; pro- and mesonotum 'toothed'; claws simple; second and third joints of antennæ equal.

80. *Odont. denticulata.*

Myingyan, Burma.....E. Y. Watson.

Gen. 19. BOTHROPONERA (Mayr.)

Knot cubico-globular ; claws simple; second and third segments of antennæ sub-equal, last twice as long as the penultimate.

81. *B. sulcata* (Mayr).

Poona District.....(6-11-89 ♂).
Kanara.....E. H. Aitken.
Salem, Madras .....A. Burroughs Sharpe.
Travancore .....H. S. Ferguson.
Thana Districts .....F. Gleadow.
Kondmals, Orissa .....Jas. Taylor.
Madras .....G. A. J. Rothney.

This is a very common species. The nest is always under a stone, but usually reaches a considerable depth underground. Solitrry individuals may constantly be found roaming apparently aimlessly among the grass, or carrying home prey (a dead beetle or what not) in the usual ponerine way. Their sense of locality seems feeble, and they behave exactly as libellously predicated of ants in general by Mark Twain. The probable explanation is that the *Ponerida* are normally nocturnal in their habits; the best provided have fewer facets in their eyes than other ants, while the ♀ of some European

species, at any rate, are known to be blind. Their sting is most powerful and quite as painful as that of a bee or wasp.

82. *B. tesserinoda* (Mayr).

Kanara.....E. H. Aitken.
Orissa .....Jas. Taylor.
Calcutta .....G. A. J. Rothney.

83. *B. rubiginosa* (Mayr).

Poona Districts.

I found a large community near Lanowli, but failed to reach the main chamber of the nest, which was very deep down underground. I saw no individuals outside the nest. This is a transition species and might perhaps be better classed with *Ponera*.

84. *B. luteipes* (Mayr).

Coonoor, Madras .....R. W. Daly.
Dharmsala, Punjab.....Capt. Fulton.
Mussoori, N-W.P. .....G. A. J. Rothney.

85. *B. rufipes* (Jerdon).

Kanara.....E. H. Aitken; G. D. Bell.
Burma .....Major Bingham; E. Y. Watson.
Orissa .....Jas. Taylor.

I have never seen this species in the Dekhan. The specimens sent me have only been one, or, at most, two at a time, whence I conclude that it is solitary in its foraging, like *sulcata*. Major Bingham notes: "Blows a whitish, acrid smelling, rather gelatinous froth "when seized;" and this is confirmed by Mr. Taylor, who writes: "When irritated exudes a milky substance of a frothy nature which "hardens on exposure to the air and resembles fine cotton; it is "called 'domona chunti' or 'gendu,' the 'domonas' being the weaver "caste in Orissa."

Gen. 20. Diacamma (Mayr).

Knot almost spherical, flat behind, bidentate; claws simple, second joint of antennæ twice as long as the third.

86. *D. vagans* (Smith).

Pegu, Burma.....Major Bingham.
Calcutta; Madras.....G. A. J. Rothney.

Mr. Rothney in his paper on Indian Ants, reprinted in this Journal,

writes very fully of this species. He declares it to be, viewed individually, the most intelligent of all the ants.

87. *D. scalpratum* (Smith).

Tenasserim.....Major Bingham.

Major Bingham describes it as "very common; makes a big ant heap in paddy fields; stings and bites virulently."

88. *Diacamma sp.*

Travancore.....H. S. Ferguson.

The identity of this species has not yet been definitely settled; but it is believed to be undescribed.

89. *D. versicolor* (Smith).

Barrackpore.....G. A. J. Rothney.

Gen. 21. PONERA (Lin.).

Knot transverse, vertical, unarmed; claws simple; second joint of antennæ longer than the third.

90. *P. Jerdoni* (Forel in M S.).

Poona Districts.

Calcutta.....G. A. J. Rothney.

The only nest of this species I have ever found was under a stone and very shallow, the main chamber being barely three inches below the surface.

91. *P. Gleadowi* (Forel in MS.).

Poona Districts.

This is not an uncommon species in the Dekhan, but owing to its small size and sluggish movements, is easily overlooked. I have found it several times, always under stones on very moist ground. Mr. Aitken sent me a variety from Kanara.

92. *P. truncata* (Smith).

Calcutta.....G. A. J. Rothney.

Gen. 22. HARPEGNATHUS (Jerdon).

The monstrous mandibles of this genus render it recognizable at a glance from any other ant. Whatever doubts there may be, as to the jumping powers of *Odontomachus* and *Anochetus*, I, at least, have none, as to those of *Harpegnathus*. The single specimen of the genus, which I have had the luck to find, made leaps of a foot or 18 inches with perfect ease, exactly like a grasshopper. I had

much trouble in securing this specimen, and, when I succeeded, I found she could sting better than she could jump.

93. *H. cruentatus* (Smith).

Poona Ghats.
Canara .....H. G. Palliser.
Orissa.....Jas. Taylor.

In each case a single specimen only was taken. There is also a specimen in the Society's Collection labelled Matheran. *H. cruentatus* is nearly an inch long with very long legs.

Gen. 23. LOBOPELTA (Mayr).

Tarsal claws pectinate.

94. *L. distinguenda* (Emery).

Poona Districts.
Kanara.....E. H. Aitken.
Travancore .....H. S. Ferguson.
Orissa .....Jas. Taylor.
Ceylon .....Major Yerbury.
Calcutta .....G. A. J. Rothney.

This species is fairly common from Poona westwards to the Ghats. The idea of a disciplined army has been fairly developed in this genus. *L. distinguenda* may sometimes, it is true, be found loafing about singly, but these individuals are probably only scouts; ordinarily, she is only met, in the early morning or late in the afternoon, travelling in an unbroken column 4 to 6 or 8 abreast, straight, or rather by the easiest road, to the scene of operations. This is usually a colony of white ants whose galleries have been broken open by the hoof of a passing beast, or some similar accident. Arrived at destination, each ♀ seizes her termite prey, tucks it under her thorax in the orthodox ponerine fashion, and the column then returns (but marching 'at ease' and much less regularly than on the outward journey) to the nest. I have never succeeded in finding a nest; on one occasion I tracked a column for more than 50 paces, only to lose it in a patch of prickly pear. I do not think that *L. distinguenda*, any more than any other ant, ever has the inspiration to open a termite gallery for herself; on the occasion mentioned above, the column passed close to several, and even over one colony of white ants before reaching its destination; I believe, however, I

saw a ☿ break open a piece of tunnel, into which a termite had retreated, but cannot be sure, and the practice certainly was not general. Nor are the termites followed into the galleries, partly, perhaps, because the passage is too small for a *Lobopelta*, but equally, I imagine, because such a measure would be very like 'drawing' a badger 'only more so.' Mr. Aitken tells me he has seen "hundreds going into a hole in the ground and emerging with white ants," but this is very different from entering a termite gallery.

95. *L. Chinensis* (Mayr).

Poona Districts (18/10/90 ♂).
Kanara.....E. H. Aitken.
Mt. Abu .....F. Gleadow.
Calcutta .....G. A. J. Rothney.
Orissa. .....Jas. Taylor. (2/9/90 ♂).

This species is even commoner than the last. *Distinguenda* would seem to be a denizen of forests, while *Chinensis* prefers more open and inhabited country. I have only once seen *Chinensis* on the war-path, and then the objective, a large worm, in several pieces, had been reached, and the column was on its way home. The column I must say was more a mob than a disciplined army, but this may have been due to the fact, that the normal irregularity of the homeward march was enhanced by the size and shape of the booty, which did not admit of its being carried 'according to the regulations.' On the other hand, I have often, during the early part of the rains, witnessed a migration (or was it a colonization, in no case was a ☿, even apterous, present?), when the discipline and regularity of the column left nothing to be desired. My experience seems to show that *Chinensis* prefers a formation in fours, at any rate when carrying her own larvæ and pupæ. Mr. Aitken has furnished me with the following most interesting note on *Chinensis*. "There is a populous community of this ant, in a hole, "in the foundations of my house, at Goa. From the nest there is a "well marked 'road,' crossing a broad gravel path, and then "ramifying all over the tennis ground. They issue after sunset, "and march along one of the main branches, or break up into par-"ties and take different routes. When they come to a place where

" the termites have thrown up new earthworks, and are busy eating " the dead grass underneath, they collect in dense masses, waiting " for an opportunity of breaking in, which they very likely find " when the termites attempt to extend their works on any side. " Then the slaughter begins. Sometimes the poor termites are killed " far faster than they can be carried off; and on one occasion, as " late as 7 a. m., I saw the ground still heaped with slain, and an " unbroken stream of ants, 56 yards long, carrying them away. " Each ant had 2 or 3 in her jaws. If these ants cross the grounds "of a community of 'Harvesters' (? *Holcomyrmex*) after the latter " are up in the morning, they have to flee in their turn. A *Lobo-* " *pelta*, when once a ♀ major has laid hold of her by the leg, appears " to be perfectly helpless; she can neither kill her enemy, nor shake " her off. Sometimes another *Lobopelta* will come to her assistance, " and, after vainly trying to tear off the aggressor, will pick up her " comrade and carry her, and her enemy, off together."

96. *L. diminuta* (Mayr).

Mt. Abu.....F. Gleadow (Christmas' 90 ♂).
Coonoor .....R. W. Daly.
Kanara .....H. G. Palliser.
Calcutta .....G. A. J. Rothney.
Orissa.....Jas. Taylor.
Tounghoo, Burma .....E. Y. Watson.
Ceylon.....Major Yerbury.
Ataran Valley, Tenasserim ...Major Bingham.

The specimens from Tounghoo and Tenasserim vary slightly from the type.

97. *L. dentilobis* (Forel in MS.).
Coonoor, Madras .....R. W. Daly.

98. *L. Yerburyi* (Forel in MS.).
Hot Wells, Trincomalee.....Major Yerbury.

99. *L. punctiventris* (Mayr).
Calcutta.....G. A. J. Rothney (type).

100. *L. Kitteli* (Mayr).
Calcutta.....G. A. J. Rothney.

Gen. 24. LIOPONERA (Mayr).

The joints of the antennæ (except the scape) very short; thicker than long.

101. *L. longitarsus* (Mayr).

Poona Districts. ♂.

Thana Districts ♂.

Calcutta; Nuddea.....G. A. J. Rothney ☿ (type).

Orissa.....Jas. Taylor ☿ ♂.

The ♂ comes freely to a light, at night; all through the rains, I have never taken the ☿.

Gen. 25. AMBLYOPONE (Erichson).

The knot soldered to the abdomen along its whole depth.

102. *Amblyopone sp.*

Poona Districts ♂.

This species comes freely to a light; but I have not been able to obtain the ☿.

103. *Amblyopone sp.*

Kanara.....T. R. D. Bell.

Mr. Bell sent me some specimens of what will probably prove a new species; but its identity is not yet definitely settled.

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Note.—In plate B, fig. 10, the division between segments 1 and 2 of the *flagellum* has been omitted.)

(To be continued.)

THE POISONOUS PLANTS OF BOMBAY.

BY

SURGEON-MAJOR K. R. KIRTIKAR, I. M. S.

(*With Plates A. and B.*)

(*Read before the Bombay Natural History Society on 5th April, 1892.*)

WHEN four years ago Brigade-Surgeon Lieutenant-Colonel I. B. Lyon did me the honour of asking me to supply him with a few concise notes on the Botanical Characters of Indian Poisonous Plants, which he has embodied in one of the Miscellaneous Appendices of his deservedly successful work on Indian Medical Jurisprudence, I thought if an independent series of accurate, well drawn, and properly coloured illustrations were placed into the hands of persons interested in the study of the poisonous plants of Bombay, it would be a great help towards the ready identification of such plants. Such a series would serve as a companion to Dr. Lyon's work, which is now extensively read all over the Presidency, without attempting to rival it or mar its usefulness. It would, moreover, I thought, enable me to add a few useful hints regarding the plants which I could not then do from the nature of the work assigned to me by Dr. Lyon, and from the necessarily limited space placed by him at my disposal.

Having been engaged for some years past in getting up the illustrations of some of the most typical and useful forest and garden plants commonly seen in and around Bombay and Thana, and happening to have in my possession the illustrations of some of our poisonous plants drawn at my request and under my personal supervision by Mr. Isaac Benjamin, I broached the subject of publishing some of them in the Society's Journal to our energetic Secretary, and placed at his disposal my illustrations, offering at the same time to write the letter-press. Mr. Phipson, with the promptness which marks everything he does, whether in connection with the Natural History Society or any other Institution, at once accepted my offer, and promised to supplement my illustrations with a few more drawn by Mr. Benjamin expressly for this series, under my supervision. My original pictures are all of the natural size. Most of them, therefore, have to appear as reduced copies of the original to suit the size of the Journal. In each case, however, at the foot of each illustration a

note will be added as to what extent the natural size has been reduced. Of Mr. Benjamin's work, I can safely say that, apart from their artistic finish, the specimens depicted are accurate and can be depended upon for the details of their botanical characteristics. They are in every instance copied from nature in their fresh condition, and in each case every attempt is made to secure a typical specimen as far as available.

"What is a poisonous plant?"—it will be asked. It is as difficult for a Botanist to answer this question as it is for a Medico-Jurist to define "a poison" in works on Medical Jurisprudence. Not even does the Indian Penal Code attempt to define "a poison," be it of vegetable, animal, mineral, or any other origin. Beck, one of the earliest of the standard writers on Medical Jurisprudence, quotes the definition given by Foderé, which, as the former rightly observes, is probably as unexceptionable as any that has yet been attempted. It runs thus:—"Poisons are substances which are known by physicians as capable of altering or destroying in a majority of cases some or all the functions necessary to life." This brief definition may be further illustrated in the words of Dr. Francis Ogston, so as to restrict the term to "such substances as when exhibited in certain quantities to healthy and ordinarily constituted individuals are capable of producing injurious or fatal effects in a more or less direct and certain way, unless where specially and specifically counteracted." Plants exhibiting such qualities may be looked upon as poisonous. The poison or noxious element may consist of an alkaloid or active principle and may exist in any or all the different parts of the organs of nutrition, *viz.*:—root, stem and leaves or their appendages, such as hairs, glands, &c., or in the different parts of the organs of reproduction, *viz.*:—flower, fruit and seeds. Poisonous plants are more or less speedy in their action, but they may not affect all alike or with equal severity. Their effects vary in an individual under different circumstances. Thus, for instance, the empty or loaded condition of the stomach materially modifies the injurious effects of a poison. The latter state even annihilates the toxic or irritant effects of some poisonous plants. Habit, again, manifestly affects the deleterious effects of poisons. The ganjah-smokers or bhàng-drinkers, who respectively indulge in their pipe of the flowering tops of *Cannabis*

Indica (Indian hemp) or a cold infusion of its leaves, may not suffer anything more than a mere temporary excitement or inebriation which may pass off without remedy. The same quantity, however, may in the novice or uninitiate produce double-vision, profound narcosis and even death by coma. This illustrates the popular adage that "what is one man's food may be another's poison." This will also explain why I have in the present series tried to illustrate plants and include them among the poisonous, such as have not hitherto been included in the noxious category, nor indeed are even suspected as being possessed of deleterious properties. "Forewarned is forearmed." In describing poisonous plants, therefore, it will be my endeavour to embody in this series, not only such plants as have been reputed poisonous from time immemorial, but also those which, within my experience, have struck me as having proved deleterious sometimes to some individuals, although used harmlessly by others.

To District Officers, and particularly to those on whom devolve the magisterial duties of trying cases of clandestine poisoning, and to Medical Officers on whom lies the sole responsibility of identifying and naming the poisonous plants, and thus occasionally helping in the cause of the administration of justice, it is to be hoped that these illustrations may be of some use in a country, the vegetation of which is essentially different from that of the land of their birth and education.

I am conscious that the illustrations fall far short of what they might be, though, as I have already said, every attempt has been made to secure accuracy. What merit or artistic beauty they possess is entirely due to the facile pencil of Mr. Benjamin, who has been my valued collaborateur in my illustrations of the Bombay Flora, Phanerogamic and Cryptogamic, and whose eye to details is as trustworthy as it is capable of delineating a charming copy true to nature.

No attempt is made to describe the plants according to their natural orders. Nor indeed is there any order as regards their appearance in this Journal. The plants are depicted just as I came across them, regardless of their virulence or severity of action on the human frame. But each plant as it appears here will be accompanied with a letter-press giving a detailed description of the plant, to enable the reader to identify it.

It may perhaps be useful to explain how vegetable poisons act. Their action is either local or remote. When they act locally as, for instance, on the skin or stomach, they irritate the parts *direct;* they are therefore called *Irritants*. The irritation may or may not be followed by inflammation. Their action in this respect is sometimes purely mechanical as, for instance, in the irritation produced by the rigid brown hairs covering the sigmoid rods of *Mucuna pruriens* (cowhage). When poisons act remotely they do so either through the nervous system and are hence called *Neurotic*; or through the heart and are hence called *Cardiac*. Cardiac poisons distinctly affect the heart in the first instance, and cause death by a sudden or gradual failure of its action. Neurotic poisons either affect the brain or the spinal cord singly, or both together. In the first case the poisons are known as *Cerebral*, and produce delirium or torpor which goes under the name of Narcotism, the poisons themselves being termed *narcotics*; in the second case, where the poisons affect the spinal cord they are called *spinal poisons*. They cause increase or decrease or total loss of sensation or motion in parts supplied by the nerves issuing from the spinal cord; thirdly, when the neurotic poisons act on the brain and spinal cord jointly they are called *Cerebro-spinal poisons*. In them we find a combination of the symptoms of both the cerebral and spinal poisons. I am not aware of any vegetable poison acting as what is called a *Septic* poison, *i.e.*, producing death by destroying the vitality of blood as is the case in colubrine or viperine poisoning.

STROBILANTHES CALLOSUS—(*Nees.*)

MARATHI—KÂRAVI (कारवी.)

(Natural Order—ACANTHACEÆ.)

DESCRIPTION.—A shrub 6 to 8 feet.

ROOT.—Bearing buds of the future plant, which are thickly covered over with 8-10 stiff, tough imbricated scales, studded with fine white wavy woolly hairs from three to four lines in length.

STEM.—Erect, cæspitose, irregularly quadrilateral, rounded off at the angles; grooved often deeply, throughout, thus marking off each of the four angles of the stem; distinctly jointed like the bamboo down to the central pith; joints bilaterally swollen above the point of juncture, varying in length from a span to a span and

Isaac Benjamin del. Mintern Bros. Chromo. lith. London.

THE POISONOUS PLANTS OF BOMBAY.

Strobilanthes callosus Nees. Order Acanthaceæ.

(¼ Natural size.)

a half. Surface of stem irregularly verrucose or "scabrous tubercled," as Clarke calls it; glabrous where there are no warts. The whole stem tapers gradually from the root to the growing tip, varying in thickness at the root from ½ to 1 inch in diameter. This tapering is highly characteristic of this plant. The inner substance of the stem throughout consists of close-packed white pith which occupies over three-fourths of its diameter. The pith has an aromatic sweetish smell, not unlike the smell of some of the pith containing stems of the *Graminaceæ*. The woody portion is barely a line or two in width or thickness. The outer-bark peels off very thin on scratching, is translucent and of buff colour in the old parts of the plant, purplish or pink at the growing end. The warts do not extend to the inner bark. The inner bark, green.

Branches.—Generally absent, but when given off, always arise at the joints; are seldom subdivided; bearing a pair of opposite leaves; not thicker than a goose-quill; partaking of the quadrilateral nature of the stem; verrucose; buff coloured when old; pink or purplish and downy when young and growing.

Leaves.—Decussate, arising at the joints only; 7-10 inches long, 3-5 inches broad; crenate; scabrous and ciliated on the upper and under surfaces; "Elliptic-cuspidate"—running down into a thin long petiole, 2-3 inches long; nerves well marked especially on the under surface, whitish, and here and there covered with small warts, 8-20 pair. Odour faintly aromatic when the leaf is bruised,—some say strongly aromatic. Feel sticky when the leaves are young, from the fluid contained in the hair-cells.

Spikes.—Axillary single or in pair, bilateral; 1-4 inches long; strobiliform. It is on account of this characteristic strobiliform arrangement of the bracts that the genus derives its name *Strobilanthes*. Inflorescence densely cymose. Peduncles 2-3 lines in length. Bracts ½-1 inch long, concave, glabrous, with entire margins; the lower ones elliptical or oval, tough, green, remote from each other; the lower ones tapering or orbicular, tender, beautifully pink, closer packed, imbricate. The colour of flowers, beautifully purplish-blue, tinged with pink or rosy hue. Dalzell describes the flower as being "*deep blue*." Nees calls it "*cærulea*." (*Vide* Wallich's Plant. Asiat. Rarior. Part III., p. 85.) It may be noted that the colour of my

illustration is copied from nature, from a specimen growing in my own garden at Thana when in full bloom and fresh. Hooker mentions *Strobilanthes purpurea* as growing in Ceylon (*Vide* p. 183, DeCandolle's Prodromus, P. XI., under *Strobilanthes asperrimus*.)

Calyx.—Persistent, ½ inch long; in fruit often exceeding even an inch; deeply quinquipartite; segments or lobes often free down to the base, oblong or acuminate, tough, covered with soft hair, greenish or yellowish-white. Segments become tougher and stiffer as they grow older.

Corolla.—Delicate, 1½ to 2 inches long, subequally five-lobed; glabrous without; very hairy—softly so—within.

Stamens.—Didynamous inserted on the corolla; filaments hairy downwards; anther-lobes brightyellow, two-celled; included.

Pistil.—Glabrous, elevated on a scarlet or deep-yellow conspicuous globular disc of the size of a millet seed; style filiform, white, slightly bifid, if at all divided.

Fruit.—A capsule two-celled, 1 inch long, ½ inch broad; coriaceous; obovate; loculicidal; valves elastically recurved, carrying the seeds on each half of the capsule.

Seeds.—Three or four in each half of the capsule; ¼ inch long, roundish or ovoid, covered over with fine soft down.

Testa.—Membranaceous.

The tree flowers from June to September. The specimen I have described threw out flowers in my garden, even when very young, from July to September. The idea that this plant flowers only once in seven years is a rural myth. The stem of the plant is an article of domestic economy in rural and even town life. The stem of the plant is cut down when about 6-8 feet long for making the mud-plastered walls of our rural and town huts and homes. It takes each stem about three years to grow to that height, and in the forest it does not flower until fairly grown. The impression, therefore, prevails that it only flowers once in seven years. The fact is when once the plant has flowered, *i.e.*, has grown sufficiently big to be cut down for economic purposes, it is cut down and sold in the bazaars as an article of commerce. The result is, until another plant grows of sufficiently large size in the same place from the same root, for mark you, the stem is

cæspitose, there are no flowers in the place for a year or two or three which is the time necessary for the 6-8 ft. growth of the plant. As I have said above, the plant has flowered in my garden in the very first year of its growth.

Remarks.—The plant I have described is known on this side of India—in the Konkan—as *Kârav or Kâravî* (Marathi कारव or कारवी). In Thana it grows abundantly on the hills dividing the Thana valley from the Vehâr and Tâlsi valleys. My description is from the outgrowth of the species common here. There is some confusion, unfortunately, but I believe not unnecessarily with regard to the scientific name that should be given to the plant which goes under the Marathi popular name of *Kâravî*. The Hon'ble Mr. Justice Birdwood designates Kârvi as *Strobilanthes Asperrimus* in his Catalogue of Mahableshwar and Matheran plants. Brigade Surgeon Dymock—the Prince of our living Bombay, aye, Indian Botanists—calls it *Strobilanthes ciliatus*. Colonel Beddome, another well-known name in Indian Botany, designates Kârvi as *Strobilanthes grahamianus*.

Grahamianus.

Now when three such eminent authorities—apparently widely differing from each other—writers on Indian Botany well versed in the local Flora they have respectively studied and mastered, designate Kârvi in their own special way, while I, on the other hand, follow a defunct Professor from a distant Academy, some apology, some words of explanation, may be deemed necessary, and here I will tender them in all humility.

The term *Kârvî* to my native Indian mind is essentially expressive of *economy*. Every plant, therefore, of the genus *Strobilanthes*, whether it be *Asperrimus, Ciliatus, Grahamianus*, or *Callosus* represents a species that is known among the natives of the soil as an economic plant, fit to build up their mud-plastered huts, and as such is known as *Kârvi*. What matters it then whether a Birdwood calls it *S. asperrimus*, a Dymock calls it *S. ciliatus*, a Beddome calls it *S. Grahamianus*, or I, following Nees, call it *S. callosus*? It is *Kârvî* after all!—a *Strobilanthes* and nothing more. It would still appear to be necessary that I should note the distinguishing points which characterize the specimens which have been named

or described by the distinguished and accurately observant Botanists I have named—appearing as they do to differ so much, though in my tesimation really not differing to any material extent.

The specimen of the *species* I have examined is perhaps different from the specimen the Hon'ble Mr. Justice Birdwood, or Brigade Surgeon Dymock, or Colonel Beddome may have examined, but it is generally and generically speaking *Kârvi* or *Strobilanthes* all the same. Specific differences may exist in all of them if each one is compared with the other, and what I have chiefly to point out in this contribution is that if the leaves of the *Kârvi* that I describe as *Strobilanthes Callosus* have any irritant properties or poisonous effects on the human stomach on account of its hairs or glandular appendages, Birdwood's *Strobilanthes Asperrimus* Kârwi, Dymock's *Strobilanthes ciliatus* Kârvi, and Beddome's *Strobilanthes Grahamianus* may, if similarly carelessly used, produce similar effects on the human body. Let me therefore prepare my reader to note how the plant I have described differs in its minor points from that described or named by Mr. Birdwood, Dr. Dymock and Col. Beddome, respectively. Mr. Birdwood's species has hirsute joints and trichotomous petioles. The species I describe has none of these. Dr. Dymock's description of *S. ciliatus* is very much the same as that of my *S. Callosus*. But the description of *S. ciliatus* given by Nees in Wallich (Pt. III., Plant. Asiat. Rar., p. 85) whom Dr. Dymock cites as his authority, is slightly different from the description given by Dr. Dymock. The plant described by Professor Nees has "*Rami supra genicula fibroso-fimbriati*," whereas Dr. Dymock's species is "branchless." (*Vide* 2 ed., Mat. Med. of Western India, p. 592.) The flowers in Nees' specimen are described as "longitudine bractæ" "Corolla lutea (?)"—the query Nees' own, thus showing that Nees was doubtful as to whether the colour of his species was really yellow. Whereas Dymock is positive about the colour of his *S. ciliatus* being not only blue but *bright blue*.

Leaving these three Botanists aside when I pursue this subject still further and take up Hooker's standard work on the Flora of British India, another question crops up. It is this. I must humbly admit, I find some difficulty—no small one—in following the attempt made by Clarke in amalgamating Dalzell's *Strobilanthes*

Grahamianus with *Strobilanthes Callosus* (Nees). It must be apparent to every reader of Dalzell that his *Strobilanthes Grahamianus* is essentially different from *S. Callosus*. For *S. Grahamianus* has peltate hairs, whereas the hairs of *S. Callosus* are longitudinal and tapering at the free end in a sharp point, and are composed of 2-3 longitudinal cells placed end on end. This latter I have verified by personal microscopic examination. Again, Dalzell's *S. Grahamianus* has trifid peduncles; the peduncles of *S. Callosus* are solitary. *S. Grahamianus* and *S. Callosus* must therefore on close scrutiny appear to be two distinct species.

The Poisonous Nature of the Plant.

With regard to the poisonous nature of the plant, the announcement now made for the first time that the *plant is poisonous*, will, to not a few, if not to all, come with some surprise. But it need not be so although in the large number of the genera of the natural order *Acanthaceæ*, there are only a few plants which are known to have irritant or, broadly speaking, poisonous properties. The poisonous quality is exhibited either in the irritant juice of its leaves or in the irritating action of its surface-hairs. Thus, for instance, the leaves of the well known *Gajakarni* (गजकर्णी) *Rhinacanthus Communis* are well-known for the local irritation—often amounting to vesication—they cause in the treatment of ringworm. It is a favorite native remedy for ringworm in certain stages. The leaves of *Blepharis Edulis* similarly, which are armed with prickles,—(only an advanced stage of the hairs on the leaves of our *S. Callosus*) and the stem of which is still more prickly, Dr. Dymock says "cause redness, burning and itching" (*vide* p. 593, 2nd ed. Mat. Med. of Western India), when they come in contact with the body. Similarly I have found that the pounded or bruised leaves of *Strobilanthes Callosus* when taken internally as a cold infusion have sometimes caused irritation of the stomach and produced severe vomiting followed by symptoms of gastritis. The inflammation of the mucous membrane of the stomach thus produced appears to me to be due to the mechanical irritation caused by the hairs on the leaves. Any careless use therefore of the pounded leaves for medicinal purposes is fraught with danger to the mucous coat of

the stomach. The infusion should be strained through fine muslin or flannel to get rid of the hairs before use. The fresh leaves are occasionally used by the rural classes as a general tonic, antifebrile and antiperiodic remedy in malarial fevers, and also as a stomachic stimulant and purgative. These remedial uses have the sanction of Nighanta Ratnâkara, which serves as a guide to many a native medical practitioner. (*Vide* Vol. III., Arka-Prakash, p. 24, Bombay edition, 1864.) It was when the fresh leaves were used for one or other of these remedial purposes that distinct symptoms of gastric irritation showed themselves, for the relief of which latter the cases came under my observation. An examination of the vomits under the microscope showed on each occasion numerous hairs embedded in mucus. It is when the leaves are quite fresh and the minute hairs stiff and erect with the liquid contents of their cells intact, that their irritative potency is most active. Beyond local irritation therefore limited to one organ only I do not suppose the plant has any other poisonous action. The amount of irritation that its leaves produce when taken in an unguarded way will, I hope, justify my including this plant among the poisonous plants of Bombay.

Description of the Figures in Plate A.

The main figure in the centre is the growing top of the plant showing the hairs on the upper and under surface of the leaves, and the decussate arrangement of the latter. The strobiliform spikes with expanded flowers above and buds below.

The first figure at the bottom from the reader's left to right is the quinquipartite stiff calyx, two of the segments of which are turned down to show the red disc over which the ovary is situated bearing the filamentous style.

The second figure is the stiffening and growing calyx as the ovary is maturing into fruit.

The third figure is the mature fruit—a capsule, still on the disc, which has changed colour.

The fourth figure is half the capsule opened out to show the seed, which is slightly pubescent. The other half of the capsule has been removed.

Isaac Benjamin del. Mintern Bros. Chromo lith. London.

THE POISONOUS PLANTS OF BOMBAY.

...lmata Roxb. Order Cucurbitaceæ.

(Natural size.)

TRICHOSANTHES PALMATA.—(*Roxb.*)

Marathi "*Koundal*" (कौंडळ).

(Natural order.—CUCURBITACEÆ).

DESCRIPTION.—A large climbing perennial herb; sometimes twisting spirally to a marked degree; a native of forests and field hedges, running over the highest trees at times: distinctly dicœcious.

ROOT.—Inclined to be wavy or contorted.

STEM.—Angular or irregularly rounded; deeply fissured longitudinally; often as thick as a man's arm, says Dr. Dymock, and marked with parallel rows of small irregular warts on either side of each fissure; noduled and jointed; each joint situated at the distance of from 1½ to 2 or 3 inches; giving off leaves or branches at the joints only. The transverse section of a mature stem shows that the longitudinal fissures correspond to the medullary rays and include between each pair of them wedge-shaped woody and vascular bundles, studded with round or oval intercellular canals of pretty large size sufficient to admit an ordinary pin. Dymock calculates these wedge-shaped portions as seven, but I have specimens before me in which they are as many as ten. When in spring or before the rains, the plant is resting and leafless, these intercellular spaces contain air. But when the plant revives, and resumes its activity in the rains, they contain sap which continues to flow through them for some time after the rains.

THE OUTER BARK.—Is light grey or brown, warty, corky, often presenting the appearance of crocodile skin; peeling off easily in irregular bits. *Mesophlœm* deep green.

BRANCHES.—Partaking of the spiral or winding nature of the stem; minutely tuberculated; young branches full of greenish pith. Older branches contain brown pith which loses its spongy nature and hardens into a rough friable substance.

TENDRILS.—Three-cleft, oftener bifid, minutely spiral.

LEAVES.—Generally palmate, bright green, membranous; 4-8 inches long, 2-6 inches broad, 3-5 or even 7-lobed; cordate at base; scabrous upon the upper and under surfaces; upper surface more markedly scabrous, and spotted with larger hairs seated on raised circular discs, giving the leaf a characteristic appearance under the

magnifying glass. Nerves 3-5 markedly scabrous on the under-surface, having a gland or two on each nerve deeply seated. Lobes broad, sometimes entire, sometimes again lobed, and with segments narrow, linear-lanceolate. Margin slightly serrate or dentate: Lobe-divisions sometimes deep.

Petioles also having a tendency to be winding or twisted 1-2 inches long; channelled; several large glands at the apex of petiole.

Stipules single, small, axillary.

Flowers.—White, delicate in the female, stout in the male, fading soon after opening over-night or early morning. The plant blossoms during hot and rainy seasons, says Roxburgh, but I have seen male flowers in November and December in Thana in the Judge's garden. This Thana plant is leafless now (March), and will continue so until the next monsoons.

Male Flowers.—Racemed, large, white, most delicately fringed with long white branched bifid or trifid filaments. *Racemes* axillary, longer than the leaves, solitary, with a smaller few-flowered second *Peduncles* sometimes paired, stout, 5-6 inches long. *Bracts* of the male racemes large, foleacious, sheathing the flower from a broad base, many times larger than the very short pedicels; ovate; fringed; viscid; covered on the outside with dark green glandular spots of the size of linseed or millet seed. *Calyx* 1—1½ inch, bract-like; segments ovate, deeply toothed or serrate; tomentose. *Corolla* 4 inches in diameter, hypercrateriform, having the appearance of a flat open parasol with its fimbriæ hanging down in beautiful tapers. Petals marked yellow at the base, cuneate. *Filaments* triadelphous. Anthers syngenesious, very anfractuose.

Female Flowers.—Solitary, smaller and more delicately fimbriated than the male; axillary; peduncle not so stout as in the male. Calyx-teeth of the female flower less marked. Calyx-tube in female short. Petals according to some nearly destitute of fimbriæ *Corolla* smaller than that of the male.

Fruit.—2-4 inches in diameter, globose, smooth, of the size of an ordinary orange. When ripe of a bright deep red colour replete with a dirty looking dark greenish pulp in which the seeds nestle.

SEEDS.—Numerous, oblong, compressed, irregularly triangular, obtuse-margined; $\frac{1}{3}$ inch long; according to Dr. Dymock $\frac{1}{16}$ inch long, covered with a blackish shell, and containing a sweet oily kernel.

REMARKS.—With regard to the height of this plant Clarke (in Hooker's Flora of British India, Vol. II, p. 607) puts it down as "often 30 ft." But I think Roxburgh described it more accurately when he mentioned it as a "native of forests where it runs over the highest trees." The plant may be seen trailing over hedges and branches of trees over several yards. Roxburgh designates the plant monœcious. Wight and Arnott describe the female flower as "*solitary, in the same axil as the male*" or occasionally racemose. I have not seen the male and female flowers in the same axil yet; nor on the same plant. But I should be afraid of a definite opinion in the face of such weighty authorities: I would leave other observers to note this point. "Leaves," says Wight, "are *glabrous, sometimes slightly scabrous.*" The whole plant I think is scabrous to a more or less degree, except the fruit. Observe Clarke's remark at p. 607, Vol. II. Hooker's Flora of British India:—"A *Trichosanthes* collected in Mergin by Griffith has the leaves with short hairs beneath." Variety *Trichosanthes Tomentosa* is also tomentose beneath (*Heyne in Herb Rottle*).

Clarke describes the fruit as marked with ten orange *streaks*. I cannot help thinking that when he wrote this he had the *Cucumis Trigonus, var. pubescens* or "*Takmak*" (Marâthi) before his mind's eye. I have not seen a fruit of this plant so definitely streaked. Hooker follows this description in the letter-press accompanying Tab. 6873 in Vol. XXII of the 3rd series of Curtis' Bot. Magazine, May 1st, 1886. The plate is a good illustration of the male flowering plant. My plate, be it observed in passing, is of the female plant with the fruit changing colour in the course of its maturity. The colour is rich, but not uniform; it changes from day to day from the bright green of its younger days to the golden yellow, orange, or bright vermilion of advanced life, interspersed with all the shades between, often exhibited on one and the same individual fruit, at one and the same time in its later life.

Hooker describes the flowers as sweet-scented. I think to some

the odour may prove not particularly agreeable—mawkish if anything. The fruit is seldom if ever pyriform, a form which has been observed by some writers. Dr. Dymock says the number of seeds ranges from 60—100. This is rather a high average for the Konkan, where perhaps the fruit is smaller. 20-30 is as good an average as I can strike. The whole fruit of the plant—the rind and pulp included—is intensely bitter, but, as has been noted above, the kernel of the seed is sweet. Dr. Dymock says the vine is *not bitter* (*vide* "Pharmacographia Indica," Vol. II., p. 71). I have now a section of the stem of the male plant before me. The bark and the wood are both bitter, but not half so bitter as the fruit.

In passing I may here observe that the size of the fruit, as growing in India and as noted by all Indian Botanists, is much smaller than that of the same fruit growing in Australia. Baron Sir Ferd. Von Mueller, the accomplished veteran Government Botanist of Victoria, notes that the *Trichosanthes Palmata* growing near Burnett River bears fruit 3-6 inches long, 2-3 inches broad (p. 187, Vol. VI., Fragmenta Phytographiæ Australiæ).

The Poisonous Properties.—The poisonous properties of the plant exist in the pulp and fruit-shell. The pulp acts like a drastic purgative when taken internally as a mere laxative. In producing this effect the plant partakes of the drastic properties of its congener *Ecbalium Elaterium* (Syn. *Ecbalium officinarum*) commonly called the squirting cucumber, which furnishes the British Pharmacopœia with one of its most powerful purgatives, known as Elaterium, which is the dried sediment of the expressed juice of the fruit. It may be noted that these purgative properties of the respective plants do not suffer on drying. The pulp and shell of *Trichosanthes Palmata*, even if dry, retain all their deleterious element intact. They soon soften when moistened with water, and are as potent as fresh fruit. It seems to me that *Trichosanthes Palmata* is more powerful in its action than *Citrullus Colocynthis*—another of its congeners from the *Cucurbitaceæ*, which is a recognized purgative in English and Indian Medicines According to Charak, an ancient standard authority on Indian Materia Medica, *Trichosanthes Palmata* is a blood-purifier and a

nervine tonic. The root of it is besides used as a stomachic tonic. It is in the course of the administration of the root of this plant and of the pulp and rind of the fruit that I have seen the poisonous effects which I think are sufficient to justify the introduction of this plant among the Poisonous plants of Bombay. Roxburgh had heard of its poisonous effects on birds in his day. He notes that "mixed with rice it is used to destroy crows." Dalzell and Gibson note that it is much esteemed in India in diseases of cattle. Dr. Lyon refers to me (*vide* p. 199, Medical Jurisprudence for India, 1889) as having informed him of the fact that the fruit pulp is used by forest frequenters as a cattle poison. I have since met with cases wherein it has acted as a poison on men. When it is used for poisoning cattle it is mixed up with fodder. Sometimes however it has unexpectedly acted as a poison when administered medicinally to cattle for the cure of inflammation of the lungs. The fact that the root is used by Indian villagers for curing acute lung diseases among cattle has long since been noted by Wight. The unsuccessful efforts made at the instance of Sir William O'Shaughnessy and referred to in the Bengal Dispensatory (p. 350) to ascertain whether the fruit had any properties at all, by giving such small doses as three grains thrice daily, need not make us sceptical as to the truly dangerous nature of the fruit-rind and pulp. In small doses the plant root or fruit may act as a stomachic tonic, or may have no sensible effect. But when the pulp of half the fruit, or even a quarter is used—say if a dram or more in weight—finds its way into the human stomach it does not appear to be free from danger. Administered by ignorant or unsuspecting persons not necessarily with a view to poison, it has done harm; drastic effects have been known to follow. The dry fruit-rind or pulp when smoked is said to act beneficially in the cure of asthma. I have no experience of this myself. On the other hand, I have not heard of any poisonous effects following such administration. But I have known of cases of accidental poisoning when the fruit was administered internally as a laxative and was followed by drastic purgation and irritation of the *primæ viæ*. I know of no case however in which it has caused death, or has ever been used on men for criminal purposes.

DESCRIPTION OF PLATE B. (*a female plant*).

1. Central branch bearing leaves and a solitary female flower.
2. Growing end of a branch to the left of the reader.
3. Top row of fruits (4) showing different colours in the order of development from green to red.
4. Transverse section of the fruit through its centre with the green pulp and seed surrounded by the yellow rind.

(*To be continued.*)

HEREDITARY DISEASE OF THE BRANCHES AND LEAVES OF *FICUS TSIELA*.

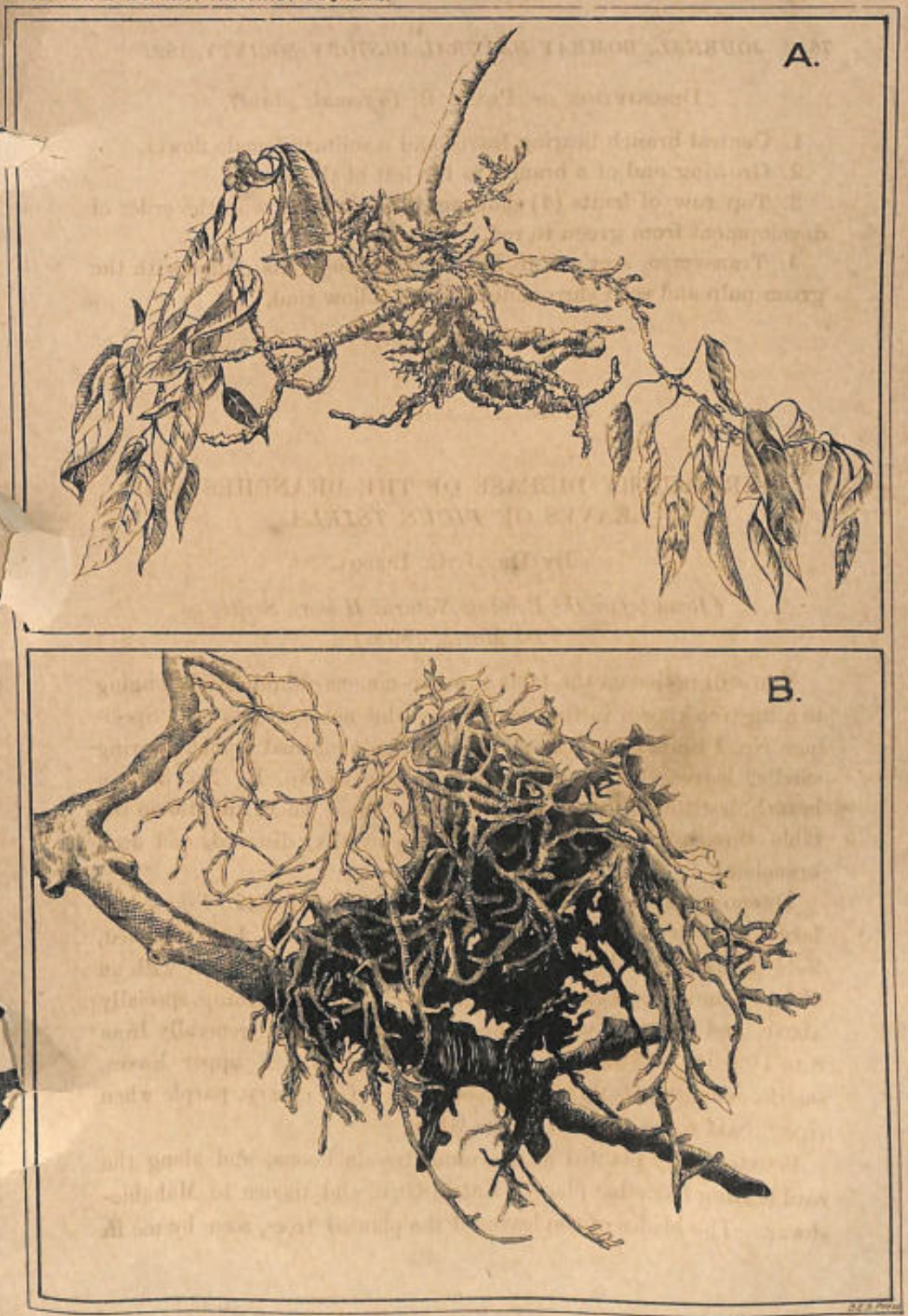
BY DR. J. C. LISBOA.

(Read before the Bombay Natural History Society on 1st March, 1892.)

YOU will notice on the table three specimens of branches belonging to a fig-tree known in this country by the name of *Pipree*. Specimen No. 1 bears large leaves. No. 2 is an abnormal branch bearing smaller leaves though of the same shape as No. 1. No. 3 is a branch destitute of leaves, in fact a dead one. There are also on the table three photographs, representing healthy, diseased, and dead branches.

DESCRIPTION.—*Ficus Tsiela*, Roxb., *Fl. Ind.* III. 549. *Pipree*, is a large tree, trunk greenish and smooth. Leaves long petioled, 2-4½ in. long, broadly-ovate or ovate-lanceolate, cuspidate or with an abrupt acumination, entire, smooth on both sides and shining, specially above, and marked with numerous parallel veins, generally from 8 to 10 pairs. Fruit paired, crowded on the axils of upper leaves, sessile, somewhat turbinate, smooth, size of a cherry, purple when ripe. Said to be common on the Ghats.

Is extensively planted as an avenue tree in Poona, and along the road leading from that place to Katraj Ghât, and thence to Mahableshwar. The blades of the leaves of the planted trees, seen by me in



HEREDITARY DISEASE OF THE BRANCHES AND LEAVES OF *FICUS TSIELA*.

(*a*) Early stage of the Disease.

Poona, are smaller, generally 3-4 in. long. Those who have travelled along that road or been in Poona must have noticed a curious phenomenon presented by the tree. From its branches may here and there be seen hanging large green balls like Chinese lanterns. They are oval or ovoid-oblong, varying in size from 2-3 feet or longer. These are composed entirely of numerous small leaves (I have counted about 1,650 in one single ball) thickly congested on small branchlets, also numerous and congested on larger branches. Seeing from a distance one is apt to infer that the leaves have been brought together by the viscid secretion of spiders or red ants; but a glance at the specimen on the table shows that they are free from one another and that the appearance is due to the innumerable short branches shooting out in close proximity to one another, and bearing small closely imbricated leaves. To understand thoroughly the formation of these green balls, let us examine the healthy branch and compare it with the abnormal one. In the former we see that it, the parent branch, and its secondary branches are long, smooth and alternate, arising at some distance from one another, being marked with an imperceptible line; the secondary branches arise rather irregularly, those of the same side at a distance of 3-4 in.; they never or very seldom give out branches, nor are they swollen at their origin. The leaves are large, long-petioled, and shoot out at a distance of 1-2 in. from one another.

In the abnormal branch this arrangement of secondary branches and their leaves is altered. Being stimulated by some cause or other the primary branch shoots out numerous short, thin or slender branches thickly congested. These in their turn give out shorter and still thinner branches, so closely approximated that the space between he internodes almost disappears. All the large branches and their divisions are swollen and knotty, specially at their origin and on the internodes. The swollen joints resemble small balls, size from a pea to a bettel-nut. The leaves are small, 1½ in. long, inserted on a more or less long petiole, and, as you see, highly crowded on the branchlets. These small dwarfish leaves are so numerous that, as I have previously stated, 1,650 leaves were counted in one single ball 3 ft. long.

At the commencement of this abnormal condition, or as I take it,

of the attack of the disease which is essentially chronic, the branches are not very short nor the leaves very small, but as the malady advances, the new leaves which appear at each successive season, become gradually more and more dwarfish in appearance, the branches turning knotty and producing new smaller ones. The old trees on which such phenomena take place, are covered with leaves of a paler colour and of rather diminished size, though not so small as those on the abnormal branches. The parts affected die a premature death ; this is however a slow process.

The *Pipree* sheds its leaves in the cold season and renews them. This fact was observed by me last year, and in a short time confirmed by the experience of the natives and Europeans. This renewal takes place also in the abnormal branch, and continues from season to season for several years with this difference, that new leaves do not shoot out at each season or every 2nd or even 3rd from the branchlets, at their origin from the parent branch; thus they gradually become destitute of leaves from the lower or first attacked part to the free extremity and, at last, die. After a time the whole branch dies thus, and the dead branch, now dark brown or black, remains attached for a long time to the tree, resembling a broom from a distance. Now and then it happens that certain branches at their origin from a parent branch becoming thus affected form balls of leaves, and die in the manner described above. The paren branch, however, if strong and tolerably large, continues to grow, but ultimately it too becomes attacked and falls a victim to the morbid action which appears to have been extended from the primary or first attacked branchlets. It is curious that this process goes on whilst the contiguous parts of the tree are healthy. It is a well-known fact that in animals the death of the whole body or of a part of it begins to manifest itself almost always at the extremities farthest from the centre. Symptoms of leprosy, senile gangrene, and of various kinds of paralysis in man, are first observed at the tips of the toes and of the fingers. So also does a tree or a branch of a tree show signs of death at its extremity farthest from the roots. Just the reverse is the case with *Pipree*. You will observe from these specimens and photographs that the lower part of the affected branch is swollen, nodose, dark-brown, or a shy-coloured and destitute of leaves, whilst

the upper extremity of the branchlets still bear leaves. By this slow and steady process, the whole branch dies in the space of two, three, or more years. It appears that in the inferior, almost dead, part there are still some more or less altered vessels capable of carrying scanty nutriment from the trunk towards the few living leaves, and the sap elaborated by these back towards the trunk.

As to the history, no Indian botanist out of so many has made even a passing allusion to this abnormality. Dr. King, Superintendent of the Calcutta Royal Botanic Garden, who is the only one who alludes to it in his comprehensive monograph on the species of the genus *Ficus* says:—"All the specimens which I have seen issued by Wallich as 4,503, letter C, consist however of a *sport* of the tribe with small leaves and greatly elongated petioles which is not uncommon on old trees. This sport forms curious tufts on the ends of some of the branches, and can be seen growing in abundance in Madras." This is copied in Sir J. Hooker's *Flora of British India*. Dr. King does not state whether these tufts, which he calls *sports*, appear in wild as well as in cultivated trees, and whether they are to be seen in Bengal. Dalzell and Gibson, the authors of the *Bombay Flora*, say that *Ficus tsiela*, Roxb., is a very common tree in this Presidency as it is in other parts of India and Ceylon, but do not allude to the extraordinary phenomenon. May the silence of all the authors be due to the *Ficus* in the wild state being free from the disease, and appearing only in the planted trees in the Poona district and in Madras? Why should this be so? Again, may it be that the disease had not appeared in this Presidency at the time the authors of the Bombay Flora were living in this country, whilst it existed in Madras during the lifetime of Dr. Wallich? These are questions which must occur to many, and which, I regret, I am not in a position to answer. I have not observed this phenomenon in any other species belonging to the fig tribe, or to any other tribe or genus, though they may be seen growing in close proximity to *Ficus tsiela*. The disease, is, I think, hereditary, because it appears on trees grown from seedlings, or from healthy branches, but apparently it is neither infectious nor contageous, nor does it arise from the condition of the soil.

Many intelligent Europeans and Natives, who had noticed the green mass or tuft of leaves on the *Pipree* tree, had attributed it to some

parasitic plant growing from it, and some had even gone so far as to aver that similar phenomena (balls) might be observed on the mango tree, but when asked to produce specimens they brought a mass of *Loranthus longiflorus*, Desv., &c. I do not deny that the mango may not be attacked by the same or a disease similar to the one I am describing, but I must confess that as yet I have not seen a single well authenticated case.

Dr. King is, as you must have observed, of opinion that the condition of some branches and leaves above described is a *sport*. To this opinion are opposed the following facts:—Sports are almost always vigorous growths or off-shoots which appear in a vigorous branch of a healthy tree, this being generally young. Now the abnormal condition of branches of the *Pipree* tree appears almost always in an old tree, the leaves of which are always of a pale yellowish colour, branches dying sooner than the unaffected ones. At first only one green ball is seen upon a tree, but as the years roll on and the tree becomes older, it bears several such tufts.

I am inclined to think that this state of branches is a chronic and hereditary disease which in its course resembles cancer in the human body. This, as is well known, affects at first a certain part, say a female breast, and makes at first a slow progress, affecting one portion after another till the whole breast is destroyed by the mass of disease consisting mainly of adventitious cells. At advanced stages this dire disease extends to the glands in the axils, and takes all the malignant forms of certain tumours, and appears simultaneously or successively in various parts of the body.

The nodose branches resemble the nodose condition of the feet and toes of men suffering from elephantiasis of long standing. No cause can be assigned to this affection. Although carefully sought no insect agency producing the knotty swelling has been discovered. Dr. W. Dymock thought that it might be the result of an insect which he found in one dead branch submitted to his examination; subsequently careful examination revealed that it had accidentally gone into the interior of the wood from the basket in which it was enclosed. Mr. Woodrow, Professor of Botany and Agriculture of the Poona College of Science, examined under the microscope some branches without any result.

The following is the answer of Dr. Barklay to whom was submitted one specimen for examination :—

KENNEDY COTTAGE, SIMLA,
21*st October*, 1891.

"I have now examined the specimen of *Ficus tsiela* you so kindly sent me, but find no evidence that the abnormalities you observed are due to the fungal invasion. I made several sections of a twig bearing the smaller and more numerous leaves, and staining with Gentian violet could find no trace of mycelium. If you like, I will, with pleasure, send you a slide for your own inspection. It is possible that the DYING of the specimens, while in transit, destroyed any mycelial filaments which they may have contained when fresh, though I do not think this probable. In the absence of a fungal cause I am at a loss to suggest any causation for the remarkable phenomenon."

AERIAL ROOTS.—It is believed by many, even by Botanists, that *Ficus tsiela*, Roxb., does not send down root-drops, or aërial roots. Some of the authors who have described the plant, are silent on the point, though they mention trees from the branches of which aërial roots shoot out. Dr. Roxburgh (*Flora Indica*) is explicit. He says:—"Bark smooth, greenish, no roots from the trunk nor branches." Wright in his *Icon. Plant.* says:—"It is very generally planted by road-sides for the sake of its shade, and by not sending down roots from the branches is so far superior to either *F. Indica* (Banyan tree) or *F. Benjamina*, Linn., the pendulous roots of which are often dangerous impediments on a road." Beddome, *Manual of Forestry*, says:—"No roots from the trunk or branches." Dr. King, in his memoir above alluded to, says:—"A large spreading tree without aërial roots, all parts glabrous." Sir J. Hooker in the *Flora of British India* repeats Dr. King's statement. Are we to think that trees in Bengal and elsewhere are free from this kind of roots? For there is no doubt that many *Pipree* trees (not all) are seen in Poona bearing down abundant aërial roots (see specimen on the table), though never so long as to reach the ground. Generally speaking, they are about one yard long. The roots of *F. retusa*, Linn. (Nundrook), and *F. Benjamina*, Linn., do not also, so far as my

observations go, reach the ground. I believe the only root-drops of *F. Bengalensis*, (Wad.) Linn., reach the earth.

It is not ascertained, at least no author I have consulted, explains why some trees should produce aërial roots and not others. Among fig-trees in a few species only such as Wad. *Pipree*, and *Nundrook*, *F. Benjamina*, Linn., and *F. Mysorensis*, Heyne, are such roots seen.

Cure of the Disease in Ficus Tsiela.—As to the cure of this abnormal condition which I consider to be a disease, it would, I think, be considered absurd by some that I should propose such a thing, especially in a country where valuable fruit-trees such as the mango are allowed either from apathy or ignorance on the part of the proprietors to be destroyed by the attacks of parasitic plants, without employing such a remedy as that of cutting them down as soon as they make their appearance.

The *Pipree* is only used as a shady avenue tree, neither its wood nor fruit being of any value. The ball-like green masses of small leaves hanging like Chinese lanterns add at first to its beauty, but in course of time they die, remaining attached to the tree as an ugly appendage for a great length of time, often many years. Then the leaves of the entire tree thus attacked become smaller and of a rather paler colour than in health. To prevent this, I would recommend those who have opportunity, to watch the disease carefully for years, to find out whether it is caused by an insect puncturing a branch or fruit, &c., and whether by cutting the first branch, in which the disease appears, it be possible to arrest its further progress as is done by extirpating a cancerous part of the human body. The *Pipree* plant is certainly not of much value, but the experiment is recommended in the interest of science, for if a remedy be found, or if the cutting of a branch lead to the arrest of the disease, the fact may lead us to the knowledge of some other phenomena of plant-life, and give us an insight into the nature of this and similar abnormal conditions. As Dr. King thinks that it is a sport—I would ask you to plant this sport in good season and appropriate soil and see whether it can be reproduced.

Besides the photographs already mentioned at the commencement of this paper, there are on the table others which give graphic

representations of the trunks of *Ficus Bengalensis*, Linn. (Wad), *F. religiosa*, Linn. (Pipal), *F. tsiela*, Roxb. (Pipri), and *Pangamia glabra*, Vent. (Karunj).

Trunk of the Fig Trees.—Now I would call your attention to the comformation of the trunk of the fig-trees in general. This is marked by several more or less deep furrows, which, however, very seldom extend beyond the large primary branches. They are sometimes so deep as to make it appear that two or three trees during their growth are united together. This appearance is still more delusive when the ridges, which form the walls of the furrows, continue down to the roots. Occasionally the trunk of a tree is divided by a large furrow into two parts, which are held together by a sort of diaphragm or flat central portion. I have seen a tree of this kind at the foot of the Katraj Ghât, on the left side of the road leading to it, and another in the city of Poona. The trunks of all the young trees, cultivated or grown from seedlings, are round. It is only after years that they show a tendency to become irregular. This conformation of the trunk is common to all fig-trees, though more marked in some than in others; thus in the *Pipal* (*Ficus religiosa, Linn.*) the trunk is much disfigured by ridges and furrows being divided and subdivided in all directions, and the latter (furrows) being deep here and shallow there, or the former becoming more or less prominent and sharper in one place than in another. Roxburgh in his *Flora Indica* notices this condition thus: "trunk (of *Pipal*) erect, in small trees round, when large and old, it becomes full of irregularities, *i. e.*, large perpendicular ridges and hollows as if many trunks were united."

The same botanist describing Wad (*Ficus Bengalensis, Linn.*) says: "Trunk when young is distinct and single, at all times its form, thickness, and height very variable, still more so than *Ficus religiosa*, Linn., because generally reared from branches procured naked and stuck in the ground." It is well known that Wad (*Ficus Bengalensis*) is enormously extended by the aërial roots descending and fixing themselves on the ground and gradually increasing in size, and becoming similar to the parent trunk. I have seen on one tree in Poona these aërial roots gliding over the trunk, increasing its thickness and adding a ridge or ridges to the already existing ones.

The irregularities of the trunk of this fig-tree, and of other specie I am speaking of, are caused independently of the aërial roots They (the irregularities) are not confined to the trunks of the fig-trees alone, but are also met with in those (though to a slight extent) of *Poinciana* (*Cesalpinea*) *regia*, Bojer, and of several other plants, specially trees of long standing. The cause of this state is not well known. Mr. Woodrow, of the Poona Science College, thinks that surface-growing trees are thus furrowed. Why these should be so is not clear, inasmuch as there are many surface-growing trees, such as palms, the trunks of which never show a tendency to this kind of furrowing. It is true that the roots of such trees spreading over the surface are prominent, and appear to form ridges; these are like buttresses, but do not produce the trunk. The food they absorb from the earth is taken up to be elaborated by the leaves, and thence it descends to nourish the whole tree.

I believe that the ridges are due to the vigorous growth of large primary branches; for on close observation it will be found that the former are in a line with the latter, becoming large and more prominent as they descend towards and into the roots. In their descent the ridges sometimes bifurcate or divide themselves into more than two ridges. The space between the ridges form furrows which are deep or shallow according as the former are prominent or less vigorously formed.

I believe that the sap descending from the branches contributes to the enlargement of that part of the trunk which is opposite to them by supplying it with more nourishment than the contiguous part. In corroboration of this comes the fact that the aërial roots of Wad (*Ficus Bengalensis*, Linn.) and of other trees, before they reach the earth and fix themselves into it, are chiefly supplied with nourishment from the parent branch. In fact all the parts of a tree are nourished from above.

HORSE-BREEDING IN INDIA.

By Veterinary-Captain G. Rayment, A.V.D.,
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(*Read before the Bombay Natural History Society on 3rd May* 1892.)

I feel in writing this paper, that I am almost presumptuous in publishing my opinions on Horse-breeding in India, after an experience extending over only five years of actual work in my department, particularly when there are still amongst us such masters of the subject as Major-General Parrott, Messrs. Hallen and Kettlewell. But with the exception of a few articles in sporting papers, a pamphlet or two, and the reports of the Stud Commission, the ripe experience and knowledge of these gentlemen have never been placed at the disposal of the public. My chief object in bringing this subject before the Society, is to provoke a discussion, and enable us to get at the opinions of practical horsemen and breeders all over India. I therefore trust that nothing in this paper may be taken as spoken *ex cathedra*, but simply as the opinion of one still a student, and anxious, by comparing his views with those of others, to impart what little knowledge of the subject he may possess, while correcting his own errors, and learning fresh facts from the free discussion which he trusts will follow.

Considering what a "horsey" nation we are, it is curious how few understand anything of practical Horse-breeding, and how little it is studied scientifically. Patience, time, and money are all required to breed good horses, combined with a special aptitude for the work, great powers of judgment, and practice in the art of matching the mare and stallion. Few possess these qualities; hence, breeding is frequently "hit or miss," and good horses are produced accidentally instead of being the result of forethought and science. A Thoroughbred, *i.e.*, pure bred horse, must have five top crosses. Thus, five generations are necessary to get hereditary qualities fixed, or we have no surety that the stock may not throw back. Conformation, colour, temper, constitution, and unsoundnesses of many kinds, or a tendency to them, are hereditary.

Conformation.—Defects and excellences are both inherited. Crooked legs, toes in or out, straight shoulders, and many others.

To eradicate them, one cross is not sufficient, as the defect may miss a generation and appear in the next. By continually crossing, for instance, with good sloping-shouldered stallions in several generations, a straight shoulder would be got rid of, but not in one or two.

Constitution.—Weak constitution is inherited, especially that known as *washy, i.e.*, horses sweating easily, liable to diarrhœa when worked, and apt to get superpurgation from a very small dose of purgative medicine.

Temper.—Many vices, buck-jumping in Australians, impetuosity and excitability are inherited.

Colour.—Is also inherited. Europeans prefer bay, black, dark chestnut, and brown. Hence these colours are selected for breeding the best class of horses. The result is, we practically never see roan, grey, dun, or piebald Thorough-breds. Horses of these colours in England are coarse and to be avoided, except greys and sometimes roans. Grey is a favourite colour amongst the Arabs, so out here many excellent horses are of that hue. Witness the pony "Blitz," the famous "Greyleg," and others. Since long-range rifles and guns have come so much into use, greys have been objected to for Army purposes, as they are so easily seen. Hence they will probably die out; in the meantime they are becoming cheaper. *Native* princes like dun as a colour; the result is good dun horses and ponies are by no means uncommon in India. For generations they have been well cared for, and the best stallions and mares amongst them purposely mated to reproduce that shade. They frequently have noses, arms, scrotum, and sheath pink, and blue eyes. This, though hideous in the sight of an Englishman, is much approved by many natives.

Unsoundness.—The following are the principal hereditary unsoundnesses, or, strictly speaking, unsoundnesses, a tendency to which is hereditary:—

Constitutional Ophthalmia.
Cataract.
Amaurosis.
Glaucoma.
Iritis.
Roaring and Whistling.

Splint.
Spavin.
Ringbone.
Sidebone.
Laminitis.
Navicularthritis.
Curb.
Defective feet, &c.

Tendency to brittle feet, weak soles, flat soles, sand-crack, &c. Lameness, produced by strains, sprains, break-down, dislocations, fractures, etc., is not transmitted. Especially avoid unsoundness in dam or sire. The tendency to it is always inherited, and no amount of crossing seems to eradicate it. The famous "Ormonde" is one of a family of Whistlers. "Galopin," the sire of "Donovan," is coarse hocked. "Godolphin," a son of his, now in India, is markedly defective in his hocks, and his stock are frequently spavined. By breeding always from one particular stamp possessed of certain qualities which we wish produced, we get at last a breed or variety of a race. In nature, Darwin says this is done by natural selection. Let us take birds. Say a certain male bird by accident gets a few feathers on the top of his head forming a slight crest, and this crest takes the fancy of the hens he will mate more easily than his fellows. His sons will probably have these small crests and are quite likely to mate in after-life with their sisters, this will accentuate the tendency to produce crested males, and if, again, incestuous mating occur, the tendency grows stronger, so in the course of many years, perhaps thousands, a crested race is produced, hoopoes, bulbuls, etc.

This is the way Darwin contends that race varieties are formed in nature. Now, here is what we also want to do in breeding domesticated animals and to form a variety which shall possess certain qualities or conformation, rendering them more serviceable for the purposes for which we require them. We cannot wait, as nature does, hundreds or thousands of years, but must stamp the qualities we want speedly. Say we want pace—we take a stallion of great galloping powers (irrespective of other qualities), and put him to the fastest mare we can get; the produce we mate with its own sire, if a filly; with its own dam if a colt. This accentuates the

power of speed; and the system carried on results in very fast stock, such as the Thorough-bred English horse of to-day. This is called breeding "in and in." But in producing an especial quality like this, we also produce others which are not always beneficial. We rarely get strength combined with speed; hence, the stronger horses being slower are not bred from, and, as we can see any day in England now, we get any number of race horses possessed of marvellous powers of speed for a short distance, carrying a very light weight, but only with a very few, who can gallop, say, five miles with 14 stone up. When we do get them, they are of course the best animals in the world, but they are rare. To get this speed too, stallions and mares are employed that are unsound and of delicate constitution, hence many Thorough-bred English horses go wrong in training, either lame, or get knocked up. In cattle this is very marked in Short Horns, a breed produced by "in and in" breeding. They are immense animals, growing very big while still mere babies and fatten very rapidly, hence they should be extremely valuable and profitable to farmers, but, unfortunately they have a tendency to tuberculosis, which has been so much enhanced by "in and in" breeding that it has now become a perfect plague amongst Short Horns. Many breeds of dogs, bred to win prizes at Shows, are similarly affected with hereditary tendencies to certain diseases.

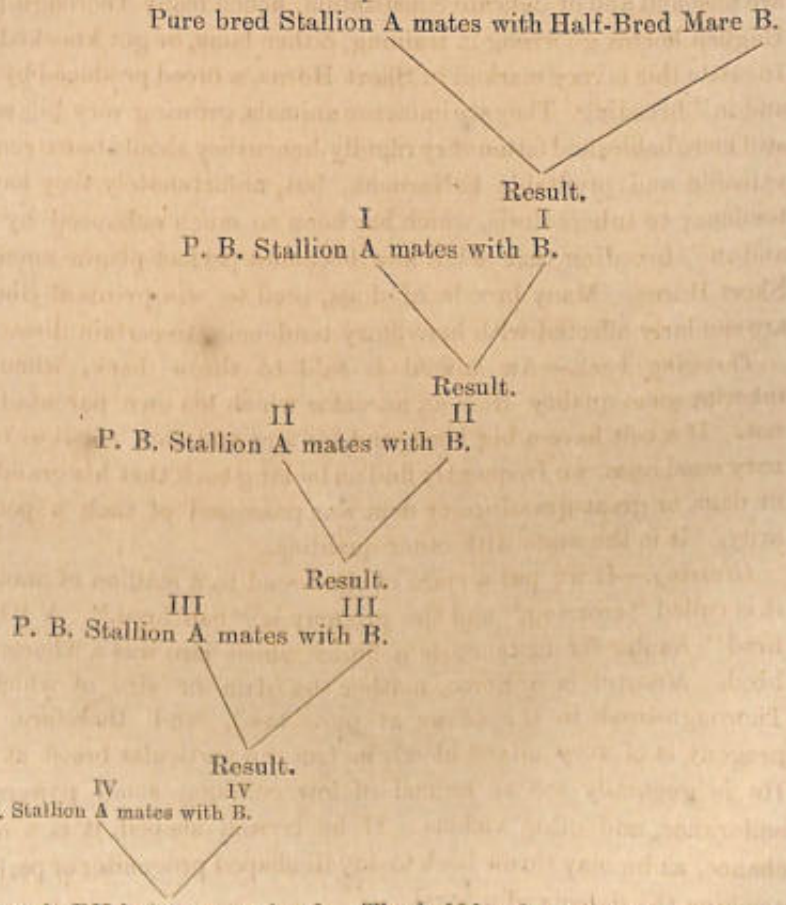
Throwing back.—An animal is said to throw back, when he inherits some quality from an ancestor which his own parents have not. If a colt have a big head, and his sire and dam small or ordinary sized ones, we frequently find on looking back that his grandsire or dam, or great-grandsire or dam was possessed of such a peculiarity. It is the same with other qualities.

Crossing.—If we put a mare of one breed to a stallion of another, it is called "crossing," and the progeny is "half-bred." A "half-bred" hunter for instance is a horse whose sire was a Thorough-bred. *Mongrel* is a horse, neither the dam or sire of which is Thorough-bred in the sense of pure bred, and therefore the progeny is of very mixed blood, in fact, no particular breed at all. He is generally too an animal of low courage, small powers of endurance, and often vicious. If he is well shaped, it is a mere chance, as he may throw back to any ill-shaped progenitor or perhaps combine the defects of several.

Nicking.—This term is used by breeders to denote the matching of the mare and stallion. A mare is said to have *nicked* well with a horse when the offspring is satisfactory, or badly when the reverse is the case. Also certain breeds are said to *nick* well with certain others.

Strains of blood—Mean that a family of horses have been crossed a generation or more back by some particular breed or well-known horse. Thus we say of a horse, perhaps Mongrel, "he has a strain of Thorough-bred blood," or "he has a strain of 'Hermit' blood," meaning the race-horse "Hermit."

Last Top Cross—Means the cross between the sire and dam. A pure bred horse must have five top crosses. *sic.*



Result BV being pure bred. The half-bred taint in the mare B being now supposed to be eradicated.

The Progeny is supposed to take after the sire, in the conformation of the fore limbs, in strength, energy and capacity for work. The mare gives height, size, and shape behind. But this rule is general to which there are many exceptions.

Age.—The foal often takes after that parent which is in middle life and therefore most vigorous.

Breed.—The better bred parent also stamps him or herself more markedly on the progeny. So strong is this that many horses are noted for what is called stamping their stock.

Sex.—A colt takes after the sire, a filly after the dam.

Stallions and mares.—We must now pass to the mating of the stallion and mare. In the first place we will consider the stallion. Whatever class of stallion we wish to breed from, he should be the best of his kind, free from vice, hereditary unsoundness, and of good conformation. It is a mistake to suppose, for instance, that if a stallion has an ugly head we can modify or alter the head of his offspring by putting him to a mare with a small well-shaped one. Stallions in this country are generally larger than the mares. But we should avoid too large a sire or we may injure the mare in copulation. Nor will it necessarily follow that the foal will be very large and vigorous. The Oriental breeds used by Government in India are Arabs, Persians, Country-breds, Turkoman, and Stud-bred.

Arab stock are well shaped, hardy and good-looking, have great powers of endurance, are good goers, have good feet, good tempers, are often fast, and make troopers for Native Cavalry. The stallions themselves too are hardy, and will keep health and condition on food, and in a climate where other horses would die. They are generally good tempered, which is a point of some importance, as an impetuous vicious stallion is often very troublesome, and gets himself disliked by the syces and mare owners. The drawback to the Arab stock is that it is generally wanting in height, has insufficient bone below the knee (shank measurement), has too long and sloping pasterns, and is frequently narrow chested, and raily. Also the Arab often, when not quite pure bred himself, fails to stamp his stock, and it takes after the Country-bred's dam, showing the crooked hind limbs, cow-

hocks, and falling away behind of the mother. Arab stallions are best fitted for districts where grain and forage are scarce, and the people poor, and unable to feed their youngsters well. As already mentioned, Arabs will grow into useful animals on food that would stunt the growth of English stock, and produce weedy, misshapen, worthless creatures. Arab stock in England grow large, because they get well fed, and both climate and soil are favorable to their development. Again, well-bred Arab stallions may with advantage be put to pure bred, big, roomy mares, to produce foals adapted for generally useful purposes. The cross of Arab blood thus infused gives the progeny beauty, endurance, and spirit. But be careful that the mare is pure bred, if mongrel, and holding strains of a variety of breeds, the progeny will be mongrel too, and may throw back to one or more of its maternal ancestors, and you may get an ill-shaped brute not worth rearing.

Persian.—I am not greatly in favour of this class of horse, for the reason that he is not "true bred," his pedigree is doubtful, and being mongrel himself it is not possible to tell what his produce will be like. I have seen but little of the stock of Persian horses in India, and those I have come across have not impressed me very favourably. There are, moreover, but very few of this class of stallion in the country. In my opinion all the good qualities of the Persian or Gulf Arab he owes to the infusion of pure Arab blood, and the stronger they hold this strain the better they are. As far as their powers of endurance, ability to live on short commons, and hard indigestible food goes, they come next to the Arab. But they want his speed, his courage, and his good looks. They are sluggish tempered, and lymphatic, especially when gelt. They have, however, generally the advantage of size, standing higher, possessing more bone and substance, and are good tempered.

Country-breds.—We sometimes find very good horses of this class, sired by a Government stallion. If his pedigree is not crossed too much, so as to make him a mongrel, he often proves a very useful sire. It is not possible to describe a Country-bred stallion in general terms, as so much depends on whether he is of Thoroughbred, Half-bred, or of Arab descent. Care should be taken in this class of sire to reject such horses as show the defects of the Indian

animal, such as straight shoulder, narrow chest (legs both coming out of one hole), toes in or out, want of bone, want of depth, want of substance, cow hocks, hocks away from him, sloping croup, or falling off behind. These being the faults of the Country-bred mare, if she be put to a Country-bred stallion possessing them, they will be accentuated in the stock. I have purchased a few Country-breds for stallions in the last few years, and their stock, although promising, is not yet old enough to show with certainty what they are worth. Many persons in India are possessed with the idea that in a certain number of years we shall be able to do without imported stallions, and to select from the improved Country-breds our future sires. This is in my opinion visionary; for, except in a few districts in the north, specially favoured by climate and soil, the indigenous Indian horse is small, narrow, and wanting in bone and substance, and to this type there is a strong tendency to revert unless a continual supply of foreign blood be imported to prevent it.

Turkoman.—The real Turkoman is a pure bred horse, and the best of them are very fine animals, well calculated to make excellent stallions. The prices asked for these are enormous. They are big horses, over 15 hands, possess much bone and substance, good shoulders, and do not fall off behind. Their hardness and powers of endurance are historical. Chestnut is a common color. Unfortunately the general run of Turkomans, although standing high, are narrow, raily, and want bone. There are also many so-called Turkomans which are Mushids or half-bred Mushids, and this class are a poor lot, coarse, soft, and currish.

Stud-bred.—This class, bred in the old Government Studs, is now extinct. They were fine horses, and many excellent animals were bred from them; unfortunately the stud authorities crossed their stock injudiciously, and the result was, that these stallions were far from pure bred. As they were put to mongrel mares, it was a mere lottery as to whether the stock obtained was good or bad.

Amongst other *Indian* breeds are the Kathiawar, the Dekani, the Wuzuri, the Kata, and the Punjabi.

Kathiawar.—Were good, often mouse-coloured, and had almost invariably a list, and often donkey marks. Now spoiled by injudicious crossing.

Dekani.—A good hardy pony, but small and light. Practically extinct.

Wuzuri.—Good looking and hardy, but light. Has curiously pointed ears.

Kata.—A breed in the Mozuffarnagar district. Encouraged a good deal by the Sikh Rajahs for Cavalry purposes. They were large, big-framed animals, and of a good stamp. The Kata still produces good animals.

Punjabi.—Bad colour, white, dun, etc. Pink nose, sheath, arms, etc.; but large, and frequently possessing much bone and substance. A favourite stallion with many natives, but disliked by Europeans for his colour, heavy shoulder and bad action. All the same, there are many good horses amongst them.

Other stallions are Thorough-bred, Norfolk Trotter, and Half bred, Waler, Cape, and New Zealand. These may be called Foreign or Exotic horses

Thorough-bred English.—About this horse opinions vary so very widely that I almost fear to touch on the subject at all.

I know my ideas differ considerably from those of many experienced men, and are likely to call forth, if not a torrent of vituperation and indignant denial, at least sneers and contemptuous remarks. Let me preface the expression of my opinion by stating that I consider a *good* English Thorough-bred the finest horse in the world. As a stallion racer, hunter, or charger he is unequalled; but unfortunately the *good* English Thorough-bred is not common, and there is an enormous demand for him; hence, his price corresponds. If breeding in India were on a small scale, Government could go into the market against the private purchaser, and by the length of its purse, beat him and obtain such horses as by breed, shape, and general conformation, would in a very few generations supply us with magnificent stock. This is, however, not the case. Exclusive of Bombay, Government use 300 stallions in India, and could not possibly afford to pay the enormous sum which would be required to have them all, or a majority of them, the best class of Thorough-breds, even if this large number were procurable, which I very much doubt. The Thorough-breds now imported for stud purposes, though I honestly believe the best to be had at the price, £ 250 to

£400, are not, as a rule, the class of horse calculated to improve the indigenous stock. The latter want size, substance, bone, and shape. And I assert that the class of Thorough-bred for which the Government can afford to pay, and which exist in sufficient numbers to supply the demand, are not capable of producing such improvement. I do not make this statement on theoretical grounds, but as the result of careful inspection of many hundreds of their stock in the Punjab and N.-W. P. Let me now endeavour to account for this.

For many years past this class has been bred for the turf, *i.e.*, for speed. A winner of races, be his faults what they may, when his career is finished, retires to the stud. Here, he is mated, not with mares selected for roominess, bone, and substance, but with mares whose speed has also been proved by their feats on the turf. Soundness, constitution, conformation, in fact every quality desirable in parents of good stock are overlooked, if the dam and sire are speedy. The breeder gets what he wants, fast animals capable of covering a certain limited distance in an amazingly short period of time, carrying a very light weight.

Now, as breeding this class of horse is expensive, a quick return on the outlay is necessary to make it profitable. To obtain this, the stock is forced to precocious maturity by high feeding.

The colt who should still be running in the paddocks, developing bone and substance, and maturing naturally into a fine horse, finds himself at two or three years old facing the starter on a race course. Now what results would any horseman predict from this? *First*—soundness not being a *sine quâ non*—unsound stock. *Second*—lightness, length, and a long stride being favourable for speed, want of substance and narrowness. *Third.*—Precocious maturity by artificial means, *i.e.*, high feeding and pampering—delicacy of constitution and early failure. *Fourth*—Taxing inordinately; immature bone, tendon, ligament and wind, splint, spavin, sprain, breakdown, and roaring.

Are these predictions verified? For answer observe the Hansom cabs in London and other large towns. Ask the Veterinary Surgeons and trainers at racing centres.

On the other hand their advocates contend, and very justly, that the Thorough-bred hunter for speed, endurance, power,

courage, and fencing, is *par excellence the horse*. Exactly so. Let us trace his history, and we find he has proved as a young horse too *slow* for the turf. The very qualities that give him his long staying powers and big jumping capabilities, militate against the terrific speed required for the modern racer. Again his price is very high, even hunting men with long purses, ready to give fancy sums for blood horses, find it difficult to obtain what they want, the difficulty yearly increasing. In other words, the demand is greater than the supply. One more objection, last, but not least. These horses are *castrated*. Firstly—because they would be too troublesome in the hunting field with mares. Secondly—they would not beget the speedy stock required for the turf, for, although faster than anything they meet with to hounds, as before remarked they are too *slow*, to meet their weedy, speedy relatives for short distances, carrying small boys, on the turf.

Under these circumstances, I am not an advocate for the indiscriminate use of the Thorough-bred English as a stallion in India. But there is no man in the country who more upholds his employment in a judicious manner, mating him with mares of the proper stamp in suitable districts as a cross. The stock not to be bred from, but utilized for Cavalry, riding horses for the public, and light draught, leads in Artillery, etc. The proper stamp of mare to mate the Thorough-bred with is a *pure bred*, sound, roomy, deep-chested, big-girthed animal, with plenty of bone and substance; height at least 15 hands, age not less than five. To put my opinion in another way, and in fewer words, I consider the Thorough-bred that Government can afford to purchase for India is not calculated to produce, when mated with the indigenous mare, the class of stock required for military, or general utility purposes; but an admirable stallion, if mated with judiciously selected pure bred mares, the produce of a larger, if coarser, pure bred horse. This applies equally to the Arab. If I understand Mr. Hallen's views correctly, these have been the lines he has worked on, in his efforts to provide us in India with a good useful stamp of animal. After considerable experience and much thought, I have come to the conclusion, that they are sound, and will give us the best results if he be allowed to carry them on without injudicious interference. A description of a

Thorough-bred English horse would be a work of supererogation, so I will omit it.

Norfolk Trotter.—Here again I fear my views will meet with scant approval in many quarters. The "horsey" public in India are generally the racing public. Apart from those interested in the turf, there are but few men, even in the Army, who take an interest in the question of breeding, and still fewer, whose opinions are valuable, either from experience or study. Hence a sire that cannot gallop, and whose pedigree holds no strain of racing blood, is to most men "anathema marantha." The Norfolk Trotters have been overwhelmed with a shower of abuse from all quarters. Hallen's fools (not foals as I once saw it printed), three-cornered, hairy-legged devils, plough horses, and conservancy cart horses, were some of the epithets applied to them. Of late years, the tide has turned, the numerous fairs, held annually in the Punjab and N.-W. Provinces, have given the public a chance of seeing the stock of these much abused stallions for themselves. Their superiority to other classes has been so palpably shown at these gatherings that both civilians and soldiers are confessing themselves converted. But they have still many bitter opponents. The Norfolk Trotter is by no means the coarse, hairy-legged animal that people have been taught to believe. A good specimen is a compact, well ribbed-up horse, with great girth and shank measurement, standing level on short legs, very short shanks, large flat knees, well developed square hocks, and is singularly free from disease of the feet and eyes. He has first class action at the trot. I would employ none without five top crosses, ensuring purity of pedigree. Unfortunately we cannot always obtain exactly what we want. A certain number of the horses that have come out to India, are not of pure pedigree, are coarser than they should be, and wanting in action. But with all these faults, they have done an immense amount of good, and are continuing to do so. Let any one, however prejudiced, see a collection of branded mares of all ages, and he will be forced to confess that the young mares are far superior to the old ones, and with a little trouble it can be easily demonstrated that the improvement is progressive, each generation being better than the last. Consult the birth certificates, and it will be found that the big roomy mares

are sired, grandsired, and even great grandsired by the Norfolk Trotter. Frequently we get monstrosities in the shape of a colt with a Norfolk Trotter body and Country-bred legs, a wretched animal whose legs are not fit to carry his body. This sort of beast is a perfect godsend to the Thorough-bred advocates. His shortcomings are trumpeted abroad, and, if he be found in a fair, the whole place rings with the discovery. There may be twenty head of nice stock by Norfolk Trotters in his immediate vicinity, but they are never taken notice of. The goose amongst the swans attracts all eyes. Yet these very men on a judging committee at a fair, will turn the Thorough-bred stock out of the ring in shoals and be very much surprised when they are informed at the end of the business that the major part of the prizes and all the highest have been awarded by their own decision to Norfolk Trotter stock. This I have seen not once, but over and over again. Some years ago an Artillery Officer walked round some stables in India, holding 25 or 30 Norfolk Trotters; before starting he was asked to point out any he considered *too coarse* for Field Artillery. From the lot he selected *two*; when asked if Field Artillery never received Walers as coarse, he confessed that they did, and coarser.

Now, if the stallions themselves are not too coarse for Field Artillery (I am certain many a Colonel of Dragoons would be glad to take the majority as remounts in the ranks of his regiment), how can the stock of such horses, out of lighter mares than themselves, be too coarse for Army purposes. This is a conundrum I am unable to find an answer for.

The Half-bred English.—This class I am not an admirer of. Undoubtedly many are fine horses, and some of the flyers from General Parrott's stud had a strain of this blood. The most popular horse in the Horse-breeding Department of the N.-W. P. was a stallion of this breed, so much so, that advances were made by dealers on his unborn foals. But in spite of this, I distrust a cross-bred horse, especially when put to an equally cross-bred mare; the result must be mongrel, good perhaps, but quite likely to be worthless, and, if a filly, not likely when her time comes to add to the equine population to produce anything worth having. The *Half-*

bred is impossible to describe, as he may have been thrown to his Thorough-bred sire, or his coarse-bred dam. In consequence he may look a well-bred, handsome horse, or a coarse, ugly one. Specimens of each may be found in India.

Australian Waler.—Generally Thorough-bred. They are, I think, more delicate in India than the English Thorough-bred, and I have found their stock disappointing. This I am told was also acknowledged to be the case in old stud-days.

New Zealanders.—As far as I am aware have not as yet been tried.

Cape.—Have now become extinct. I am informed that there used to be some very superior stallions of this breed in former days in the stud. Captain Nunn, D.S.O., of the Army Vety. Department in his report on the Cape horses, published a few years ago, speaks unfavorably of the present breed.

Mares.—Speaking in general terms, the indigenous equine of India is really what would be considered in England a pony. Gifted with marvellous powers of endurance, ability to live and work on a minimum of food, and capable of continuous exertion for long periods. These are the good qualities of the race. On the other hand, as a result of many generations of ill management, want of knowledge and care in breeding, climatic influences, and bad keep, they are narrow, wanting in middle piece, in bone, in height, and in action. Though often of fair conformation in front, they nearly always fall off behind, drooping quarters, narrowness across the hips, sickle, or cow-hocks are the rule, not the exception. This is the class of horse that is at our disposal to produce remounts for the Army and useful horses for the general public.

Without doubt exceptions to the above may be found, and there are in the Punjab and on the Frontier several breeds which furnish promising brood mares, of fair height, bone, and substance. In Bombay too, Kathiawar and the Deccan produced in the old days a good class of animal, but now one is met on all sides by lamentations over the decadence of the Kathiawari, and the almost utter disappearance of the little Deccanni.

The problem to be solved, or, I may say, in course of solution is, "What are we to do to improve the indigenous stock up to the

needs of our requirements, starting with the class of dams described above?" To answer this question, the following points must be considered, as they affect the various districts :—

1. Climate.
2. Soil.
3. Nature of crops.
4. Extent of Waste or Pasture Lands.
5. Poverty, wealth, habits, and customs of the inhabitants.
6. Will horse growing pay better than grain or cotton growing?

1. *Climate.*—Much depends on climate. A dry, warm climate is undoubtedly favourable for the development of equines, and could the necessary nutritious grains and grasses be grown under such conditions, there would be no hesitation in at once selecting countries like Arabia, Afghanistan, Sind, etc., as the best breeding grounds. Unfortunately dry heat means generally a scanty water-supply, and deficiency of forage and grain. The result being that the young stock do not get enough to eat, and never grow to any size. On the other hand, a damp, warm climate is fatal. Bengal, many parts of the Madras Presidency, the greater portion of the Indian coast, are eminently unsuitable to breeding. As a rough practical rule, we may say, that where rice flourishes horse breeding will not. The same rough rule applies I am told to tobacco.

2. *Soil.*—Damp, marshy soil is unfavorable to the rearing of good stock. Horses brought up on such land are soft and washy, their bones spongy and wanting in hardness, feet large, flat, and the horn soft. Well-drained, light land, rather sandy is the best we can have. Between these two extremes we get, of course, all varieties; but, as a general rule, the drier and better drained the land, the more adapted is it for our purpose. The presence of lime in the soil is indispensable for young stock. Bone is made up largely of this substance and, if it does not exist in the soil, the herbage cannot contain it; as a result, the bone of animals reared in lands deficient in lime, is wanting in earthy constituents and is too soft to be of any use. Not uncommonly such soft bone bends and we get crooked legs, etc., etc., in fact, ricketts.

3. *Nature of Crops.*—The nature of the crops in a district have much to say to the production of horses. Where barley, chennah,

etc., are cheap, where kurbi and bhoosa are plentiful, where such grasses as Dub (*Cynodon Dactylon*), Anjana (*Pennisetum Cenchioides*), Sanwak (*Panicum Crus-Galli*), Makra (*Panicum Egyptiacum*), Jurgah (*Andropogon Annulatus*), Kewai (*Panicum Cilare*), etc., etc., flourish, there we can raise big horses. The young stock are well fed. The climate and soil favourable for such crops are also favorable for horses.

Again, where scanty crops and coarse unnutritious grass only are obtainable, we can raise only scant crops of horses. And these, though they may be good of their kind, and, for hardiness and endurance, superior to their better fed brethren, will never grow to the same size.

4. *Extent of Waste or Pasture Lands.*—Of late years owing to the immense increase of the export trade in grain, its cultivation has received a powerful stimulus.

Hence, lands that a few years ago were lying waste and only used for the grazing of cattle and other stock are now put under the plough, and produce wheat and barley instead of bullocks, cows, sheep, and horses. It was always difficult to induce the horse-owners to allow sufficient liberty to their stock, but now-a-days, over a very large part of the country, liberty is impossible, as there are no pastures to allow them to run on. Where grass could be had for the cutting, it is now rather an expensive luxury, for, instead of more or less extensive maidans in the neighbourhood of every village, we have square miles of grain and cotton, and the grass growing on the bunds and paths that intersect these fields is jealously guarded by the owners, who can barely get enough of it to feed the bullocks they require for their ploughs and wells. Owing to this too the question of grass supply for Army horses is daily becoming a more serious one, and Government has had to face the difficulty by allotting grass lands to the various mounted branches in the neighbourhood of Military Cantonments.

5. *Habits and customs of the people.*—The tastes, castes, manners and customs of the inhabitants of a district have a great deal to say to the number and quality of the horse stock they raise. Many castes have a natural taste for horses, and, although their ideas on equine matters but rarely accord with ours, still they make

fair stock owners and take great interest in the subject. In former days, when every man's hand was against his brother's, and each petty Raja or Chief made war on his fellow at his own sweet will and pleasure, a good sword and a good horse were considered a very sufficient outfit for any smart young fellow. The most important part of the forces employed in these petty wars that raged interminably throughout the land consisted of horsemen, hence all the warlike tribes took the greatest interest in the breeding and rearing of the horse. With the advent of a settled Government under British supremacy these turbulent days passed away, and the need for large numbers of horses in every petty state passed away with them. The taste rapidly decreased, and we now find a very large proportion of natives utterly indifferent to, if not disliking, the noble animal. The extension of railways has helped also in still further rendering the horse less useful to our native fellow-subjects. In former days when a respectable person wished to make a journey, his ladies travelled in bullock carts, while he himself with the other males of the family rode; now he simply takes tickets for himself and his belongings from one station to another. It must be borne in mind too, that the zemindar never uses horses for agricultural purposes. In the old days of course they were wanted for military work, and now the custom of using bullocks is much too deeply rooted to be overset by anything we can teach him for the next century. But in spite of all these disadvantages, there are many districts in India where the zamindars are fond of horses, and, if encouraged judiciously, will continue to own mares and breed stock. Chief amongst these are the Rajputs who make the best owners and breeders of all. Mussalmans in the N.-W. P., though fond of riding and sport, do not, in my experience, pay sufficient attention to their dams and stock, and often feed them insufficiently. Amongst the Goojurs we get many successful breeders, but the lowest class Chumars, etc., are almost invariably bad owners. Many Sikhs and Punjabi Mussulman are keen and do well; and of course the Wuzaris, Brohois, and other Afghan tribes are born horsemen and know as much about practical equine matters in their own way as we do.

In Bombay the Mahrattas, judging from their history, ought to be

good men, but my experience of them in connection with breeding is very limited.

6. *Will horse growing pay better than grain or cotton growing?* As already mentioned, when speaking of waste and pasture lands, the export of wheat and cotton have increased enormously of late years. This has militated considerably against breeding in many districts. Formerly where one might easily find fifteen or twenty mares in a village, now none or only one or two exist; the reason being that more money is to be made out of grain, cotton, etc., than out of horse rearing. The zamindar, alive to his own interests, sells his mares and puts his money into bullocks, well digging, etc., to raise what will pay him best. If we could induce him to use his mares in the plough, in drawing water for irrigation, etc., etc., instead of his non-productive bullocks, an immense step would be taken in the right direction. For various reasons, the chief of which is his intense conservatism, nothing will persuade him to do this. There we have one of the many difficulties to be contended with in India. The zamindar keeps his mare simply to breed from, and with the exception of leading her in a wedding procession, or, occasionally riding her at a walk from one village to another, never uses her. So, the sale of her produce has to cover the expenses of her keep and leave a margin of profit. As long as grass costs nothing and grain but little, this was all very well, but now there is barely sufficient fodder to be got off the land for the plough-bullocks and grass must be bought. Grain too has gone up in price. Thus, as the mare does nothing for her own keep, she becomes an expensive luxury instead of a remunerative animal. If her produce does not sell for a good price, dies, or she slinks a few times, she becomes ruinous and is disposed of, and the zamindar, finding he has lost money, is very chary of speculating in the breeding line again.

Selection of Breeding Districts.—Having now shown some of the difficulties which have to be contended with when breeding on a large scale in this country, I will proceed to give my own ideas of how such difficulties are to be overcome.

Our object is to increase the bone, substance, and height of Indian stock, in order to meet Army requirements, and the wants of the general public, who now have to invest largely in Australians to get

the stamp of horse they desire. To do this we must have big, roomy, pure bred mares, and plenty of them. These can only be obtained, in my opinion, by selecting districts where the soil and climate are favourable, fodder cheap, and zamindars can afford to feed the young stock well. In such districts place Norfolk Trotters and no other class; get mares by continued perseverance with this stallion as closely resembling him as you can. The colts of such stock will go to Field Artillery, or if not high enough for the modern gunner's idea of a draught horse, the Calcutta, Lahore, and Bombay Tramways, and the public will buy them as fast as they are bred. The horse being a polygamous animal, we are always sure to have, when breeding on a large scale, a preponderance of filly stock. As far as possible have your Norfolk Trotter Districts together, and bear in mind that you do not want remounts from them, but brood mares.

In the districts round your Norfolk Trotter centre place your Thorough-breds and your largest and finest Arabs, putting them to mares obtained from the Norfolk Trotter centre. This cross will give you your remounts and general utility horses, but do not breed from them. Refuse all fillies that are not pure bred Norfolk Trotter for brood. In the outlying districts where fodder is scarce, the people poor and yet "horsey" in their tastes, place your Arab. He will get from the little country mare polo and racing ponies or Native Cavalry Remounts and at the worst, good transport ponies and mares who will breed fine mules if put to big European donkeys.

I am perfectly aware that breeding on a small scale is conducted in a very different manner; that each mare is selected to match and nick with a particular stallion. That good qualities in the dam should be accentuated by mating with a stallion also possessing them to a marked degree. That defects should be eradicated if possible by mating with excellencies of the opposite type. But, when thousands of mares and hundreds of stallions have to be dealt with, we must follow a general idea. The business must be worked on a large scale, and a certain percentage of failures, mistakes, and disappointments must be allowed for and taken as inevitable. But until some plan of this sort is adopted and steadily persevered in, I feel convinced we shall meet with nothing but failure. Breeding

mongrels on a hit or miss method will result in waste of money, time and discredit to those who work it, be they Government officials, Native Princes, or private individuals.

PROTECTIVE RESEMBLANCES.

By W. E. Hart.

(Read before the Bombay Natural History Society, 5th April, 1892.)

From the frequency with which it is reverted to in the pages of the *Journal*, the subject of protective resemblances in the insect world would appear to be a very fascinating one. In the case with which it seems to fit into the doctrine of evolution, and the wide field it opens to interesting speculation, those who treat of it will, no doubt, be found in danger of being led into the extremes humorously noticed by "Eha" in one of his amusing contributions to the *Times of India* as "A naturalist on the Prowl." At the same time, he seems to me rather hard on those even of the extremest opinions. As I understand them, none go the length of suggesting any volition on the part of the mimic in the selection of a protected type for imitation. The perpetuation of the likeness is involuntary and brought about, not by selection, but by the fact that those members of an unprotected species which resemble the members of a protected one, have, in that resemblance, an advantage in the struggle for existence, which will be an advantage to the species in proportion as it is transmitted from one generation to another. The perpetuation of the likeness is, therefore, a process of evolution.

Nor does it seem to be insisted on, even by those who most strongly insist on the value of protective resemblances as a means for securing the perpetuation of an unprotected species, that the likeness between it and a protected one is necessarily always an *imitation*, in the strictest sense of the word. It is true such expressions as "imitate" and "mimic," are very commonly used, but often, I think in a figurative rather than a literal sense, merely because they concisely and conveniently express the resemblance between an unprotected species and a protected one, but without any intentional suggestion

that each may not independently have arrived, by the process of evolution, at the establishment of a similar typical feature which has proved useful to each in the struggle for existence. A resemblance will thus be found between them, though neither can in strictness be said to imitate the other.

In this connection, I wish to describe a very curious likeness not only in appearance but behaviour, which has come under my notice between two harmless caterpillars and a venomous snake. It suggests several questions of interest, possibly of importance, but their solution must be left to wiser heads than mine.

Among the inmates of our "caterpillar farm" described at p. 277 of the fourth Vol. of the *Journal*, was a large *Geometra* ("loofer") caterpillar, given to us by our Honorary Secretary, in whose compound on Cumballa Hill it had been found. It was then fully three inches long, and nearly as thick as my little finger, of a very dark brown, almost black colour, with the exception of a large irregular Y-shaped patch of a dirty yellowish-white near the tail end. This, when the creature's back was "looped" in its characteristic manner, gave it the appearance of a cobra, erect, with expanded hood, in act to strike. From the shape and position of the markings, this likeness was only perceptible from behind. But to an enemy meditating an attack from the rear it would be so striking as to cause an involuntary pause, during which the caterpillar, hurrying in the other direction, could easily increase its distance, if not altogether effect its escape. That this was the use of the resemblance was clear from the fact that the caterpillar always assumed what Weissmann calls its "terrifying attitude" when annoyed or startled, as, for instance, by having its tail tickled with a straw, or the floor of the cage suddenly tapped.

This specimen was of very vagrant habits, constantly effecting its escape from the cage in a mysterious way, and turning up in unexpected places at a distance from it. Possibly its activity was due to hunger, for we did not know, and could not discover its food plant, and it would not touch any of the numerous leaves which we supplied in the hope of tempting its appetite. At last it disappeared, and was only found again long afterwards behind the wainscotting, when it was what Mr. Mantalini would describe

as an "unpleasant body," we therefore failed to raise a moth from it, and so were unable to determine its species.

In the other specimen the likeness to a cobra was even stronger. This also was a *cometra* caterpillar, of about the same size as that just described, which we found in August, 1890, at Nasik, feeding on a species of *Evolvulus*, that small creeping herb with bright blue flowers, like a tiny *Convolvulus*, which grows commonly in spreading tufts on rocky ground during the rains in Bombay. Its markings were at the head end, and gave it when "looped" exactly the appearance, from the front, of a cobra reared in act to strike. Not only so, but if the annoyance which caused it to assume the "terrifying attitude" was continued, it actually did strike, though of course quite innocuously, exactly like a cobra, in the direction of its assailant, turning for the purpose to the side or rear and with such hearty good will as sometimes to over-reach itself and fall prone. I frequently tested it, sometimes with so uninviting a subject for attack as the toe of my boot, and never failed to "get a rise out of it."

Unfortunately this specimen was lost on its way down to Bombay before it had turned into a chrysalis, so in this instance also we failed to determine the species.

Now these are to my mind two very interesting cases, well worthy of further consideration. In the first place, it will be noticed that the one first described uses its likeness to a venomous snake for the purpose of making an opportunity to avoid its assailant; but the one last described, though evidently belonging to a closely allied species, uses a very similar likeness for the purpose of making its assailant avoid it.

In the next place, it will be observed that in the latter case the likeness is more complete, not only in appearance, but in conduct.

Then comes the question, Whence the likeness? Is it because it has proved of use to the caterpillar to be like a cobra; or is it because it has proved of use both to cobra and caterpillar that a "creeping thing" should be able to suddenly assume an erect and minatory attitude with expanded crest and spectacled head?

If the former is the true answer, we are met with the difficulty that, for the likeness to be of any general use to the caterpillar, the

creatures to be terrified thereby must be assumed to be capable, not only of remembering, but of communicating to others, their experiences in regard to cobras, and these others of understanding and remembering such communications.

If the latter is the true answer, we avoid this difficulty, but are met with another, *viz.*, that the conduct of the caterpillar secondly described, in actually striking like a snake at its assailant, though powerless thereby to injure him, is more consistent with the theory involved in the first question than the second.

REVIEW.*

Mr. W. T. Blanford and the Secretary of State (let the former have precedence on his own "midden") have sent the Indian Empire a New Year's gift of the present volume—for a consideration. They call it a "part," but we prefer when a book is published in two volumes at an interval of 3½ years, to call them volumes. Be that as it may, Mr. Blanford's "Mammalia of India" is now a complete work; and is, and must be for many a year to come, the standard work upon the subject.

In a preface, hibernically placed at the caudal extremity of the volume, Mr. Blanford points out that six of seven "volumes in which it was originally proposed to describe the Vertebrata of British India have been completed." He adds that three volumes on Moths, by Mr. G. F. Hampson, are to be added to these on Vertebrata; which is very good news, and recommends Mr. P. L. Sclater to the public for having recommended him (Mr. Blanford) to the Secretary of State, which was, perhaps, superfluous in both cases. Both gentlemen have reputations which are, or might be thought be, to above the need of "mutual admiration."

The volume now under Review begins with the Bats, and at their head is our eminent friend the Flying-Fox, who is favoured with several vernacular names that would make a Brahman Quintilian

* Fauna of British India, including Ceylon and Burma. [Why not Afghanistan and Beluchistan?] Published under the authority of the Secretary of State for India in Council. Edited by W. T. Blanford, F.R.S. Mammalia; by W. T. Blanford, F.R.S. Part II., Price 10s.

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stare and gasp. "Warbagul," for instance, is not Marathi for a flying-fox or anything else. "Wághúl," in that language is a bat, and "Wadh" a banyan tree, and "Wadh-Wághúl" or "Banyan-bat" is a flying-fox, because it affects the banyan tree for board and lodging.

"Tickell" (says Mr. Blanford in a note) "notices their preference for tamarind trees, and I think he is right. In Bengal, they sometimes remain on bamboos." One would rather like to know whether they "remain on bamboos" any longer than on tamarinds. But as a matter of fact, if a particular grove or tree suits the bats from position, they will roost there, perfectly indifferent as to species and foliage, provided it is not thorny. They can't abear thorns, because, in flapping and scrambling about the trees, their wings are in frequent contact with the branches.

Early British Administrators in the Ratnagiri District were perplexed at finding certain Banyan trees assessed as Undi trees (*Calophyllum Inophyllum*) whereof the stone of the fruit yields a marketable oil. The reason was that flying-foxes haunted the banyans, and dropped on the ground below the undigested Undi stones, whereof they had converted the pulp into living bat. The owner of the Banyan tree hereby got more Undi nuts from his Banyan tree than the original owner of the Undis; but the Maratha tax-gatherer was keen enough to find that out. Mr. Blanford, though he notices that "the trees on which the bats perch are frequently injured," takes no notice of the fact that these brutes are a scourge to all orchards of every sort.

They infest even toddy palms (and other palms tapped for juice), but do not drink the toddy in the pots. What they do is to chew the flower stem on tap.

Our author notices the yarn about these bats fishing, and thinks himself that they skim the water to drink, which is probable enough as they only do so at starting in the evening, when they have been without food or water for many hours, and do *not* do it on salt water.

The fishing hypothesis is not so absurd as it looks. One of the South American carnivorous bats has been fairly convicted of catching fish by a very similar action, and this volume records one case of ichthyophagy in the Indian Vampire, *Megaderma lyra*. Some

naturalists, moreover, hold the flying-foxes to be not altogether Brahmans in diet.

The English nomenclature of the bats is unhappy. It is very inconvenient to any man who has any sense of Greek to find that the "Horse-Shoe Bats" are quite a different set of creatures from the genus *Hipposideros*, or as our author (who delights in breaking Priscian's head) writes *Hipposiderus*.

We want to know more about bats. The best shikar to be had out of them is as follows:—Get a foil (nothing else is fine enough) and go for that bat when he comes into your room o' nights. He dodges landing nets and defies the clumsy bamboo; but the foil is too fine and smart for him. It's equal to pig-sticking. If he can't rip, he can fly in your face, and does.

If you walk into a Buddhist cave at midday with a bamboo, or a besom, or anything else, you can generally get bats by swiping into the brown of them, but this is less artistic.

On the whole, observation of their habits is more wanted than specimens, but of course one must identify.

After the bats come the Rodents. *Pteromys "Philippensis"* is very properly discarded for *P. Oral*, for the same reason as *Ursus tibetanus* in the last volume, *viz.*, that although the name has priority, it has not got accuracy, the flying squirrel in question not existing in the Philippines. (O si sic omnia), "Bombay skins are said by Sterndale to be grey." They *are* grey; from Khandesh to to Kanara. "Bus."

It was to be expected that a lot of our big red squirrels would be clubbed under *Sciurus Indicus*. But it is not clear why nothing is said of the mammæ in this species, and great stress laid upon their being "6, all inguinal" in the next, *S. bicolor*. This oddity runs through the whole set of squirrel descriptions. It may be presumed that Mr. Blanford's authorities and specimens don't usually show the number of mammæ; in which case any gentleman reading this, and getting a female squirrel, might do well to note the same in this Journal.

Our author doubts the specific distinction of *S. palmarum* and *S. tristriatus* but retains it, and notes (correcting Jerdon), that the former *is* often seen on palms. Jerdon, perhaps, never had occasion

to live in a palm-garden. *Sciurus Palmarum* is a pest to the owners of such gardens. But, on the palm, it is excessively shy, and sticks to the crown; because the bare stem gives no protection against birds of prey. Now it is hard to observe any creature so small in the crown of a palm tree, without one is a toddy-drawer, and comes to close quarters with the "common or garden squirrel."

The Rats, of course, require much notice. But with all due respect the Indian gerbille is not *always* "thoroughly nocturnal," and very rarely seen outside its hole by daylight. In some cases it accustoms itself to man very well; and the present writer admired a colony in a railway cutting just outside a station which came out and admired him, and a whole trainful of other featherless bipeds with the coolness of London sparrows.

Our author notices this boldness in the other gerbilles, and it is probably a question of circumstances with all of them, as with most other creatures that have any sense at all.

About the Porcupines there is little new to say, except that the proper Maratha name is Sail; and that *Hystrix leucura* is the very best wild meat of all beasts of Western India. Both of which may go down for marginal notes upon our copies of the volume under review. The strange form of tail quill which receives a special illustration at p. 446, as normal with *Atherura macrura*, sometimes occurs in *Hystrix leucura*, but is less developed.

About the Hares, the most important thing to note is that the frontiers of *Lepus Ruficaudatus* and *L. Nigricollis*, in our own presidency, are not yet "scientific frontiers," which is not creditable to us. They are probably not far from the latitude of Bombay or a trifle north of it in the Konkan and south of it in the Deccan. If anything this boundary is too far north, there must be a debatable land: as there is no boundary that would stop a hare either above or below the ghât. *Nigricollis* occurs north of the Waitarna.

In the *Proboscidea* Mr. Blanford recognizes only one Asiatic Elephant. The notice is rather meagre, but two passages are worth transcribing: "the ankle joint or heel in the hind leg, corresponding to the hock in other ungulates, is very little raised above the ground" (he might have added "and inconspicuous"); "and the only pace

of elephants is a walk, slow or quick, at time increased to a shuffling run. They are incapable of any motion resembling a gallop or of the least jump." Every man who is going to draw an elephant and ought to learn these sentences by heart, albeit one is as incomplete the other as awkward as the elephant's 'shuffling run.' Artists usually draw elephants with hocks, and then reviewers correct them and say that elephants "have no hocks." Arcades ambo.

Tame elephants very rarely breed in India. A good observer told the writer that he had witnessed their nuptials at Panna in Bundelkhand many years ago, which differed in no material point from those of other quadrupeds. There are other (some very old) authorities for this, and mahout lies to the contrary; now the mahout is of all men the premier liar, and the close companionship of elephants is, indeed, more corrupting than even that of the horse. Whereof a tale of Bengal,—(Mr. Raikes's, we think) Baxu, dealer in elephants took several to a fair and sold all but one; and around this sole survivor there walked an uncommonly shrewd-looking one-eyed Rajput stranger examining him closely. "Sir," said Baxu, "I perceive that you are a judge of elephants. You are also my father and mother and a few other relations,—and what's more I see the Raja of Dustypore's Diwan coming up to look at this elephant, and if he buys him, you shall have 50 rupees." The Diwan did buy the elephant, and Baxu, who fancied that the stranger had detected the 'screw loose' that had so long kept that elephant on his hands, paid up, and said he, "Sir, I thought I knew how to 'fake' a screwed elephant if any man in Hindustan does, but you are my master. How did you find him out?" "My brother," quoth the judge of elephants, as he put a 'granny' knot on the rupees in his sash, "the truth is that I never saw an elephant before, and I was seeking to discover which end of the brute was his head, and which was his tail."

Our tale is at this end for the present.

MISCELLANEOUS NOTES.

No. I.—NOTE ON *ANGRACUM SESQUIPEDALE*.

(*Read before the Bombay Natural History Society, on 26 January, 1892.*)

The orchid which I exhibit to-night is an *Angracum*, a native of Madagascar; it has been in my possession about four years, and has flowered regularly every season.

The *Angracum* belongs to the tribe *Vandeæ*, and in some degree resembles *Aerides*, having, like them, the stems clothed with ever-green leathery distichous foliage, which in some kinds is curved and graceful, while the flowers are produced in long racemes from the leaf axils. The flowers are characterised by the spreading sepals and petals, and by the long slender spur to the lip, which has a spreading entire or 3-lobed limb.

This particular species "*Angracum sesquipedale*" is described by Williams in his "Manual on Orchids" in the following terms:—

"A wonderful and noble plant of great beauty. It was brought to England "by the late Rev. W. Ellis of Heddeslow from Madagascar, where he found it "growing on trees. The stem is simple and rooting; the leaves close-set, dis- "tichous, leathery, oblong, blunt and bilobed at the apex, keeled, and of a dark "green colour. The flowers are of a clear ivory white and very large, a foot "across, with a greenish tail or spur from 12 to 18 inches in length hanging "from the flower. The peduncles are axillary, and bear from one to four of these "fragrant flowers, which are produced in November, December and January, "and last about 3 weeks in beauty. There are two varieties, one having larger "flowers than the other."

It is the smaller plant that I have shown this evening.

As regards the treatment of orchids generally, my experience is that in Bombay they have to be protected from the sea-breeze and red dust. Dirt, of course, to any orchid, is poison, and it is one of the trials of my life to see the *chota malli* brushing the pathways next the orchid-house, raising a noble cloud of dust, which settles lovingly and lastingly on the foliage of the orchids. A prolonged course of this dusting is quite sufficient to kill any orchid. Cleanliness in orchids is so much insisted on that in most manuals you will find advice to readers to wash the foliage with sponge and soap.

Orchids require a fair amount of sun; the ordinary Bombay fernery netting seems to admit the right amount. Creepers growing over orchid-houses are, I find, a mistake. Recently my orchids in one house were looking dull and depressed and anything but healthy. The fellow-plant to the one exhibited dropped its flowering stem, and I discovered that the creepers had grown so thickly over the roof of the house as to obscure the sun's rays. I at once had the creepers cleared away and the plants have recovered.

Water of course is essential. I water my plants once a day all the year round except in the rains. Excess of water is liable to damage the plants, and I find that bulbous orchids especially are liable to rot off in the rains. It is most difficult to make the *malli* understand how to moderate the supply of water, and also to syringe the orchids instead of watering them from a bucket. In the hot weather the floor should be kept well damped. It will help your ferns as much as your orchids, and in my experience this is most essential in all fernaries, especially where you cannot have artificial tanks in the houses.

There is a good deal also in selecting the right spot in which to place an orchid in your fernery. This knowledge can only be obtained by carefully watching the progress of your plants, and moving them about until the healthy appearance and growth of your orchids indicate that they are in suitable localities. As regards the method of growing orchids, I find as a general rule they do best in pots with charcoal and brick or broken potsherds and a little moss on the surface, especially in the hot-weather months. In the rains the moss can be removed. Many orchids do well on slabs of teak, but when they grow much they are too big for the wood and it is a troublesome task to remove them. Terrestial orchids of course require the ordinary potting. Do not attempt to grow hill orchids in Bombay. Barton-Groves writes :—"It is useless attempting to cultivate in the plains hill orchids which grow at an "altitude above 2,000 ft. They will probably blossom the first season, but then "either die off at once or dwindle away by degrees."

Lastly, do not leave the charge of your orchids to your *malli*, for this will be but to court failure. Orchid culture requires much patience and constant care and attention, which only the *madam sahib* or *sahib* will give.

Bombay, 26th January, 1892. M. C. TURNER.

No. II.—*SEPTICÆMIA IN A DEER.

The case in question occurred in a young, tame, female deer that had been bitten by a dog. The owner being ill, it was left to the care of native servants, and was not properly attended to until 10 days after the injury had been inflicted. When admitted to hospital on the 13th November, there was a large wound on the near quarter, extending almost the whole length of the femur down to the patella. The edges of the wound were deeply under-run, and the whole was fly-blown, the triceps, external, vastus and ischio-tibialis muscles being in a gangrenous condition and sloughing. There was also a deep ulcerated wound at the back of the limb, about an inch above the point of the hock, and the gastrocnemius tendon was badly torn, a large portion afterwards sloughing away. The wound was cleaned, the gangrenous portion of the skin and muscles removed, the whole irrigated with corrosive sublimate solution, 1 in

* The above appeared in the *Veterinary Journal* for January, 1892.

1,000, and afterwards dressed with iodoform. On the 16th there was considerable erysipelas of the whole of the tibial region. This was treated with belladonna externally, and tinc. ferr. perchlorid 4 minims, and pot. chlor. 4 grs. in a draught morning and evening. On the 18th all symptoms of erysipelas had vanished, and the treatment was discontinued. The case did well till the 20th, when the temperature rose to 103·8 with a muco-purulent discharge from both nostrils. The animal was found dead at 6 a.m. on the 21st.

Post-mortem at 11 a.m., 21st November, 1891.

The body was well nourished. At the umbilicus a hard tumour was felt. On dissection of the wound, the whole of the adjacent muscles were infiltrated with minute abscesses. The sacrosciatic nerve was highly inflamed, and there was a large clot in the popliteal vein. The inguinal lymphatic glands were highly inflamed, and showed numerous points of pus on section. The ilio-cæcal valve was highly congested. The rumen showed four deep ulcers, with the characteristic raised edges. The lungs showed old adhesions on both sides, but more particularly on the right. Both lungs were in a gangrenous condition, and were simply a mass of minute abscesses, especially the right one. The heart was adherent to the pericardium, and both it and the endocardium had well marked ecchymosis on them. The right side of the heart was almost filled up with a large ante-mortem clot, that passed right through the auricular-ventricular opening. The tumour felt at the umbilicus turned out to be 6 hair calculi in the rumen, that altogether weighed $3\frac{3}{4}$ ozs. There was an entire absence of the new mown hay smell that is so characteristic of septicæmia in the human being.

This case appears to show how little chance there is of deer living that have been wounded and escape into the jungle, and how, from motives of humanity, sportsmen should refrain from firing "Long" and "Snap-shots."

J. A. NUNN,
Principal, Lahore Veterinary School.

No. III.—A TUBICOLAR ANNELIDE.

On the beach of Mahim—not the Bombay Mahim, but that 50 miles north of it, best known as Kelvi Mahim—I came across an annelide worth describing, as some one may identify it.

The tube was leathery, about 6 inches long, and one-sixth of an inch in extreme diameter, of a dirty fleshy-white colour. About four and a half inches of this tube were attached to the underside of a loose stone some 10 inches by 6, and 3 inches thick; such a stone as one would think rather too big to throw at a dog, but not too big to dash down upon any object which might deserve that attention. This attached part of the tube was much flattened to the stone and greatly contorted. The remainder was straight, free, and cylindrical, bearing at its end at the surface of a tide-pool, wherein

the stone lay, the usual flower-like tuft of branchiæ. These were not as usual crimson or whitish, but of a very rich chestnut-colour. I watched them for some time, and found them extremely sensitive to light. My movements affected them but little. But on moving my stick so as to bring a mere pencil of shadow (that of a steel point) across the branchiæ, they immediately retreated with a jerk into the tube. The stick itself was a foot above the water, and no motion of it, or of my body, affected the action of the annelide until the tiny shadow fell upon it with as sharp and instant effect as that of red-hot iron.

This is a great neighbourhood for the tubicolar annelides. *Serpula* builds reefs here that would not be a disgrace to some of the corals, and the sands are full of the great sea-caddis (*Terebellæ*).

In a general way, however, the beach is not rich, the most noticeable thing (in the walk now recorded) was an immense number of small olive-gray *Aplysiæ*, with white spots, apparently beached against their will, and dying.

Oddly enough, while observing these, my attention was attracted by the sound of heavy rifled ordnance from Bombay; over 50 miles away, and not up wind either.

KESWAL.

No. IV.—"ST. BRANDAN'S ISLE."

It is a trifle hard to say whether a meteorological phenomenon comes within our scope or not.

At any rate, on the 11th February, 1892, there was visible from Mahim Fort, Tanna district, an unusually distinct appearance of the "Fata morgana," "St. Brandan's Isle," or (as it is best known to sailors), "Cape Flyaway."

West and North of West was a bank of clouds; unmistakeable enough, clear of this, from W. by S. to W. S. W., was a group of mountainous islands apparently about 30 miles away; but clearly reflecting the coast ranges behind us, distant from our backs, the nearest about 8 miles in a straight line, the farthest, perhaps 20.

I called up two boatmen, who spontaneously remarked the identity of the apparent island with the hills to the east. They had no knowledge of any legend about such things, but thought them a sign of doubtful weather. There was no inversion of anything.

No. V.—SPORT IN THE ISLAND OF KARATIVOE.*

Off the North-west coast of Ceylon, and about a mile and a half from the mainland, is a long narrow island called Karativoe, very little known, and of almost no mercantile importance, its only merit in this sense being that it is, at

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* The above appeared in *The Field* on 30th January, 1892.

certain times of the year, used as a fishing station by the natives of the colony. Excepting in the season, when the Singalese fishermen visit it to catch fish for the purpose of drying and salting, it is wholly uninhabited, unless, indeed, it be by a few Chinamen, who go there to catch the sea-slug (called in Tamil "attai") which abounds on this part of the Ceylon coast. These slugs—I do not know their correct scientific name—are large things about 8 in. or 10 in. in length, black and slimy, and of a most uninviting appearance when freshly caught, but when boiled they shrivel up to very small dimensions, and lose a great deal of their repulsive look. I have never tried them, but they are esteemed a great delicacy among the Celestials. But if the island is, in all important respects, insignificant, it is, looked at from the sportsman's point of view, a perfect paradise. Its entire length is about ten or eleven miles, and its breadth at the widest part, which is at the north, about a mile. It is mostly composed of loose sand, covered with scrub jungle and large mangrove swamps, but there are a few glades of coarse grass here and there, and plenty of springs of excellent water. It simply teems with deer, or did a few years ago, when I was shooting there. How they got there is somewhat a mystery. The prevalent idea is that they were introduced by some old Dutch grandee before the occupation of Ceylon by the English, and there is some colour to this opinion, from the fact that there is a ruined old building on the island, which may possibly have been a sort of shooting box in the time of the Dutch.

It was early in January when I made a solitary hunting trip there. I took a native dhoney, and sailed through the Calpentyn Lake and past Dutch Bay, and after a twenty-four hours' run, reached the north of the island. At this season there were fortunately for me, a large number of Singalese fishermen there; they had their "kottoos" or huts all along the shore, and they proved invaluable allies in driving the deer. These men were nearly all Roman Catholics from the towns of Colombo and Negombo, and consequently had no Buddhistic scruples about hunting or taking life; in fact, they were very keen sportsmen, and very obliging fellows to boot. The golden plover simply swarmed in many parts along the coast, and curlew, whimbrel, and every description of waders were to be seen in great numbers about the shallows of the lagoons, while large packs of wild fowl were floating about well out of range from the shore. The grey partridges also were very plentiful, and in the early morning and evening could be heard calling all over the place. It should be understood that the west coast of the island faces the high sea, but between the east coast and the mainland of Ceylon is one of those back-waters so common along the north-western coast; comparatively smooth, and in many places very shallow, and it was here that the wild fowl, curlew, &c., were to be found.

The first morning (Jan. 3) I tried stalking. The place is not very favourable from it being very bushy, and having very little grazing ground in the open. Any amount of fresh tracks of deer were to be found, and twice I found a small

herd but they were among the bushes, and only offered snap shots which failed to do any execution. Coming home, or, more properly speaking, to the boat, for we made it our camp, we saw four magnificent ducks in one of the lagoons about 80 yards from the shore. They were a very rare kind, called in Tamil "chemboo-tara" (copper duck), as large as a Brent goose, and of a golden colour; hence the name. I tried to get near them, but they kept on rising just out of shot and pitching a little further on, until at last I resolved to try a shot with the rifle at them. The bullet appeared to pitch within an inch of them, but clearly did no damage, for they got up and flew out of sight, to my great disappointment. In the evening I again found deer, and bagged a doe, and had good sport with golden plover and whimbrel along the shores of the lagoons.

Next day (Jan. 4) I persuaded a lot of the Singalese fishermen to come and drive the jungle for me, and they willingly complied, and proved capital beaters. It was not at all easy shooting, for the bushes were very thick, and the deer nearly always avoided crossing what open spaces there were. The first chance I had was at a grand buck, who galloped past me within 40 yards, and I managed to miss him carefully with both barrels, but in the next two drives I was lucky, and bagged a buck and a doe. We were having the last drive of the morning, and a magnificent buck, with a grand head, broke cover some 50 yards from me and presented a side shot. I distinctly heard the bullet strike, and saw the deer stagger, but he galloped on through a mangrove swamp, and out on to the mud bordering the lagoon. He was going weakly, and I ran after him as fast as I could, but it was very bad going, first in the loose sand and then in the mud, and he got a long way from me. He held on through the mud, and then took to the water to swim across the lagoon, which was about 150 yards wide. He presented a fine picture, boldly striking out, and every now and then turning his grand, antlered head, as if to look back at his enemies. He was evidently making for some thick covert on the opposite shore. I could not get very far out on the mud, but fired three shots at him from where I was. It was a long range, and I was shaking from my run, and, of course, missed him. By good luck, however, there were two or three fishermen on the opposite side, and they saw the buck swimming, and one of them waded out into the shallows, and got up to the deer who was nearly exhausted by his wound and long swim, and killed him with an oar. He was afterwards brought over to me, and I found that my bullet had struck him behind the shoulder but too low down. It was satisfactory that he should be brought to bag, rather than die a lingering death in the jungle. This made our third deer—two bucks and a doe—and we considered that we had had a good morning's sport.

In the afternoon we beat for partridges. I had no dogs—they would not have been of much use there, and would probably have been knocked up by the sun, the heat being intense—but employed three of my boatmen to beat

the bushes, while I kept a little ahead of them. It is very pretty shooting. The birds are very much like the English ones about the back, but have dark bars on the breast, and pink legs, armed, in the case of the cocks, with sharp spurs half an inch long. They fly very well, though not quite so sharply as the home bird. I have weighed a great many large individual birds, and have often got an old cock of 15 oz.; but this is exceptional, the ordinary weight being from 11 oz. to 13 oz. They are excellent eating, but owing to the climate, cannot be hung long enough to get the true game flavour. We found plenty of birds in the north of the island, and had excellent sport with them.

The white-headed fish eagle was very common. These grand birds often measure over 6 ft. across the wings, and their strength of talon is wonderful. I saw one do an extraordinary thing; he pounced down on to the lagoon, seized a good-sized fish, fully ½ lb. and soared upwards with it in his talons. He was some 90 yards or 100 yards distant, and I fired at him with the rifle. The bullet no doubt whizzed close to him, for he gave a twist and dropped the fish, but instantly he darted downwards again, and caught it almost as soon as it touched the water, and bore it off.

On the following day (Jan. 5) we had another deer drive, and I bagged a buck, missing two other chances, and then we left the island and sailed across the back water to the mainland. We landed at a place called Kutherai Mallee (Horse Mountain). Why "horse" I cannot say, but there is a small hill there which is very remarkable, considering the unvarying flatness of the rest of the coast. There was a miserable little hamlet in the neighbourhood, where there were a few Tamils, and one of them undertook to show me a place where bears came at night to drink. We found the fresh track of one bear near a small pond, and I determined to watch there. This particular bear had a certain notoriety about there, from the fact that he had a lame foot, as his track plainly showed. The natives of the village spoke of him as "the cripple," and I was told that he had been shot at more than once.

It was not the best time of year for night shooting, being the wet monsoon, but in this part of the island there is never a very great abundance of standing water; the sandy soil absorbs the rain almost as fast as it falls. It was a good moon, and we watched the pool through the night, but no bear appeared. In the morning we went and examined another pool, about half a mile distant, and found that our lame friend had paid it a visit during the night: his peculiar track could not be mistaken. We resolved to watch here in the night, and placed pieces of newspaper on the bushes surrounding the other pool. This was done with the idea that, if the bear went there, he would be frightened by the appearance of the paper, and might possibly come to our pool: but as we afterwards found, he never went there at all. It was about 2 a.m. when we heard the welcome rustle in the jungle which told of the advent of bruin, and when he came to the water he gave a splendid shot under the clear moonlight. The bullet caught him well behind the shoulder; but, as is usually the case,

he bolted off yelling into the jungle. In the morning we found him lying dead with a stick between his teeth, not more than 50 yards from the pool. He was an old male, and one of his hind feet had been wounded in some way, either by a bullet, or very likely in a fight with one of his kind. It was an old wound, and had long since healed. At any rate, the foot had a clubbed appearance, and accounted for the peculiar track which he left, which had obtained for him the *soubriquet* of "the cripple."

JESSE.

No. VI.—A TIGER ATTACKING ELEPHANTS.*

I fancy that it is in the *Field* that I have seen it stated more than once that a tiger will not attack an elephant, or that, on the rare occasions when it does venture to attack one of these huge brutes, it always gets the worst of it. The following facts will, however, I think, help to disprove these statements:—In September last, a timber contractor reported to me that a female elephant and calf had been attacked by a tiger when they had been turned loose to graze at the head-waters of one of the streams which rise in the Pegu Yomahs, and that the calf had been killed. I hardly credited the report at first; but on inquiry, I found that it was perfectly true. From the footprints it was evident that the tiger had tackled the calf (a two-year old male) when it had strayed from its mother. The mother had come to the rescue, but was unable to do anything and only got badly mauled about the hind quarters, and was apparently driven off; the calf was killed, and found partly eaten the next day. That night a row of spring spears was set by the Karens (who are very cute at this sort of trap), and in the morning it was found that one of these had taken effect and the tiger had gone off with about 3 ft. of it. The greater part of that day the brute was heard in a large paing grass jungle, roaring, and evidently not at all pleased with the 3 ft. of bamboo. The next that was heard of him, three months later, was that he had lifted two bullocks from a Cutch camp, about forty miles from the scene of his former exploits. Shortly after, another attack on a contractor's elephant was reported. It was evident, from the marks on the ground, that the animal, which was a full-grown female, had been caught when asleep; and when I saw it a week afterwards it still had dreadful marks on the top of its shoulders and in the centre of the back, which could be the work of nothing else but a tiger. It is more than probable that it was the same tiger which had killed the calf three months before, for he was evidently very lame, if not maimed, the marks of three feet being distinct, whilst only the claws of the fourth just touched the ground. The spear had evidently nearly given him his quietus.

Four days afterwards a tiger tackled another elephant, this time a big tusker, worth over Rs. 2,000, which died five days after. In this case it would

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* The above appeared in *The Field* on 13th February, 1892.

appear that the elephant was in a narrow and shallow nullah with steep banks. The tiger jumped from the bank, and was shaken off more than once, but returned to the charge again and again. The elephant, however, got off with its life for the time being, and was taken into the nearest village with dreadful wounds along nearly the whole length of its back, the points where the tiger had apparently concentrated his attacks being the backbone about a foot in front of the root of the tail.

The tiger, I am sorry to say, is still at large; the Europeans in the district are all officials, and are too hard-worked to spare time for a tiger hunt; whilst a party of Burman shikarries who have gone out, urged on by the offer of a reward, have as yet had no luck.

G. Q. Corbett, Deputy Conservator of Forests.

Thanawaddy, Lower Burma.

PROCEEDINGS.

PROCEEDINGS OF THE MEETING HELD ON 26TH JANUARY, 1892.

The usual monthly meeting of the members took place on Tuesday, the 26th January, Dr. G. A. Maconachie presiding.

The following gentlemen were elected members of the Society :—

His Highness the Gaekwar of Baroda, Captain H. R. Tufnell (Neemuch), Lieutenant C. H. Ward (Fyzabad), Dr. Maneckjee Dossabhoy Cama (Bombay), Mr. W. G. Wood (Naini Tal), Mr. C. P. George (Secunderabad), Mr. Frank Field (Behar), Dr. Nadershaw H. E. Sukhia (Bombay), Mr. G. J. Nicholls, B.C.S. (Benares), Captain A. L. Hibbert, R.A. (Belgaum), Mr. A. V. Munro (Mooltan), Mr. N. D. Glazebrook (Bombay), Mr. Mathew Loam, P.W.D. (Vizagapatam), Captain Meade (Resident, Bhopal), Mr. Curreembhoy Ebrahim (Bombay), and Professor W. H. Sharp (Bombay).

CONTRIBUTIONS DURING DECEMBER, 1891.

Contribution.	Description.	Contributor.
2 Spotted Doves (alive). ...	Turtur suratensis	Miss G. O'Neill.
2 Pin-tailed Sand Grouse (alive).	Pterocles alchata	Mr. W. Cumming.
1 Torpedo Fish	Narcine timlei	Mr. Ardeshir Dadabhoy.
1 Panther's Skin	Felis pardus	Mr. R. S. Gupte.
1 Bird's Skeleton	Erithacus rubecula	Mr. W. F. Sinclair, C.S.
2 Red-Crested Wood-Quails (alive).	Rollulus roulroul	Purchased.
2 Bronze-Winged Doves (alive).	Chalcophaps indica	Do.

Contribution.	Description.	Contributor.
3 Bird-eating Spiders (alive).	Mygale fusciatus	Mr. H. R. P. Carter.
1 Skin of the Crested Grebe.	Podiceps cristatus	Mr. H. Bulkley.
1 Egg of do. ...	From Kharaghora.....	Do.
1 Egg of Bustard	Eupodotis edwardsi	Do.
1 Eight-Legged Puppy ...	Canis familiaris	Miss Hale.
24 Birds' Skins	From Central Provinces ..	Mr. N. S. Symons.
1 Jungle Cat	Felix chaus.....	Do.
1 Kingfisher (alive).	Halcyon smyrnensis	Captain Mitchell.
1 Bittern	Botaurus stellaris	Mr. W. Murray.
1 Cobra	Naga tripudians	Major Gerald Martin.

MINOR CONTRIBUTIONS.

From Colonel K. Mackenzie, Mr. W. Shipp, Captain Shopland, and Mr. V. H Pathare.

CONTRIBUTIONS TO THE LIBRARY.

"Catalogue of the Dipterous Insects of the Oriental Region" (Bigot), from the Author; "La Nature," for 1890-91, from Dr. W. Dymock; "The Indian Forester"—No. 12, in exchange; "A Monograph of the Oriental Cicadidæ" (Distant), Part IV., in exchange; "Indian Museum Notes," Vol. II., in exchange; "The Fauna of British India—Mammalia," Part II., (Blandford), from the Author. "North American Fauna," No. 5, in exchange.

THE CRESTED GREBE.

Special attention was drawn to the skin and egg of the Crested Grebe received from Mr. H. Bulkley, of Kharaghora, where the bird was found breeding in August last. This is the first instance on record of the Crested Grebe having been found nesting in India.

AN EXHIBIT.

Mr. M. C. Turner exhibited a beautiful specimen of a large white orchid (*Angræcum sesquipedale*), from Madagascar, which was greatly admired, and read a short paper on the difficulties which attend the successful culture of orchids in Bombay.

THE MAMMALIA OF SOMALI-LAND.

The Honorary Secretary read the continuation of Mr. J. D. Inverarity's interesting paper on Somali-Land, containing an account of his two sporting tours in that country.

The following papers were also read:—"The Protection of Game in Sind," by W. S. Hexton. "The Butterflies of Travancore," by H. S. Ferguson, F.L.S. "Note on *Cassia grandis* and *Cassia marginata*," by G. M. Woodrow. "Branching Palms and Tree-Ferns," by L. de Nicéville. "The Protection of Larvæ," by E. H. Aitken.

Doctor Maconochie proposed a vote of thanks to the authors of the various papers, and the meeting then ended.

PROCEEDINGS OF THE MEETING HELD ON 1ST MARCH, 1892.

The usual monthly meeting of the members of this Society was held on Tuesday the 1st March, 1892. Mr. Andrew Murray presiding.

The following new members were elected :— Captain C. H. R. Browne, P.W.D. (Bombay), Captain G. H. Loch, Looshai Hills (Cachar); Mr. R. M. Thomason (Sheogarh); Mr. E. E. Fernandez (Baroda); and Dr. Dhargalker Luxmon (Bombay).

The following contributions were acknowledged :—

CONTRIBUTIONS DURING FEBRUARY, 1892.

Contribution.	Description.	Contributor.
1 Owl (alive)	Strix javanica	Miss Atkinson.
1 Brown Flying Squirrel (alive).	Pteromys oral	Mr. J. David.
1 Green Tree Snake	Dryophis mycterizans	Dr. T. S. Weir.
1 Porcupine's Skull.....	Hystrix leucura.....	.....
Deer's Horns	Rucervus eldii	.....
2 Sarus Crane's Eggs	Grus antigone	Capt. A. Gwyn.
1 Snake	Lycodon aulicus	Mr. C. E. Kane.

MINOR CONTRIBUTIONS

From Mr. G. Owen Dunn, Mr. C. J. Michael, Mr. J. Benjamin, Mrs. Aston, Veterinary Captain J. Mills, and Captain A. Gwyn.

CONTRIBUTIONS TO THE LIBRARY.

"The Fauna of British India (Blandford)—Mammalia," Vol. II., from Mr. W. F. Sinclair, C.S.; and "Phamacographia Indica," Part V. (Dymock), from the author.

EXHIBITS.

The Hon'ble Mr. Justice Birdwood exhibited a fine specimen of *Gloxinia* grown in Bombay, and Mr. M. C. Turner sent two beautiful orchids in flowers, *viz.*, *Phalcenopsis schille* and *Cendrobium aggregatum*, which were much admired.

THE ACCOUNTS FOR 1891.

The Accounts of the Society for the year ending 31st December, 1891, were laid before the meeting by the Honorary Treasurer, Mr. Andrew Murray. The total expenditure during the year amounted to Rs. 8,932 (out of which Rs. 4,316 were spent on the *Journal*), and a balance of Rs. 1,454 was carried forward.

The Accounts were passed subject to the usual audit, and a vote of thanks was passed to the Honorary Treasurer.

LANDSCAPE GARDENING IN NATIVE STATES.

The Honorary Secretary read an interesting paper on the above subject, by Mr. H. St. John Jackson, of Allahabad, containing descriptions of the gardens which had been laid out at Jeypore, Gwalior, Oodeypoore, Durbhunga, and other places. The paper appeared in No. IV., Vol. VI., of the *Journal*.

DISEASES OF FIG TREES.

Dr. J. C. Lisboa then delivered a lecture on what appears to be an hereditary disease of the branches and leaves of the fig-tree known as the Pipree (*Ficus tsiela*). This tree occurs in large numbers on the road between Poona and Mahableshwar, and those who have travelled along that road must have noticed a curious phenomenon presented by the tree. From its branches may here and there be seen hanging large green balls, like Chinese lanterns. They are composed entirely of numerous small leaves, thickly congested on small branchlets, which are also numerous and congested on larger branches. As seen from a distance one is apt to infer that the leaves have been brought together either by spiders or red ants, but closer examination, shows that the leaves are free, and that the appearance is due to the innumerable short branches shooting out in close proximity to one another and bearing small closely imbricated leaves. The branch of the tree thus affected gradually dies. The lecturer stated that these abnormalities were, in his opinion, due to an hereditary disease, and were not caused by either a fungus or by insects.

A vote of thanks was passed to Dr. Lisboa for his valuable lecture, which was illustrated by means of photographs and specimens.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of Account from 1st January, 1891 to 31st December, 1891.

RECEIPTS.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.
Balance in the Bank of Bombay on 1st January, 1891	1,514	10	10	Rent of the Rooms from 1st December, 1890, to 30th November, 1891, at Rs. 100 per month...	1,200	0	0
Cash with the Honorary Secretary on 1st January, 1891	29	10	0	Salaries from 1st December, 1890, to 30th November, 1891	1,144	0	0
Subscriptions for 1890 (in arrears)	135	0	0	Furniture Account	247	1	9
Do. ,, 1891	7,096	4	0	Cost of Printing Journal and Coloured Plates from England	4,316	1	2
Do. ,, 1892 (in advance)	45	0	0	Printing and Stationery	493	13	9
Do. from Members out of India	204	0	0	Library Account	98	2	0
Entrance Fee	870	0	0	General Expenses	1,432	2	11
Sale of 3 Camp Beds	65	0	0	Balance in the Bank of Bombay on 31st December, 1891	1,454	11	3
Miscellaneous Receipts	426	8	0				
Total.....Rs.	10,386	0	10	Total.....Rs	10,386	0	10

ANDREW MURRAY,

Honorary Treasurer.

Bombay, 31st December, 1891.

E. C. S. Baker del.

Mintern Bros. Chromo lith. London.

THE BLACK-CRESTED YELLOW BULBUL.

(Otocompsa flaviventris.)

N. CACHAR HILLS.

JOURNAL

OF THE

BOMBAY

Natural History Society.

No. 2.] BOMBAY, 1892. [Vol. VII.

THE BULBULS OF NORTH CACHAR.

— By E. C. Stuart-Baker.

Part II.

(With 1 Plate.)

(Read before the Bombay Natural History Society on 4th July, 1892.)

Otocompsa flaviventris.

Black-crested Yellow Bulbul.

Oates' "B. of B. B.," Vol. I., No. 196, p. 199; *id.*, "Avifauna of B. I.," Vol. I., p. 278; Murray's "Avifauna of B. I.," Vol. II., p. 46; Hume's "Nest and Eggs," Vol. I., p. 183; *Rubigula flaviventris*, Jerdon's "B. of India," No. 456, Vol. II., p. 88.

Description.—Head, with long crest, chin and throat glossy black; upper plumage and wing coverts olive-yellow, brighter on the rump and upper tail-coverts; quill feathers of wing brown, primaries and secondaries edged with olive-yellow on the outer webs, and the tertiaries with all or nearly all the outer webs of that colour; tail brown, the feathers for about nine-tenths of their length edged with olive-yellow; whole plumage below and sides of neck bright King's yellow.

Irides bright pale yellow; bill dark horny, culmen and tip almost black, and the gape dull yellowish; legs brown or grey-brown.

Length 7·8 in.; tail 3·5 in.; wing 3·4 in.; bill at front ·5 in., from gape ·75 in.

Female, length 7·3 in.; tail 3·3 in.; wing 3·2 in.

The female only differs from the male in having the yellow of the lower plumage less bright, and in having the flanks tinged with olive-green. The young male cannot be distinguished from an adult female.

NIDIFICATION.—The nest of this bulbul can, as a rule, be distinguished at a glance from that of any other member of the family by its colour and shape.

The first nest I ever saw was built in an old orange tree in my garden. When found, it contained an egg, so that I cannot tell what was the length of time taken in its construction, beyond the fact that it took under twenty-five days, that being the time I had been away in camp, and when I went out it had not been commenced. It was a very neat nest, and for the size of the bird very small. The outer part of the walls were composed entirely of dead orange leaves, all these being of different tints of olive-yellow and bright olive-brown, much the same colour, as a whole, as the upper plumage of the bird. These leaves were wound round and interlaced by rather thick shreds of bark, one or two elastic twigs and a single stalk of some weed; in addition, it was further strengthened by cobwebs here and there all round. Inside this outer wall was a rough lining of coarse grass stems, fine twigs, and fern roots, and within this again was the true lining, consisting entirely of mithna hair, easily recognized by its deep-purple tint. This nest was in every way but one quite a typical specimen, the exception being in the lining. This is, in nine cases out of ten, composed only of the finer stems of tan-coloured grasses, whilst in the tenth case it may be of fine moss roots or some other vegetable fibre.

As already remarked, this nest was rather smaller than usual. The dimensions were as follows:—Diameter at broadest part 4 in.; at the top where there were no leaves 2·98 in., in depth 1·45 in., and internally 1·76 in. by ·75 in. The contrast of the bright yellow leaves with the green of the bush was very marked, and the nest

could be seen from a long way off. A few nests are made chiefly of coarse grass and twigs, only a few leaves being worked into the base, and one or two nests, taken by me, have differed from the nests of the common bulbul only in their smaller size, though even in these the major part of the materials were light coloured. The lining is generally very neatly made, the grass ends being tucked carefully in, whereas in the nests of Blyth's bulbul (*Xanthixus flavescens*), the ends nearly always project from the nest a good distance. The manner of putting in the lining is in fact the principal difference in the nests of the two birds, though Blyth's bulbul seldom uses many leaves in the work of building.

The internal measurements of ten nests average 2·2 in. by ·94 in.

The only two abnormal nests that I have taken were both found in 1888; one was a very shallow broad cup, not half an inch deep, and made of grass, inside and out, and the second was an ordinary nest as far as shape was concerned, but the whole lining and a great part of the walls as well were composed of white goats' hair. It was a most remarkable looking nest, but being built on a bush with leaves which were white on the lower surface, was far from conspicuous whilst in its natural position. In about four nests out of seven the interior lining is of fern roots and stalks of plants alone. The nest is generally placed in a low bush at from two to five feet from the ground, sometimes in rather higher bushes, and very rarely in small trees. The site selected is, as far as I am aware, never one in dense jungle; it prefers thin scrub jungle, scattered bushes, and even the outskirts of villages and rice fields, but, with one exception, *viz.*, that in which the nest was built in my garden, I have never known them to breed in compounds.

They lay three eggs as a rule, but sometimes four: I have never seen five eggs in a nest, but have often seen two only, which shewed signs of incubation.

The ground-colour of all my eggs is a faint pinky-white, varying very little in intensity; typically they are covered with numerous freckles of dull reddish, underlying which are others of pale blue-grey, which cause the general appearance of the egg to be a rather dull purply tint. In some eggs there are a few exceedingly fine lines the colour of clotted blood which are almost always confined

to the larger half. The primary markings are generally fairly equally distributed over the whole surface, but the secondary ones are most numerous at the larger end.

I have two very beautiful clutches in which the markings are all of light pinky red, almost obliterating the entire ground-colour. Another clutch has the markings of dark reddish. They do not, taking a large number into consideration, vary nearly as much as the eggs of most bulbuls, and the character of the markings is very constant. Thus in the hundreds of eggs I have seen, I have never seen one which could, properly speaking, have been said to have been *blotched*, though in some cases the markings are large enough to be termed spots rather than specks or freckles. The main difference in different specimens lies chiefly in the distribution of the markings rather than in their character, though even in this respect I have never met with a *very* sparsely marked egg.

In size, too, they differ but little, the extreme length and breadth being ·92 in. and ·72, and the least ·82 in. and ·61 in. The average of forty eggs is ·87 in. by ·66 in. In shape they are either regular ovals, or are drawn out and slightly pointed towards the smaller end. Intermediate forms are common and exaggerated ones very rare. The texture is the same as that of *Molpastes pygæus* or *burmanicus*, but the shell is more fragile and perhaps smoother. I have no eggs which exhibit any gloss, except the two pink blotches above referred to. They breed principally in May and June, but their eggs may be taken throughout more than half the year. My earliest eggs were found on the 24th March, the next earliest on the 8th April, again on the 21st, and then numbers until the end of July. On August 4th I took two fresh eggs, on the 17th three more, and the latest I have noted were found on the 3rd September.

This bulbul is almost as common, from the plains to nearly the highest hills, as is *M. burmanicus* and *pygæus*. Above 4,000 feet it gradually gets scarce, and is not to be found much over 5,000 feet. They remain in the broken ground at the foot of the hills all the year round, breeding in suitable places, such as tea gardens, &c. I have never seen this bird in the interior of heavy forest, seldom, indeed, in forest of any sort, though it is often enough to be seen in bamboo jungle. It keeps much to the semi-open ground in the

vicinity of villages, and may be observed on the banks of every stream and the sides of every road. The flocks are sometimes rather numerous, having as many as twenty or twenty-five members, but more frequently they number some ten or a dozen. They are by no means noisy birds, and have no great variety of notes. Their cry may be written weet-tre-trippy-wit, but I am afraid syllables convey little meaning when attempting to record the notes of a bird, and this cry is one almost impossible to explain. It has no song, at least that can really be so called, but during the breeding season this call is prolonged by the last two words being repeated, and when the bird utters it rapidly it is like a jerky, but sweet, short song.

It frequently associates with both *O. emeria* and *Molpastes burmanicus* and *M. bengalensis*, more rarely with other species of bulbuls, and on one or two occasions I have seen it in company with *Chloropsis*.

In its general habits it resembles *Otacompsa emeria* too closely to require further description. Its food, flight, &c., are all as in that bird.

Hypsipetes concolor.

The Burmese Black Bulbul.

Oates' "Avifauna of India," Vol. I., p. 261; *id.*, "Birds of B. Burmah," Vol. I., p. 174; Murray's "Avifauna of B. India," Vol. II., p. 19; Hume's Catalogue, No. 446 *bis*.

Description.—Head, hind neck, back, and lesser wing-coverts black, the edges of the feathers more or less metallic and giving a gloss to the whole upper black plumage when not very closely viewed; median and greater wing-coverts brownish-grey, quills dark brown, almost black, edged with grey; rump and upper tail-coverts dark grey; ear-coverts lightish grey, contrasting strongly with the colour which surrounds them. Lower part of cheeks, throat, and whole lower plumage dark grey, the feathers of the under tail-coverts margined with white, but much less broadly than in *H. psaroides*. Tail brownish-black, the feathers edged with greyish, the depth of this varying much in different individuals.

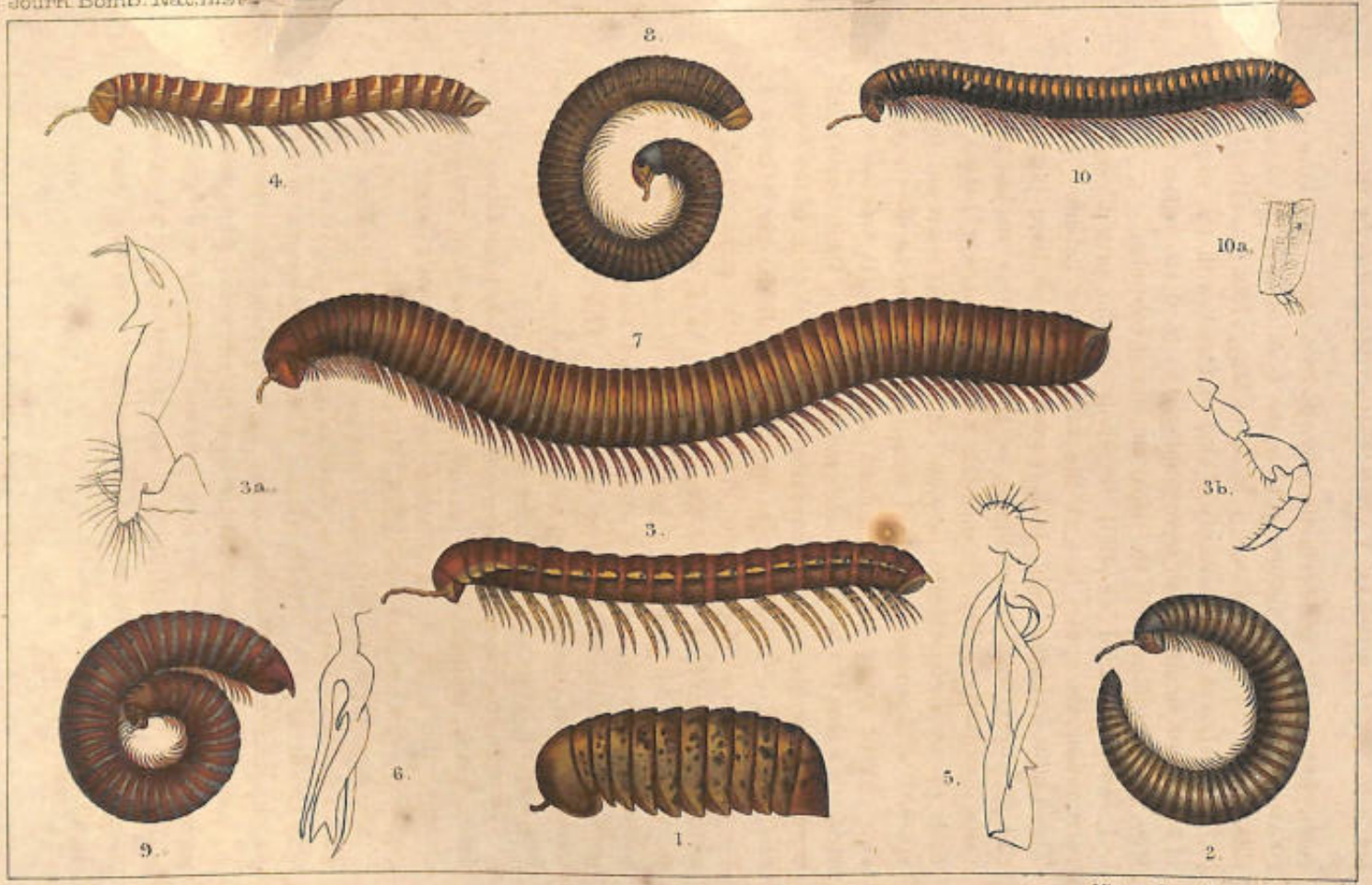
Nidification.—This does not differ in any important detail from that of *H. psaroides*, but taking the nests as a class, I think they average

somewhat smaller, and certainly they appear neater. In all the nests I have taken, a large amount of moss has been used in the construction, and one nest, which I took in May, 1892, at Hungrum, (5,800 feet), was made entirely of this material, with the exception of a few soft stems which were employed to bind the whole to the tree, in conjunction with the usual amount of cobwebs.

I found this bird in 1891 breeding on the precipitous hills surrounding the upper part of the valley of the Laishung River. These hills, owing probably to their great steepness, have but little soil on them, with the exception of that which is washed by the rains into deep crevices or into the numerous narrow ledges. In such places a considerable amount of scrub jungle grows, interspersed with numerous stunted trees, which seem to die early, for two out of every three are dead and rotten. It was on these dead trees that the birds had selected positions for their nests; nor were the branches selected those near the top or outside of the trees, such as would be usually made use of, but all the three nests I found were placed in the first bifurcation of the main trunk, and were all within fifteen feet of the ground. As I was engaged at the time in stalking serow I had to leave the nests alone, but a native was sent a few days afterwards and found one nest still empty and two containing two eggs each. The nest is generally built in much the same kind of position as that of *H. psaroides*, but, I think, more often on lower bushes.

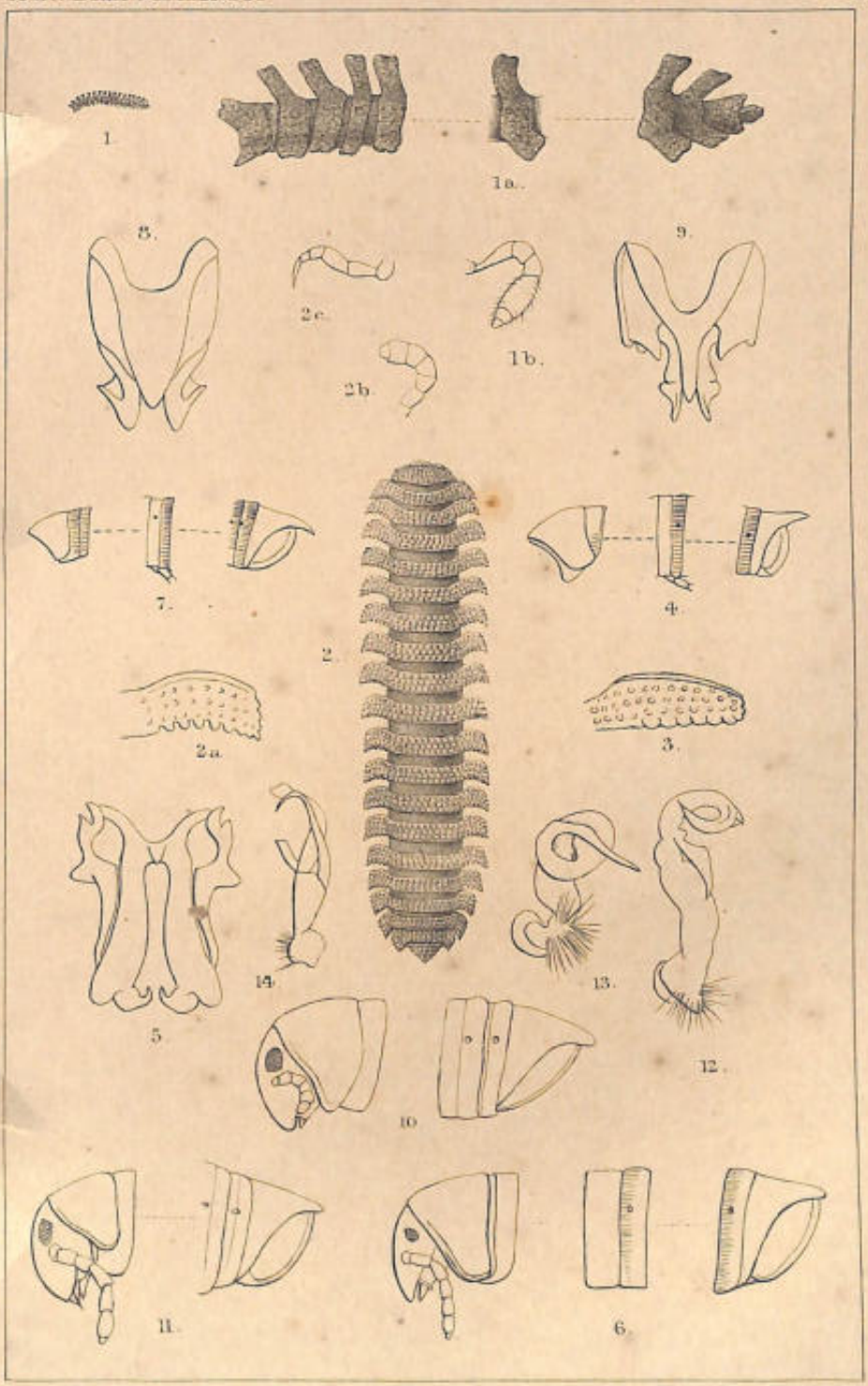
The eggs are, of course, quite undistinguishable from those of the other black bulbuls as far as coloration, shape, and texture go, though the eggs I have taken average a shade larger. The eighteen eggs measured averaged 1·12 in. × ·78 in.

The largest pair are abnormally large, measuring 1·24 in. × ·81 in. I have no others nearly this size, the next largest being 1·18 in. × ·76 in. The smallest egg is ·97 in. × ·69 in. I have taken one clutch of eggs which differ much from any other eggs of either this species or *H. psaroides*, the ground-colour is a rather warm pink, and the markings consist of rather numerous bold blotches of bright red, each spot being very well defined, and no two running together or blurring one another's edges by too close proximity; they are singularly handsome eggs.



Mintern Bros. Chromo lith. London.

CEYLONESE AND INDIAN MYRIOPODA.



Mintern Bros. lith. London.

CEYLONESE AND INDIAN MYRIOPODA.

As regards their habits I do not think I can say anything beyond that they appear to be shier and somewhat less noisy birds than their Himalayan relations. They seem to be partially migratory, and during the cold season I have not seen half a dozen birds in as many years. They are confined to the East and South-East of the district, and, as I have already said, to a certain extent replace *H. psaroides* in that part, though even there they are less common than that bird is. I have never seen a bird further West than the centre of the Sub-division, and only once as far as that. Another thing that seems to point to their being more or less migratory is that certain seasons they are more common than in others. Thus in 1891 and 1889 they were very plentiful, comparatively speaking, in 1888 and 1890 they were rarely met with, and amongst my notes I have not one concerning any bird or nest taken in 1887.

REPORT UPON TWO COLLECTIONS OF MYRIOPODA SENT FROM CEYLON BY MR. E. E. GREEN, AND FROM VARIOUS PARTS OF SOUTHERN INDIA BY MR. EDGAR THURSTON, OF THE GOVERNMENT CENTRAL MUSEUM, MADRAS.

By R. I. Pocock, of the British (Nat. Hist.) Museum.

(*With Plates I. and II.*)

(*Read before the Bombay Natural History Society, 5th April, 1892.*)

In seeking the honour of laying this paper before the Natural History Society of Bombay, it has been my hope that from the information thus afforded something, however little, is being done to throw light upon Myriopod fauna of India, and that it may induce naturalists resident in that country to pay attention to these little-known animals.

The neglect that this group, as a whole, has met with, is a circumstance sufficiently familiar at least to all who have studied it. Nor is an explanation of this hard to find, for the species that compose it are lacking in almost all those attributes which recommend more favoured ones to the notice of collectors. They are difficult

to preserve, obscure in characters, and, doubtless to many, though not, let us hope, to the majority, repulsive in aspect; with no marketable value worth mentioning, and with little or nothing of interest in their habits to attract the attention of naturalists. Add to all this that the literature is scattered, that such species as have been described are not as a rule recognisable from their descriptions, and that the name of the species is legion, and we need look no further for the causes of the fact that so small an amount of time and trouble has been devoted to these creatures by systematic zoologists.

The above remarks apply, however, most forcibly to the group of Millipedes. The Chilopoda or Centipedes are much fewer in number of species, and such as have been described are now well-known. But even in this group an enormous amount of new material must be still undiscovered. Perhaps a rough estimate of the new forms, likely to be obtained, may be gathered from the following figures:— Out of a collection of 33 species of Chilopoda amassed by Mr. Oates and Signor L. Fea in Burma, 16 were new; while out of the 11 species that Mr. Thurston has sent home to the British Museum, 5 were new. This percentage is very large, and it could doubtless be increased if special attention were paid to the smaller and more obscure forms.

The average number of new species in Diplopoda would most likely be higher. Mr. Thurston has been somewhat unfortunate in only obtaining 3 new ones out of 11, while Mr. Green, on the contrary, discovered 11 new species in a collection of 21, and without especially laying himself out to get these animals, he has, apart from the species, added two families and one genus to the Oriental fauna, and one interesting new genus to science.

But in the present state of our knowledge of this group, the value of a collection depends perhaps less upon the discovery of new forms than upon the re-discovery of old ones. For what is now required in the Myriopoda is that the species that have been poorly characterised in past years should be brought again to light; so that opportunities may be afforded of re-describing them in accordance with modern requirements or of figuring them so that they may be readily recognised. For unless the species that have been

characterised are known to an author, all work that he may do in the description of new species is more or less groping in the dark. As by slow degrees the old species are re-determined, so firmer and firmer becomes the basis from which satisfactory work in the future can be done. The described Indian and Ceylonese species are not so many, but that with a little diligent collecting they may one and all be found again. When this result is once attained, the working out of the fauna will be tolerably plain sailing.

For these reasons it was far more gratifying to me, when examining Mr. Thurston's collection, to discover examples referable to species long buried in obscurity, than to be compelled to characterise them all as *species novæ*.

It was originally my intention to write separate reports upon the two collections forming the subject-matter of the present paper; but upon further consideration, seeing that so many of the species occur both on the mainland and in Ceylon, I have thought that it would be more convenient both to my readers and to myself, if I treated the two collections as a whole and wrote the one report for them both. But to render the paper a still more complete record of Indian and Ceylon Myriopoda, I have incorporated descriptions of other new species from these countries.

To further the object which, as above expressed, I had in view in sending this paper to an Indian Natural History Journal, I have been asked to say a few introductory words upon the various kinds of Myriopoda that are known from India and Ceylon. It has also been suggested to me that a list of the described species might still further forward the same object.

The so-called group Myriopoda is, with the exception of some obscure forms, readily divisible into two sections—the Chilopoda or Centipedes, and the Diplopoda or Millipedes.

The Chilopoda are carnivorous, active, flattened, more or less soft animals with a single pair of legs attached to each somite. They are divisible into four families, *Scutigeridæ*, *Lithobiidæ*, *Scolopendridæ*, and *Geophilidæ*. The *Scutigeridæ* contains one genus, *Scutigera*, of which only two Indian species are known. This is an exceedingly long-legged, swift-footed diurnal species, no examples of which were found in either of the collections here discussed. The *Lithobiidæ* have not yet

been recorded from India or Ceylon; but doubtless the genus *Lithobius* exists in these countries, since two species of it have been described from Burma. Any one who remembers the common English centipede—the 'forty-legs' of some parts—found under almost every stone in England, will know *Lithobius* if he comes across it in India. The *Geophilidæ* are the long, vermiform, subterranean centipedes, all being of relatively small size, with legs varying in number from about 40 up to over 100. Three species, referable to three genera, have, so far, been recorded from India and Ceylon; but many more undoubtedly remain to be discovered; for Mr. Oates obtained eight species in Burma. Two of the three known Indian forms are recorded below; the third was on a previous occasion sent by Mr. Thurston from Madras. The *Scolopendridæ* are the best known members of the group. They are mostly of large or medium size, and have 21 (rarely 23) pairs of legs. The Indian and Ceylonese members of the group are referable to the genera *Scolopendra*, *Cormocephalus*, *Otostigma*, *Rhysida*, (*Branchiostoma*), and *Heterostoma*. The last two differ from the others in having a pair of stigmata on the 7th somite. *Heterostoma*, recognisable from *Rhysida* by its large sieve-like stigmata, is of large size, approaching in this respect *Scolopendra*; there are some five or six mostly ill-defined species of this genus known from India, Ceylon, and Burma.

Rhysida, with two Indian species, both recorded below, is of small size, and has stigmata that have been described as 'ear-shaped.' *Otostigma* is exactly like *Rhysida* except for the absence of stigmata on the 7th somite. This is the most abundant genus in the Oriental region—6 species having been recorded from Burma, 2 of them occurring also in Ceylon, and 5 being known from India, 4 of them having been sent by Mr. Thurston from Madras. *Cormocephalus* differs from *Otostigma* in the structure of the head-plate, and in the more elongate shape of its stigmata. Four species, all of small size, are known from India and Ceylon. One of these is described below as coming from Madras. *Scolopendra* differs from all the preceding genera in having the head covering the anterior portion of the tergite that succeeds it. There are only about 7 species known from Burma, India, and Ceylon. The genus *Cryptops*, which is composed of small, slender, somewhat geophilus-like, blind species, has not yet been

recorded from Ceylon and India, although three species are known from Burma; and the peculiar genus *Asanada*, with its single species, occurs in Burma, and was originally recorded from Kulu in the Western Himalayas.

The Diplopoda are herbivorous, slow-moving, usually cylindrical, hard crustaceous animals, with two pairs of legs upon most of the segments of the body. The Oriental families of this group are the *Polyxenidæ* or hairy-tailed millipedes; the *Zephroniidæ* or pill millipedes, the *Polyzenidæ* or suctorial millipedes, the *Lysiopetalidæ*, *Iulidæ*, and *Polydesmidæ*. The *Polyxenidæ* and *Lysiopetalidæ* are here for the first time recorded as Indian or rather Ceylonese. The former are quite unmistakable, and the affinities of the single-known genus of the latter are given below. The *Zephroniidæ* cannot be confused with the others, and the *Polydesmidæ* differ from the *Iulidæ* in having only 20 segments in the body. Four of the genera of *Polydesmidæ* mentioned are hard to recognise and of doubtful value. In *Leptodesmus* the tail is cylindrical; in *Paradesmus* and *Strongylosoma* it is triangular and truncate, *Paradesmus* having larger keels than *Strongylosoma*; while *Polydesmus* has the dorsal surface sculptured. The form of the other two genera is very peculiar, and is well shown in the plate at the beginning of this paper. The two genera of *Iulidæ* are very much alike externally. *Spirobolus* as a rule is shorter and stouter, with the mandibles more exposed at the sides, a differently constituted lower lip, and the 4th and 5th segments each with a single pair of legs; in *Spirostreptus*, on the other hand, the 4th segment is without legs, and the 5th has two pairs. *Trachyiulus* may be recognised from both of them by the peculiar arrangement of the eyes, the carinate or warty segments of the body, &c.

List of the described species of Indian and Ceylonese Myriopoda :—

CLASS, DIPLOPODA.

Sub-class, Pselaphognatha.

Family, *Polyxenidæ*.

Polyxenus ceylonicus, sp. n. Ceylon (cf. infra, p. 142).

Sub-class, Chilognatha.

Order, Oniscomorpha.

Family, *Zephroniidæ*.

Zephronia heterosticatica, Newport; *brandti* and *inermis*, Humbert (cf. infra, pp. 145, 143, 144); *zebraica*, Butler (Ann. Nat. Hist., (4), x, p. 356), Bombay; *marmorata*, id. (Ann. Nat. Hist., (5), ix, p. 197); *versicolor*, White (Ann. Nat. Hist., (3), iii, p. 405), Ceylon; *noticeps*, Butler (Ann. Nat. Hist., (4), x, p. 355), Ceylon; *pilifera*, id. (loc. cit., p. 357), Ceylon; *hercules*, (Brandt), Ceylon (*teste* Karsch, Arch. Naturg., 1881, p. 34); *nigrinota*, Butler (Ann. Nat. Hist., (4), x, p. 356), Assam, Sikkim; *tumida*, id. (Ann. Nat. Hist., (5), ix, p. 196), N. Assam; *tigrina*, id. (op. cit., p. 356), Assam; *excavata*, id. (Ann. Nat. Hist., (4), xiv, p. 185); *maculata*, id. (l. c., p. 186), Sikkim.

ORDER, HELMINTHOMORPHA.

Family, *Polydesmidæ*.

Polydesmus stigma, Fabr. (Ent. Syst., ii, p. 394), Tranquebar, (doubtless either a *Leptodesmus*, *Strongylosoma*, or *Paradesmus*).

Polydesmus (s. s.) *cognatus*, Humbert (cf. infra, p. 153), Ceylon.

Paradesmus kelaarti (Humbert)(cf. infra, p. 149), Ceylon and Madras.

Leptodesmus luctuosus, Peters (Mon. Ak. Wiss. Berlin, 1864, p. 532); *saussurii*, Humbert (Mem. Soc. Phys. Genève, 1866, p. 26); *thwaitesii*, id. (cf. infra, p. 147); *layardi*, id. (p. 28); *inornatus*, id. (cf. infra, p. 147)—all from Ceylon; *tanjoricus*, sp. n. (cf. infra, p. 147), Tanjore.

Strongylosoma nietneri, Peters (op. cit., p. 535), Ceylon; *skinneri* Humb. (op. cit., p. 31); *simplex*, id. (cf. infra, p. 149); *cingalense*, id. (cf. infra, p. 150); *greeni*, sp. n. (cf. infra, p. 149)—all from Ceylon; *phipsoni*, sp. n. (cf. infra, p. 151), Calcutta; *jerdani*, sp. n. (cf. infra, p. 152), Madras.

Cryptodesmus ceylonicus, sp. n. (cf. infra, p. 153); *greeni*, sp. n. (cf. infra, p. 154), Ceylon.

Pyrgodesmus obscurus, g. et sp. n. (cf. infra, p. 155), Ceylon.

Family, *Lysiopetalidæ*.

Stemmiulus ceylonicus, sp. n. (cf. infra, p. 157), Ceylon.

Family, *Iulidæ*.

Trachyiulus ceylonicus, Peters (cf. infra, p. 158).

Spirostreptus nigrolabiatus, Newport (cf. infra, p. 159), Madras; *cinctatus*, Newport (Ann. Mag. Nat. Hist., xiii, p. 270); *maculatus*, id., ibid., India; *malabaricus*, Gervais (cf. infra, p. 158), Malabar; *spinicaudus*, id. (Ins. Apt. p. 165), Malabar; *lunelii*, Humbert (Mem. Soc. Phys. Genève, 1866, p. 47); *kandyanus*, id., p. 49; *lankaensis*, id.,

p. 50; *hamifer*, id., p. 52 (cf. infra, p. 160); *modestus*, id., p. 53—all Ceylon; *caudiculatus*, Karsch (Zeits. Ges. Naturw., (3), vi, pp. 27, 28); *contemptus*, id. (p. 29), Ceylon; *asthenes*, sp. n. (cf. infra, p. 161), Madras; *jerdani*, sp. n. (cf. infra, p. 161), Madras; *centrurus*, sp. n. (cf. infra, p. 162), Ceylon; *insculptus*, sp. n. (cf. infra, p. 163), Ceylon.

Spirobolus carnifex, (Fabr.), (cf. infra, p. 166), Madras and Ceylon; *crebrestriatus*, Humbert, op. cit., p. 55; *taprobanensis*, id., p. 56, Ceylon; *spirostreptinus*, Karsch, op. cit., p. 55, Ceylon; *goësi*, Porath (cf. infra, p. 167), Madras; *thurstoni*, sp. n. (cf. infra, p. 167), Madras; *uroceros*, sp. n. (cf. infra, p. 169), Madras; *greeni*, sp. n. (cf. infra, p. 170), Ceylon; *longicornis*, sp. n. (cf. infra, p. 171), Ceylon; *longicollis*, sp. n. (cf. infra, p. 172), Ceylon; *obtusospinosus*, Voges, Zeits. wissen. Zool., xxxi, p. 189, Ceylon.

Family, *Polyzonidæ*.

Siphonophora picteti, Humbert, op. cit., p. 59; *humberti*, sp. n. (cf. infra, p. 173), Ceylon.

The following species of *Iulidæ* are too briefly described to be recognizable:—*Iulus indicus*, Linn., Mus. Adolf. Frid., p. 90; *indus*, id., Syst., Nat., p. 3019; *fuscus*, Linn., Amœn. Acad., iv, p. 263; *ceilanicus*, Brandt, Rec. Mem., p. 93.

CLASS, CHILOPODA.

Family, *Scutigeridæ*.

Scutigera longicornis (Fabr.), Haase, Abh. Ber. Mus. Dresden, 1887, no. 5, p. 17, India and Ceylon; *rabrolineata*, Newport, Tr. Linn. Soc., xix, p. 358, India.

Family, *Scolopendridæ*.

Asanada brevicornis, Meinert, Amer. Phil. Soc., 1886, p. 189, Kulu.

Scolopendra hardwickii, Newport, op. cit., p. 395, India and Ceylon; *subspinipes*, Leach, Tr. Linn. Soc., xi, p. 383, India and Ceylon; *morsitans*, (Linn.), Kohl. (see infra, p. 140); *latro*, Meinert (Vid. Medd. nat. Forening, Copenhagen, 1884, p. 127), Serampore; *indica*, id. (Ann. Phil. Soc. 1886, p. 104), Kulu.

Cormocephalus sarasinorum, Haase (op. cit., p. 63), Ceylon; *inermipes*, Pocock (Ann. Nat. Hist., 1891, p. 64), Ceylon; *dentipes*, id. (loc. cit., p. 66), Bengal; *pygmæus*, sp. n. (cf. infra, p. 140), Madras.

Otostigma carinatum, Porath (Bih. Sv. Vet. Ak. Handl., iv, pt. 7, p. 20); *ceylonicum*, Haase (cf. infra, p. 140); *orientale*, Porath (op. cit.,

p. 19), Bombay ; *splendens, morsitans, nudum, ruficeps*, Pocock (Ann. Nat. Hist., 1890, pp. 245-248), Madras.

Rhysida longipes, Newport (cf. infra, p. 139), Madras and Ceylon ; *immarginata*, Porath (cf. infra, p. 139), Madras and Ceylon.

Heterostoma langiconda, Pocock (Ann. N. H., 1891, p. 55), India and Ceylon ; *spinosum*, Newport (op. cit., p. 414), Ceylon ; *paucispinosum*, Haase (cf. infra, p. 138), Ceylon ; *triste*, Meinert (cf. infra, p. 139), Madras, &c.; *silhetense*, Haase (op. cit., p. 92), Silhet ; *cribriferum*, Gervais, (*teste* Haase, op. cit., p. 94), Mysore.

Family, *Geophilidæ*.

Mecistocephalus punctifrons, Newport (op. cit. p. 429), Ceylon and India.

Orphnæus brevilabiatus, Newport (cf. infra, p. 142), Ceylon.

Himantosoma striatum, Pocock (Ann. Nat. Hist., 1890, p. 248), Madras.

This list does not contain references to those species which have been recorded vaguely as from the East Indies, although it must be admitted the area is sufficiently comprehensive to embrace any spot between Papua and the Punjab.

Nor are the Burmese species included. For the Chilopoda of this country, reference may be made to my paper in the Ann. Mus. Genov., (2), x, (xxx), pp. 401-432 (1891) on the Chilopoda collected by Sig. L. Fea and Mr. E. W. Oates. Of the Diplopoda, only one group, the *Oniscomorpha*, has as yet been worked out. This may be found in the Ann. Mus. Genov., (2), x, pp. 384—395 (1890).

CLASS, CHILOPODA.

Family, *Scolopendridæ*.

Heterostoma paucispinosum, Haase.

Die Indisch.-Austral. Chilopoden, Abh. Ber. Zool. Mus. Dresden, no. 5, 1887, p. 90, pl. v, fig. 95.

Dr. Haase looked upon this form as a variety of *H. spinosum* of Newport, a species which also occurs in Ceylon. It appears to me, however, to be sufficiently well characterised to rank, at all events, provisionally, as a distinct species. The two forms agree in the interesting fact that in the ♂ the distal spine on the upper inner edge of the anal femur is enormously enlarged. *H. paucispinosum* may be recognised by the presence of only 7 spines on the anal femur, by

the absence of sulci on the sternites, and by the fact that the anal pleura is terminated by two spines, one inferior and large, the other at some distance above it and smaller.

Ceylon: Mr. Green brought back one female specimen measuring about 90 mm. (3½ inches) in length.

Heterostoma triste, Meinert.

Meinert, Vid. Medd. Nat. Foren. (Copenhagen), 1886, pp. 114, 115; Haase, op. cit., pp. 91, 92.

This is the species that I previously (Ann. Nat. His., 1890, p. 245) referred to as the ♀ of *H. spinosum*. Mr. Thurston has sent one specimen from Madras, another from the Nilghiri Hills, and a third from Mysore. Dr. Meinert's specimens were from Vellore and the Sheveroy Hills.

In this species the anal femur is armed with 7 or 8 strong spines; the anal pleura terminates with two spines, one above, smaller and at some distance from the other, there is a conspicuous lateral spine and sometimes also a superior spine; the sternal sulci are conspicuous although posteriorly abbreviated. In the ♂ the tarsal segments of the anal leg are thickened and compressed.

The ♀ of this species bears a strong resemblance to the ♀ of the Ceylonese species *paucispinosum*. It may, however, be recognised by the absence of sternal sulci.

Dr. Haase regards *triste* only as a variety of the Chinese species *H. rapax* of Gervais.

Rhysida longipes, (Newport).

Haase, op. cit., p. 83.

One specimen sent from Madras by Mr. Thurston. This species is wide-spread, occurring in both the East and West Indies. The British Museum has examples from Burma, Bengal, and Ceylon.

This species may be recognised from the one following by the strong spine-armature of its anal legs, and by the raised side margins of the tergites in the posterior half of the body.

Rhysida immarginata, (Porath).

Bih. Sv. Vet. Ak. Handl., iv, no. 7, p. 24 (1876); for full synonymy, see Pocock (Ann. Mus. Genov., (2), x, p. 417).

One specimen sent from Ceylon by Mr. Green.

The tarsi of the pre-anal legs are furnished with a single spur; the anal pleuræ are furnished on one side with two apical spines and on the other with one; the anal femora are armed with three small spines, one on the middle of the upper inner edge, one on the under inner edge, and one on the under outer edge.

Mr. Thurston has, on a previous occasion, sent this species from Madras.

Otostigma ceylonicum, Haase.

Op. cit., pp. 69, 70, pl. iv, fig. 67.

Mr. Green brought back several specimens from Punduloya.

This species also occurs in Burma, as I have elsewhere pointed out.

Two very nearly allied forms were on a previous occasion sent to the British Museum from Madras by Mr. Edgar Thurston. Both of these were new and were described by me in the paper to which reference has already been made. These were called *Ot. splendens* and *Ot. morsitans*; but at the time, not having then seen *Ot. ceylonicum*, I was not able to give very satisfactory characters to distinguish the three. In *Ot. splendens* the anal pleuræ are much longer and stronger than in *Ot. ceylonicum*, in which they are remarkably weak; while in *Ot. morsitans* the tergites are beset with minute spicules, and the sternites are laterally and not mesially impressed.

Scolopendra morsitans, (Linn.), Kohl.

Haase, op. cit., pp. 52, 53.

Mr. Thurston sent specimens from Mysore and Madras.

This species is found in all tropical and subtropical countries. It is of medium size, and varies considerably in colour; but it may be recognised by the presence of nine spines in three longitudinal rows on the lower surface of the femur of the anal legs. It seems to be widely distributed in India; the British Museum has examples from Burma, Calcutta, Bengal, N.-W. India, Mahallah, Midnapore, Madras, and Ceylon.

Cormocephalus pygmæus, sp. n.

Colour a deep greenish-blue throughout, darker posteriorly.

Body moderately robust and nearly parallel-sided.

Head very minutely punctured, marked in its posterior half with two anteriorly diverging sulci.

Antennæ short, thick at the base, attenuate, composed of 17 segments, whereof the basal six are naked, and the rest pubescent.

Maxillipedes minutely punctured, coxæ slightly depressed mesially in front, the anterior plates somewhat long, slightly separated at the base, in contact distally, each bearing four teeth, whereof the three internal are fused, and the external distinct and conical.

Tergites minutely punctured, each of them, with the exception of the last *but including the first*, marked throughout by two complete conspicuous sulci; the last five with raised margins.

Sternites, except the last and first, with conspicuous sulci, not impressed.

Anal somite; *tergite* with a complete median sulcus; *pleuræ* marked with very clearly defined circular larger and smaller pores, the process conspicuous but not elongate, smooth, tipped with two spines, a single spine near the tergite on the posterior border; *sternite* somewhat narrow, its sides strongly converging posteriorly, with rounded posterior angles; *legs* moderately robust and moderately long, the femur armed with about 17 spines, 3, 4, 3 in longitudinal rows on the inner surface, and 3, 4 in longitudinal rows on the under outer edge, the process small and tipped with two spines, the claw not basally spurred.

Legs somewhat robust with unspined tarsi but spurred claws.

Stigmata small and circular.

Length 25 mm.

A single specimen, probably not adult, from Madras.

Resembling *C. dentipes*, from Bengal, in having the first tergite completely bisulcate, but differing in having the anal legs smooth and not tubercular.

Family, *Geophilidæ*.

Mecistocephalus punctifrons, Newport.

Trans. Linn. Soc., xix, p. 429 (1845); for synonymy, Pocock. Ann. Mus. Genova, (2), x, p. 423.

Ceylon: Mr. Green.

This is far the commonest oriental species of this family. Mr. Thurston has already sent it from Madras. Mr. Oates has collected it at many localities in Burma.

Orphnæus brevilabiatus, (Newport.)

Op. cit., p. 439; for synonymy, Pocock, op. cit., p. 425.

One specimen sent by Mr. Green from Ceylon. With the exception of the preceding this species is more abundant in the East than any other member of the family.

The British Museum has examples from Burma, Madras, and Ceylon.

CLASS, DIPLOPODA.

SUB-CLASS, PSELAPHOGNATHA.

Family, *Polyxenidæ*.

Polyxenus ceylonicus, sp. n.

Colour (in alcohol) entirely ochraceous.

Of large size.

Lower half of *head* perfectly smooth, labrum defined by a sulcus and angularly excised in the middle; a deep sulcus between the antennæ; upper surface of head lightly hollowed in the middle, furnished along its anterior margin with two tufts of long hairs; eyes composed of about 8 ocelli on each side; antennæ long and slender, projecting far beyond the sides of the head. *Body* composed of 11 segments, the terga indistinctly divided longitudinally in the middle line; each tergite furnished on each side of its posterior border with a transverse tuft of hairs; the pleura on each side produced into a prominence which is adorned with a large tuft of hairs; the terminal segment bearing an elongate funnel-shaped tuft of hairs.

Length 3 mm.

Punduloya. Mr. Green informs me that he obtained this species by beating the bushes.

Unfortunately the immersion in alcohol of these specimens has removed nearly all the hairs that adorn the body when living. I have consequently been obliged to judge of their position by the scars which mark their points of attachment. Fortunately Mr. Green made a sketch of the lower surface of one of these animals before the destruction of the hairs, and this sketch shows clearly that the plumes were arranged very much as they are in *P. lagurus*. The hairs, judging from a few that remain on the dorsal surface, were very much finer than in our European species.

SUB-CLASS, CHILOGNATHA.

Order, ONISCOMORPHA.

Family, *Zephroniidæ*.

Zephronia brandti, Humbert.

Syn. *Sphæropæus brandti*, Humbert, Mem. Soc. Ph[illegible] -viii, p. 38, p. iii, fig. 15 (1[illegible] -arsch, Arch. Naturg., 1881, p. 29.

„ *Zephronia chitonoides*, Butler, Ann. N. H., (4), x, p. 354, pl. xviii, fig. 2 (1872).

„ „ *rugulosa*, id., t. c., p. 355, pl. xviii, fig. 1.

Mr. Green obtained this species at Punduloya, in Ceylon.

Colour testaceous or ochraceous, head and nuchal plate usually darker than rest of the body, the anterior portion of the tergites may be darker than the posterior.

Head sparsely punctured above, more thickly so in region of labrum; armed above with from four to ten sharp teeth borne on a ridge which extends without interruption from one eye to the other.

Nuchal plate with inferior margin nearly straight and upturned edge; not marked with a sulcus or ridge; almost without punctures, somewhat thickly punctured above its inferior margin.

First tergite with somewhat abruptly rounded anterior border; not sulcate; lamina very slightly developed, scarcely represented by more than the upturned edge of the tergite; anterior edge of the tergite very gradually produced forward on each side of the head, then curving gently back to the inferior portion; anterior portion either punctured or almost smooth.

Tergites anteriorly more or less punctured or rugulose; posteriorly without punctures; sometimes almost wholly smooth.

Anal tergite exceedingly finely or coarsely punctured or rugulose; without a ridge on each side of the inferior internal surface, and without a trace of a notch or the antero-lateral inferior edge.

♂. Anal tergite saddle-shaped, *i. e.*, concave from before backwards and from side to side. Antennæ larger.

Forceps; 1st pair—proximal and second segments wide and flat; third segment rounded and stout, with a slender conical dactylar prolongation; distal segment more compressed, truncate, projecting

a long way beyond the dactylus of the preceding segment; bearing two processes, of which the proximal is very small and the distal very large.

2nd pair—proximal segments stout, dactylar prolongation of the second blade-like, with straight minutely denticulated inner surface, rounded apex and outer surface rounded from base to apex; distal segment also blade-like, considerably longer than the dactylus of the preceding segment; anterior edge of the inner surface straight and simple, the posterior edge furnished with a series of minute denticles is considerably thicker at its proximal than at its distal extremity; outer surface evenly rounded from base to apex.

♀. Anal tergite not saddle-shaped, antennæ smaller.

Vulva. Basal sclerite rounded proximally, distally angled and separating the two distal sclerites; internal sclerite, from the front, more or less rod-like, with perfectly straight outer border and rounded apex, expanded proximally and distally, projecting considerably beyond the external sclerite; external sclerite (the cap) varying somewhat in shape, with tolerably straight inner border and more or less irregularly rounded external border, thinner at its proximal than at its distal end.

Length 15-40 mm.

The species *Z. chitonoides* was established by Mr. Butler upon certain specimens which differ from *Z. brandti* in the narrower and more elongate shape of the body. But this difference of shape is clearly due to distortion of the tergites during the process of drying.

The type of *Z. rugulosa* cannot be separated by any reliable characters from specimens of *Z. brandti*.

Zephronia inermis, Humbert.

Syn. *Sphæropœus inermis*, Humbert, Mém. Soc. Genève, xviii, p. 37, pl. iii, fig. 16 (1865).

„ *Zephronia corrugata*, Butler, Ann. Nat. Hist. (4), x, p. 355 (1872).

„ „ „ id., Proc. Zool. Soc. 1873, p. 180, pl. xix, fig. 8.

„ „ *leopardina*, id., t.c., p. 356.

„ „ „ id., Proc. Zool. Soc. 1873, p. 181, pl. xix, fig. 10.

Not *Sphæropœus inermis*, Karsch, Arch. Naturg., 1881, p. 29, pl. ii, G. and g.

Also obtained at Punduloya by Mr. Green.

It is needless to describe this species, for, as Mons. Humbert pointed out, it can only be distinguished from *Z. brandti* by the absence of the teeth on the head. I very much doubt the value of this character by itself, and am disposed to think that further researches will show that it cannot be considered as of specific importance.

Although in his original descriptions Mr. Butler points out the resemblance existing between *Z. corrugata*, *Z. leopardina*, and *Z. inermis*, in his later revision of this group, he refers these three species to distinct sections of the genus. The rugosity upon which *corrugata* was based and the colours of *leopardina* are not, in my opinion, of specific importance.

Dr. Karsch's specimen of *Z. inermis* differs from those in the British Museum in the form of the copulatory forceps; and, since Mons. Humbert asserts that in the shape of this organ *Z. inermis* resembles *Z. brandti*, I have no doubt that the specimens in the Berlin Museum have been wrongly identified. The copulatory foot of Dr. Karsch's *Z. inermis* appears to bear some resemblance to that of *Z. versicolor*.

Zephronia heterosticatica, Newport.

(Pl. i, fig. 1.)

Syn. *Zeph. heterosticatica*, Newport, Ann. Nat. Hist. (1), xiii, p. 265 (1844).

" " *lutescens*, Butler, Ann. Nat. Hist. (4), x, p. 356 (1872).

" " " id., Proc. Zool. Soc., 1873, p. 179, pl. xix, fig. 5.

" " *atrisparsa*, id., Trans. Ent. Soc., 1878, p. 302.

Colour, varying from testaceous to olivaceous, tergites generally ornamented with more or fewer irregularly arranged black spots; dull or slightly polished; without punctures or sparsely punctured.

Head like that of *Z. inermis*; nuchal plate like that of *Z. inermis* in having a nearly straight inferior border, and in not being marked with a faint sulcus or ridge; a row of punctures along the superior and along the inferior border.

1st tergite with scarcely developed lamina and evenly arched anterior border; the upper surface evenly sloped from behind

forwards; in small specimens (*i.e.*, in those named *atrisparsa* and *lutescens*) there is a faint sulcus running parallel with the anterior border and just behind it; in larger forms this sulcus becomes obsolete.

Anal tergite near the middle of its hinder half more thickly punctured than the others; the ridge on its inner surface represented by an anterior longer and a posterior shorter black portion; the notch absent or scarcely visible.

♂. Anal tergite rounded.

Forceps.—1st pair with immovable dactylus short and upcurled; movable dactylus with a basal external rounded projection, a compressed distal half, and a distinct more or less rounded tooth projecting inwardly to meet the immovable dactylus.

2nd pair:—The two dactyli about equal in length; the immovable blade-like, not attenuated towards distal end, with a nearly straight denticulate inner edge, outer edge proximally nearly straight, distally exceedingly convex, the movable dactylus hollowed internally, and with hinder edge denticulate, much thicker at base than at apex, with gently convex outer border and concave inner border.

♀. Anal tergite resembling that of the male.

Vulva formed on the same plan as in *Z. brandti*, and not differing from it in any important particulars.

Length 18-35 mm.

This species closely resembles *Z. inermis*, Humbert, in the form of the head, nuchal plate, and 1st tergite, but differs in the form of the copulatory forceps, in the presence of the ridge on the anal tergite, in colour, and in sculpture.

I cannot separate *Z. lutescens* from *Z. heterosticatica* by any character which I consider specific. There are certainly no black spots on the two specimens of the former species, which served as Mr. Butler's types, and there is a sulcus on the first tergite. Nevertheless both these characters are variable, inasmuch as in one specimen of *Z. heterosticatica*, the spots are few in number and the sulcus is feebly indicated.

The type of *Z. atrisparsa* differs from *lutescens* and resembles *heterosticatica* in being, as the name indicates, spotted with black; and it closely resembles *lutescens* in having the first tergite sulcate.

This species has not yet been recorded from Ceylon. It appears, however, to be tolerably widely distributed in Southern India. The British Museum has examples from Bombay and Madras; and in addition to further examples from Madras, Mr. Thurston has sent others from the Nilghiri Hills.

Order, HELMINTHOMORPHA.

Family, *Polydesmidæ*.

Leptodesmus inornatus, (Humbert).

Loc. cit. pp. 30, 31, pl. iii, fig. 11.

This species was recorded originally from Peradenia. Mr. Green brought one example from Punduloya. This specimen is concolorous and pale coloured, thus differing markedly from the *L. tanjoricus* described below.

Leptodesmus thwaitesii, (Humbert).

Loc. cit., pp. 27, 28, pl. ii, fig. 9.

This beautiful species was also recorded in the first instance from Peradenia; Mr. Green obtained several examples at Punduloya. It is a very marked form. The keels are well-developed and like the posterior half of the segment are nearly white, while the anterior half is chocolate-brown with white spots.

Leptodesmus tanjoricus, sp. n.

(Pl. i, figs. 3, 3a, 3b.)

Colour, upper surface deep chocolate-brown, almost black, the under surface, the labral region of head, the antennæ and legs pale brown, the keels of all the segments and the caudal process pale yellow; polished.

Body nearly parallel-sided; somewhat slender, lightly convex between the keels. First tergite much wider than head with lightly convex anterior border, the posterior border nearly straight and running obliquely outwards, forwards, and downwards, the border with raised margins, the keels of the 1st, 2nd, 3rd and 4th tergites nearly in a straight line, sloping backwards and upwards to the 5th; keel of the 2nd well developed and a little depressed, with anterior border and angles lightly convex, squared posteriorly; 3rd and 4th with keels horizontal and directed backwards; the rest of the segments with the keels horizontal and not elevated, not long, the posterior

forwards; in small specimens (*i.e.*, in those named *atrisparsa* and *lutescens*) there is a faint sulcus running parallel with the anterior border and just behind it; in larger forms this sulcus becomes obsolete.

Anal tergite near the middle of its hinder half more thickly punctured than the others; the ridge on its inner surface represented by an anterior longer and a posterior shorter black portion; the notch absent or scarcely visible.

♂. Anal tergite rounded.

Forceps.—1st pair with immovable dactylus short and upcurled; movable dactylus with a basal external rounded projection, a compressed distal half, and a distinct more or less rounded tooth projecting inwardly to meet the immovable dactylus.

2nd pair:—The two dactyli about equal in length; the immovable blade-like, not attenuated towards distal end, with a nearly straight denticulate inner edge, outer edge proximally nearly straight, distally exceedingly convex, the movable dactylus hollowed internally, and with hinder edge denticulate, much thicker at base than at apex, with gently convex outer border and concave inner border.

♀. Anal tergite resembling that of the male.

Vulva formed on the same plan as in *Z. brandti*, and not differing from it in any important particulars.

Length 18-35 mm.

This species closely resembles *Z. inermis*, Humbert, in the form of the head, nuchal plate, and 1st tergite, but differs in the form of the copulatory forceps, in the presence of the ridge on the anal tergite, in colour, and in sculpture.

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Leptodesmus tanjoricus, sp. n.

(Pl. i, figs. 3, 3a, 3b.)

Colour, upper surface deep chocolate-brown, almost black, the under surface, the labral region of head, the antennæ and legs pale brown, the keels of all the segments and the caudal process pale yellow; polished.

Body nearly parallel-sided; somewhat slender, lightly convex between the keels. First tergite much wider than head with lightly convex anterior border, the posterior border nearly straight and running obliquely outwards, forwards, and downwards, the border with raised margins, the keels of the 1st, 2nd, 3rd and 4th tergites nearly in a straight line, sloping backwards and upwards to the 5th; keel of the 2nd well developed and a little depressed, with anterior border and angles lightly convex, squared posteriorly; 3rd and 4th with keels horizontal and directed backwards; the rest of the segments with the keels horizontal and not elevated, not long, the posterior

border being slightly produced backwards in the anterior half of the body and more so in the posterior half, but the keels never extend beyond the level of the posterior border of the tergites, the antero-lateral border convex; border of the keels thickened and elevated, those of the poriferous segments much thicker than the others; keels of the 19th somite not produced, tuberculiform; the pores completely lateral and situated in the posterior half of the lateral surface; 5th to the 18th furnished with a weak median transverse sulcus. Lateral portion of the somites beneath the keel sub-granular, the upper surface being smooth or at most slightly reticulated; the 2nd to about the 18th somites furnished with a conspicuous ridge above the tracheal apertures.

Sternal surface of the 5th furnished in its anterior half with a low, wide, posteriorly slightly elevated prominence; sternite of the 20th obtusely triangular, its posterior angle rounded, bearing a tubercle on each side in front of the margin.

Legs: femur of 5th, 6th and 7th pairs (*i. e.*, the posterior pair on the 5th and the two pairs of the 6th somites) bearing an inferior prominence, which is smaller on the 5th, largest on the 7th. Copulatory feet reaching to the middle of the sternum of the 6th somite (with the body etxended), the 2nd segment hairy, narrowed distally, and bearing internally and posteriorly a backwardly-directed projection, the 3rd segment externally convex, terminated by four processes, which considered from behind forwards may be described as follows—the first is slender, short, and nearly at right angles to the axis of the foot, the second belonging to the same piece as the first, is directed forwards, thin, blade-like, and pointed, the other two are slender, curved and closely in contact, almost equal in length, the external embracing the internal.

Length 36 mm.

Several specimens, all males, from Tanjore.

This species at least differs from *L. luctuosus*, (Peters), from Ceylon, in colouring; for *luctuosus* is said to have the posterior border of the somites pale coloured. It cannot, moreover, be confounded with any of the species recorded by Humbert from the same island.

Paradesmus kelaarti, (Humbert).

(Pl. ii, fig. 12.)

Essai Sur les Myriapodes de Ceylan. Mém. Soc. Phys. Genève, xviii, pp. 23, 24, pt. ii, fig. 7.

Recorded originally from Ceylon.

Mr. Thurston sent one specimen (♂) from Tanjore, and two (♀) from Madras.

This species has the dorsal surface remarkably flat and rugulose, and only the posterior angles of the keels flavous.

Strongylosoma simplex, (Humbert).

Loc. cit., pp. 34, 35, pl. iii, fig. 14.

Specimens of both sexes from Punduloya (Ceylon) were brought by Mr. Green.

The types of the species were collected by Mons. Humbert at Pundel-Oya (*sic*).

This species approaches *Leptodesmus* in the form of its caudal process. The colour of the head, antennæ, legs, caudal process, and the anterior and inferior portions of the somites—of the whole animal in fact, except just the upper surface of the keel-bearing portion of the somites and the keels, which are ferruginous or piceous—is ochraceous or testaceous.

Strongylosoma greeni, sp. n.

(Pl. ii, fig. 14.)

Colour (in alcohol) entirely pale ochraceous or testaceous.

♀. *Body* attenuated in its anterior half.

Head hairy below with a vertical sulcus above; *antennæ* long, the 2nd, 3rd, 4th, and 5th segments sub-equal in length.

Segments smooth and shining; the 1st with convex anterior margin, rounded angle and posterior margin straight in the middle, not sulcate; the 2nd with an indistinct transverse sulcus, the keel projecting below the level of the angle of the 1st and the keel of the 2nd, produced forwards and downwards; 3rd and 4th obsoletely sulcate transversely, the keels very small, the 2nd, 3rd and 4th with an elongate tubercle above the base of the legs; the rest of the somites marked with a transverse sulcus; the keels very small, situated above the middle, not attaining the posterior margin of the somites, the pores situated in their posterior half, keels on the 19th

somite almost absent; the caudal process of the 20th normal in form; the sternum bituberulate posteriorly. *Legs* hairy and elongate.

♂. Body a little more slender, the keels a little more prominent; the sternum of the fifth unmodified, and the femora of all the legs normal.

Copulatory feet short; the basal segment hairy, the second segment stout and terminating distally in two processes, an external slender, filiform, and curled at the apex, an internal stouter, giving off a short slender lamina on the inner side at its base, strongly curved inwardly in its distal half.

Length up to 23 mm.

Several examples from Punduloya; Mr. Green.

This species resembles *St. simplex* in having only a transverse dorsal sulcus; but may at once be recognised by the difference in colouring, in the form of the copulatory apparatus, smaller keels, &c. Moreover in *simplex* there is present on all the segments except those at the posterior end of the body a conspicuous sub-crescentic crest above the base of the legs—a crest which is entirely absent in *Str. greeni*.

Strongylosoma cingalense, Humbert.

(Pl. i, fig. 5.)

Loc. cit., pp. 32, 33, pl. iii, fig. 13, ♀.

Two males and three females were obtained by Mr. Green. Humbert's species was based upon a single female specimen which was also captured at Pundel-Oya. As this author pointed out, this species is very closely related to his *Str. skinneri*, and the differential characters he was able to give were of doubtful value seeing that members of different sexes were being compared. Mr. Green's discovery of the male has, however, settled the point, and has clearly shown that the two species are in reality distinct, although very closely allied. Thus the male of *St. cingalense* has the same peculiar process on the sternum of the 5th somite, and its copulatory feet are very like those of *St. skinneri*. In *St. skinneri*, however, according to Humbert's figure and from a specimen of this species in the Museum collection, the two slender pieces of the copulatory apparatus are as long as the median laminate piece, and there is a distinct small basal process. Whereas in *St. cingalense* there is no small basal process, and the slender pieces are shorter than the central lamina, which is itself differently cleft.

Furthermore, the longitudinal sulcus of the tergites is *less* strongly developed than in the ♀, being in fact nearly obsolete, while in *St. skinneri* it is more strongly developed than in the ♀ of *cingalense*.

Strongylosoma phipsoni, sp. n.

(Pl. i, fig. 4; Pl. ii, fig. 13.)

♀. *Colour*; head, antennæ, upper surface of legs and somites, as far as the transverse sulcus, ferruginous, the lower surface of the legs and of the somites pale coloured; the borders of the first tergite, the portions of the other tergite, posterior to the transverse sulcus, with the corresponding half of the keel yellow; sometimes there is an abbreviated, narrow, darker median longitudinal streak on the posterior half of the tergites; the entire upper surface generally exceedingly polished.

Head with a sulcus running from the vertex to a point on a level with the joint of the antennæ, labral region rugulose; antennæ elongate. *First tergite* without trace of keel; the second with a conspicuous keel, slightly produced in front and behind, which is below the level of the margin of the first and of the keel of the third; the other segments distinctly keeled, the keels, however, are small, although defined above almost throughout the length of the keel-bearing portion of the tergites, and project slightly posteriorly; the upper surface of the tergites is perfectly smooth, the transverse sulcus is conspicuous, but there is no longitudinal sulcus; the portion beneath the keel is at the anterior extremity of the body apparently granular, posteriorly it is irregularly and longitudinally striate, especially behind; there is a complete inferior keel above the base of the legs on all the segments; the pores are lateral and situated in the posterior half of the keels; the groove which separates the anterior cylindrical from the posterior keel-bearing portion is above indistinctly beaded.

Legs shortly hairy beneath.

♂. Of more slender build, with more prominent keels. The anterior legs thickened, the two distal segments of the legs thickly hairy beneath. The sternum of the 5th somite without any outgrowth.

The copulatory feet short; the proximal segment is thickly hirsute and bearing a backward projection, the following segment apparently undivided, but stout at the base and tapering to the point, its distal half, when at rest, spirally coiled on itself.

Length up to 27 mm. The British Museum has several dried specimens of this species. Most of these are ticketed 'Indian Museum,' so doubtless they came from some part of India; but one of them presented by Mr. G. R. G. Rothney is labelled Calcutta.

This species may be easily recognised from all the known Ceylonese and Indian species by its curious banded colouring—a character in which it appears to come nearest to an Australian species known as *transverse-tæniatum* of L. Koch—a species of which the Museum has several examples. But in this last-named the keels are brown, as also are the anterior and lateral borders of the first tergite. It is moreover not smooth and polished. I have great pleasure in dedicating this well-marked species to Mr. H. M. Phipson of the Bombay Natural History Society.

Strongylosoma jerdani, sp. n.

Colour (dry specimens), entirely testaceous throughout. Closely related to the preceding species; it is consequently needless to reproduce in full the foregoing description. The most satisfactory way of describing this new form will be perhaps to point out how it may be recognised from *phipsoni*.

1*st*.—The colour is entirely different.

2*nd*.—The upper surface of the somites is not smooth and polished, but dull and rugulose.

3*rd*.—The keels are almost absent; they are very short, being scarcely represented by more than a tubercle on the hinder portion of the somite, and are less conspicuous than the inferior keels. These specimens are all males, and if we may judge by analogy with *phipsoni*, in which the keels of the males are larger than those of the females, in this new species the keels should be absent in the females.

In sexual characters, *i.e.*, the form of the copulatory foot, the absence of any prominence of the sternum of the 8th somite, and the hairy tarsi of the legs—this species is quite like *phipsoni*.

The Museum has three dry, possibly faded male examples from Madras from the collection of Mr. Jerdan.

I trust that Mr. Thurston will soon obtain fresh specimens of this species so that its real colour may be known.

Polydesmus cognatus, Humbert.

Loc. cit., pp. 22, 23, pl. ii, fig. 6.

Three specimens from Punduloya (Mr. Green).

Recorded by Humbert from Peradenia and from Pundel-Oya.

Cryptodesmus ceylonicus, sp. n.

(Pl. ii, figs. 2, 2c.)

Colour (in alcohol) uniform pale brown above; upper part of head also pale brown; labral region and legs ochraceous.

Head thickly and shortly hairy, labral region somewhat produced and quadrate with rounded angles, defined from the upper part of the head by a shallow transverse groove; vertex of head lightly sulcate longitudinally.

Antennæ short but thick and clavate, the sixth segment the largest, the seventh nearly as large as the fifth.

Body hairy, a little narrowed in front and behind, the upper surface very convex, the keels rising low on the segments and directed downwards; the first tergite narrower than the second, but much wider than the head and covering it, its anterior border evenly convex from apex to apex of keel, its posterior border nearly straight, covered throughout with tubercles arranged irregularly in 5 or 6 rows; the keel-bearing part of the rest of the segments covered with large tubercles which are arranged in three transverse rows, in some of the segments there are also indications of a fourth row of smaller tubercles; the anterior margin of the keels is defined by a sulcus but is unarmed, the antero-lateral angle is obtuse and rounded, the postero-lateral angle is sharp and produced, the posterior border being slightly concave, the lateral margin bears five or six sharp teeth, and the posterior margin also five or six more or less quadrate teeth, the keels of the nineteenth do not project so far posteriorly as the extremity of the anal segment; the sides of the anal segment meeting at an angle of 90°; the lower surface of the keels is transversely sulcate towards the lateral margin. Sterna deeply sulcate longitudinally and very narrow.

Legs thickly hairy.

Length, 11 mm.

Two female specimens from Punduloya (Mr. Green).

This is the first record of this genus from any part of the Oriental Region.

Cryptodesmus greeni, sp. n.

(Pl. ii, fig. 3.)

Colour (in alcohol), brown above, antennæ and labrum testaceous, legs ochraceous.

Head hairy, with a shallow vertical sulcus, labrum defined above by a transverse furrow, somewhat produced as in the preceding species, with rounded angles and widely excised border. *Antennæ* short and thick, clavate, the segments increasing in size to the sixth, the seventh about as large as the fifth.

Body hairy, convex above, the keels directed downwards and outwards, not continuing the slope of the back but inclined to it at an obtuse angle; 1st tergite much wider than the head and narrower than the 2nd, convex in the middle, the margins of its keels sloping towards each other and meeting in a rounded angle of about 50°, covered with close-set rounded tubercles; the rest of the tergites adorned with many tubercles arranged in four transverse rows, these tubercles becoming nearly obsolete on the keels; anterior border of the keels unarmed, lightly convex and defined by a sulcus, posterior border straight and armed with a series of close-set quadrate teeth, the anterior angle rounded, the posterior angle squared, the lateral margin quadri-dentate; keels of 19th extending nearly as far as the apex of the anal which is pointed; under surface of the keels sulcate towards their margins, the sulci running inwards from the margins. *Sterna* narrow and deeply sulcate; *anal sternite* tri-tuberculate.

Legs hairy.

♂. Copulatory forceps very small the distal segments simple, closely in contact, hooked at the apex.

Length about 9 mm.

A single male specimen from Punduloya (Mr. Green).

This may prove to be the ♂ of the preceding species. But there is no evidence at present to show that the differences between the two are of a sexual nature. The keels are very different in shape. In *Cr. ceylonicus* they are much narrower, the posterior angle is produced, and the posterior border concave. Whereas in *Cr. greeni* they are more produced, the posterior border is straight, and the posterior angle squared.

Pyrgodesmus, gen. nov.

(Pl. ii, figs. 1, 1b.)

Allied to *Cryptodesmus*.

Head covered by an expansion of the first tergite.

Keels rising below the middle of the sides of the somites and depressed.

Each sorvite bearing a large upstanding projection or keel in the middle of its dorsal surface.

Pores minute, occurring on the 5th, 7th, 9th, 10th, 12th, 13th 15th—19th segments, situated on the upper surface of a special tubercle which projects from the posterior half of the lateral margin of the keels.

Pyrgodesmus obscurus, sp. n.

Colour (in alcohol); somites of a uniform dull brown colour; labrum, antennæ, and legs testaceous.

Head tubercular above, labral region smooth but punctured and hairy, produced, its sides being sub-parallel, its angles rounded. *Antennæ* close together, of moderate length, the second segment long, the fifth the longest and the thickest, the sixth and seventh very small, forming together a conical termination to the appendage.

Body granular and subtubercular throughout; 1st tergite with its anterior border carinate and evenly convex from side to side, as wide as the second segment, bearing on its upper surface a very large, erect, wide, tubercular prominence, the upper surface of which is shallowly excavated; the rest of the segments with keels depressed, oblique, *i. e.*, sloping backwards and upwards, with anterior and posterior margins sub-parallel, the angles squared, and the lateral margin quadrilobate, those of the 2nd, 3rd and 4th segments straight, the rest projecting more and more backwards towards the posterior end, those of the 19th small and not produced posteriorly so far as end of the 20th, the keels of the 2nd with margins a little thicker than those of the rest, but of the same level; the median dorsal crests or prominences thicker at the apex than at the base, those at the anterior end of the body directed forwards, and those at the posterior end backwards, those in the posterior three-quarters of the body marked on the summit with a longitudinal groove, the two sides of which are bilobate; at the anterior end of the body the groove becomes deeper and deeper,

and the prominences in consequence more and more bifid, so that the crest on the 2nd is divided to the base and consists of a right and left half; the surface of the segments between the base of the dorsal and the base of the lateral keel furnished with a longitudinal series of three conspicuous tubercles.

Sterna very narrow, so that the bases of the legs are nearly in contact in the middle line; *anal sternite* triangular.

♂. All the legs thick, especially those in front of the seventh somite; copulatory feet with basal segment enormously enlarged, hairy, punctured and sub-tubercular, the distal segment pale coloured, slender, blade-like, in repose projecting obliquely inwards and backwards, crossing its fellow of the opposite side.

Length 10·5 mm.

Two male specimens from Punduloya (Mr. Green).

Family, *Lysiopetalidæ*.

Genus, *Stemmiulus*, Gervais.

Gervais, Ann. Soc. Ent. Fr., (2), ii, p. 28; Ann. Sc. Nat., (3), ii, p. 70; Ins. Apt., iv, p. 200, pl. 41, fig. 7. Karsch, Zeits. Naturwiss., (3), vi, p. 11.

This genus was referred to the *Iulidæ* by both Gervais and Karsch, both authors stating that it differs from *Iulus* in the structure of its eyes.

The type of the genus, *i. e.*, *St. bioculatus* from Colombia, is in the collection of the British Museum, and is beyond all question congeneric with the specimens described below.

The characters that I believe to be of generic value are as follows:—

1. The eyes are situated behind the antennæ and consist of either one or two, simple, round ocelli.
2. The antennæ are exceedingly long, slender, and not incrassate.
3. The collum is small like that of *Lysiopetalum*.
4. The body is compressed, and each somite is divided above by a longitudinal sulcus.
5. The pedal laminæ are all free.
6. The pores begin upon the 5th somite.

It will thus be seen that in characters 2, 4, 5, and 6, the genus agrees with *Lysiopetalum*, and differs from the typical *Iulidæ*. In character 1 it resembles neither.

It therefore appears to me to be rightly referable to the *Lysiopetalidæ*.

Stemmiulus ceylonicus, sp. n.

(Pl. i, fig. 2.)

Colour (in alcohol), obscure testaceous or ochraceous, with fuscous bands; head, antennæ and collum black, the posterior end of the body becoming infuscate, the terminal somites being black; legs pale infuscate.

Body moderately robust, compressed, a little narrower in front, and tapering to a point posteriorly.

Head and face convex, not sulcate, sparsely punctured and hairy; margin of labrum shallowly and angularly excavated and serrate throughout its width, with about 6 piliferous pores above; *eyes* two on each side, subcontiguous, round, behind the socket of the antennæ, a larger above and a smaller below. *Antennæ* long, slender, not incrassate, the second segment the longest, the third, fourth, and fifth about equal in length, sixth about half the length of the fifth.

Somites finely striolate; *collum* narrowed laterally to an acute angle, margin thickened as high as the eye, and marked behind by a fine sulcus, the rest of the somites marked anteriorly by a fine transverse sulcus, those at the anterior end of the body obliquely striate inferiorly and laterally, the striæ ascending posteriorly so that the dorsum of the middle and posterior end of the body is conspicuously striate; the striæ sub-parallel on each side, but those on one side inclined at an angle of about 80° to those on the other; the middle line of the back marked by conspicuous longitudinal sulcus, and the inferior portion of the somites above the legs also marked by a strong and deep sulcus; the posterior margin of each somite inferiorly dentate, the teeth very strong at the anterior extremity of the body; *anal tergite* very small, not produced beyond the valves; *valves* hairy, nearly flat, with simple margins, a few short membranous processes projecting above the valves; *sternite* with straight or lightly concave hinder border and rounded posterior angles. *Pores* small, just behind the transverse sulcus and far from the hinder border of the somite, situated very high on the lateral surface of the dorsum.

Legs not long, hairy.

Number of segments 40-45; length about 32 mm.

Punduloya (Mr. Green).

Two species of this genus have hitherto only been known—*St. bioculatus* of Gervais from Columbia, and *St. compressus* of Karsch from Porto Rico. Consequently the occurrence of the genus in Ceylon is of very great interest.

The species here described resembles *compressus* and differs from *bioculatus* in having *two* eyes on each side of the head. From *compressus* it seems to differ in the form of the collum, in having all its segments, except the first, marked with a median, dorsal, longitudinal sulcus (Dr. Karsch describes a median, dorsal *costa*). Moreover, Dr. Karsch makes no mention of the segments being laterally dentate.

Family, *Iulidæ*.

Trachyiulus ceylonicus, Peters.

Peters, Mon. Ak. Wissen., Berlin, 1864, p. 547.

Humbert, op. cit., pp. 43-46, pl. iii, fig. 18.

Mr. Green obtained several examples of this remarkable species at Punduloya.

Hitherto it has been regarded as peculiar to Ceylon, but the British Museum has one example ticketed Madras.

Spirostreptus malabaricus, Gervais.

Ins. Apt., iv, p. 165.

Colour; *head* castaneous, clouded with piceous above; *antennæ* clear yellow, the basal segment brown, and the second segment feebly shaded with the same colours; *legs* the same tint as the antennæ, with the basal or basal two segments infuscate; *collum* fusco-castaneous; anal segment and valves nearly black; the rest of the segments with anterior half ferruginous and posterior half very nearly black; shining.

Head entirely smooth and polished, at most very faintly punctured with feebly rugulose upper portion of vertex, the sulcus on the vertex faint, inner angles of the eyes not united by a transverse sulcus; labral margin moderately excavated, with 2 (? more) punctures above the excavation. Antennæ short, punctured, when stretched laterally barely reaching to the hind border of the collum; the four distal segments pubescent. Eyes composed of about 72 ocelli, and separated by a space greater than their longest diameter.

Somites; collum smooth and shining, much narrowed laterally, with anterior and posterior borders of the lateral portion concave, with squared angles, the inferior and the anterior margin as high as the eye defined by a sulcus which widens below, for the rest entirely without grooves and ridges; the rest of the segments (except the anal) with a strong transverse median circular sulcus, the anterior portion of each nearly smooth, only very feebly concentrically striate, the posterior portion smooth above, but very finely striolate, the lower portion longitudinally striate above the legs to about half the distance between the legs and pores; *pores* situated about the middle of the body immediately behind the sulcus, which is at this point lightly sinuate; ventral grooves small, triangular, about half the width of the sternal piece; anal somite convex above from before backwards and from side to side, the process projecting over the valves, slender, short and upcurled apically, finely and closely punctured, the valves convex from above downwards and from before backwards, the margins distinctly compressed, but not defined by a strong groove, the sternite with lightly convex hinder border.

Legs with one strong spine above the terminal claw; not hairy above.

Number of segments 79; length about 250 mm.

A single ♀ specimen sent by Mr. Thurston from Kortallum. I have very little doubt that I have correctly identified this specimen, although Gervais' description is not so exact as one could wish. Gervais' type was taken on the coast of Malabar.

Spirostreptus nigrolabiatus, Newport.

(Pl. i, fig. 7; pl. ii, fig. 5.)

Newport, Ann. Mag. Nat. Hist., xiii, p. 269 (1844).

This species is undoubtedly closely related to the preceding, the colour, sculpturing, form of collum and of anal somite being very similar in the two. It is, however, much smaller, measuring only about 134 mm. in length, has only 57 or 59 segments, and in the ♀ the face is strongly striate and rugulose. Moreover the lateral portions of the collum are less slender, the anterior angle is rounder, and the posterior a little more obtuse.

In the ♂ the collum is of the same form as in the ♀. In the copulatory foot the anterior piece of each half gradually widens from above downwards, ending in two processes below, the external of these

is shorter, rounded and blunt, the internal, directed inwards towards its fellow of the opposite side, has the form of an upcurled hook; the posterior piece sends a long slender process down the outer surface of the anterior piece, but ceases at the base of the external process; the central (protrusible) piece is distally expanded, sub-membranous, and spirally coiled, the membranous portion is divided distally into two laminæ, each of which is irregularly excised along its free border, and the posterior is armed with a single elongate style.

The specimens here identified have been compared with Newport's type of the species, which is preserved in the British (Nat. Hist.) Museum. Newport vaguely gives 'East Indies' as the locality of this species. It is consequently satisfactory to know exactly an area where it does occur.

Spirostreptus hamifer, Humbert.

Mem. Soc. Phys. Genève, xviii, pp. 52, 53, pl. iv, fig. 22.

Madras (Mr. Thurston), and Punduloya (Mr. Green).

The Madras specimen that I refer to this species differs from the specimen figured and described by Humbert in possessing 66 segments, and in having the lateral portions of the collum posteriorly striate. The caudal process moreover is longer and more hooked than in Humbert's specimen.

This species was originally obtained from Peradenia in Ceylon; this is, I believe, the first record of its existence on the mainland. It is of small size, slender build, and may be recognized by its curiously hooked caudal process.

Spirostreptus caudiculatus, Karsch.

Zeits. Gen. Naturwis., (3), vi, pp. 27, 28 (1881).

Madras: Mr. Thurston sent one specimen only. Described by Karsch from Ceylon.

This species is small, measuring about 50 or 55 mm. in length, and being relatively slender. It may easily be recognised by the longitudinal parallel ridges that adorn the segments, a form of sculpturing in which it closely resembled *Spirobolus crebrestriatus* of Humbert from Ceylon. But apart from its different generic characters, *Sp. caudiculatus* may be at once recognized by its pointed and upcurled 'tail'—a process which is not developed in *Sp. crebrestriatus*.

The two specimens from Madras have a median dorsal flavous band.

Spirostreptus asthenes, sp. n.

Colour (in alcohol). Head infuscate above, ochraceous beneath, the antennæ and legs ochraceous; collum infuscate, with paler anterior border; anterior part of the rest of the segments pale, posterior part infuscate with reddish border, a pale median spot on each forming together a dorsal band; anal somite infuscate except for the pale borders of the valves and the median dorsal band which extends on to the caudal process.

Of small size and slender build.

Head smooth, not sulcate, margin of labral excavation furnished with six pores, of which the two extremes are widely separated from the rest. Eyes composed of about 40 ocelli, widely separated.

Somites; collum smooth, its lateral portions with straight posterior and lightly sinuate anterior border, its anterior border defined by a sulcus which extends as far as the eye, the inferior portion marked by about two straight ridges and sulci; the rest of the tergites nearly smooth, irregularly and feebly longitudinally striolate, the inferior and lateral surface of the posterior portion ridged up to the pores, which are situated in the posterior half a little below the middle line; *anal tergite* above produced into a short blunt nearly straight process, compressed at the base, projecting beyond the anal valves, with its upper edge pointing slightly downwards and backwards; *valves* convex, their borders smooth, very convex and strongly compressed, the angle formed by the compressed portion roughened; *sternite* small, with posterior border very slightly angled.

Number of segments 63. Length about 53 mm., width about 3·5 mm.

A single ♀ specimen from Madras (Mr. Thurston).

Spirostreptus jerdani, sp. n.

Colour? (specimen dry and probably faded); tergites cinereous, with ochraceous posterior border; legs, face and collum entirely ochraceous.

Face convex, with frontal sulcus, punctulate above, marked below with a coarse reticulated pattern of short sulci; *antennæ* of moderate length, reaching beyond the margin of the collum; *eyes* of large size, composed of about 60 ocelli arranged in 8 transverse rows.

Collum punctulate, its hinder border shortly striate, moderately narrowed laterally, the anterior and posterior borders being inferiorly at most very slightly concave, the anterior angle rectangularly convex, the posterior angle nearly a right angle, marked with norma marginal sulcus, but not marked with other sulci or striæ. The rest of the somites marked with transverse sulcus, the half in front of the sulcus transversely striolate in front and thickly punctured and rugulose close to the sulcus, the half behind the sulcus also closely punctured and rugulose in front and shortly striolate along the hinder border, the inferior part furnished with five longitudinal ridges, which do not extend as high as the pores. *Anal somite* punctulate and striolate; the tergite simply angled along its posterior border, without any caudal process, the angle not impressed, its apex just covering but not projecting beyond the superior angle of the valves; valves widely but weakly compressed. *Pores* about the middle of the side, behind the sulcus.

Legs with a single set on the under surface of each segment.

Number of segments 66, length about 88 mm.

A single female specimen from Madras (Jerdan coll.)

In the absence of a caudal process projecting beyond the anal valves, this species resembles *Sp. insculptus* and *Sp. modestus*. In *Sp. modestus*, however, the segments are described as smooth, and in *Sp. insculptus* they are very much more coarsely sculptured, the anal tergite is more acutely angled, the valves more compressed, and the face not rugose.

Spirostreptus centrurus, sp. n.

(Pl. ii, fig. 4.)

♂. *Colour?* specimen dried and faded, but probably castaneous or olivaceous, with the hinder margins of the segments darker; antennæ and legs ochraceous.

Head with a superior vertical sulcus, convex, smooth and polished, with six labral punctures; *antennæ* long, reaching considerably beyond the collum; *eyes* rather small, composed of about 44 ocelli, arranged in about 7 transverse rows, separated by a space that is about equal to a diameter and a half.

Collum very large, almost entirely smooth and polished; the anterior angle very much thickened and produced, so that the anterior

border is inferiorly lightly concave; the posterior angle nearly a right angle, the portion of the posterior border immediately above it lightly emarginate; a few obliquely longitudinal sulci on the surface of the lateral portion. The rest of the segments with the posterior portion a little higher than the anterior; the anterior portion finely striolate in front, and covered with a closely and finely reticulated pattern of smooth low ridges behind; the portion behind the transverse sulcus, which on the posterior somites is almost obsolete, is polished above, but is more or less longitudinally sulcate throughout; below the level of the pores the striæ are close-set and clearly defined, above the pore, however, they are more widely separated and less clearly defined; one sulcus is median. *Anal somite* smooth, produced into a long stout caudal process, the axis of which is directed slightly upwards, forming an obtuse angle with the line of the back, and the apex is neither up turned nor down turned, anal valves with margins widely compressed. *Pores* conspicuous behind the transverse sulcus and about in the middle of the side. *Ventral grooves* short.

Legs tolerably long, with the fourth and fifth segments padded beneath, and the others adorned with three or four hairs in a series. Number of somites 67; length about 160 mm.

Copulatory feet with anterior laminæ very narrow and slender, widening distally, with its surface sub-costate; the central, protrusible portion consisting of an elongate, slender, cylindrical rod, pointed at its distal end; from the distal fourth of its length there springs a posterior piece, which, slender at first, rapidly expands into a wide lamina bearing distally on its external angle a backwardly directed, slightly curved, slender-pointed process, fringed beneath with conspicuous hairs.

Of this handsome species the British Museum has a single dried specimen from Ceylon (Holdsworth coll.).

This species may be at once recognised by the form of the collum in the ♂, and by the straight, long, stout caudal process.

Spirostreptus insculptus, sp. n.

(Pl. i, fig. 8.)

Colour (in alcohol), anterior half of somites deep reddish-cinereous, posterior half deep blackish-grey, anterior and posterior borders of collum narrowly ferruginous, upper portion of head brunneo-fuscous,

lower portion ferruginous; antennæ flavous; legs flavous-ferruginous at the base; anal somite with valves pale ochraceous.

Head; vertex with a faintly marked sulcus, lower portion irregularly striolate, four punctures above the labral excision; *eyes* composed of 53-66 ocelli arranged in 7 or 8 transverse rows, distance between the eyes about equal to or a little less than a diameter; *antennæ* somewhat short, reaching just beyond the hind border of the side of the collum.

Somites; collum covered with a reticulated pattern of striolæ; lateral portion not markedly narrowed, with infero-anterior angles obtusely convex and defined by a sulcus, posterior angle rectangularly convex, marked inferiorly and posteriorly with two crescentic sulci; the rest divided into an anterior and posterior half by a complete transverse groove, the anterior half nearly smooth in front and finely striolate transversely, but distinctly and finely rugose behind; the posterior half strongly sculptured out into fine, close-set, more or less branching and anastomosing, smooth ridges which inferiorly pass into the normal longitudinal striæ; the *pores* situated about in the middle of the side, in the posterior half immediately behind the groove which here is sinuate: *anal somite* covered with a reticulated pattern of striolæ, the upper portion irregularly grooved longitudinally, transversely impressed and angled posteriorly, but not produced into a tail, merely covering and not overlapping the upper angles of the valves; *valves* with their margins but little convex, but strongly and somewhat widely compressed; *sternite* with hinder border convex.

Legs very smooth, with a single set on the lower surface of each segment.

Number of *somites* 64-65; length up to 117 mm.

The British Museum has two dried and faded examples of this species from Ceylon (Templeton); Mr. Green brought one from Punduloya, which, seeing that it is not faded, I have selected as the type of the new species. This specimen is the smallest of the three, measuring only 70 mm. in length; whereas Templeton's examples measure 90 and 117 mm. respectively.

Sp. contemptus of Karsch is related to *Sp. insculptus*; the two may indeed prove to be synonymous, but in the description of *Sp. contemptus*,

nothing is said about the size of the species, or the number of segments, or the distance between the eyes, and the segments are described as being laterally and superiorly "subgranulosa, rugosa," and since the former epithet certainly does not to my mind intelligibly express the sculpturing of *Sp. insculptus*, I must provisionally, at all events, look upon the two species as distinct.

Spirostreptus lankaensis, Humbert.

(Pl. ii, fig. 6.)

Op. cit., p. 50.

Colour (in alcohol); *head* ochraceo-fuscous; *antennæ* fuscous, flavo-annulate; *legs* ochraceous, concolorous, *anal somite* fuscous, with margins of valves and apex of tail ochraceous; rest of the somites fuscous anteriorly, ochraceous posteriorly.

Body long and slender; sub-cylindrical. *Head* and face convex, smooth and shining; with a very faint sulcus above; four labral punctures; *eyes* widely separated, composed of about 39 ocelli arranged in six transverse series; *antennæ* moderately long, stretching to the end of second somite.

Somites; collum laterally narrowed, its anterior border straight, anterior angle widely rounded, inferior border lightly convex, posterior angle nearly squared, a wide and deep sulcus running from the posterior angle as high as the eye, defining a narrow inferior border and a wide anterior border to the lateral lamina, in front of this sulcus is a second fine and shorter one reaching half way to the eye. The rest of the somites (except the anal) with a deep transverse sulcus; the anterior half concentrically and transversely striolate anteriorly, the posterior half longitudinally striate throughout, the striæ close-set, running from the sulcus and just falling short of the hinder margin, some longer and some shorter; *pores* about the middle of the body, conspicuous, situated in a smooth area, about one-quarter of the distance between the sulcus and the hinder margin of the somite; *ventral grooves* small; *anal somite* smooth, produced above into a short straight blunt process which continues the line of the back and projects slightly beyond the anal valves; *valves* convex, with compressed margins; *sternite* posteriorly angled, defined posteriorly by a groove.

Number of somites 63. Length about 53 mm.; width 3·5.

A single ♀ specimen from Punduloya.

This species apparently falls into the same category as *Sp. caudiculatus* of Karsch. It may, however, be recognised by its blunt, straight caudal process, the incompleteness and the varying length of the tergal striæ, the separation of the pores from the sulcus, &c.

Spirobolus carnifex, (Fabr.).

(Pl. ii, fig. 9.)

Syn. *Iulus carnifex*, Fabr., Sys. Ent., p. 428; Spec. Ins., i, p. 530; Ent. Sys., ii, p. 395, no. 9.

„ *Spirobolus carnifex*, Brandt, Recueil., p. 188; Gervais, Ins. Apt., iv, p. 163 (1847); C. Koch, Die Myr., i, p. 62, fig. 53 (1863).

„ *Spirobolus ruficollis*, Newport, Ann. Mag. Nat. Hist., xiii, p. 269 (1844).

Mr. Thurston sent two ♂ specimens from Madras. The British Museum has it also from Ceylon. The type was described from Tranquebar. Tömösvary has recorded it from Matang in Borneo, but whether correctly or not I am unable to judge. C. Koch has apparently described the right species, but his locality for it, *i. e.*, Georgia (N. America), needs, to my mind, confirmation.

Newport's species *Sp. ruficollis*, the type of which is in the British Museum, is the same as *Sp. carnifex*.

This author gives New Holland as the locality, but upon what authority I am unable to determine. At the present time there is not a particle of evidence to show whence the specimens were obtained.

In the ♂ the anterior 6 pairs of legs are curiously modified, the proximal segments being inferiorly produced and somewhat compressed; on the 3rd, 4th and 5th pairs there projects from between the legs an elongate, slender, clavate process which is in contact with its fellow of the opposite side; the processes are outgrowths of the basal segment of the legs. There appear to be no suctorial pads upon the feet in this sex.

The anterior unpaired portion of the copulatory foot is composed distinctly of three rami, two projecting obliquely upwards and outwards to embrace the summits of the lateral moieties and hold them together, the third slender, shorter, and pointed projects in the middle line, far below the lowest point of the anterior portion of the

lateral moiety, and almost as far as the lowest point of its posterior portion; the anterior portion terminates below in a strong spiniform process, the posterior portion is somewhat slender and pediform.

Spirobolus goësi, Porath.

Syn. *Spirobolus goësi*, Porath, Bih. Sv. Vet. Ak. Handl., iv, p. 36 (1876); id., Ann. Soc. Est. Belg., xxxii, pp. 244, 245 (1889).

„ *Spirobolus dominicæ*, Pocock, Ann. Mag. Nat. Hist., (6), ii, (1888), pp. 481-483, pl. xvi, figs. f.-f^{6} (1888).

One specimen from Madras (Mr. Thurston).

This species is very widely spread, and its synonymy almost certainly not yet known.

So far as can be at present determined Porath's name has the priority; but there is little doubt, in my opinion, that this name will have ultimately to give way to some other at present not yet identified. This species is very commonly met with in the Oriental Region. Porath has recorded it from Sumatra, Java, and Borneo. The British Museum has examples from Assam, Burma, Cambodia, China, Cochin-China, Singapore, the Seychelles, and from Dominica in the W. Indies. I have carefully compared the type of *dominicæ* with examples from many localities in the old world and can find for it no differential characters.

Spirobolus thurstoni, sp. n.

(Pl. i, fig. 9; pl. ii, fig. 8.)

Colour (in alcohol); head rufo- or griseo-olivaceous, margin of labrum ochraceous; antennæ and legs ochraceous; segments deep bluish-grey in front of the sulcus, picco-castaneous behind it, anterior border of collum pale, anal somite wholly brown.

Head and *face* punctured and striolate, the vertex with a very feeble sulcus, the face with a longitudinal sulcus, the labral margin widely excavated, bearing two widely separated punctures on each side; *eyes* forming an irregularly rounded cluster composed of about 32 ocelli; widely separated.

Somites; collum finely punctured and striolate, its anterior border smooth, laterally gradually narrowed, with apex blunt, rounded behind, squared in front, not marked with groove or crests, the

anterior border being undefined; the second segment also punctured and striolate, produced laterally below the level of the collum and sending forwards a strong angular process beneath it, which projects as far forwards as the anterior margin of the collum; the rest of the segments (except the anal) with a well-marked transverse circular groove, the anterior piece above ornamented with fine anastomosing striæ which behind become imperceptibly coarser, when the pattern takes the form of a multitude of close-set semilunar pits, laterally and inferiorly this portion is ornamented behind with irregularly branching longitudinal striæ; the transverse groove marked laterally with a series of pits; the posterior half is a little elevated, longitudinally sulcate at the sides, punctured and obscurely longitudinally striolate above, nearly smooth posteriorly; *pores* conspicuous, all on a level above the middle of the body, in front of the transverse sulcus; *anal somite* punctured and rugulose, a well developed, basally sub-compressed, nearly smooth, caudal process; the process nearly continuing the line of the back, usually nearly straight, rarely markedly down curled, never up-curled, projecting far beyond the margin of the valves; *valves* punctured convex, border convex above, nearly straight beneath, nearly smooth, strongly compressed, the compressed part above more than half the length of the convex part; *sternite* forming distinctly an obtuse angled triangle.

Legs short and very smooth, each segment furnished beneath with a single distal seta, a single seta above the terminal claw.

Number of segments 45; length about 80 mm.

♂. Slenderer than the ♀; the distal segment of the legs with adhesory disk throughout its length.

Copulatory feet; the median anterior piece very long, tongue-like, projecting below nearly as far as the apex of the lateral pieces, excavated superficially, ending above in two long stout processes which embrace the summits of the lateral portions; anterior portion, right and left halves, externally convex; the posterior portion projecting inferiorly far below the anterior, bluntly pointed below with a conspicuous notch on its external border, the notch bounded below by a conspicuous process and passing posteriorly into a wide excavated area; central (protrusible) portion anteriorly evenly convex, upper half stout, lower half ending in two processes, an upper shorter,

wider, bearing a strong curved pointed tooth, and a lower, longer, more slender, bearing an apical curved spine, and posteriorly more or less membranous.

Several specimens from Madras (Mr. Thurston).

This species, with which I have great pleasure in associating Mr. Thurston's name, appears to fall into the same category as *Sp. vogesi* of Karsch from New Hanover. It, at least, however, differs in having the collum not marked with a sulcus, and the second somite below produced forwards.

Spirobolus uroceros, sp. n.

(Pl. ii, fig. 7.)

Colour : the posterior half of the segment probably piceous and the anterior more or less cinereous; face, antennæ and legs ochraceous. *Face* tolerably flat, with a short frontal sulcus, and a conspicuous long sulcus dividing the labral region, punctulate, with four labral pores, two near the middle and two at the sides; *antennæ* short although of normal length for the genus; *eyes* composed of about 43 ocelli arranged in 6 or 7 transverse rows; the distance between them about equal to a diameter and a half.

Collum punctulate, coarsely punctured along its posterior border; neither striate nor sulcate laterally, and with an almost obsolete marginal sulcus, the anterior angle nearly a right angle, the posterior angle widely convex, the posterior border sloping obliquely backwards and upwards from the posterior angle; the 2nd segment projecting inferiorly below the level of the first, with its inferior portion produced forwards to a point on a level with the anterior angle of the collum. The hinder half of all the segments, except the first and last, furnished posteriorly with distinct coarser and finer tubercles, which gradually disappear inferiorly and laterally, and give place to longitudinal striæ, the anterior portion, lower than the posterior portion, nearly smooth, the sterna striate. The *anal somite* of large size, punctulate, compressed above and produced into a long, stout, smooth, pointed, slightly down-turned caudal process; margins of the anal valves strongly compressed. *Pores* situated in front of the transverse sulcus and above the middle of the side; the first on a level with the rest. *Ventral grooves* short.

Legs with a single seta on the under surface of each segment.

Number of segments 49. Length about 120 mm.

A single ♀ specimen from Madras (Jerdan coll.)

This species may be readily recognised by its long hooked caudal process, and the tubercular ornamentation of the tergites. This last character is one by which it may be at once distinguished from *Sp. thurstoni*, which in other respects it seems to approach.

Spirobolus greeni, sp. n.

(Pl. i, figs. 10, 10a.)

Colour (in alcohol); *head* infuscate, antennæ infuscate, paler at the base; collum infuscate with paler borders, rest of the somites bluish slate-grey, with a single large, wide, fulvous spot on the posterior half on each side of the middle line of the back, anal somite fulvous, slightly fuscous above; legs wholly fulvous.

Head and *face* smooth, the latter marked with a longitudinal sulcus, and with two pores on each side; *antennæ* very long for the genus, reaching to about the 4th or 5th somite; *eyes* large, widely separated, composed of about 50 well defined ocelli.

Somites without scobina; collum punctulate and rugulose, not produced so low as the inferior extension of the second, the apex obtusely rounded, with the margins nearly straight, *i.e.*, only slightly convex, the apex and the anterior margin as high as the eye defined by a sulcus; the posterior half of the other segments much higher than the anterior, marked laterally as high as the pores with distinct sub-parallel longitudinal striæ, the upper part above the pores marked with punctures and irregularly scattered, abbreviated, anastomosing striæ, forming an obscurely reticulated pattern; the anterior portion marked above with circular or elliptical areas, and below with oblique more or less curved striæ which are continuous with the striæ of the posterior portion; *pores* situated above the middle of the sides, in the posterior half of each somite the first a little lower than the second. *Anal somite* punctulate, the upper part produced into a short, blunt, straight, slightly compressed caudal process, projecting a little beyond the margin of the valves; *valves* convex, strongly but narrowly compressed, the upper angle not compressed and a little produced; *sternite* posteriorly rounded and angulate.

Legs slender, elongate, with a single seta on the lower edge of each segment.

Number of somites about 40; length about 35 mm. Punduloya (Mr. Green).

Like *Sp. spirostreptinus* of Karsch in having long antennæ, in the position of its pores, &c. But differs in sculpturing, *Sp. spirostreptinus* having the upper part of its segments roughened with longitudinal striæ.

Spirobolus longicornis, sp. n.

(Pl. ii, fig. 11.)

Colour (in alcohol); head fusco-testaceous, antennæ testaceous, infuscate at the apex, legs ochraceous, somites with ferruginous posterior portions, fuscous anterior portions, anal somite paler.

Head and face smooth, vertex marked with a slender sulcus; face marked with a sulcus, and furnished with 2 pores on each side; antennæ long as in the preceding species; eyes composed of about 30 ocelli.

Somites; *collum* finely reticulated, not produced inferiorly so low as the second somite, its inferior angle less narrowed, more rounded, with convex posterior and lightly concave anterior border, posteriorly striolate, anteriorly marked with a marginal sulcus; posterior part of the rest of the somites scarcely higher than the anterior, and ornamented throughout with exceedingly fine, close-set, sub-parallel striolæ, but these striolæ, instead of being absolutely longitudinal, are slightly oblique, diverging slightly from the median dorsal line which is a little elevated, the anterior portion with scobina, marked below laterally with longitudinal striolæ continuous with those of the posterior portion, and above with a distinctly defined reticulated network formed by the anastomosis of striolæ; *pores* above the middle in the hinder half of each somite, the first scarcely below the level of the rest. *Anal somite* punctulate and striolate, produced above into a short, blunt, markedly compressed process which projects a little beyond the margin of the anal valves; *valves* convex with borders compressed; *sternite* conspicuously angled.

Legs slender, elongate, with a single seta on the under edge of each segment.

Number of somites 40-42; length up to about 32 mm.

Punduloya (Mr. Green).

Resembles the preceding species and *Sp. spirostreptinus* in having long antennæ, but differs from both in colouring, in being furnished

with the so-called scobina, &c. Probably most nearly related to *Sp. crebrestriatus* of Humbert, which it somewhat resembles in sculpturing and in possessing the so-called scobina. It may, however, be recognised by the much greater convexity of the margins of the anal valves, and by the strongly-angled border of the anal sternite, and by the differences of colour.

Spirobolus longicollis, sp. n.

(Pl. ii, fig. 10.)

Colour (in alcohol); pale testaceous throughout, the anterior half of the somites only being of a deeper greyish tint.

Head nearly smooth, the face marked with a short longitudinal sulcus; two widely separated pores on each side of the labral region; *eyes* widely separated, composed of about 30 indistinctly defined ocelli; *antennæ* very short, scarcely reaching to the margin of the collum.

Somites without scobina; *collum* punctured throughout, produced laterally *below* the inferior extension of the succeeding somite, narrowed to a rounded apex with convex posterior border and straight anterior border, the apex and the anterior border as high as the eye defined by a groove, the rest not sulcate; the second and succeeding segments divided into an anterior and posterior portion by a groove; the posterior portion is more elevated than the anterior, punctured and obscurely and irregularly striolate above, longitudinally striate at the sides, the anterior portion marked laterally and inferiorly with oblique close-set striæ, which becoming more and more curved dorsally, eventually pass into elliptical and crescentic areas on the upper surface; *pores*, all on a level above the middle of the side, in the posterior half of the somites well behind the transverse groove; anal somite punctulate, the upper surface produced posteriorly into a stout, blunt, cylindrical, slightly down-turned caudal process which projects a little beyond the anal valves; *valves* convex with strongly but narrowly compressed borders; *sternite* transversely elongate, with nearly straight hinder border.

Legs slender, with a single seta on the under surface of each segment.

Number of segments 38 or 40; length about 28 mm.

Two female specimens from Punduloya (Mr. Green).

Differs from all the known Ceylonese forms in that the collum extends laterally below the level of the 2nd somite.

Family, *Polyzonidæ*.

Siphonophora humberti, sp. n.

Colour (in alcohol) uniformly ochraceous.

Body slender, composed of 60 segments.

Head ovate, about as long as the rostrum which is lightly curved; *antennæ* about as long as the rostrum.

Somites lightly convex above, meeting the pleuræ at an obtuse angle, and separated from them by a distinct suture, neither tubercular nor carinate. (The upper part of some of the somites is higher than the others. But since there is no symmetry in these elevations I shall regard them as abnormalities, until evidence to the contrary is forthcoming.) Anal somite blunt posteriorly.

The head and upper part of the somites densely and coarsely hairy and granular; pleuræ granular but less hairy; rostrum smooth.

Length about 12 mm.

A single specimen from Punduloya (Mr. Green).

Only one species of this genus has hitherto been recorded from Ceylon, namely, *S. picteti* of Humbert. This species is unknown to me, but judging from the figure, it is much stouter in build than the one here described. Moreover, the somites are laterally carinate.

(*To be continued.*)

DESCRIPTION OF PLATE I.

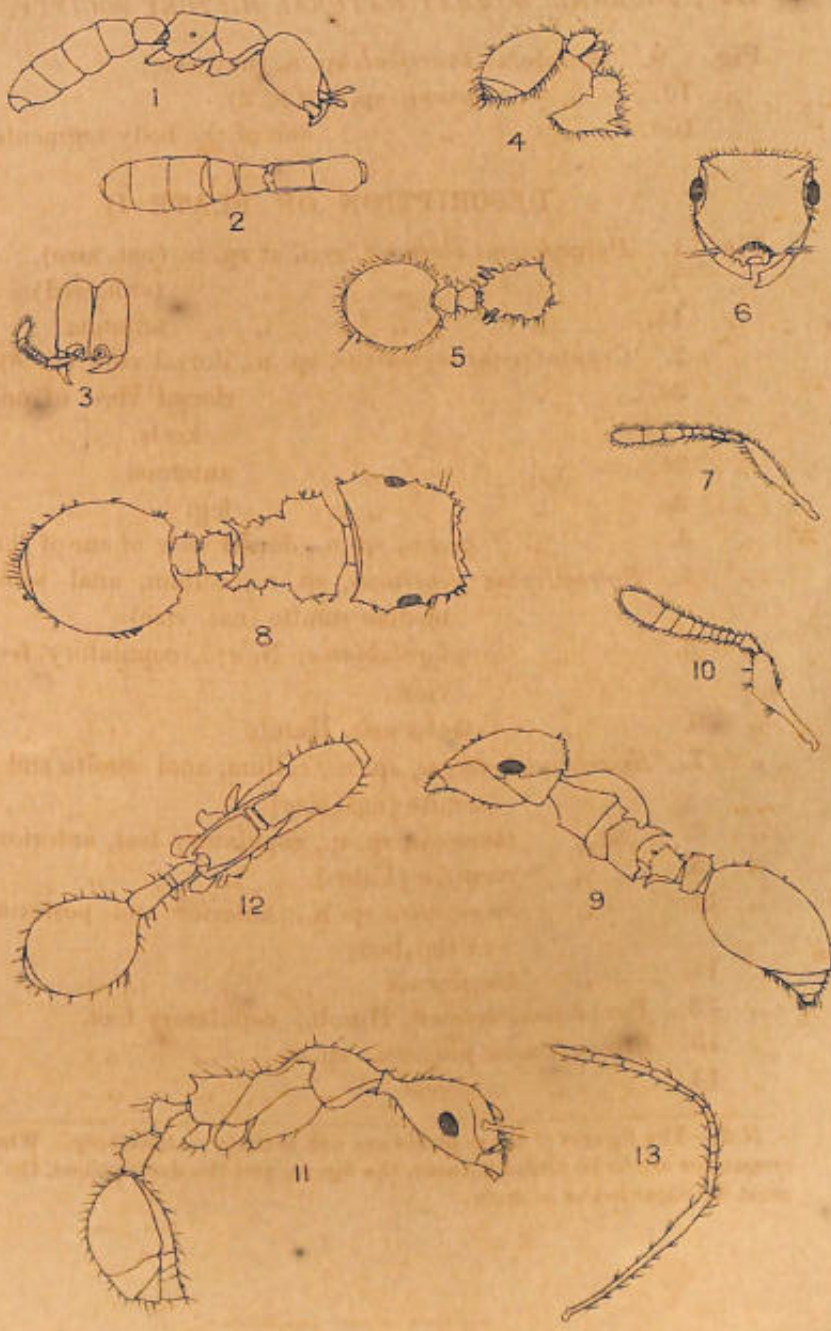
Fig. 1. *Zephronia heterosticatica*, Newp. (nat. size).
„ 2. *Stemmiulus ceylonicus*, sp. n. (× 3).
„ 3. *Leptodermus tanjoricus*, sp. n. (× 2).
„ 3*a*. „ „ copulatory foot.
„ 3*b*. „ „ posterior leg of 6th somite of ♂.
„ 4. *Strongylosoma phipsoni*, sp. n. (× 2).
„ 5. „ *cingalense*, Humb., copulatory foot.
„ 6. „ *skinneri*, Humb., copulatory foot.
„ 7. *Spirostreptus nigrolabiatus*, Newp. (nat. size).
„ 8. „ *insculptus*, sp. n. (nat. size).

Fig. 9. *Spirobolus thurstoni*, sp. n. (nat. size).
„ 10. „ *greeni*, sp. n. (× 2).
„ 10*a*. „ „ „ one of the body segments.

DESCRIPTION OF PLATE II.

Fig. 1. *Pyrgodesmus obscurus*, gen. et sp. n. (nat. size).
„ 1*a*. „ „ „ (enlarged).
„ 1*b*. „ „ „ antenna.
„ 2. *Cryptodesmus ceylonicus*, sp. n., dorsal view (× 6).
„ 2*a*. „ „ dorsal view of one of the keels.
„ 2*b*. „ „ antenna.
„ 2*c*. „ „ leg.
„ 3. „ *greeni*, sp. n., dorsal view of one of the keels.
„ 4. *Spirostreptus centrurus*, sp. n., collum, anal somite and median somite (nat. size).
„ 5. „ *nigrolabiatus*, Newp., copulatory feet, front view.
„ 6. „ *lankaensis*, Humb.
„ 7. *Spirobolus uroceros*, sp. n., collum, anal somite and median somite (nat. size).
„ 8. „ *thurstoni*, sp. n., copulatory feet, anterior view.
„ 9. „ *carnifex* (Fabr.) „ „ „
„ 10. „ *longicollis*, sp. n., anterior and posterior ends of the body.
„ 11. „ *longicornis* „ „ „ „ „
„ 12. *Paradesmus kelaarti*, Humb., copulatory foot.
„ 13. *Strongylosoma phipsoni*, sp. n. „ „
„ 14. „ *greeni* „ „ „

N.B.—The figures of these plates are not entirely satisfactory. Where discrepancies are to be found between the figures and the descriptions, the former must be regarded as in error.



Robt Wroughton, del.

Govt Photozinco. Office, Poona 1891

Govt. Photozincos Office, Poona 1911.

OUR ANTS.

By Robert Charles Wroughton, F.E.S., Deputy Conservator of Forests, Poona.

Part II.

With Plates C and D.

(*Read before the Bombay Natural History Society, 15th April, 1892.*)

DORYLIDÆ.

Gen. 26. Dorylus (Fab.).

Pedicle with one knot; antennæ 12-jointed.

104. *D. juvenculus* (Shuck.).

Poona Dists. (♂).

Bombay, through H. M. Phipson (♂).

Among the *Dorylidæ* the various sex-forms are so astonishingly different, and, owing to their subterranean and nocturnal habits, have so seldom been taken together, that the described species contain only ♂ or ☿, never both; for a long time indeed the ☿ *Dorylus* was placed in a separate genus, *Typhlopone*. Jerdon and others, however, took *Dorylus* and *Typhlopone* in the same nest, and it is now generally admitted that they are one genus. Yet another genus *Dickthadia*, which contains two species (one specimen of each species has been taken) of most extraordinary looking apterous insects, is conjectured to be the ♀ of *Dorylus-Typhlopone*. Until the ♂ and ☿ can again be taken together and examined by an expert, they must remain as at present different species. *D. juvenculus* is the commonest species; he is well over an inch long, a very large part being abdomen, which is so unwieldy that it is not 'carried' but 'trailed' by its owner. They come freely to the light at night. E. H. A., in his "Tribes on my Frontier," describes a 'flight' of this insect which emerged in his bath-room. These flights, I have reason to believe, occur frequently in Bombay, and I would ask members, should they be present at such a flight, that they will secure and send me some specimens of the ♂ together with the ☿ which invariably come out to see them off. This species is also found on the Mediterranean littoral.

105. *D. longicornis* (Shuck.).

Poona Dists. (♂).

Calcutta.....G. A. J. Rothney (♂).

This species, though fully an inch long, is smaller and slighter than *D. juvenculus*.

106. *Dorylus* (*Typhlopone*) *sp.*
Poona Dists. (☿).

I have no doubt that this will prove to be the ☿ of *D. juvenculus*.

107. *Dorylus* (*Typhlopone*) *sp.*
Mian Mir, Punjab.....Major Sage (☿).

108. *Dor.* (*Typhlopone*) *orientalis* (Westwood).
Calcutta.....G. A. J. Rothney (☿).

Gen. 27. ALAOPONE (Emery).

Pedicle of one knot; antennæ 9-jointed.

109. *Al. oberthüri* (Emery).
Poona Dists. (☿).
Orissa.....Jas. Taylor (☿).
Calcutta.....G. A. J. Rothney.

Mr. Taylor notes of this species: "It never appears outside the "ground, at any rate during the day. I had a lot of damage "done to my trunks by them, as they eat them just like *Termites* "do, and also cut through my cauliflower stalks below the "ground." I do not know the ♂, but have sometimes wondered whether *D. longicornis* could be he.

Gen. 28. ÆNICTUS (Shuck.).

Pedicle with two knots.

(NOTE.—This applies to the ☿; the ♂ has a strong family likeness to *Dorylus* ♂, but is much smaller, the largest I know being only ½ inch long).

110. *Æ. wroughtoni* (Forel MS.).
Poona Dists. (♂).
Thana Dists.....F. Gleadow (♂, ☿, 31-3-90).
Dharmsala, Punjab .....Major Sage (a variety; ☿).

Æ. wroughtoni is the only species of the genus of which the ♂ and ☿ are known; all the other species contain only ☿ or ♂. The ♂ and ☿ of this species were taken together by Mr. Gleadow in the Rest House at Sawa, near Dahanu. By this discovery the genus *Typhlatta*, which formerly contained the various known species of ☿,

was merged in *Ænictus*. A detailed description of this species by Dr. Forel has been reprinted in this Journal.

111. *Æ. ambiguus* (Shuck.).
Poona Dists. (♂).

This is the largest species I know; it is not uncommon in the Dekhan, coming to the light at night, especially in the hot weather months.

112. *Æ. latiscapus*. (Forel MS.).
Poona Dists. (♂).

113. *Æ. clavatus* (Forel MS.).
Poona Dists. (♂).

114. *Æ. ceylonicus* (Mayr).
C. Provinces .....J. A. Betham (☿).

115. *Æ. bengalensis* (Mayr).
Calcutta, 1872.....G. A. J. Rothney (☿; type).
Colombo .....G. A. J. Rothney (variety).

116. *Æ. brevicornis* (Mayr).
Calcutta..... G. A. J. Rothney (☿; type).

117. *Æ. aitkeni* (Forel MS.).
Goa..... E. H. Aitken (☿).
Thana Dists. ....F. Gleadow (a variety; ☿).

118. *Æ. binghami* (Forel MS.).
Burma .... Major C. T. Bingham (☿).

119. *Ænictus sp.*
Poona Dists.

This is the only species of ☿ I have ever met; but it is far from uncommon in the Dekhan. Notwithstanding the possession by *Ænictus* ☿ of two knots in the pedicle like the *Myrmicidæ*, she is distinctly ponerine in character and carries her booty exactly as do the *Ponerida*. She has brought the military organization to perfection. Perhaps on account of her small size, (single-handed she does not seem able to cope with a *Pheidole*, as small as or smaller than herself), she cannot afford to relax discipline, like *Lobopelta*, even in the moment of victory. Whatever the reason, a column of *Ænictus* (5 or 6 abreast), so long as it is above ground, never shows the slightest irregularity. The destination of the column is not fixed beforehand by scouts, as is apparently the case with *Lobopelta*. It starts, and proceeds at a long

slinging trot, until a likely hole, crevice, or ants' nest is met with, when it pours in, until enough having entered, the remainder of the column goes on, in search of another hole. Moreover at times, when on the march, the column at a certain point in its length, turns off at an angle, striking out a new line, and, though this manœuvre is often repeated, so far as I have seen, it never happens a few files from the head of the column, but always so that each column shall be strong enough to cope with any ant community likely to be met with. Indeed, this manœuvre seems often to be of the nature of a flanking movement. I have seen a strong column, marching on a white ant heap, detach, in this way, columns right and left, and the several detached columns enter the heap from different points of the compass. The notion irresistibly forced on any one, watching these manœuvres, is that they are either the result of preconcerted arrangement, or are carried out by word of command.

MYRMICIDÆ.

Gen. 29. Cataulacus (Smith).

The most striking characteristics of this genus are 'flatness' and 'raggedness'; every 'edge' is serrate or crenelate, and every corner (usually a curve in other ants) is produced into a 'tooth' or spine.

120. *Cat. latus* (Forel MS.).
Poona Dists. .....(14-6-90, ☿, ♂, ♀).
Thana Dists. .....F. Gleadow (a variety).

I found a nest of this species in the hollow bough of a tree; on opening the nest I found the tunnel full of larvæ and pupæ, and lined with the pupæ of some kind of *Lycæna* (*?*); I tried hard, but failed to rear the butterfly, the pupæ apparently requiring the moist atmosphere of the ants' nest, and possibly the tender care of the ants. I have always found the nest of this species in hollows in growing trees.

121. *Cat. granulatus* (Smith).
Tounghoo, Burma ..... E. Y. Watson.

122. *Cat. taprobanæ* (Smith).
Colombo ..... G. A. J. Rothney.

Gen. 30. MERANOPLUS (Smith).

I have been unable to obtain any scientific details about this and the preceding genus. *Meranoplus* is a small ant, which by its hairiness reminds one strongly of a *Mutilla*; once seen it can never be mistaken for any other ant. The antennæ are 9-jointed.

123. *Mer. bicolor* (Guérin).

Poona Dists..... (24-1-90, ♂).
Kanara..... ..... E. H. Aitken.
Salem, Madras..... A. Burroughs Sharpe.
Calcutta .....G. A. J. Rothney (☿, ♀, ♂, May, 1873).
Upper and Lower Burma ... E. Y. Watson.
Ceylon..... Major Yerbury.

M. bicolor is very sluggish in her movements; she rolls herself up into a ball on the smallest provocation, and always dies in that position. The nest is subterranean, and the ones I have explored were on the typical myrmicine plan; the grain harvested being brought home 'clean' and stored in the subsidiary chambers. I found the entrance to the nest, in one case, strewn with the petals of a lilac flower. Mr. Aitken also notes: "I found several nests last February, with "the ants busy collecting minute bluish flowers; these were taken "into the nest, something extracted from them, and then the "petals (whole corollas rather) thrown out."

Gen. 31. TRIGLYPHOTHRIX (Forel).

To the ordinary observer this genus is apparently a very small *Meranoplus*; in it the main hairs are trifurcate, whence its name. A detailed description of this genus has been reprinted in this Journal.

124. *Trig. walshi* (Forel).

Poona.
Coonoor, Madras .....R. W. Daly.
Pooree, Bengal .....D. Walsh (type).

This is the only species of the genus. In its appearance, movements, architecture, habits and tricks it is an under-study of *Meranoplus*. In one nest I opened there were some minute hymenopterous insects which I took at first for ♂, but which were not so. Unfortunately they were blown away while I was examining them under the microscope. They were evidently either pets or cattle. There

is some doubt whether this is not a synonym of *Tetr. lanuginosum* (Roger), in which case it will become *Triglyphothrix lanuginosus*. I cannot repeat too often that such points must necessarily be left doubtful for the present. Dr. Forel can only devote his studies to one genus at a time. A monograph on *Camponotus* has been completed and another genus is in hand, the rest must wait their turn.

Gen. 32. HOLCOMYRMEX (Mayr).

The antennæ are 12-jointed, the 3 terminal joints, forming the club, are shorter than the rest of the flagellum (*i.e.*, than the rest of the antennæ, excluding the scape, or first joint): the abdomen is truncate at the base.

125. *H. scabriceps* (Mayr).

Poona Dists. .....(10-3-90, ♀).
Kanara.....E. H. Aitken.
C. Provinces .....J. A. Betham.
Salem, Madras.....A. Burroughs Sharpe.
Thana Districts .....F. Gleadow.
Nuddea; Barrackpore .....G. A. J. Rothney (type).
Rai Bareilli, Oudh .....Dr. Simpson.
Orissa .....Jas. Taylor.

In a community of this genus there are ☿ of all sizes. *Holcomyrmex* is, as a rule, a most industrious harvester, and sets about her work in a most methodical way. The ☿ never forage individually for grain, but all take the same road and all return by the same road; the result being that every nest is the starting point of one and often of several, well-beaten tracks, cleared of vegetation and obstacles, and extending sometimes 100 feet and more in length. How these tracks are engineered I have never discovered, but am pretty certain that they are made gradually; a commencement at hazard is made, and, as the country immediately adjoining the road is exploited, the road itself is carried forward. Where one of these roads crosses a sheet of bare rock, it is there marked in white; I can only presume that this is the result of some chemical action, set up by the formic acid exuding from the ants; this acid, though too small in quantity in a single ant to cause any appreciable effect, might easily become sufficient when thousands of ants are continually passing, backwards and forwards, all day long. *Holcomyrmex*

brings home the grain unthreshed, and, in this form, it is taken into the nest, from whence the chaff is brought out, and deposited round the entrance, or, where the force of a prevalent wind is felt, in a heap to leeward. The normal nest of *Holcomyrmex* is on the typical plan; she, however, adapting herself easily to circumstances. There is a note on this species in Mr. Rothney's paper, under the name of *H. indicus*.* Mr. Rothney considers this species as the 'harvester' *par excellence*, and to some extent she deserves the title for her ingenuity in saving time by methodical labour. She cannot, I think, compare with *Pheidole* in results achieved; she is handicapped by her shape, her huge head, long body, and short legs rendering cross country work most difficult for her; indeed, it is possibly these disabilities which have driven her to evolve road-making to enable her to hold her own in the struggle for existence.

Mr. Rothney, writing to me on this subject, says:—"In the "Calcutta District *Pheidole* is but poorly represented, and I have not "met with any harvesting instincts worthy of the name, while "*Holcomyrmex* is a great 'harvester,' but, removed from the compe-"tition of *Pheidole*, does not work quite so systematically in the way "of 'walks' or 'tracks' as she seems to do on the Bombay side." During breaks in the rains *Holcomyrmex* brings her stores of grain to the surface, evidently to dry: I have never seen any *Pheidole* do this.

126. *H. criniceps* (Mayr).

Poona Districts... .....(11-6-90, ♂, ♀).
Thana Districts.....F. Gleadow (Xmas, 90, ♂, ♀)
Ceylon .....Major Yerbury (a variety).
Madras .....G. A. J. Rothney.

This species I have only found round about Poona.

In nesting and habits it does not differ from *H. scabriceps*. I took the sexes 'swarming' in June.

127. *H. criniceps* (Mayr); race *nigra* (Forel MS.).

Poona Districts.....(30-4-90, ♀).

This is the common form on the Poona Ghâts, where alone I have taken it. Curiously enough it is there associated not with *H. criniceps*

* Note.—This error of nomenclature was due to the late Frederick Smith, but was corrected in the Transactions of the Entom. Society of London, 1889, Part V.

but with *H. scabriceps*. I saw a migration of this species, on one occasion, in April; there were plenty of ♀, but only one ♂. This is curious, as, usually, there are plenty of ♂ in an ants' nest before the first ♀ is hatched. I took the sexes swarming in June.

128. *H. glaber* (André).

Poona Districts.

This and the next are cretin forms of *Holcomyrmex*. *H. glaber* is small, bleached, and feeble-looking; her nest is placed under a stone, and extends to no depth. There are no roads and no sign of life outside the nest and no grain-refuse at the entrance, but the chambers contain grain.

129. *H. glaber* (André); race *clara* (Forel MS.).

Poona Districts.

H. clara is very like *H. glaber* proper, but still more feeble.

130. *Holcomyrmex, sp.*

Travancore.....H. S. Ferguson.

This species has not yet received her "given name."

Gen. 33. Aphœnogaster (Mayr).

Antennæ much as in *Holcomyrmex;* abdomen not truncate at the base.

131. *Aph. beccarii* (Emery).

Poona Districts.

Kanara.....E. H. Aitken (variety).

A. beccarii is common enough all over the moist zone of the Dekhan, but I have only once found a nest, a mere depression under a stone, containing larvæ and pupæ, but no sexes, not even an apterous ♀. The ♂ comes freely to the light during March, April, and May. The shape of this ant is very characteristic; it looks like two small shiny black beads, joined by a black line (about ¼ inch long, over all) and mounted on long legs. The ☿ moreover has a curious way of walking about on tip-toe with the abdomen tucked forward under the thorax. In many ways *A. beccarii* is ponerine in her habits; for instance, a ☿ never seems to call for help from her companions, but rather to desert a prey which happens to be too large for her own unaided powers. She never, however, carries a load in the ponerine

fashion. It is curious that this markedly carnivorous species should have been bracketted, in the same genus with the next species but one, which is exclusively a vegetarian, and even a harvester; it is now proposed to separate these latter into a new genus *Messor*. Mr. Aitken sent me a fine red-headed variety of *A. beccarii* from Kanara.

132. *Aphænogaster, sp.*

Lahoul .....Major Sage (8-91, ♂, ♀).

This new species was brought from Lahoul by Major Sage, but has not yet been named by Dr. Forel.

133. *Aph. (Messor) barbarus* (Linn.).

Var. *a*—Dharamsala, Punjab .....Major Sage.
Rai Bareilli, Oudh .....Dr. Simpson.
Var. *b*—Rai Bareilli, Oudh.....Dr. Simpson.
Var. *c*—Dharamsala, Punjab .....Major Sage.
Var. *d*—Mount Abu, Rajputana.....F. Gleadow.
Vars. *e* and *f*—Agra; Delhi; Lahore;
Benares; Mussoorie, N.-W.P..... ..G. A. J. Rothney.

This seems to be a most variable species. Major Sage notes it as harvesting seeds. This species, with a number of 'races' and 'varieties,' is found in Egypt, Tunis, &c., where it apparently behaves exactly like our *Holcomyrmex*. Mr. Rothney writes of variety *e* (*f* was taken at Mussoorie) which Dr. Forel has provisionally named var. *punctatus*: "This ant, like the bee *Apis dorsata*, seems to have a great liking for the buildings of the old Moghul Emperors; the bee frequenting the roofs, the ant the steps. You can always find this species in the Taj gardens, Secundra, Itmad-ud-Daulah (Agra), under the great gateway of Fatehpore Sikri at Tughlukabad (Delhi), Shah Dara of Jehangir (Lahore), and the Man Mandir (Benares). It will always be associated in my mind with the "Lions of the North-West."

Gen. 34. MYRMICARIA (Saunders).

Antennæ 7-jointed.

134. *Myr. subcarinata* (Emery).

Poona Districts.
Kanara .....E. H. Aitken, T. D. Bell, H. Palliser.

Travancore.....H. S. Ferguson.
Orissa .....Jas. Taylor (16-6-90, ♀).
Pegu Hills, Burma...Major C. T. Bingham (a variety).
Benares; Calcutta ...G. A. J. Rothney.
Ceylon.....Major Yerbury.

In my experience this is the laziest ant in India; though not uncommon, I have never seen it do anything but 'loaf.' Mr. Rothney, however, says:—"This species is not uncommon in "Bengal, and forms its nests by excavating the earth round the "trunks of trees, throwing it up in mounds of very fine grains, "away from the trunk, and so making a ditch or fosse round the "tree. The winged sexes 'swarm' July 7th to 10th, and are very "handsome in appearance. There was (and probably still is) a nest, "or rather colony, at the big banian tree in Barrackpore Park, near "the Trunk Road, which I have known from 1872 to 1886, not only "is the main stem more or less encircled by these ditches, but many "of the minor ones are partly surrounded by earthworks, some "being completely so. It forms the largest ant-work I have met "with in India. These fosses make excellent traps for other insects, "and a very respectable and miscellaneous list of captures can "always be made from them, such as other species of ants, woodlice, "bugs, cockroaches, &c., &c. These, if so inclined, one might "describe as ant-'pets,' but I have never been able to trace the least "connection between these casuals and *M. subcarinata*, and I think their "presence is purely accidental. As regards food-supply, *M. subcarinata* "lives much like a *polyrachis*." *

135. *Myr. longipes* (Smith).
var. *birmana* (Forel MS.).
Yoonzaleen Valley, Burma .....Major C. T. Bingham.

Gen. 35. LEPTOTHORAX (Mayr).

Antennæ 11-jointed, of which the 3 last form the club; metanotum armed; spurs wanting on the intermediate and posterior legs.

136. *Lept. inermis* (Forel MS.).
Dharamsala, Punjab.....Major Sage.

* Since the above was written, I have seen this species in Kanara, where it is very common. It is there, as described by Mr. Rothney, a great "crater" builder.

Gen. 36. Tetramorium (Mayr).

Antennæ 12-jointed, thorax not constricted; metanotum dentate; spurs simple.

137. *Tetr. obesum* (André).

Poona Districts.

Kanara ... .E. H. Aitken.

Calcutta .....G. A. J. Rothney (variety).

I have several times seen *T. obesum* harvesting some vegetable product (not grain) which looked like dead wood, or fungus. Dr. Forel records of a Tunisian species, that he found them, as slaves, in the nests of other ants; though I have never been able to detect anything approaching to slavery among the Indian ants, I should not have been astonished to find *Tetramorium* enslaved, for her movements and manner remind one irresistibly of the patient, plodding ass.

138. *Tetr. simillimum* (Nyl.).

Poona Districts.

In the only nest I have found there was a little grain stored. The general economy seemed to me to be very much that of *Holc. clarus*, a nest of which was close by.

139. *Tetr. cæspitum* (Lin.).

Poona Districts.

This insect is almost, if not quite, identical with the European form.

140. *Tetr. guineense* (Fab.).

Kanara..... E. H. Aitken.

141. *Tetr. smithi* (Mayr).

Calcutta, 1872 ..... G. A. J. Rothney (type).

Gen. 37. Monomorium (Mayr).

Antennæ 12-jointed, the three terminal joints taken together are shorter than the rest of the flagellum; metanotum unarmed.

142. *Mon. salomonis* (Lin.); race *indicum* (Forel).

Poona Districts .....(6-5-90, ♂, ♀).

C. Provinces... .....J. A. Betham.

Burma .....Major C. T. Bingham.

Mian Mir, Punjab.....Major Sage.

Rai Bareilli, Oudh.....Dr. Simpson.

Madras; Calcutta .....G. A. J. Rothney.

This is the Indian form of a species very fairly common on the Mediterranean littoral and in Egypt. It is a phenomenally active species, and by far the widest 'ranger' of all the ants; it is very common moreover, and hence ubiquitous. It would be quite safe to affirm that a specimen could be found within 50 yards of any spot in any grass land in the Poona Districts. It is a harvester, and in the immediate vicinity of the nest there are usually fairly well-marked roads; I have occasionally found a community travelling up and down a tree, where the only attraction could have been vegetable juices or 'cattle.' I took the winged sexes from a nest early in May.

143. *Mon. vastator* (Smith).

Poona Districts; Thana Districts.

C. Provinces .....J. A. Betham.

Calcutta.....G. A. J. Rothney.

Ceylon .....Major Yerbury.

Smith has also described this species, or a variety, under the name of *M. basale*; the explanation probably being that this species 'varies' enormously. It is almost certainly the 'brown ant' referred to in "Tribes on my Frontier." *M. basale* is very common in the Konkan, where she is a 'house' ant, and is very quick to find any food, especially sugar, which may be left about. She is slow in her movements, and always travels in single file to the food-supply which is being harvested. It is curious to watch the scrupulous way in which a ♀, even though there be no other within 6 inches, follows every winding of the path taken by the ♀ in front of her, leading to the irresistible conclusion that she follows by scent. I have never seen *M. basale* harvest grain, but Mr. Aitken tells me that in Bombay "it "used to carry off the seed from my bird cages. It eats bread too, "gnawing its way into the heart of a loaf, the same with cold "mutton. It is very fond of olive oil." Above the Ghâts it is a wild species, but not common.

144. *Mon. pharaonis* (Lin.).

Poona Districts (a variety).

Kanara.....E. H. Aitken.

Calcutta .....G. A. J. Rothney.

This is a European form.

145. *Mon. mayri* (Forel MS.).
Poona Districts.
Thana Districts.....F. Gleadow.
Tounghoo, Burma.....E. Y. Watson.

I have never found a nest. *M. mayri* came to some jam I had put down as bait in a nala; *Pheidole naoroji* came at the same time, in large numbers; reinforcements of *M. mayri* were then sent for, *Pheidole* beaten off, and the jam enjoyed without molestation, except from me.

146. *Mon. latinode* (Mayr).
Poona Districts.
Mussoorie, N.-W. P.; Calcutta, 1872 ...G. A. J. Rothney.
Orissa .....Jas. Taylor.

I have always found it nesting underground; Mr. Rothney found it in a decayed tree trunk.

147. *Mon. wroughtoni* (Forel MS.).
Poona Districts.

I have only taken this species at sugar; it is very timid and exceptionally nimble.

148. *Mon. orientale* (Mayr).
Calcutta, 1872 .....G. A. J. Rothney (type).

149. *Mon. speculare* (Mayr).
Ceylon.....Major Yerbury.
Calcutta .....G. A. J. Rothney.

Major Yerbury writes: "Nest on trunk of a tree resembled nest "built by many *Hymenoptera*, though substance of nest was decom- "posed horse dung, not mud." I have never come across any attempt by *Monomorium* to 'build' a nest, and think this must have been an adopted and adapted nest.

150. *Monomorium sp.*
Poona Districts.
Poona.....F. Gleadow.

This is a microscopic yellow species. She came to jam on the same occasion as *M. mayri*, mentioned above; whatever the reason, she was avoided by *M. mayri* and *Pheidole* alike; she marched down, in a column only, 30 or 40 strong, unmolested, through the fight raging all round, ate her fill of jam, and marched off, unmolested, home.

In Mr. Gleadow's bungalow, at Poona, a rat, one night, tore a piece off a panther-skin lying on the floor, in the morning a large number of ☿ of this species were found, clustered on the newly-exposed surface.

151. *Monomorium sp.*
Lanowli, Poona Districts.....(18-10-90)

152. *Monomorium sp.*
Baramati, Poona Districts.....(16-12-90)

153. *Monomorium sp.*
Mulsi, Poona Districts.....(9-4-91)

154. *Monomorium sp.*
Dharmsala, Punjab..... Major Sage.

155. *Monomorium sp.*
Myingyan, Burma..... E. Y. Watson.

156. *Monomorium sp.*
Mt. Abu, Rajputana.....F. Gleadow.

157. *Monomorim sp.*
Ataran Valley, Burma.....Major C. T. Bingham.

Most of these species are more or less like *M. basale* alias *vastator*. They must wait until Dr. Forel has leisure to devote to the special examination of this difficult genus, in their present anonymous form.

Gen. 38. CARDIOCONDYLA (Emery).

Antennæ 12-jointed, the last joint longer than the three preceding together.

158. *C. nuda* (Mayr).
Poona Districts (☿).
Calcutta.....G. A. J. Rothney.

I have never taken the ☿ of *C. nuda*, but found a number of apterous ☿ on some rocks in December, 1889. It is a European form.

159. *C. wroughtoni* (Forel).
Poona Districts; Thana Districts ...(4-11-89, ♂ (?), ☿, ☿)

On two occasions I have found a number of communities of this species in blisters on the leaves of Jambhul (*Eugenia jambolana*) trees. In each case with the ☿ and ☿ of *C. wroughtoni* I took a single specimen of an apterous ant, which was described as a new genus

by Dr. Forel under the name of *Emeriya wroughtoni* (a translation of the detailed description was published in this Journal). Lately, Dr. Forel took, in South-Eastern Europe, a new species of *Cardiocondyla*, and, associated with it, an abnormal ant, analogous to *Emeriya*. Dissection of this ant showed it to be a ♂, and the circumstances attending its capture point to it as the ♂ of *Cardiocondyla*; so that *Emeriya* is almost certainly the ♂ of *C. wroughtoni*. This adds a fresh case to the, already known, very rare ones of an apterous ♂ ant.

Gen. 39. Solenopsis (Westwood).

Antennæ, in the ☿, 10-jointed; in the ♀ 11-jointed.

160. *S. geminata* (Fab.).

Calcutta.....G. A. J. Rothney.
Myingyan, Burma .....E. Y. Watson.

Mr. Rothney says "sexes almost all the year round."

161. *S. geminata* (Fab). var. *armata* (Forel MS.).

Bombay .....(Xmas, 1890, ♂, ♀).
Myingyan, Burma.....E. Y. Watson (variety).

This is I think the commonest ant in Bombay; its roads meander all over the maidan, which is also dotted with the heaps of rejected chaff thrown out from the nest. Out of Bombay I have found it nowhere in this Presidency; possibly it is an imported species, modified by its environment. As Mr. Rothney records of *S. geminata* proper that there seem to be sexes in the nest at all seasons; I have taken them in April, and at Xmas in the University Gardens, and Mr. Gleadow took them at the Yacht Club early in November. In habits and general organization of the community it strikingly resembles *Holcomyrmex*. The variety sent from Burma by Mr. Watson would seem to be intermediate between this and *S. geminata* proper.

Gen. 40. Phrudogeton (Mayr).

Antennæ 11-jointed, the last 2 joints forming the club; metanotum bidentate. There are no intermediate forms between the ☿ and the ♀; but the ♀ themselves vary very greatly in size.

162. *Ph. ocellifer* (Smith).

Kanara.....E. H. Aitken; H. Palliser (variety).
Burma .....Major C. T. Bingham (8-90, ♀).
Barrackpore .....G. A. J. Rothney.

Mr. Aitken writes:—"The entrance (of the nest) which is strewn "with chaff, is large, but the passage soon splits up, and I failed to "follow it. I turned up a lot of pupæ, however, close to the surface. "The community is enormous and industrious, collecting large seeds "of trees or plants, which it takes a dozen to carry; these are taken "in and the husks are thrown out afterwards. If *P. ocellifer* meets a "white ant or any other insect, she collects it in the same way. "They travel along a distinct road, which often passes under leaves "and grass but not under or through earth. The smaller ♀ often "laid a jaw to a burden, but the giants appear to do nothing."

163. *Ph*$^{ton}_{on}$ *laboriosus* (Smith).

Poona Districts; Thana Districts.....(7-85, ♂ ♀.)
Calcutta .....G. A. J. Rothney.

I have only found this species once above the Ghâts, at Lanowli; in Thana it is common enough. One nest I found there was in the foundations of the bungalow. A column of *P. laboriosus* was moving along at the foot of the plinth, on an open 'road,' but further on, where a garden path had to be crossed, a 'tunnel' had been constructed. This tunnel was built dry, and not of concrete as with the *Termites*. Numbers of the ☿ were carrying larvæ and pupæ, while the rest were engaged in the transport of food. I saw a live worm about 1½ inch long and some dead beetles and bugs being so conveyed. The smaller ♀ helped in the commissariat transport work, but did not carry larvæ; the larger ♀ did neither one nor the other; when the tunnel was injured the ☿ alone did the repairs. The larger ♀, though terribly formidable to look at, were not pugnacious. I saw one attacked, killed, beheaded, and his body carried off by 3 comparatively small ants of another species. The ☿, on the contrary, are plucky and vicious.

Gen. 41. Pheidole (Westwood). *

Antennæ 12-jointed (11-jointed in one species); the club, formed of the last 3 joints, is equal to, or slightly longer than, the rest of the flagellum; the ninth joint is twice as long as the eighth. The ♀ are all of one size.

* See footnote on *Ph. quadrispinosa*, page 196.

164. *Ph. latinoda* (Roger).

Poona Districts; Thana Districts.....(13-3-90, ♂).

Madras; Mussoori, N.-W.P; Calcutta...G. A. J. Rothney.

This genus is exceptionally developed in the Dekhan, and I must confess is my favourite. Though behind *Holcomyrmex*, *Solenopsis*, *Messor*, and even their near relation *Pheidologeton* in road-making, to my mind they bear off the palm in the matter of individual intelligence. It has been proved (?) by numberless experiments that, though ants can go and *fetch* associates, they cannot *send* them. These experiments, however, have all been made with European ants (mostly *Formicidæ*) and in captivity. One has only to frighten, with a piece of grass, the ☿ about the entrance to a nest of *Pheidole*, and to note the rapidity with which one or more ♀ come bustling on to the scene, to have his faith in the result of these experiments somewhat shaken. On one occasion I was trying to attract some *Triglyphothrix* with a piece of bacon (in order to find the nest); a single ☿ of *P. latinoda* appeared on the scene, and, having tasted the bait, immediately started off at a run for home, meeting, and passing the word to several ☿, on the way. I traced her to the nest, a good ten paces off, and then returned at once to my bait. It had been lying for a good quarter of an hour before the first ☿ found it, but immediately after my return to it, I became aware of several ☿ making for it, not in a direct line, but quartering the ground like pointers, and steadily advancing all the time in the right direction; nor were these following the return track of ☿ No. 1, but were converging on the bait, each along a line of her own. Very shortly after they had reached the food, two or three ☿, followed by a lumbering ♀, appeared, coming from the nest, following very closely, though somewhat hesitatingly, the return track of No. 1. On seeing them coming I lifted the bait, and the few ☿ which had already reached it, and then saw the new comers arrive, and actually overrun the spot where the bait had lain. It seemed to me clear that one or the other batch of ☿ must have been *sent*. In this genus the ☿, almost without exception, are plucky and attack fearlessly even in the face of 'manifestations' (such, for instance, as a human being poking about the entrance to the nest with a straw). When news of a 'find' of food or of 'danger' is conveyed into the nest, several ♀ almost

invariably rush out immediately. If the 'danger' is from ants or anything in the 'usual course of nature' they behave gallantly; if, however, the danger is of a 'superusual' kind, the ♀ are curiously timid, rushing for the security of the nest, or the nearest cover, without the least shame. In most cases *within the nest* the ♀ are as fearless as the ☿, and I have frequently secured specimens of ♀, without the trouble of digging, by 'fishing' in the nest with a straw. I can only conclude that this difference in the behaviour of the ♀ under different circumstances is due to the fact that the small size (and cubic contents) of the ☿ renders them safe from the attacks of birds, lizards, &c., and that such is not the case with the ♀. *P. latinoda* is a very common form in the Dekhan. Mr. de Nicéville records it as tending larvæ of *Taruecus theophrastus* (Fab.).

165. *Ph. latinoda* (Roger), race *angustior* (Forel MS.).
Poona Districts.

166. *Ph. latinoda* (Roger), race *confinis* (Forel MS.).
Poona Districts.

The nest was in a tree; *P. latinoda* is exclusively subterranean.

167. *Ph. wroughtoni* (Forel MS.).
Poona Districts.....(12-6-90, ♂, ♀)
Thana Districts.....F. Gleadow.

Fairly common; the ♀ has an enormous head. In one nest of *P. wroughtoni*, when I removed the stone which covered the entrance, I found a number of beetles. All sorts of insects, as cockroaches, bugs, &c., and even *Lepismidæ*, are fond of sheltering under stones; consequently, when the entrance to an ants' nest is also under a stone, it is very difficult to know if there is any (and if so what) special relation, between the ants and these outsiders. In this case, however, there could be no doubt that the beetles were 'owned.' When I disturbed the nest, quite as much fuss was made over the beetles as over the larvæ and pupæ. The ☿ seized hold of their antennæ and dragged or led them to the gallery communicating with the nest below ground. There was no attack on the *legs* of the beetles, which would certainly have been the case had they been intruders; indeed I do not believe an ant would ever take a living enemy into its nest, and in this case the intention to take the beetles in alive was most marked. Moreover, the beetles themselves submitted passively to the handling of the ants, yet when

I interfered and with forceps seized one of them by the leg, it immediately discharged, with an appreciably audible report, a puff of yellow dust. The beetles have been identified by Herr Wasmann, S. J., of Vienna, as belonging to the genus *Paussus*, of which species have also been found domesticated in ants' nests in Europe and elsewhere.

168. *Ph. sykesi* (Forel MS.).

Poona Districts.....(10-6-90, ♀)

Thana Districts.....F. Gleadow.

A large species. *P. sykesi* throws up concentric embankments round the entrance to the nest; the extent of these earthworks varies according to circumstances, from a mere single tube, less than an inch high in flat dry country, to half-a-dozen concentric rings, the centre tube 3 inches and more high, each ring decreasing in height, and the outside ring 18 inches in diameter. Moreover, when the nest is on a slope, the up-hill half of a ring is always considerably higher than the other. *P. wroughtoni* and *P. latinoda* also build these earthworks, but they are always rudimentary compared with those of *P. sykesi*.

169. *Ph. naoroji* (Forel MS.).

Poona Districts.

I have already described one meeting with this species in my notice of *Monomorium mayri*. I have also taken it nesting in a hole in a tree stem.

170. *Ph. lamellinoda-naoroji* (Forel MS.).

Poona Districts.

This is a transition form, and further examination must decide whether it shall be absorbed as a variety into one or other of the closely related species, or whether it shall stand, perhaps even receiving a specific name of its own.

171. *Ph. lamellinoda* (Forel MS.).

Poona Districts.

This is a very well marked, yellow species, characterized by the peculiarly developed lamellar process beneath the pedicle. It is a rare species and rather sluggish.

172. *Ph. spathifera* (Forel MS.).

Coonoor, Madras .....R. W. Daly (♀).

Travancore.....H. S. Ferguson (a variety, ♀).

Unfortunately Messrs. Daly and Ferguson sent only the ♀ form; consequently the ♂ is still unknown. The extraordinary spoon-shaped process on each side of the thorax, like the 'balancers' of a fly, make it impossible to mistake this species.

173. *Ph. punensis* (Forel MS.).

Poona Districts.

Thana Districts..... F. Gleadow.

Orissa..... Jas. Taylor (a variety).

Characterized by the very short scape; it is not uncommon in the moist zone of the Dekhan.

174. *Ph. punensis*, race.

Poona Districts.

This is probably the dry zone form of the last; I have taken it only once in the east of the Poona District. Dr. Forel has not yet decided whether it deserves a name of its own or not.

175. *Ph. rhombinoda* (Mayr).

Poona Districts.

Kanara.....E. H. Aitken (12-6-90, ♂, ♀).

Calcutta .....G. A. J. Rothney (♀ type).

I got a number of nests containing sexes from flower-pots in my garden at Poona in June. Mr. Aitken tells me it is very common in Kanara.

176. *Ph. striativentris* (Mayr).

Poona Districts.

Thana Districts.....F. Gleadow (variety), (11-6-90, ♂).

Calcutta.....G. A. J. Rothney (type).

A fairly common species.

177. *Ph. indica* (Mayr).

Poona Districts .....(2 varieties).

Kanara.....E. H. Aitken.

C. Provinces .....J. A. Betham.

Mount Abu, Rajputana .....F. Gleadow.

Madras; Calcutta, 1872 .....G. A. J. Rothney (type).

Dharmsala, Punjab .....Major Sage (and 2 varieties).

Rai Bareilli, Oudh .....Dr. Simpson.

Orissa .....Jas. Taylor.

This is a most variable species, shading away into other species in all directions.

178. *Ph. indica* (Mayr); race *rothschana* (Forel MS.).
Poona Districts.

This form is quite common East of Poona.

179. *Ph. jucunda-indica.*
Orissa.....Jas. Taylor.

180. *Ph. jucunda* (Forel).
Poona Districts.....(A variety).
Dharmsala, Punjab..... Major Sage (variety).

Another variable species.

181. *Ph. multidens* (Forel MS.).
Poona Districts.

I took it only once, on the Ghâts, at a meat bait.

182. *Ph. parva* (Mayr).
Dharmsala, Punjab .....Major Sage (variety).
Calcutta.....G. A. J. Rothney.

183. *Ph. parva* (Mayr); race *dekhanika* (Forel MS.).
Poona Districts.

This would seem to be the local form of *P. parva.*

184. *Ph. ghatika* (Forel MS.).
Poona Districts.

I have taken it only on the Ghâts. On one occasion I found a community of *P. ghatika* working very hard bringing out corpses from the nest; there was a considerable heap of them already, and all were unmutilated and limp; there must, apparently, have been some terrible epidemic in the nest. A neighbouring community of *Monomorium mayri* were at work removing the corpses to their own nest, and were allowed to do so unmolested by *P. ghatika.* Was *P. ghatika* too dispirited to resent this desecration of her dead? Or was she only too glad to get them removed?

185. *Ph. wood-masoni* (Forel).
Poona Districts.
Coonoor.....R. W. Daly.

This is a dreadfully cretin form, more like a termite than a decent *Pheidole.*

186. *Ph. javana* (Mayr).
Calcutta, 1872.....G. A. J. Rothney.

187. *Ph. splendida* (Forel MS.).
Myingyan, Burma .....E. Y. Watson.

Mr. Watson only sent one or two specimens of the ♀ form.

188. *Ph. quadrispinosa* (Jerdon).*
Kanara.....E. H. Aitken (☿).
Orissa .....Jas. Taylor (☿).
Calcutta .....G. A. J. Rothney (☿).

This is an aberrant species, having 11-jointed antennæ, and, as far as is known, no ♀ form. Jerdon described, under the name of *æcodoma*, some 7 or 8 species of *Pheidole*, but owing to imperfect descriptions and loss of types this one alone can be identified.

189. *Ph. watsoni* (Forel MS.).
Calcutta .....G. A. J. Rothney.

Gen. 42. TRIGONOGASTER (Forel).

This genus is very like *Pheidole*, with 11-jointed antennæ; the peculiar shape of the abdomen, from which it takes its name, is characteristic; no ♀ form is known.

190. *T. recurvispinosus* (Forel).
Poona Districts.

A detailed description of this genus and species has been reprinted in this Journal.

Gen. 43. CREMASTOGASTER (Lund).

Antennæ, 11-jointed; the insertion of the pedicle is on top of the abdomen, instead of at its base as in all other ants.

191. *Cr. difformis* (Smith).
Pegu Hills and Ataran Valley, Burma...Major C. T. Bingham.

Major Bingham says, "it makes a large globular nest on trees; a rare species."

192. *Cr. ransonneti* (Mayr).
Nuwara Eliya, Ceylon.....Major Yerbury.
Colombo .....G. A. J. Rothney.

* Since the above was in print I have been able to send the ♂ and ♀ to Dr. Forel from Kanara. An inspection of these forms shows that *P. quadrispinosa* must be removed to a new genus, *Lophomyrmex*, lately established for an allied species, from Borneo, by Emery.

Major Yerbury describes nests of this species: "Nest in bush, "pear-shaped, roughly 5" long, 3" diameter, made of a substance resem- "bling bleached, decomposed cowdung. Another nest, material blacker "and more like *papier maché*, possibly due to age; inverted bottle- "shape, apical portion almost cylindrical. Nests very common."

193. *Cr. subnuda* (Mayr).

Kanara.....E. H. Aitken.
Hakgala, Ceylon.....Major Yerbury (variety).
Calcutta .....G. A. J. Rothney (type).

Major Yerbury states that it nests underground.

194. *Cr. subnuda-rabulöides.*

Orissa .....Jas. Taylor.

195. *Cr. subnuda* (Mayr); race *rabula* (Forel MS.).

Poona Districts.....(6-6-90, ♂, ♀).
Orissa.....Jas. Taylor.
Coonoor .....R. W. Daly (variety).
Calcutta .....G. A. J. Rothney.

This is the commonest form in the Dekhan; towards the Ghâts it is arboreal; but in the dry zone inland it nests underground.

196. *Cr. dohrni* (Mayr).

Ataran Valley, Burma .....Major C. T. Bingham.
Trincomalee and Colombo, Ceylon...Major Yerbury (2 vars.).

Major Yerbury found it nesting underground.

197. *Cr. dohrni-rogenhoferi.*

Ceylon ... .Major Yerbury.

198. *Cr. rogenhoferi* (Mayr).

Poona Districts.....(12-3-90, ♂).
Kanara .....E. H. Aitken, T. D. Bell.
Travancore.....H. S. Ferguson.
Thana Districts.....F. Gleadow.
Calcutta..... .....G. A. J. Rothney.

This is the common forest species of Western India. It builds large nests of 'brown paper,' with projecting pent-houses, more or less overlapping one another. The nests may usually thus be distinguished from those of *Cr. ebeninus*, which, at most, have only rudimentary verandahs. I believe this system of 'frills' is intended to give protection from the sun as much as from the rain; on one occasion I broke off a piece of nest, the size of a man's fist, which fell and

lay in the sun ; in half an hour every ant it was dead. In the more Eastern Dekhan *C. rogenhoferi* ceases to build nests and lives in holes in trees like *C. rabula*; but I have never found it nesting in the ground.

Mr. Aitken has sent me the following interesting note on a woodpecker which habitually rears its young in the nest of this species:—

"I had on several occasions seen *M. gularis* excavating the nests of "*Cremastogaster*, but it was not until the 27th of last March that "I found a nest actually occupied by the birds. It was a very large "and solid nest, fixed on and embracing the stem of a teak sapling. "I tried to climb the tree, but was routed by the ants, which not "only swarmed down the trunk to attack me, but dropped on me "like rain from the branches above. Afterwards I got a ladder and "reached the nest without alarming the ants overmuch. The wood-"peckers had made two holes on opposite sides of the nest, on "above and one below. The upper one led into a round and suff "ciently roomy chamber, in which I found three eggs. There wa "no lining, but the sides of the chamber were very smooth. Th "lower hole contained nothing. I do not think that it was made for "any special purpose. My idea is that these woodpeckers excavate "many nests before they are able to find one that affords room for "them to turn in, and that they have to try the same nest at "different points. The branch on which the nest is built does not "generally run through the middle of it, but lies like the bone in "a leg of mutton, and the birds, like a young carver, sometimes "begin at the wrong side. I have seen a pair of woodpeckers "excavating the same nest at opposite sides. I cannot explain or "imagine how the birds 'square' the ants. In the nest I have "mentioned they appeared to have abandoned the upper part, where "the birds were in possession, but the lower part was swarming "with them. In the May following I found another nest with "young ones in it. It was also swarming with ants. Jerdon men-"tions a resinous substance found upon the feathers of these wood "peckers. It is just possible that this is some anti-ant preparation.

199. *Cr. rothneyi* (Mayr).

Poona Districts.

Calcutta..... G. A. J. Rothney (type).

This is a very common and exclusively terrestrial species.

200. *Cr. contemta* (Mayr).

Poona Districts...(and a variety) (4-4-91, ♂, and 29-3-90, ♀)
Coonoor, Madras.....R. W. Daly (2 varieties).
Sunderbuns .....Robert Ellis (variety).
Calcutta .....G. A. J. Rothney (type).
Orissa .....Jas. Taylor.
Ceylon .....Major Yerbury.

This is the commonest terrestrial species of the Dekhan; it may be found wandering everywhere, though it has a strong tendency to follow its own made road within a considerable distance from the nest. I do not think these roads are kept long in use, for they are but indistinctly marked.

201. *Cr. coriaria* (Mayr).

Burma.....Major C. T. Bingham.

202. *Cr. flava* (Forel).

Kanara.....E. H. Aitken.

203. *Cr. perelegans* (Forel MS.).

Poona Districts.

A very large and handsome species; it is fairly common east of Poona, but is essentially a jungle ant. It uses a road which, however, is not well marked, nor necessarily on the ground surface. In one Maratha Fort I traced a column of these ants, sometimes on the walls, sometimes on the ground, for fully 100 yards; all the ants followed practically the same road, but the column was not continuous. I have recorded already the looting of *Holcomyrmex* by this species.

204. *Cr. wroughtoni* (Forel MS.).

Poona Districts.....(11-3-90, ♀).

I have found it only once, on the Ghâts; the nest was in a hollow mango tree.

205. *Cr. ebeninus* (Forel MS.).

Poona Districts.....(24-4-91, ♂, ♀).
Orissa .....Jas. Taylor (variety).

In the Dekhan *C. ebeninus* occurs only on the Ghâts, but, unless I am mistaken, I remember it as a fairly common species in the Thana jungles. Its nest is like that of *C. rogenhoferi* without the 'flounces,' or having them in a very rudimentary form. Mr. Taylor records,

of the specimens he sent, that he "found them milking a lot of *Aphides* on some broad beans in the garden."

206. *Cr. aberrans* (Forel MS.).
Thana Districts .....F. Gleadow (24-4-91, ♂, ♀).
Calcutta .....G. A. J. Rothney.
Kanara .....H. G. Palliser (Xmas, 1890, ♀)
This species is aberrant in the forms of the sexes.

207. *Cr. dalyi* (Forel MS.).
Coonoor.....R. W. Daly.

208. *Cr. aitkeni* (Forel MS.).
Kanara .....E. H. Aitken.

(NOTE.—I think I should repeat here that the names I have used have been given provisionally, after a comparatively superficial examination; very many of them will, undoubtedly, be confirmed, but in some cases, no doubt, study of a wider series of specimens will necessitate a revision of this nomenclature. This is specially the case in this genus; many of the species are most variable, and the specific differences of the majority are only appreciable under the microscope).

209. *Cr. minchini* (Forel MS.).
Calcutta.....G. A. J. Rothney.

Gen. 44. SIMA (Roger).

Antennæ 12-jointed, not clubbed. Though the chief generic characteristics are not easily appreciated, the very long body and short legs render it unmistakable.

210. *S. rufonigra* (Jerdon).
Poona Districts.
Travancore.....H. S. Ferguson.
Mount Abu, Rajputana .....F. Gleadow (♀).
Calcutta .....G. A. J. Rothney.
Orissa.....Jas. Taylor.
Ceylon .....Major Yerbury.

This is a species of the moist zone. I found it only once in the East Dekhan, in a large oasis of irrigated land; the community was a very large one, and in connection with it I found a considerable number of the *Ampulex (Rhinopsis)* mentioned in his paper by

Mr. Rothney. It was a capital imitation of *S. rufonigra*, but I could detect no connexion between it and the ants. On the other hand, I saw several times a *Rhinopsis* seize a small cockroach (of a species of which there were several specimens about) by the antennæ, lead and drag it about, and finally disappear with it into some crevice of the bark. In each case the cockroach reappeared uninjured, and in one case was promptly taken charge of by another *Rhinopsis*. The cockroach did not struggle or attempt to escape at any time, and *S. rufonigra* took not the slightest notice of it or of *Rhinopsis*. The whole affair was most mysterious. The mimicking spider, mentioned by Mr. Rothney, is common wherever *S. rufonigra* has communities; a very fine one was sent me by Mr. Aitken from Kanara. I have never found the sexes in the nest, but have found a solitary ♀ once or twice.

211. *S. nigra* (Jerdon).

Poona Districts..... (15-12-91, ♂, ♀).
Kanara .....E. H. Aitken.
Madras; Calcutta .....G. A. J. Rothney.

In the Dekhan this form seems to be limited to the dry Eastern Districts, where, however, it frequents moist positions, such as the dense babul groves on the banks of the large rivers. I have never examined a nest of *S. nigra* without finding ♀ winged or apterous, which is a strong contrast with *S. rufonigra*. Dr. Forel had called my attention to a closely allied genus *Pseudomyrma*, which is found nesting in the large hollow thorns of a Nicaraguan *Acacia*. I searched many hundred similar thorns of the Pulati (*Acacia latronum*), where this bush was the sole, or almost the sole, tree crop, and, though I found spiders, lepidopterous larvæ, &c., inhabiting the thorns, I found no ants. Lately, however, I found on some Pulati bushes, growing near a babul grove on the trees of which *S. nigra* was common, a number of thorns full of *S. nigra*, nearly the half of each community being as usual ♀ and ♂. Whatever may be the case with *Pseudomyrma*, I have no doubt that *S. nigra* does not herself make these nests, but merely occupies a convenient site for her nest; nevertheless it is a curious fact that two such closely related genera should, at opposite ends of the world, have selected such similar positions for nesting, all the more so that the position is one that would not strike a human being as anything but most cramped and inconvenient. There is a spider (*Salticus*)

which mimics *S. nigra*, though it is not so common as the corresponding under-study of *S. rufonigra*.

212. *S. compressa* (Roger).
Poona Districts.
Colombo; Calcutta .....G. A. J. Rothney.
Orissa .....Jas. Taylor.

This is far the smallest of the three species; indeed it is barely half the size of a normal *S. nigra*. It is rare in the Dekhan, and only found on the Ghâts. The only nest I have found was in a hole in a living tree. The community contained about 40 ☿, and a fourth as many apterous ♀.

INDEX TO PLATES.

PLATE C.

1.	*Alaopone oberthüri* (Mayr)	☿	× 9
2.	do.	do.	× 9
3.	do.	do.	× 9 (head).
4.	*Meranoplus bicolor* (Guérin)	☿	× 9
5.	do.	do.	× 9
6.	do.	do.	× 18 (head).
7.	do.	do.	× 18 (antenna).
8.	*Cataulacus latus* (Forel MS.)	☿	× 9
9.	do.	do.	× 9 (profile).
10.	do.	do.	× 18 (antenna).
11.	*Aphænogaster beccarii* (Emery)	☿	× 9
12.	do.	do.	× 9
13.	do.	do.	× 9 (antenna).

PLATE D.

1.	*Pheidole latinoda* (Roger)	☿	× 9
2.	do.	do.	× 9
3.	do.	do.	× 18 (antenna).
4.	do.	♀	× 9
5.	do.	do.	× 18 (antenna).
6.	*Cremastogaster rabula* (Forel MS.)	☿	× 9
7.	do.	do.	× 9 (profile).
8.	do.	do.	× 18 (antenna).
9.	*Sima nigra* (Jerdon)	☿	× 9
10.	do.	do.	× 18 (antenna).

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Colombo; Calcutta .....G. A. J. Rothney.
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7.	do.	do.	× 9 (profile).
8.	do.	do.	× 18 (antenna).
9.	*Sima nigra* (Jerdon)	☿	× 9
10.	do.	do.	× 18 (antenna).

THE POISONOUS PLANTS OF BOMBAY

11. *Myrmicaria subcarinata* (Emery) ♀ × 9
12. do. do. × 9
13. do. do. × 9 (head).

(NOTE.—In Plate D, Figs. 1, 6 and 7, owing to my bad drawing, it looks as if there were 5 segments in the abdomen proper, instead of 4.)

THE POISONOUS PLANTS OF BOMBAY.

BY

SURGEON-MAJOR K. R. KIRTIKAR, I. M. S.

PART II.

(*With Plate C.*)

(*Read before the Bombay Natural History Society on July 4th, 1892.*)

KÆMPFERIA ROTUNDA—(*Linn., Willd.*).

(Natural Order—SCITAMINEÆ.)

MARATHI—BHUI-CHAMPÂ. (भुईचंपा.)

Roxburgh has described this species accurately. I have generally followed him and interspersed his description with a few details, whenever found necessary, from Rheede's description of the plant in his *Hortus Malabaricus* (Vol. XI, t. 9, page 17).

A very elegant plant throughout, cultivated in gardens on account of the beauty and fragrance of its flowers. Flowers appear in March and April just before the leaves are thrown out.

ROOT.—Biennial—(I think it is annual); bulbous or tuberous; outside brownish-yellow, covered with a coriaceous membrane; inside yellowish-white; dense; juicy; with numerous white rootlets two or three inches long; bearing fascicles of numerous oblong bulbs of the thickness of the thumb, varying from an inch to two inches in length; the bulbs are glabrous, inside mucilaginous.

STEM.—Absent.

LEAVES, radical; petioled; oblong, lanceolate; smooth; never exceeding a cubit in length under ordinary cultivation; usually a foot long in good soil; from four to six inches broad. Very prettily coloured underneath—rich purple; green on the ventral surface. *Petioles* sheathing, uniting into what appears a short stem, as in *Curcuma*.

Scapes, just sufficient to elevate the flowers above ground, embraced by a few common sheaths of rich greenish-purple colour, shaded with pink.

Flowers.—Scapose; from four to six to the scape; very large, of various colours which are all harmoniously blended in one and the same flower from cœrulean-white, pink, yellow to deep purple.

Bracts, two to each flower, surrounding the base of the germ; the inner one has its apex bifid; the exterior or longest is here only about half the length of the calyx.

Calyx.—Rising from the summit of the root; white, one-leaved, membranaceous; as long as the tube of the corolla; somewhat gibbous; apex generally two-toothed, and of a dotted purplish colour.

Corolla.—Tube long, slender, cylindric, nearly erect; obliquely funnel-shaped towards the mouth. Petals, 6, in two rows of three each. *Exterior* row of petals drooping, linear, white tinged with purple, with margins involute. *Inner* row of petals has two of them longer than the third when the flower fully opens; erect, lanceolar, acute; colour principally cœrulean-white with pink or crimson central and marginal streaks. The third petal inferior, deeply divided into two broad obcordate, deflected, pointed lobes of a deep purple colour particularly towards the centre and base. This deep division of the lower petal gives the flower the appearance of a four-petalled organ.

Filament.—Purple arising from the base of the calyx (Rheede); short, erect, broad, inserted on the base of the uppermost two interior divisions of the corolla (Rox.). The corolla is deciduous; calyx thickens, bearing with it seminal capsules.

Anther.—Linear and enlarged with an ovate two-forked yellow-coloured, somewhat recurved crest. Rheede calls it a "cornute yellow tongue."

Germ.—Ovate.

Style.—Filiform.

Stigma.—Funnel-shaped.

Remarks.—The plant figured in Curtis' Botanical Magazine, Vol. XXIII., Plate No. 920, p. 920, is by no means one that would give an accurate idea of the vivid colours of the plant, or the profusion of the fasciculated tubers as seen in the Indian specimens. This can be easily accounted for from the fact that that picture was taken from a plant grown in the Brompton Botanic Garden, and

necessarily reared under the warmth of a stove and possibly in the absence of bright sunshine. It will be useful to note that Rheede has observed—that Jacob Breynius, a learned authority—in his Prodromus Secund. calls this plant *Zedoaria radice rotundâ* (*i.e.*, with a round root). Rheede further notes that the whole plant is used externally as an unguent (Poultice? K.R.K.) to wounds, which it is known in Malabar to cure wonderfully. When applied externally it has been supposed to cause "resolution" where there is "coagulation of blood in the body"—meaning, I presume, congestion. It is said "to consume also all purulent material." The juice of roots taken internally is supposed to act as a resolvent of phlegm, of dropsical affections of hands and feet, and of effusions in joints. Such is also the use of this plant on this side of India. Dr. Dymock speaks of it as a popular remedy in mumps (*Galgand*).

The Poisonous Nature of the Plant.

I have noticed instances of profuse salivation and vomiting produced by the internal administration of the juice of the tubers. They are sometimes used by villagers in their fresh condition in throat affections, known under the generic name of *Ghât-sarpa*, to relieve the sense of dryness in inflammations of the pharynx and tonsils. The fresh tubers are pounded or rubbed on a stone with water,—a couple of them,—mixed with water, a small cupful and drunk sediment and all. This mixture carries with it the active principle or alkaloid of the plant and causes in some cases unpleasant symptoms, such as profuse salivation and subsequent vomiting or retching. The active principle is presumably not unlike what is found in the various species known as the "Galangals" and "Zedoarias," which have a more or less "strong, bitter, pungent, camphoraceous taste." The plant I am describing is, as Breynius has determined, a veritable *Zedoaria*, and a representative of the order *Zingiberaceæ* which is noted more or less for its sialogogue properties. How is this salivation caused, when the juice of Bhui-Champâ is administered by the mouth? The juice may act in one of the two following ways, or both ways simultaneously:—(1) It may act through the stomach on the pneumogastric nerve, and produce *emesis* (nausea and vomiting); or (2) it may act locally on the mouth, *i.e.*, on

the lingual terminations of the glosso-pharyngeal nerve, or on the lingual branch of the fifth nerve and produce salivation. Sialogogues are either (1) *topical* or *direct*, or (2) specific, *remote* or indirect, to follow Dr. Lauder Brunton's classification of them. Ginger, the most typical species of the order to which Bhui-Champâ belongs, is classed by him as a topical sialogogue. It is a very pungent substance. Bhui-Champâ is by no means so pungent, yet it has an unmistakably "bitter, pungent, camphoraceous taste." And here I am using the words of our careful and experienced clinical observer, Dr. Dymock.* Now the lesser amount of pungency is a mere question of degree; mere pungency, however, may not have much or anything to do with salivation; for in addition to the pungent element which ginger contains there are other crystallizable and non-crystallizable principles in it. For a fuller knowledge of these, the reader may be referred to the valuable researches of Dr. Thresh in the Year-Books of Pharmacy for 1879 and 1882 respectively. It may be presumed that Bhui-Champâ possesses some of these principles. It is for the future pharmacologist and chemical analyst to determine what they may be. I am now noting only what has been my clinical experience, and not what I can analytically or experimentally account for.

Now to come to another point. Clinically speaking, intense salivation has been known to be a forerunner of vomiting, or is an accompanying or accessory phenomenon. Dr. Lauder Brunton notes that "the nerves which convey stimuli from the stomach and excite salivation which accompanies nausea are contained in the vagus." I have also the testimony of such a careful observer as Brigade-Surgeon Lieutenant-Colonel Wellington Gray, Principal of Grant Medical College, who, when he was Acting Chemical Analyser to Government and Professor of Medical Jurisprudence, thus observed in his official report for 1874,75:—

"The occurrence of salivation mentioned by Colonel (now General Sir Robert) Phayre as having come on when he began to feel the

* Since these lines were written, Dr. Dymock has departed this life, to the great sorrow of the scientific world. Indian Botany has lost an earnest, indefatigable, quiet and unostentatious worker at a time when his mature knowledge was being used by him for the advancement of botanical and therapeutical sciences with the stamp of unquestionable authority.—*K. R. K.*

effects of the arsenic he had swallowed, admitted of the very obvious explanation that *it was nothing more than the increased flow of saliva which is the usual accompaniment of nausea*,* no matter how it might have been produced." (Trans. Med. and Phys. Soc., Bombay, no. xii, 1876, pp. 215, 216). The topical sialogogues, such as I consider Bhui-Champâ to be, produce salivation by stimulating the salivary glands reflexly through the nerve-terminations in the tongue and mucous membrane of the mouth. "The effect produced by topical or reflex sialogogues," Dr. Lauder Brunton observes, "is not the same for each." "Ether and dilute acids produce a thin watery saliva," says he, "but alkalis cause the secretion of a thicker and more viscid saliva: the former appearing to affect chiefly the chorda tympani, and the latter, the sympathetic." In the salivation which was produced by Bhui-Champâ the flow was "thin and watery." Can it therefore be said that the action of the drug is on the chorda tympani? Then there is also the effect of the drug on the stomach nerves. It is a subject worthy of investigation for any practical pharmacological experimenter.

DESCRIPTION OF PLATE C.

Leaves on either side; between them is the old root, right in the centre with a graduated conical top surrounded by numerous fascicles of bulbs with fine white rootlets; on either side is an open flower.

THE BUTTERFLIES OF ADEN AND NEIGHBOURHOOD, WITH SOME NOTES ON THEIR HABITS, FOOD-PLANTS, &c.

BY MAJOR J. W. YERBURY, R.A., F.Z.S., F.E.S.

(*Read before the Bombay Natural History Society on 4th July*, 1892.)

HAVING picked up the Journal of the Society from time to time and seen accounts of the butterflies, &c., of various parts of the Indian Empire, but ne'er a word on those of Aden, has induced me to look up my notes on the butterflies of that favoured spot, and to put these notes into something like shape in response to the Editor's appeal for "Copy." Aden, moreover, being an appanage of the

* The italics are mine.—*K. R. K.*

Bombay Presidency, is a place to which the military members, at any rate of the Society, are at some time or other likely to gravitate, and it is in the hope that these notes may be of interest to some members (whether past, present, or future inhabitants of the place), and that they may induce some of them to enter into further investigation of its entomology, that they are written.

To the Anglo-Indian, Aden is too well known to require any description of its leading characteristics, but few passengers (for the matter of that, no great number of the residents) have any idea of the affect on "the barren rocks of Aden" of a few heavy showers; how almost immediately, as if by magic, vegetation springs up in every ravine and water-course, accompanied by a tolerably abundant insect fauna.

Rain may always be expected in January, February, and March, and these months are *par excellence* the bug-hunter's season. Heavy rain often fails in May, and this sometimes produces some good butterflies towards the end of June; and early in July, 1883, was such a year, and I obtained early in July *Teracolus miles* and *Thanaos djælælæ*,—butterflies never again met with,—besides *Ismene anchises* and other good insects. July is generally a good month too for moths.

Before enumerating the species obtained, it may be worth while to mention the places found most productive. They were—in Aden itself—Gold Mohur Valley and the valleys beyond as far as Round Island, the Maala Plain, and the water-courses on the plateau above the tanks:—outside the barrier—the so-called forest at Shaik Othman, a cocoanut plantation at Huswah, generally round Al Hantah (Lahej), and in the beds of the streams and at the edges of cultivation at Haithalhim.

My identifications have been taken in great measure from Mr. Butler's account of my Aden collections, P.Z.S., 1884, p. 478. I have added several species omitted by him in the paper quoted.

The species obtained were as follows:—

RHOPALOCERA.

Family—Nymphalidæ.

Subfamily—*Danainæ*.

1. *Limnas chrysippus*, Linnæus, Syst. Nat., p. 417 (1758).

Limnas alcippus, Cramer, Pap. Exot., vol. ii, pl. cxxvii, figs. E, F (1779).

Limnas dorippus, Klug, Syst. Phys., pl. 48, figs. 1-4 (1845).

Limnas klugii, Butler, P. Z. S., 1885, p. 758.

I have lumped these four forms together, as however good species they may be elsewhere, at Aden they are only varieties. I have taken them "in coitu" in every possible combination, and have reared a considerable number of caterpillars, with the result of having obtained *L. chrysippus*, intergrades to *L. alcippus*, *L. dorippus*, and *L. klugii*. I could not detect the slightest difference between the larvæ that produced these different results. The pupæ are dichroic, green and light purple, and are very beautiful, looking as if they had been carved out of the wax tapers used to decorate Christmas trees. I lost a great number of larvæ from the attacks of a large dipterous parasite, one of the *Tachininæ*. All the larvæ reared were found on *Calotropis gigantea*.

I imagined that the forms which have white on the hindwing, *i.e.*, *L. alcippus* and *L. dorippus*, had become more common in 1883-84 than they had been when I was first quartered in Aden in 1869-70. The fact that the original *L. dorippus* of Klug had white on the hindwing appears to have been overlooked, until the receipt of my Aden collections at the British Museum caused the matter to be looked into. *L. klugii* is as worthy of specific rank as *L. alcippus* or *L. dorippus*, as it bears the same relations to *L. dorippus* that *L. chrysippus* does to *L. alcippus*, but that the four forms are (anywhere) anything more than varieties I do not for an instant believe. I took a single specimen of *L. klugii* near Foul Point (the opposite side of the outer harbour at Trincomali) on the 15th April, 1891, its first record, I believe, in Ceylon.

Subfamily—*Satyrinæ*.

2. *Melanitis ismene*, Cramer, Pap. Exot, vol. i, pl. xxvi, figs. A, B (1775). Common at Lahej, rare in Aden.

3. *Ypthima asterope*, Klug, Symb. Phys., pl. xxix, figs. 11-14 (1832). Common at Lahej, fairly common in Aden. The Aden specimens are small, very dark, and with small ocelli. The Lahej form, on the other hand, is large, pale, and with large ocelli.

Subfamily—*Nymphalinæ*.

4. *Hypolimnas misippus*, Linnæus, Mus. Ulr., p. 264 (1764). Common throughout the neighbourhood. The females mimic all the four forms of *Limnas*; the mimics of *L. alcippus* and *L. dorippus* being, however, comparatively rare.

5. *Junonia hero*, Lang, Entomologist, p. 206, Sept., 1884. Common at Lahej, rare in Aden. This is the Aden form of *J. orithyia*.

6. *Junonia clelia*, Cramer, Pap. Exot., vol. i, pl. xxi, figs. E, F (1775). A single specimen at Huswah, 24th June, 1883.

7. *Junonia cebrene*, Trimen, Trans. Ent. Soc. Lond., 1870, p. 353. Common everywhere. The African form of *J. œnone*.

8. *Pyrameis cardui*, Linnæus, Syst. Nat., ed. x, p. 475, n. 107 (1758). The ubiquitous "Painted Lady" is common throughout the neighbourhood.

9. *Hypanis ilithyia*, Drury, Ill. Exot. Ent., vol. ii, pl. xvii, figs. 1, 2 (1773). A single specimen at Huswah, 24th June, 1883. I was shooting hares on this occasion, and sent one of the lascars I had with me as beaters to fetch a hare I had shot; the man came back carrying the hare in one hand, and holding this butterfly fluttering between the finger and thumb of the other. It was the only specimen I ever met with.

10. *Hypanis castanea*, Butler, P. Z. S., 1885, p. 759. Common at Haithalhim, March, 1883. I never met with this butterfly anywhere in the district between Haithalhim and Aden, yet I believe that the only two specimens of *Hypanis* seen in Aden (neither of them caught) belonged to this species. It is quite distinct from the last.

Family—Lycænidæ.

11. *Polyommatus bæticus*, Linnæus, Syst. Nat., vol. i, pt. 2, p. 789, n. 226 (1767). Common everywhere.

12. *Catochrysops cnejus*, Fabricius, Ent. Syst., Suppl., p. 450, n. 100, 101 (1798). Common at Lahej.

13. *Catochrysops asopus*, Hoppfer, Ber. Verh. Ak. Berl., 1855, p. 642, n. 22. Common near Lahej, rare in Aden. According to the diagnosis of this genus, *Butt. Ind.*, pp. 175, 176, a slender tail is one of its characteristics; this species, however, has no tail, its removal from the genus is therefore possible. Of course the case

may be parallel to that of some species of *Megisba* and *Nacaduba*, genera having both tailed and tailless forms.

14. *Azanus amarah*, Lefebvre, Voy. Abyss., vol. vi, p. 384, pl. xi, figs. 5, 6 (1847). Common everywhere.

15. *Azanus zena*, Moore, P. Z. S., 1865, p. 505, pl. xxxi, fig. 9. Common everywhere.

16. *Azanus sigillata*, Butler, Ann. and Mag. Nat. Hist., 4th series, vol. xviii, p. 483 (1876). Generally distributed throughout the neighbourhood, but nowhere common. Mr. de Nicéville, *Butt. Ind.*, vol. iii, p. 125, unites this species with *A. gamra* (a species I have never met with); he puts *A. crameri*, a Ceylon species, also as a synonym of that butterfly. There is certainly a strong resemblance between *A. sigillata* and *A. crameri*.

A. zena and *sigillata* differ widely in their habits, the former being a sturdy little fellow who sits at the end of a babul twig and flies about in a sharp decided manner, generally returning to his original perch. *A sigillata*, on the other hand, is one of the weak-kneed vacillating folk, and goes flopping along over low herbage in a purposeless manner; in this, too, it is resembled by *A. crameri*.

17. *Turucus pulcher*, Murray, Trans. Ent. Soc. Lond., 1874, p. 524, pl. x, figs. 7, 8. Common throughout the neighbourhood. Mr. de Nicéville, *Butt. Ind.*, vol. iii, p. 194, unites this species with *T. plinius*, judging from the specimen of the latter from Continental India only. I was loth to accept this synonomy, but the specimens I have taken in this neighbourhood (Trincomali) have almost converted me.

18. *Turucus theophrastus*, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 281, n. 32 (1793). Common everywhere.

19. *Chilades trochilus*, Freyer, Neuere Beitr., vol. v, pl. 440, fig. 1 (1844). Generally distributed. Mr. de Nicéville, *Butt. Ind.*, vol. iii, p. 91, unites this species with *C. putli*. I do not think that many Field Entomologists who have met with both species in life will agree with him in this. My own reasons for dissenting are as follows:—

I have met with the two species:—

Aden..... *C. trochilus*.
Campbellpore..... *C. trochilus* and *C. putli*.
Trincomali.....*C. putli*.

At Aden and Campbellpore a similar state of conditions exists—the volcanic rocks of Aden proper having their counterpart in the arid hills of Attock and Khairabad, while the Lahej oasis is represented by the sandy cultivated plain round the cantonment of Campbellpore. At Aden *C. trochilus* alone is found, while at Campbellpore that species confines itself entirely to the rocky nullah beds of the Attock and Khairabad hills; whereas *C. putli* is found close round the barracks at Campbellpore, frequenting a plant, *Heleotropium* sp. ?—and so far as my experience went, neither species ever trespassed on the other's territory. At Trincomali, *C. putli* regularly swarm at times in the grass, while *C. trochilus* is unknown.

20. *Zizera knysna*, Trimen, Trans. Ent. Soc., ser. 3, vol. i, p. 282 (1862). Common and generally distributed. Mr. de Nicéville, *Butt. Ind.*, vol. iii, p. 116, unites this species with *Z. lysimon* (a butterfly I am unacquainted with). *Z. knysna* is a species with long narrow wings, and, so far as my memory serves, more like l. c. pl. xxvi, fig. 174 (*Z. gaika*) than fig. 173 (*Z. lysimon*); in fact, is so little like the latter figure that I doubt the possibility of this synonomy being correct.

21. *Zizera gaika*, Trimen, Trans. Ent. Soc., ser. 3, vol. i, p. 403 (1862). Rare in Aden, common inland. I found a single colony in Aden in a water-course on the plateau above the tanks; it had established itself in some rank vegetation at the foot of a small precipice (where after heavy rain there was doubtless a waterfall), and was fairly populous, though occupying a space only a few square feet in area. Specimens from this colony were very distinct from any specimens of the latter species, but inland, where the two forms are found flying together, I fear they will be found to merge into one another. Col. Swinhoe and Mr. de Nicéville both cite *Z. karsandra* as an Aden species. I think there must be some mistake here, as I never met with it, and the former gentleman at any rate derived the greater number of his Aden specimens from me.

22. *Deudorix livia*, Klug, Symb. Phys., pl. xl, figs. 3-6 (1834). Common in Aden, January and February, 1884, not seen any other time. I took a single ♀ *Deudorix* near Lahej, 4th January, 1885, which I doubtfully identified as this species; if the identification be correct

it is the only occasion on which I met with this butterfly out of Aden proper. I made my first acquaintance with this species on Christmas Day, 1883, near Round Island, and the following incident, though it has nothing to do with butterflies, may be interesting, *viz.*, the seeing of the Aden monkeys on that day—the only time between November, 1882, and March, 1885, I saw them, although I frequently heard them. On this occasion there were three, a male (a splendid fellow), a female, and a half-grown *butcha*, and they were climbing up the rocks near the steep headland on the Gold Mohur Valley side of the bay. During 1869 and 1870 I frequently saw the monkeys, and at that time the flock numbered probably from 12 to 20 members. I have thought this worth recording, as there are many people who are sceptical as to the existence of monkeys on the rock.

Family—PAPILIONIDÆ.

Subfamily—*Pierinæ*.

23. *Terias chalcomiæta*, Butler, Ann. and Mag. Nat. Hist., ser. 5, vol. iii, p. 190, n. 10 (1879). Common at Lahej and Haithalhim.

24. *Catopsilia florella*, Fabricius, Syst. Ent., p. 479, n. 159 (1775).

Catopsilia aleurona, Butler, Ann. and Mag. Nat. Hist., ser. 4, vol. xviii, p. 489 (1876).

Catopsilia hyblæa, Boisduval, Sp. Gén., Lép., p. 612, n. 11 (1836).

Catopsilia pyrene, Swainson, Zool. Ill., 1st ser., pl. 51 (1820-21). I have lumped these four forms, as at Aden they seem so linked together as to be inseparable. All four forms are very common (particularly at the forest!) at Shaik Othman, *e. g.* "9-3-84, *C. pyrene* swarming on the *Cassia* bushes."

The next genus—*Teracolus*—being essentially a desert form is naturally well represented in the neighbourhood. Col. Swinhoe, P. Z. S., 1884, page 434, writes of this genus in a manner which appears to me to be misleading, as he seems to imply that *Teracoli* are in the habit of sitting and basking on burning sand and rock (as one sees *P. cardui* and some of the *Junoniæ* and *Vanessidæ do*). The family does doubtlessly inhabit some of the hottest and most desert-like spots on the face of the globe, but so far as my experience goes *Teracoli* never alight on the ground, but on a stem of grass or

other piece of the scant vegetation that always exists in their haunts. The three groups *Teracolus*, *Idmais*, and *Callosune* were united some years ago by Mr. Butler under the head of *Teracolus* as not being structurally distinct, and I have followed him,—though *Callosune* (with coloured tips to the forewing) and *Idmais* (without such tips) appear worthy to be kept separate on account of their peculiar facies, whereas one group of *Idmais* (the *T. faustus* group) seems almost entitled to generic distinction, not only on account of the embossed spot on the internal area near the base of the forewing in the male, but also on account of its peculiar coloration. The *Capparidaceæ* appear to be the natural attraction for the *Teracoli*, *C. galeata* and its allies being specially attractive to *T. faustus*, *T. vi* and others of that group.

25. *T. calais*, Cramer, Pap. Exot., vol. i, pl. liii, figs. C, D (1779).
T. dynamene, Klug, Symb. Phys., pl. vi, figs. 15, 16 (1829).
T. carnifer, Butler, P. Z. S., 1876, p. 138, n. 42, pl. vii, figs. 8, 9. At Aden I consider these three forms to be varieties of one species. I have taken them "in coitû" together, they fly at the same season, and all the specimens of *T. calais* taken were, I believe, females. With the exception of *T. pleione* and (perhaps) *S. glauconome*, this is the commonest butterfly in Aden.

26. *T. phisadia*, Godart, Enc. Méth., vol. ix, p. 132, n. 40 (1819). Common. This butterfly has near Aden at least four forms of female :—

(*a*) One resembling the male.
(*b*) A creamy white form.
(*c*) A saffron yellow form.
(*d*) A pure yellow form.

It is one of the handsomest species in the genus. Col. Swinhoe, l. c., quotes this species as "the common form of the group at Aden." Though common it is nothing like so common as *T. dynamene*.

27. *T. vi*, Swinhoe, P. Z. S., 1884, p. 437, pl. xxxix, figs. 6, 7. Although not uncommon it was a long time before I got any number of specimens of this butterfly. Many a weary ten minutes I spent waiting for it to come to some patch of *Capparis galeata* on a barren hill-side, a burning sun overhead and a precipice below; in due course it possibly came, but if missed came back no more,

and the nature of the ground made it impossible to follow it. One day, however, I was on the plateau above the tanks after the sun had sunk well behind the Shum-Shum Ridge, and, while hurrying along to get down before dark, passed through a patch of a plant (name unknown, but whose chief characteristic is the tenacious manner in which the leaves cling to one's trousers), when to my surprise I disturbed a specimen of *T. vi*, which I netted and on investigation found that the butterfly came to roost there, the underside of the insect being of the same colour as the dead leaves and stalks of the plant. After some searching I got four more males and two females, considerably more specimens than I had taken in the six months or so previous. A big green and white spider had also found out this habit and my first female was rescued from its clutches. When first caught this species is of a beautiful rosy salmon colour, a tint in great measure lost after death.

28. *Teracolus pleione*, Klug, Symb. Phys., pl. viii, figs. 7, 8 (1829). The commonest butterfly in Aden, though, strange to say, I never met with it inland. There are two forms of females,—white and yellow. Colonel Swinhoe, l. c., speaks of the former as albinos. This is misleading: the white females being the normal form, and being to the yellow ones probably in the proportion of three to one. I reared some caterpillars feeding on *Cleome*, n. sp.? (This plant could not be identified at the British Museum.) *T. miriam*, with a macular border to the hindwing, appears to be nothing but a casual variety of this species. At Aden these two forms fly together and interbreed freely.

29. *T. cælestis*, Swinhoe, P. Z. S., 1884, p. 435, pl. xxxix, figs. 1, 2.

30. *T. acaste*, Klug, Symb. Phys., pl. vii, figs. 16, 17 (1829). These two forms are (almost to a certainty) varieties of one species. The so-called albinos of Colonel Swinhoe, l. c., being the normal form of female, and being to the yellow ones in the proportion of at least seven to one.

The number of yellow females of this and the preceding species appeared to me to have greatly increased between 1869 (when I first collected butterflies at Aden) and 1885 (when I left on completion of my second tour), and it is possible that a development in this direction is steadily, though slowly, going on.

31. *T. protomedia*, Klug, Symb. Phys., pl. viii, figs. 13, 14 (1829). This fine species is not at all uncommon inland: it is nearly double the expanse of any other species in the genus I have ever seen.

32. *T. miles*, Butler, Ann. and Mag. of Nat. History, ser. 5, vol. xii, p. 105 (1883). I only took two specimens of this insect on 7th July, 1883, and 11th July, 1883, respectively. From the table given by Mr. Butler, P. Z. S., 1884, p. 757, the Aden form appears to be doubtfully distinct from *T. eupompe*.

33. *T. epigone*, Felder, Reise der Novara, Lep., vol. ii, p. 186, n. 180. I took one male and one female of this species at Haithalhim on 4th and 5th April, 1884, respectively.

34. *T. nouna*, Lucas, Expl. Alg., Zool., vol. iii, p. 350, n. 14, pl. i, fig. 2 (1849).

35. *T. saxeus*, Swinhoe, P. Z. S., 1884, p. 441, pl. xl, figs. 1, 2. I have little doubt that these two forms are varieties of one species: both forms are common inland.

36. *T. yerburii*, Swinhoe, P. Z. S., 1884, p. 441, pl. xxxix, fig. 12. Not uncommon inland. On one occasion I found this species and *T. protomedia* in fair numbers at the so-called forest at Shaik Othman close to Aden.

37. *T. swinhoei*, Butler, P. Z. S., 1884, p. 491, n. 33. I took a single specimen of this butterfly at Haithalhim on 5th April, 1884. It is somewhat like the preceding species, but is a larger insect with a yellow instead of a creamy-white ground-colour.

Before leaving the *Teracoli*, I would submit for the consideration of those more familiar with the subject than myself, whether in the *Idmais* group it be not the case that the males are fairly constant, whereas the females show considerable variation: *e.g.*, at Aden we have *T. phisadia* with four or more forms of female (certain), *T. pleione* two forms (certain), *T. acaste* two forms (almost a certainty), *T. calais* two or three forms (probably). Should this be found to hold good in India, I can imagine the havoc it may cause among such species as *T. puellaris*, *T. ochreipennis*, *T. intermissus*, *T. rosus*, &c., all of which I have personally looked on with suspicion as females of *T. vestalis*.

38. *Belenois lordaca*, Walker, Entom., vol. v, p. 48. Very common. I reared some caterpillars on *Capparis galeata*.

39. *Belenois leucogyne*, Butler, P. Z. S., 1884, p. 492, n. 35. At Haithalhim in April, 1883, I found the males common, while the females were rare.

40. *Synchloë glauconome*, Klug, Symb. Phys., pl. vii, figs. 18, 19 (1829). Very common. In Aden the caterpillar feeds on *Cleome paradoa*, while inland it feeds on *Dipterygium glaucum*. On one or two occasions I found whole clutches of larvæ destroyed by some hymenopterous parasite; the parasite had formed its cocoon inside the body of the caterpillar, while the caterpillar's withered-up head and tail projected at each end beyond the cocoon. When at home I saw in the collection of Mr. Bignell of Plymouth some larvæ of *Gonepteryx rhamni* which had been destroyed in precisely the same manner. The parasites in each case were probably closely allied.

41. *Nepheronia arabica*, Hopffer, in Peter's Reise nach Mozambique, Zool., vol. v, p. 363, var. B (1862). Fairly common inland. Mr. Butler told me one day at the British Museum that the neuration in all (but one) of the Aden specimens was abnormal: from this and other like cases neuration appears to be as little trustworthy as colour as a means of identification.

Family—HESPERIIDÆ.

42. *Ismene anchises*, Gerstaecker, in Von der Decken's *Reise in Ost.-Afrika*, vol. iii, p. 374, n. 29, pl. xv, figs. 6, 6*a* (1873). Not uncommon in June and July, 1883: only once seen inland. As in the case of *T. vi*, it was a long time before I got among these "skippers." At last, however, I found their roosting place in Gold Mohur Valley on a plant with a yellow flower rather like a monster groundsel: after this I had no difficulty in getting specimens, sometimes taking seven or eight in an evening.

43. *Parnara mathias*, Fabricius, Ent. Syst., Suppl., p. 433 (1798). Very common.

44. *Gegenes karsana*, Moore, P. Z. S., 1874, p. 576, pl. lxvii, fig. 6. Not uncommon, especially in the lucerne fields at Shaik Othman.

45. *Pyrgus evanidus*, var. *adenensis*, Butler, Ann. and Mag. Nat. Hist., ser. 5, vol. v, p. 223. Common in Aden. Not seen inland.

46. *Thanaos djælælæ*, Wallengren, Lep. Rhop. Caffr., p. 54 (1857). Aden, a single specimen, 1st July, 1883.

47. *Gomalia elema.* A butterfly taken at Haithalhim, 30th December, 1884, was identified by Mr. Butler as this species—it was "a Singleton." I do not know where the original description of this species is to be found.

The above exhausts my list of captures. There are four butterflies, however, that there is fairly good ground for assuming may be found in the neighbourhood, but acting on the principle of accepting only that which is caught and identified by a competent entomologist as history, while that which is seen or is unidentified remains a mystery, leads me not to include them in my list.

The reputed species are as follows :—

i. A lycænid—*Castalius* sp.?
ii. A pierid—*Teracolus* sp.

} I found these two species in the box of a brother-collector: he stated that he had taken both species at Haithalhim, but as he did not label his specimens, and moreover had Indian, Abyssinian, and Aden insects jumbled up in this box together, I declined to accept the locality.

iii. A *Papilio*, described as being like the Indian *P. erithonius*.

iv. A hesperid—*Ismene* sp.? Of the existence of this butterfly there is "no possible probable shadow of doubt." I met with it on several occasions, but it so persistently avoided my net that at length I took to calling it the "Phantom skipper." It was a large purple skipper, quite unlike anything I have seen elsewhere. Dr. Hay, at that time Port Surgeon, and who was interested in entomology, told me that he once got one of these skippers under his hat, but did not succeed in boxing it. I also heard of it from Mr. Chevalier and other employés of the Eastern Telegraph Co. Though I do not expect that many species will be added to my list from Aden itself, still (as I never visited Lahej between April and December, nor had I a chance of visiting the mountains inland, nor the neighbourhood of Shugra) I am sure that several species remain to be added from the vicinity, and I hope that somebody will carry on investigations into the entomology of the district, so that we may some day have a tolerably complete list of the Rhopalocera of Southern Arabia.

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LES FORMICIDES DE L'EMPIRE DES INDES ET DE CEYLAN.

PAR AUGUSTE FOREL,
Professeur à l'Université de Zürich.

Part I.

(*With a Plate.*)

(*Read before the Bombay Natural History Society, 5th April,* 1892.)

M. Fornaro de St. Gall m'ayant mis, il y a quelques années, en relation avec M. le professeur Wood-Mason, Directeur de l'Indian Museum, à Calcutta, je commençai à recevoir, par son intermédiaire, un certain nombre de fourmis des Indes. Mais c'est surtout grâce à l'infatigable zèle et à l'inépuisable obligeance de Mons. R. C. Wroughton, Divisional Forest Officer, à Poona, qui m'a envoyé un matériel très considérable, récolté par lui-même, aux environs de Poona, ainsi que par Messieurs Gleadow, Aitken, Simpson, Sage, Bingham, Daly, Taylor, Ferguson, Yerbury, Watson, Palliser, Bell, etc., dans diverses parties de l'Inde, que je suis en état de faire le travail suivant, dont l'honneur lui revient en premier lieu. Dr. Tull Walsh m'a aussi envoyé un bon nombre de fourmis intéressantes de Pooree, en Bengale. Enfin M. Rothney a eu la grande obligeance de me soumettre sa belle collection de fourmis qui a servi dans le temps de base à l'excellent travail de Mayr (Beiträge zur Ameisenfauna Asiens, dans Verh. d. K. K. Zool. bot. Gesellsch. Wien, 1878). Malgré ce travail, ainsi que ceux de Jerdon, de Smith, et d'Emery, la faune des fourmis des Indes est encore mal connue. Je veux essayer d'en donner une vue d'ensemble, tout en décrivant les espèces nouvelles.

La famille des Formicides doit être divisée en cinq sous-familles comme suit :—

Vessie à venin à coussinet (voir Forel : *Fourmis de la Suisse*, 1874 ; et André, *Species des Formicides de l'Europe*, 1881). Aiguillon entièrement transformé en appareil de soutien pour l'orifice de la vessie. Un seul article au pédicule. Abdomen proprement dit sans rétrécissement après le premier segment. Ouverture du cloaque circulaire, apicale, ciliée. Corps en général plus ou moins mou. Nymphes avec ou sans cocon. Les ailes n'ont jamais plus d'une cellule cubitale .... 1ère S.-Famille CAMPONOTIDÆ (Forel).

Vessie à venin sans coussinet. Aiguillon rudimentaire mais non transformé. Un seul article au pédicule. Abdomen sans rétrécissement. Ouverture du cloaque transversale, non ciliée, inférieure ou apicale. Nymphes nues. Corps en général plus ou moins mou. Les ailes ont souvent deux cellules cubitales .... 2me S.-Famille DOLICHODERIDÆ (Forel).

Vessie à venin sans coussinet. Aiguillon fort. Un seul article au pédicule. Abdomen, proprement dit, ordinairement plus ou moins rétréci après le premier segment. Nymphes toujours entourées d'un cocon. Corps en général dur. Vie sédentaire .....3me S.-Famille PONERIDÆ (Lepeletier).

Vessie à venin sans coussinet. Aiguillon fort ou faible, toujours distinct. Nymphes entourées d'un cocon. Corps dur. Pédicule tantôt d'un, tantôt de deux articles, dans ce dernier cas seulement chez les ouvrières. Femelles aptères et aveugles, ouvrières soit aveugles, soit avec deux ocelles en lieu et place des yeux composés. Mâles grands, ailés, avec des mandibules grandes sans dents et d'énormes yeux. Fourmilières très considérables, mais nomades (fourmis de visite). Habitudes très carnassières..... 4me S.-Famille DORYLIDÆ (Shuckard).

Vessie à venin sans coussinet. Aiguillon fort ou faible, toujours distinct. Deux articles au pédicule, ce qui en donne un de moins à l'abdomen proprement dit. Nymphes toujours nues. Corps en général dur. Les femelles ont toujours des ailes. Mâles parfois aptères ..... 5me S.-Famille MYRMICIDÆ (Lepeletier).

♀ signifie femelle. ☿ signifie ouvrière.
♂ „ mâle. 2 „ soldat.

1ère Sous-famille CAMPONOTIDÆ.

Tableau des genres (chez la ☿).

Antennes de 12 articles chez les ouvrières, de 13 chez les ♂. Sépales du gésier non réfléchies 1

Antennes de 11 articles * au plus chez les ☿ et de 12 au plus chez les ♂. Sépales du gésier réfléchies en parasol. Nymphes toujours entourées d'un cocon 8

* Chez les genres de l'Inde et de Ceylan.

1. Les antennes s'articulent au milieu du côté des arêtes frontales, loin du bord postérieur de l'épistome 2

Les antennes s'articulent aux angles postérieurs de l'épistome. Palpes maxillaires de 6, labiaux de 4 articles..... 4

2. La tête des grandes et des petites ouvrières a la même forme et la même grandeur relative. Palpes maxillaires de 5, labiaux de 4 articles. Pédicule très allongé et étroit. Nids filés en soie dans les feuilles ..... ŒCOPHYLLA (Smith).

La tête de toutes les ouvrières, qui sont à peu près de même taille, a la même forme et la même grandeur relative. Pédicule court, surmonté d'une écaille. Palpes maxillaires de 6 articles, dont le premier très petit, palpes labiaux de 4 articles. Corps en général épineux, court, courbé. Abdomen globuleux, le premier segment recouvre ordinairement plus de la moitié de l'abdomen. Nids petits, filés en coques de soie..... POLYRHACHIS (Shuckard).

De grandes ouvrières à tête large et grosse et de petites ouvrières à tête étroite. Palpes maxillaires de 6, labiaux de 4 articles. Corps sans épines. Pedicule court, surmonté d'une écaille ou d'un nœud. Abdomen ovale, allongé ; le premier segment recouvre moins de la moitié de l'abdomen. Nids sculptés dans le bois ou minés dans la terre ..... CAMPONOTUS (Mayr). 3

3. La tête des grandes ouvrières ou soldats et des ♀ est tronquée devant en biseau, celle des petites ouvrières est courte et obtuse. L'épistome, parfois plus large derrière que devant, se prolonge chez la ♀ et la ☿ major en arrière au delà de la troncature. Nymphes nues. Thorax large ou de form cylindrique derrière. Très ordinairement les ☿ moyennes n'existent pas, et les grandens ☿ forment une caste distincte (soldat : 2..... ...s. g. COLOBOPSIS (Mayr).

La tête n'est pas tronquée, ou, lorsqu'elle est subtronquée, l'épistome ne dépasse pas la surface tronquée. Nymphes entourées d'un cocon. Thorax comprimé ou bordé derrière. Pas de soldat distinct .....s. g. CAMPONOTUS (Mayr ; sens strict).

4. La fossette clypéale est distinctement séparée de la fossette antennaire. Corps grêle, abdomen fortement voûté, plutot étroit chez la ♀ ..... PRENOLEPIS (Mayr).

La fossette clypéale et la fossette antennaire sont confluentes. 5

5. Les premiers articles du funicule de l'antenne sont plus longs que les suivants (sauf le dernier). Trois ocelles distincts. Aire frontale très distincte 6

Les articles 2, 3, 4, et 5 du funicule de l'antenne sont plus courts, ou tout au plus aussi longs, que les suivants. Ocelles nuls ou indistincts. Aire frontale peu distincte. Corps court et épais 7

6. Le 4me article des palpes maxillaires presque deux fois—long comme le 5me. Arêtes frontales presque parallèles, concaves extérieurement. Ecaille du pédicule plus ou moins nodiforme. Abdomen comprimé ..... MYRMECOCYSTUS (Wesmael).

Le 4me article des palpes maxillaires est seulement un peu plus long que le 5me. Arêtes frontales divergentes, plutôt convexes extérieurement. Ecaille mince et haute ....FORMICA (Linné).

7. Mandibules longues, très croisées, pointues, à bord terminal oblique, fortement denté. Les grandes ♀ ont la tête fort grosse. Fossette antennaire et fossette clypéale moins confluentes..... PSEUDOLASIUS (Emery).

Mandibules triangulaires, de forme ordinaire. Petites et grandes ouvrières de même forme et peu variables de taille .... LASIUS (Fabr).

8. Fossette antennaire séparée assez distinctement de la fossette clypéale. Trois ocelles. Métanotum et écaille dentés ou épineux. Palpes maxillaire de 6, labiaux de 4 articles..... ..... ACANTHOLEPIS (Mayr).

Fossette antennaire et fossette clypéale confluentes. Pas d'ocelles. Métanotum et écaille mutiques 9

9. Palpes maxillaires de 2, labiaux de 3 articles. Abdomen acuminé à l'extrémité. Corps trapu. Epistome court, largement échancré devant. Peu de différence de taille entre ♀ et la ♀ ....ACROPYGA (Roger).

Palpes maxillaires de 6, labiaux de 4 articles. Abdomen non acuminé. Femelle beaucoup plus grande que la ♀ ... . PLAGIOLEPIS (Mayr).

1*er* Genre CAMPONOTUS, Mayr.

1. Sous genre *Camponotus* sens strict Mayr.

Tableau des ouvrières des espèces de la faune de l'Empire des Indes et de Ceylan.

1. Dos du thorax interrompu et échancré entre le mésonotum et le métanotum. Ce dernier de forme particulière 2

Dos du thorax continu, formant une voûte plus ou moins forte et ininterrompue. Le thorax est élargi devant, comprimé derrière. Le métanotum n'a rien de particulier 6

2. Mandibules armées de 5 dents seulement. Epistome sans lobe antérieur ni carène. Métanotum tronqué et plus ou moins concave derrière. Corps court, robuste..... 3

Mandibules armées de 7 à 8 dents. Epistome caréné ou subcaréné, avec un lobe antérieur median plus ou moins développé. Métanotum en bosse arrondie en tout sens. Corps allongé, mat, pubescent; tibias et scapes avec des poils dressés... 4

3. Longueur 3 à 4 millimètres. Luisant, noir, avec la base de l'abdomen, les pattes, et les antennes quelquefois jaunâtres. Face basale du métanotum plus au moins rectangulaire, sans dents. Ecaille mince, tranchante..... C. VARIANS (Roger).

Longueur 6 à 10 mills. Mat, reticulé—ponctué partout. Metanotum excavé derrière; sa face basale est nettement bordée, rectangulaire, souvent terminé par deux dents. Ecaille très épaisse, en forme de nœud arrondi ... C. SERICEUS (Fabr).

Abdomen subopaque, couvert, ainsi que le métanotum, d'une épaisse toison ou pubescence dorée qui cache entièrement la sculpture ..... var. C. SERICEUS i. spec.

Abdomen entièrement mat, couvert, ainsi que le métanotum, d'une pubescence grisâtre, très courte et très espacée, qui ne cache nullement la sculpture var. C. OPACIVENTRIS (Mayr).

4. Tête de la ♀ minor rétrécie derrière en forme de cou étroit, son pronotum sans épaules marquées. Sculpture de la tête, du thorax, et de l'abdomen densément réticulée-ponctuée, avec de gros points élevés, très épars. Nœud du pédicule très épais. Pubescence plutôt grise. Longueur 11 à 17 mill.

Entièrement noir (var: *camelinus* i.sp) ou avec la tête rouge (var: *singularis* Smith).—(=Form: *cinerascens*, Fabr.??)..... C. CAMELINUS (Smith).

Tête de la ♀ minor non rétrécie en cou derrière. Tête et thorax, surtout le métanotum, abondamment parsemés de très gros points enfoncés, souvent élevés..... 5

5. Tête de la ♀ minor tronquée derrière, aussi large derrière que devant. Pronotum de la ♀ minor avec des épaules distinctes, proéminentes. Plus large que le précédent et le suivant, surtout le mésonotum. Abdomen sans gros points couvert d'une épaisse toison dorée. Lobe de l'épistome très court, presque nul. Longueur 9·5 à 15 mill.....
C. AURIVENTRIS (Emery).

Tête de la ♀ minor rétrécie et arrondie derrière. Pronotum sans épaules. Abdomen abondamment couvert de gros points élevés et d'une pubescence soyeuse contournée. Ecaille moins épaisse que chez les précédents. Semblable au *C. camelinus*. L. 9 à 12·5 mill.....
C. HOLOSERICUS (Emery).

6. Scapes des antennes larges, aplatis, réticulés-ponctués et subopaques. Tout le corps, les pattes et les scapes abondamment couverts de longs poils roux, dressés et grossiers. L. 9 à 13 mill. Mandibules avec 5 à 6 dents. C. MISTURA (Smith).

Métatarses larges et fortement aplatis, surtout ceux des pattes antérieures. Couleur d'un rouge sombre, mat, avec l'abdomen noir ..... race: C. MISTURA i. sp.

Métatarses étroits, à peine déprimés. D'un jaune roussâtre. Abdomen brun. Tête mate, le reste luisant ou subopaque ..... race: C. FORNARONIS. n. st.

Scapes des antennes étroits, cylindriques, de forme ordinaire, sauf chez le *C. radiatus* où ils sont aplatis..... 7

7. Mandibules armées de 5 dents. L. 3 à 5 mill.; d'un brun rougeâtre, mat, réticulé-ponctué ..... C. RETICULATUS, (Roger).

Mandibules armées de 6 à 8 dents à leur bord terminal 8

8. De longs poils jaunâtres abondants formant une barbe sous la tête et sur ses côtés. Tête très longue. Epistome lobé et caréné .....C. BARBATUS, (Roger).

Dessous et côtés de la tête sans barbe..... 9

9. Ecaille et faces du métanotum bordées d'une rangée de soies longues, raides, épaisses et blanches. Tête de la ♀ minor à côtés parallèles, élargie et tronquée derrière. Thorax peu convexe ; face déclive du métanotum obliquement tronquée. Epistome sans carène, très brièvement lobé. Tibias prismatiques et comprimés. Scapes aplatis. Corps étroit, d'un noir très mat ; fortement réticulé-ponctué partout ..... C. RADIATUS, n. sp.

Pas de rangée de soies blanches autour de l'écaille ni autour du métanotum 10

10. Thorax très fortement convexe ; métanotum ne formant presque qu'une courbe. Tête de la ♀ minor étroite, allongée, un peu comprimée, mais tronquée derrière, où elle est presque aussi large que devant. Tibias cylindriques, sans épines. Entièrement jaune. L. 5 à 6 mill. (♀ minor) ..... C. INVIDUS, n. sp.

Thorax modérément convexe. Couleur autre..... 11

11. Mandibules dentées à leur bord interne et à leur bord terminal (denticulées au bord interne chez la ♀ minor). Noir, avec l'abdomen, les pattes et les funicules d'un roux brun. L. 16 à 28 mill..... C. GIGAS (Latr.).

Mandibules dentées à leur bord terminal seulement. Taille plus petite..... 12

12. Tête de la ♀ minor fortement rétrécie derrière les yeux, à bord postérieur très étroit, limité à l'articulation occipitale, aussi étroit que l'extrémité antérieure du pronotum. Taille grêle et allongée. Epistome caréné, brièvement lobé. Pattes et antennes très longues 13

Tête de la ♀ minor peu ou pas rétrécie derrière les yeux, avec une troncature ou un bord postérieur autre que l'articulation occipitale. Taille moins grêle. (Seulement chez le *C. festinus*, la tête de la ♀ minor est assez fortement rétrécie derrière.) 14

13. Tête de la ♀ minor formant un cou distinct avec le bord postérieur articulaire relevé. Tout le corps mat ou

subopaque, réticulé-ponctué. Tibias fortement prismatiques et cannelés, sans apparence de poils dressés ni mêmes soulevés, mais garnis à leur bord interne d'une rangée de piquants obliques. L. 12 à 15 mill. (ailes de la ♀ enfumées de brun) ..... C. ANGUSTICOLLIS (Jerdon).

Tête de la ♀ minor simplement atténuée derrière, où elle est très étroite et allongée, sans former de cou, ni de collerette. Corps ridé-réticulé, subopaque et en partie luisant. Tibias un peu comprimés, mais non prismatiques, ni cannelés, sans piquants, mais abondamment pourvus de poils dressés très-fins et obliques. L. 8 à 10 mill. Ressemble au *C. mitis*.....C. DORYCUS (Smith.)
race : *carin* (Emery).

14. Pubescence adjacente fort apparente ou même dense..... 15

Pubescence adjacente très courte et très espacée ou presque nulle (sauf chez le *C. nicobarensis* où elle est un peu plus forte) 16

15. Une pubescence adjacente longue, jaunâtre, un peu soulevée, espacée, mais abondante, surtout sur le thorax, la tête, et les pattes, plus courte et plus espacée sur l'abdomen. Tibias prismatiques, cannelés, sans piquants. Ecaille épaisse à sa base, avec le bas de sa face antérieure vertical, amincie au sommet, peu élevée. Epistome caréné, brièvement lobé. Mate. L. 10 à 13 mill ..... C. LAMARCKII, n. sp.

Une pubescence soyeuse ou grisâtre, très adjacente, courte, mais fort abondante, recouvre tout le corps, surtout l'abdomen, où elle forme en général un duvet soyeux qui cache la sculpture. Réticulé-ponctué et mat. Epistome caréné ou subcaréné et brièvement lobé. Tibias comprimés, mais nullement prismatiques, sans aucun poil dressé ni oblique, sans, ou presque sans piquants à leur bord interne. Noir ; segments de l'abdomen bordés de jaune doré. L. 6 à 9·5 mill. ..... C. RUFOGLAUCUS (Jerdon).

Ecaille plus épaisse ; pubescence plus serrée, plus égale et plus soyeuse ; face basale du métanotum plus convexe que chez la race *micans* d'Europe ; le thorax est un peu plus étroit et la tête des ♀ major plus large. Quelques piquants aux tibias ..... race : C. PARIA (Emery).

Tête et thorax rouges avec quelques taches brunâtres irrégulières. Abdomen d'un noir brunâtre avec une petite tache roussâtre au milieu de la base du premier segment et une autre de chaque côté de la base du second. Du reste comme le *C. paria*, mais l'écaille est plus mince et la pubescence moins dense. Pattes et antennes rouges, sauf les dix derniers articles du funicule et l'extrémité des tarses qui sont bruns .....race : C. RUFOGLAUCUS, i. sp. (Jerdon). (=C. REDTENBACHERI, Mayr?)

Angles antérieurs du pronotum légèrement accentués et surtout subbordés chez la ♀ minor. Pubescence de l'abdomen plus faible, ne formant pas de toison notable. Thorax de la ♀ major un peu échancré entre le mésonotum et le métanotum. Piquants des tibias et des métatarses plus forts et plus abondants, noirâtres. Poils dressés d'un brun foncé. Noir—bord antérieur de la tête et mandibules rougeâtres.....race : G. DOLENDUS, n. st.

16. Epistome sans caréne et sans lobe distinct. Taille moyenne. Ressemble du reste beaucoup aux races *irritans*, &c., du groupe *maculatus* ..... C. OBLONGUS (Smith).

Epistome caréné ou subcaréné et lobé ou sublobé (parfois sans carène chez le C. *festinus*)...17

17. Tibias et scapes abondamment pourvus de poils entièrement dressés, assez courts et assez fins. Tout le corps couvert de poils dressés inégaux, jaunâtres. Longueur(♀ media) 6·5 mill. Mandibules avec 6 dents obtuses. Epistome caréné à lobe antérieur trapéziforme, cilié devant. Tête rectangulaire, tronquée derrière, plus longue que large, abondamment couverte d'une ponctuation espacée. Ecaille épaisse et étroite. Tibias étroits, sans piquants. Entièrement luisant et jaunâtre, avec les articulations et les arêtes frontales brunâtres et les mandibules roussâtres ..... C. BUDDHÆ, n. sp.

Tibias et scapes sans poils dressés, pourvus tout au plus de poils obliques.....18

18. Arêtes frontales assez-écartées, sinueuses, mais aussi rapprochées l'une de l'autre à leur extrémité postérieure qu'à leur extrémité antérieure. Tête de la ♀ major grande, large, (large de 2·9, longue de 2·8 mill.) et assez déprimée, avec une ponctuation espacée abondante et distincte, fortement excavée derrière. Epistome subcaréné et sublobé. Taille

courte et assez robuste. Joues sans poils. Tibias un peu comprimés, ni prismatiques, ni cannelés, sans piquants. D'un roux testacé, avec les pattes plus claires, les mandibules, le bord antérieur de la tête, les arêtes frontales bruns, et l'abdomen brun foncé. L. 5·5 à 9·5 mill .....

C. PALLIDUS (Smith),
var. SUBNUDUS (Emery).

Arêtes frontales plus écartées l'une de l'autre à leur extrémité postérieure qu'à leur extrémité antérieure. (Sauf chez le *C. festinus* qui est très grand et chez lequel elles sont partout très rapprochées). Tête nullement déprimée, de forme ordinaire..... 19

19. Taille grande, 10 à 15 mill. (♀: 20 mill.) Arêtes frontales rapprochées l'une de l'autre. Luisant, glabre, élancé. Pattes longues, un peu comprimées, mais non prismatiques. Thorax étroit. Tête des ♀ major triangulaire exceptionellement large derrière. Ecaille épaisse, atténuée au sommet. Tête de la ♀ minor fort étroite et concave à son bord postérieur, mais rapidement élargie (très lentement élargie chez le *C. dorycus*). Epistome subcaréné ou sans carène, avec un lobe court, mais distinct. Mandibules grandes, luisantes, avec des points extrêmement petits et épars (quelques gros points vers le bord terminal). Ponctuation superposée de tout le corps très fine, espacée. Sculpture très faiblement et très finement ridée. Noir et rouge .....

C. FESTINUS (Smith).

D'un brun roussâtre clair; abdomen mésosternum et métathorax d'un roux fauve. Pattes et funicules d'un jaune testacé. var: C. DILIGENS (Smith).

Taille assez petite, 5·5 à 9 mill. Mat; derrière et côtés de la tête, pattes subopaques; très densément et finement ridé-réticulé. D'un roux plus ou moins brunâtre ou jaunâtre, avec les scapes, les mandibules, les pattes et l'abdomen d'un brun foncé. La majeure partie des deux premiers segments abdominaux devant et dessous d'un jaune roux; bord postérieur des segments d'un jaune doré. La ♀ minor est un peu plus foncée que la ♀ major. Pubescence

relativement longue et abondante, surtout sur les côtés du thorax, mais fort espacée. De longs poils dressés roussâtres sur le corps, surtout sur le devant de la tête et sur l'abdomen. Tibias un peu comprimés, non prismatiques, sans piquants, mais avec des poils obliques. Epistome légèrement caréné, à lobe très court. Ecaille épaisse, étroite, atténuée au sommet. Sur le derrière de la tête, souvent de très petites mouchetures brunes .....*

C. MICOBARENSIS (Mayr).
var. EXIGUOGUTTATUS (Forel).

Ou bien la taille est grande, et alors le corps est mat et réticulé-ponctué; ou bien la taille est moyenne ou petite, et alors le corps est subopaque ou luisant. Mandibules abondamment ponctuées, armées de 6 à 7 dents. .....
.....Groupe de races : C. MACULATUS (Fab.)

Taille grande, 6 à 15 mill. Réticulé-ponctué et mat. Noir, avec les funicules les cuisses et les hanches rouges. Tête des ♀ major énorme, avec les côtés très convexes et les angles postérieurs acuminés. Pattes assez courtes et faibles. Tibias comprimés et prismatiques. Epistome caréné, avec un lobe antérieur très grand et échancré de chaque côté. Glabre ça et là un poil dressé.....race : C. COMPRESSUS (Fab.)

Taille fort petite : 4·5 à 7 mill. Epistome caréné, avec un lobe très court. Tête de la ♀ major relativement petite. Ecaille basse, assez mince, ordinairement large. Pattes courtes; tibias cylindriques, sans piquants, avec une pubescence à peine soulevée. D'un brun châtain foncé, avec les mandibules, les funicules, et les pattes roussâtres ou jaunâtres; souvent deux taches jaunâtres sur le deuxième segment de l'abdomen de la ♀ minor. Pilosité dressée éparse, plus abondante sur le devant de la tête et sur les joues. Assez luisante, finement ridée-réticulée. Devant de la tête réticulé et moins luisant.....race : C. TAYLORI, n. st.

Taille moyenne. Luisants ou subopaques .... A

A. Les tibias n'ont pas trace de petits piquants sur le bord interne, seulement 3 ou 4 piquants à leur extrémité inférieure, à côté de l'éperon ..... B

Les tibias ont quelques petits piquants distincts à leur bord interne et n'ont qu'une pubescence entièrement adjacente ..... D

B. Epistome subcaréné et sublobé (lobe extrêmement court). Taille plus courte plus robuste que chez le *mitis*, comme chez l'*infuscus*. Tibias postérieurs (2·2 mill.) et scapes (1·9 mill.) bien plus courts que la longueur et la

* NOTE.—Le *C. nicobarensis* typique de Kar Nicobar ne m'est pas connu, mais diffère un peu de la variété continentale, d'après ce que m'écrit M. Mayr lui-même.

largeur (2·6 mill.) de la tête. Joues sans poils dressés. Tibias abondamment pourvus de poils obliques, assez courts, qui ne sont ni adjacents, ni dressés; ils sont à peine comprimés, nullement prismatiques ni cannelés. Brun, avec la tête, l'abdomen et les scapes d'un brun plus ou moins noirâtre. L. 7 à 10 mill ..... race : C. IRRITANS (Smith).
Epistome très distinctement caréné et lobé. Joues pourvues de poils dressés ..... C.

C. Assez petit; L. 5·5 à 7·5 mill. Stature de l'*irritans* et du *dichrous*. Tibias postérieurs (2·15 mill.) et scapes (1·8 mill.) environ de la longueur et largeur (2·1 mill.) de la tête chez la ♀ major. Tête de la ♀ major élargie derrière; celle de la ♀ minor presque aussi large derrière que devant, avec un bord postérieur. Lobe de l'épistome rectangulaire. Quelques poils seulement sur les joues. Les tibias sont presque cylindriques, sans cannelure, avec une pubescence entièrement adjacente. De longs poils roux sur le front, le vertex et le dos du thorax. D'un brun noirâtre avec les mandibules et les funicules rougeâtres, les pattes d'un roux jaunâtre, les hanches et les cuisses brunies ..... race : C. INFUSCUS n. st.

Stature relativement svelte. Les tibias postérieurs (2·9 mill.) de la ♀ major sont un peu plus longs que la longueur (2·6 mill.) et la largeur (2·5 mill.) de la tête. Tête de la ♀ major à côtés plus ou moins convexes, rétrécie devant et un peu rétrécie derrière (la plus grande largeur est en avant des angles postérieurs). Les tibias et les scapes sont abondamment pourvus de poils obliques, assez courts, qui ne sont ni adjacents, ni dressés. Côtés du lobe rectangulaire de l'épistome plus ou moins concaves. Tibias comprimés, subcannelés et souvent subprismatiques. Joues abondamment pourvues de poils dressés plus courts que les autres. L. 6 à 10 mill...race : ..... C. MITIS (Smith).

D'un brun rougeâtre concolore avec la base de l'abdomen pâle ..... var. MITIS. (Sens strict) Smith.

Roux, avec la tête, l'abdomen, les scapes noirâtres ..... var. BACCHUS (Smith).

Entièrement d'un noir brun, avec les hanches et la base des cuisses souvent jaunes ..... var. FUSCITHORAX (Forel).

Pilosité plus éparse, pubescence plus adjacente. Jaune ou roussâtre, avec l'extrémité de l'abdomen foncée; tête et abdomen des ♀ major bruns ..... var. DULCIS (Emery).

Entièrement jaune avec la tête des ♀ major roussie. Tibias à pubescence entièrement adjacente (passage au groupe D) ..... var. COMOTTOI (Emery).

Comme les *C. mitis* sens strict et *bacchus*, mais l'écaille est très épaisse, presque conique ..... var. CRASSINODIS n. var.

D. Assez petit; L. 5·5 à 8 mill. Stature courte, assez robuste, plus robuste que celle du *C. infuscus* qui lui ressemble. Epistome caréné et sublobé. Tête de la ♀ major longue et large de 2·25 mill.; tibias postérieurs et scapes

longs de 2 mill. Tibias à peine comprimés, ni prismatiques, ni cannelés, avec quelques piquants fort distincts à leur bord interne. Pilosité très éparse. Joues sans poils. D'un brun foncé, en partie noirâtre, avec les tibias, les tarses et les funicules rougeâtres..... race : C. JUNCTUS n. st.

Plus grand ; L. 7 à 12 mill. Taille bien plus élancée, que chez le *C. junctus*, mais moins svelte que chez le *C. mitis*. Epistome caréné, avec un lobe inférieur fort développé. Tibias comprimés, subcannelés et souvent subprismatiques, avec quelques piquants obliques sur le bord interne de leur tiers inférieur. Tête de la ☿ major longue et large de 2·9 mill. ; tibias postérieurs longs de 2·9 mill., scapes de 2·65 mill. Pilosité fort éparse ; quelques poils sur les joues. Luisant. D'un beau jaune avec la tête, la moitié postérieure de l'abdomen et l'extrémité de ses deux premiers segments noirâtres ou brunâtres ; antennes et mandibules roussâtres. Parfois le thorax brunâtre chez les ☿ major. Très voisin de la variété *C. comottoi* du *C. mitis* ..... race : C. DICHROUS (Forel).

var. KATTENSIS n. var.

Les espèces *badius* (Smith), *luteus* (Smith), *tinctus* (Smith), *arrogans* (Smith), *basalis* (Smith), *velox* (Jerdon), *variegatus* (Smith), *cinerascens* (Fab.) me sont inconnues et leur description incomplète, appliquable à plusieurs espèces, est indéchiffrable. J'avais pris d'abord le *C. radiatus* pour le *carbonarius* (Latr.), mais il n'est ni "un peu velu," ni "muni au métanotum d'une cavité pour contenir l'écaille"; puis Latreille aurait vu les soies blanchâtres.

LISTE DES *CAMPONOTUS* DE L'INDE AVEC DESCRIPTION DES ESPÈCES NOUVELLES, SYNONYMIE ET GEOGRAPHIE.

1. *C. sericeus* (Fabricius).

Formica aurulenta (Latreille).
Formica obtusa (Smith).
Formica cinerascens (Jerdon ; nec Fabricius).

A. var: *sericeus* i. sp. (Fab.).

Ceylon (Major Yerbury) ; Kanara (Aitken ; Bell ; Palliser) ; Poona (Wroughton) ; Pooree (Tull Walsh) ; Orissa (Taylor).

B. var : *opaciventris* (Mayr).

Dharmsala (Major Sage) ; Pooree (Tull Walsh) ; Barrackpore (Minchin) ; Calcutta (Rothney) ; Poona (Wroughton) ; Orissa (Taylor) &c.

Le *C. sericeus* est commun dans l'Inde entière. Le *C. opaciventris* de Mayr n'en est qu'une variété de pubescence et de forme

du métanotum. Or ces deux caractères varient à tous les degrés tant en Inde qu'en Afrique d'où cette espèce a été décrite en premier lieu.

2. *C. varians* (Roger).

Ceylan.

3. *C. camelinus* (Smith).

C. senilis (Mayr).

Formica cinerascens (Fabricius??)

A. var: *camelinus* i. sp. (Smith).

Tête noire: Burma (Major Bingham).

B. var: *singularis* (Smith).

Tête rouge: Darjiling près Sikkim (Christie); Tenasserim (Fea).

Il est absolument certain que le *C. singularis* n'est qu'une variété de couleur du *C. camelinus*. Ce dernier nom doit demeurer, étant imprimé le premier.

4. *C. holosericeus* (Emery).

Tenasserim (Fea).

5. *C. auriventris* (Emery).

Tenasserim (Fea).

6. *C. mistura* (Smith).

Formica exasperata (Smith).

A. r: *C. mistura* i. sp. (Smith).

Tenasserim (Fea).

B. r: *C. fornaronis* n. st.

♀ *Major* :—L. 12 à 13 mill. La seule ♀ que je possède diffère du *C. mistura* typique, non-seulement par ses tarses étroits (non dilatés), mais par son thorax plus vôuté et par sa sculpture bien plus faible; le thorax et les angles postérieurs de la tête sont assez luisants et assez faiblement réticulés (fortement réticulés-ponctués et mats chez le *C. mistura* i. sp.). L'abdomen est luisant (mat ou subopaque chez le *C. mistura* i. sp.). L'écaille est plus épaisse et a un bord obtus (tranchant chez le *C. mistura*). Le *C. mistura* i. sp. a une pubescence adjacente espacée assez longue, roussâtre, fort apparente; le

C. fornaronis n'a qu'une pubescence jaunâtre, extrêmement courte et fine, très peu apparente. La pilosité est comme chez le *C. mistura* i. sp. mais un peu plus espacée, un peu plus longue et de couleur plus claire, plus jaunâtre. Les scapes sont plutôt plus larges et plus déprimés encore que chez le *C. mistura* i. sp. Mandibules fortement courbées près de leur extrémité, armées de 6 dents. Tête longue de 3·75 mill. (sans les mandibules*), large de 3·9 mill. Longueur d'un scape, 3 mill., d'un tibia postérieur 3·2 mill.

Inde continentale. Peut-être cette forme mérite-t-elle de constituer une espèce distincte.

7. *C. reticulatus* (Roger).

Ceylan.

8. *C. barbatus* (Roger).

Ceylan.

9. *C. radiatus* nov. sp. (voir le tableau).

♀ *Minor et media:*—L. 5·5 à 7·7 mill. Tête relativement petite, longue de 2, large de 1·8 mill.; longueur d'un scape 2, d'un tibia postérieur 2·25 mill. Presque pas de différence de forme entre la ♀ minor et la ♀ media. La tête est chez toutes les deux trapeziforme, élargie derrière, rétrécie devant; elle a un bord postérieur distinct et n'est pas excavée. Yeux grands, situés au quart postérieur de la tête. Mandibules petites, armées de 6 dents, subopaques, très finement striolées-ridées, abondamment ponctuées. Le lobe très court de l'épistome est un peu arrondi. Arêtes frontales longues, très sinueuses, assez écartées et divergentes. Scapes très distinctement déprimés, un peu élargis. Pronotum subbordé et un peu épaulé devant (bordé aux angles antérieurs chez la ♀ minor). Le thorax est à peine convexe; à partir du milieu du métanotum son profil longitudinal est presque rectiligne jusqu'à l'extrémité de la face basale du métanotum. Cette extrémité forme presque un angle un peu obtus avec la face déclive qui est plane, subbordée et entourée, de même que l'écaille, d'une rangée de soies blanchâtres, raides et obtuses. Sutures du thorax nettes, luisantes, mais ne formant pas d'incisures. Ecaille basse, large, à bord tranchant.

* La longueur de la tête est toujours mesurée sans les mandibules. Je ne le répéterai plus à l'avenir.

la rendent très caractéristique. Elle a 20 mill. de long. Une ♀ minor de 13 à 14 mill.

13. *C. dorycus* (Smith).

C. sesquipedalis (Roger).

race : *C. carin* (Emery).

Tenasserim (Fea) ; Bombay (Wroughton) ; Ceylan (Roger).

Les autres races n'ont pas été trouvées jusqu'ici dans l'Empire des Indes.

Je ne vois guère ce que le *C. sesquipedalis* (Roger) pourrait être d'autre qu'un *C. dorycus*, ♀ minor, lors même que l'auteur ne parle pas de la pilosité des tibias.

14. *C. lamarckii* nov. sp. (voir tableau 15).

♀ *major* :—L. 13 mill. Longueur de la tête (sans les mandibules) 3·7 mill., largeur 3·5 mill. Longueur d'un scape 3·45, d'un tibia postérieur 4 mill. Mandibules relativement petites, à bord externe à peine convexe, finement et irrégulièrement coriacées, subopaques, avec de gros points assez espacés. Tête échancrée et médiocrement élargie derrière, à côtés convexes. Epistome caréné, avec un lobe antérieur rectangulaire, très-distinct. Arêtes frontales longues, fort sinueuses, seulement un peu plus distantes derrière que devant. Aire frontale courte, large, subopaque ou mate. Thorax de forme ordinaire, regulièrement et assez fortement convexe, avec un petit scutellum. Métanotum peu élevé ; face basale presque deux fois longue comme la face déclive. Ecaille très épaisse en bas, tranchante à son bord supérieur ; elle a vers sa base une face antérieure courte, presque parallèle à la face postérieur qui est à peine convexe ; puis une face antérieure-supérieure oblique qui passe par une courbe à la face antérieure inférieure verticale. L'écaille est un peu plus large et beaucoup plus haute qu'épaisse. Abdomen grand. Tibias prismatiques, cannelés, sans piquants.

Une pilosité d'un jaune roussâtre, éparse, formant surtout une rangée autour de l'écaille et de chaque segment abdominal ainsi que sur le dos du thorax. Sur le devant de la tête et sur les joues cette pilosité est abondante et courte ; nulle, par contre, sur les tibias et les scapes. Une pubescence jaunâtre longue, assez grossière très distincte, est régulièrement espacée sur tout le corps, les scapes,

et les pattes; sur les scapes elle est plus fine, sur les tibias distinctement soulevée. Sans former duvet cette pubescence est cependant fort abondante sur le dos du thorax.

Finement et très densément ridé-réticulé et mat. Ponctuation superposée obsolète. A peine quelques points épars faiblement imprimés sur le devant de la tête.

D'un roux testacé. Tête, scapes, dessus du thorax, dessus et côtés de l'abdomen d'un noir brunâtre. Tarses et tibias bruns. Mandibules et lobe de l'épistome rougeâtres. Bord des segments de l'abdomen d'un jaune doré.

☿ *Minor.*—L. environ 10 mill. Tête à bord postérieur droit et à angles postérieurs marqués, mais un peu plus large devant que derrière. Longueur d'un tibia postérieur 3·7 mill. Thorax sans scutellum. Ecaille aussi épaisse que large et seulement un peu plus haute qu'épaisse, du reste comme chez la ☿ major.

En partie seulement subopaque, mais en majeure partie mate. Pilosité et pubescence un peu plus faibles que chez la ☿ major.

Un peu plus claire que la ☿ major. La moitié postérieure de l'abdomen et le dessus de la tête sont d'un brun foncé; le reste de la tête, la moitié antérieure de l'abdomen, le dessus du thorax et les tarses d'un rouge brunâtre, le reste testacé.

Du reste comme la ☿ major.

Nord de l'Inde.

Cette espèce, fort voisine du *C. maculatus*, race *mitis*, var. *fusci-thorax* s'en distingue non-seulement par sa grande taille et sa pubescence plus abondante, mais encore par sa sculpture mate et son écaille épaisse. Cependant on pourrait encore la considérer comme race du *maculatus*.

15. *C. rufoglaucus* (Jerdon).

Formica pubescens (Brullé, nec Fabr.).
Formica (*Camponotus*) *micans* (Nyl.) [race].
Camponotus flavomarginatus (Mayr) [race].
Formica rufoglauca (Jerdon).
Camponotus paria (Emery) [race].
Formica cinerascens (Fabricius??)
Camponotus redtenbacheri (Mayr) [Var.?]
Camponotus dolendus, n. st.

Le nom de Jerdon étant le plus ancien doit prendre la place de *micans* (Nyl). La forme européenne devient ainsi une simple race (*micans*) du *rufoglaucus*.

A. race: *C. paria* (Emery).

C'est la forme indienne entièrement noire. Elle est très repandue dans toute l'Inde, de l'Himalaya à Ceylan et de l'Ouest à l'Est.

B. race: *C. rufoglaucus* i. sp. (Jerdon) (voir tableau).

Camponotus redtenbacheri (Mayr ?).

Ceylan; Carnatique; Sibsagar, prov. d'Assam (Wood-Mason).

C'est la race rouge avec l'abdomen plus ou moins noirâtre. Cette forme est souvent très irrégulièrement tachetée. D'après la description, le *C. redtenbacheri* (Mayr) ne peut guère être autre chose. Cependant M. Mayr ne peut me dire si le type défectueux du musée de Vienne est identique à mes exemplaires de Ceylan reçus de Major Yerbury.

C. race: *C. dolendus* n. st. (voir tableau).

Cette race bien distincte rappelle un peu le *C. eugeniæ* (Forel) du sud de l'Afrique. Elle a été découverte à Dharmsala, au nord de Inde, par le Major Sage (☿ ♀ ♂).

La ♀ a les ailes faiblement teintées de brunâtre et les nervures brunâtres. L'écaille de la ♀ est faiblement, celle du ♂ profondément et largement échancrée. La ♀ et le ♂ sont d'un noir plus mat que chez les autres races, et ont, de même que la ☿, les segments abdominaux plus étroitement bordés d'un jaune plus terne. Du reste identiques, mais avec la pilosité et la pubescence comme chez la ☿.

16. *C. oblongus* (Smith).

Jalpiguri, Bhutan (Musée de Calcutta). ♀

17. *C. buddhæ* nov. sp. (voir tableau 17).

☿ *media*:—L. 6·5 mill. Tête rectangulaire avec le bord postérieur droit et les angles postérieurs arrondis; longueur d'un scape 1·9, d'un tibia postérieur 2 mill. Mandibules armées de 6 dents plus ou moins rapées (obtuses), très-finement réticulées-ridées assez luisantes, abondamment ponctuées, à bord externe médiocrement courbé. Epistome caréné, avec un lobe antérieur en trapèze

bord antérieur plus court que sa base et garni de cils. Aire frontale assez grande. Arêtes frontales divergentes.

Thorax médiocrement vôuté, élargi devant, comprimé derrière. Face déclive du métanotum peu marquée, longue comme la moitié de la face basale. Ecaille étroite, ovale, biconvexe, épaisse, à bord obtus, épais, à sommet étroit. Tibias presque cylindriques (un peu comprimés), sans piquants.

Luisant ; très finement et faiblement chagriné. Une ponctuation superposée, grosse, espacée, mais fort distincte est répandue sur toute la tête, plutôt plus abondamment derrière que devant. Sur le thorax et l'abdomen les points sont plus petits, fort épars, souvent un peu élevés et piligères.

Tout le corps, les pattes et les scapes abondamments couverts d'une pilosité dressée, pointue, jaunâtre, de longueur et d'épaisseur très irrégulière ; de longs poils sont entremêlés de poils plus courts et plus fins. Sur les tibias et les scapes, cette pilosité est tout-à-fait dressée et très abondante. Pubescence adjacente très espacée.

D'un jaune testacé. Tête, tarses, et scapes d'un jaune un peu plus roussâtre. Mandibules roussâtres. Arêtes frontales, extrême bord antérieur de la tête, extrêmes bords articulaires des segments du corps et des pattes légèrement, mais distinctement, brunâtres. Aux segments abdominaux, la ligne transversale brunâtre est située avant le bord.

Lahoul, frontière du Thibet (Major Sage).

La pilosité, la ponctuation et la couleur de cette espèce la rendent fort distincte, tandis que sa forme la distingue à peine du *C. maculatus*.

18. *C. pallidus* (Smith).

Camponotus maculatus, r : *subnudus* (Emery) [var].

Burma (Fea).

On peut aussi considérer le *subnudus* Emery comme race du *pallidus*, mais pas du *maculatus*. C'est la var : *subnudus* qui se trouve dans l'Inde.

Le type du *pallidus* : sp. de Bornéo, est plus petit, a la tête moins large et moins plate et deux ou trois poils aux joues. Les particularités de la tête m'engagent à conserver cette espèce, malgré ses affinités avec le groupe *maculatus* (=*rubripes*).

19. *C. festinus* (Smith).

A. var : *festinus* i. sp. (Smith).

Inde orientale ♀, ☿.

B. var: *diligens* (Smith) (voir tableau 19).

Johor, Malay Peninsula (Wood-Mason) ♀.

Le *C. diligens* (Smith) n'est qu'une variété de couleur du *C. festinus*. La ♀ que je considère comme étant sans nul doute le *C. diligens* et que j'ai confrontée avec la veritable ♀ du *festinus* ne peut être interprêtée autrement.

20. *C. nicobarensis* (Mayr).

Camponotus exiguoguttatus (Forel) [var].

A. var : *nicobarensis* i. sp. (Mayr).

Kar Nicobar.

B. var : *exiguoguttatus* (Forel) (voir tableau).

Sibsagar, Assam (Wood-Mason) ; Burma (Watson; Fea) ; Cochinchine francaise (Musée de Lyon) ; Bangkok (Sigg).

21. Groupe de races : *C. maculatus* (Fab.) (voir tableau 19).

Groupe : *C. sylvaticus* (Oliv. Forel, Mayr, Emery, André).
Groupe : *C. rubripes* (Latr. [nec Drury], Forel).

Nous ne pouvons plus considérer cet immense groupe comme une espèce. C'est un groupe de formes très semblables qui font transition de l'un à l'autre suivant les régions. Telle forme du groupe serait une bonne espèce distincte si l'on ne considérait que certains pays, mais passe à d'autres formes par d'autres régions. En Inde la race typique (*maculatus* i. sp.) n'existe pas. La race *compressus* (Fab.) paraît être pour l'Inde une bonne espèce. Mais par la Perse et l'Arabie elle fait passage aux *C. oasium* (Forel) et *C. cognatus* (Smith). Pour comprendre le groupe *C. maculatus*, il est donc nécessaire de ne pas se limiter à la faune d'un seul pays.

A. r : *C. compressus* (Fab).

Formica indefessa (Sykes).
Formica callida (Smith). [☿ minor].
Camponotus quadrilaterus (Roger). [☿ minor].
Camponotus cognatus var. e. (Forel, nec Mayr, in Journ. Soc. Asiat. of Bengal, 1885).

Extrêmement commun et constant dans toute l'Inde, de Ceylan (Yerbury), à l'Himalaya où il atteint 6,000 ft. d'élévation (Mussorie Hills, Wood-Mason) et de Bombay à Calcutta. La ☿ minor est si petite qu'on la confond facilement avec d'autres races du *maculatus*, p. ex. avec le *C. mitis* var : *fuscithorax* ; on la distingue cependant sans peine avec un peu d'attention parce qu'elle est très mate et presque glabre. Ce sont évidemment ces petites ☿ minor qui ont trompé Smith et Roger et leur ont fait instituer les synonymes *callidus* et *quadrilaterus*.

La ♀ est relativement petite et fort semblable à celle du *cognatus*. Ce ne sont que les ☿ maxima avec leur énorme tête à angle postérieurs acuminés qui offrent un facies particulier. Les ☿ major media sont tout-à-fait semblables au *cognatus*, de même que le ♂ la ♀ et la ☿ minor.

B. r : *C. taylori* nov. st. (voir tableau).

☿ *major* :—L. 6 à 7 mill. Tête presque rectangulaire, à peine élargie, mais échancrée derrière, à côtés convexes en avant des yeux. Longueur d'un scape 1·3, d'un tibia postérieur 1·35 mill. Mandibules armées de 6 à 7 dents, ponctuées, assez lisses et luisantes entre les points, plutôt courtes, à bord externe mediocrement courbé. Epistome caréné et sublobé ; bord antérieur de la portion mediane ou lobe presque droit. Aire frontale très petite, distincte. Arêtes frontales fort divergentes.

Le dos du thorax forme une voûte égale et mediocre. Face déclive du métanotum bien marquée, longue comme les ⅔ de la face basale. Ecaille aussi large que haute, assez mince, convexe devant, plane derrière, à bord supérieur subrectiligne ou convexe et presque tranchant. Pattes et antennes courtes, tibias cylindriques, sans piquants.

Luisant, finement et faiblement ridé-réticulé. Tête réticulée ; devant de la tête moins luisant, densément et plus fortement réticulé, çà et là réticulé-ponctué, avec de gros points épars en partie subeffacés, en partie distincts. Sur le devant des joues ces gros points sont abondants et allongés. Il y a deux ou trois fossettes analogues sur le mésonotum.

Pubescence couchée extremêment courte et éparse, presque nulle. Pilosité dressé et couleur : voir le tableau.

☿ *Minor* :—L. 4·5 à 6 mill. Tête rectangulaire, aussi large derrière que devant, à bord postérieur droit. La tête est entièrement luisante et faiblement réticulée ; les gros points enfoncés sont bien plus effacés, plus petits et arrondis. Ecaille plus épaisse.

D'un brun châtain plus clair que chez la ☿ major. Deux taches sur le deuxième segment abdominal, extrémité des hanches, base des cuisses, genoux, extrémité des scapes et premier article des unicules d'un jaunâtre plus ou moins clair. Chez les exemplaire de Coonoor, les pattes sont d'un jaune claire et seulement les 10 derniers articles du funicule bruns.

Du reste comme la ☿ major.

Orissa (Taylor) ; Coonoor (Daly); Poona (Wroughton).

Les exemplaires de Coonoor n'ont pas les taches jaunâtres de l'abdomen et ont les fossettes du devant de la tête plus fortes et plus abondantes ; ils ont aussi les pattes jaunâtres et l'écaille un peu plus basse.

C. r: *C. irritans* (Smith).

Camponotus inconspicuus (Mayr).

Inde ; Malay Peninsula. (Smith, Cat.) Bangkok (Sigg).

Il m'est impossible de considérer cette forme comme autre chose que comme une race du *C. maculatus*, rapprochée des races *C. mitis*, *novæ-hollandiæ*, &c., malgré l'absence presque complète de lobe à l'épistome.

D. r. *C. infuscus* nov: st.

Ceylan (Yerbury).

Très semblable au *mitis* var. *fuscithorax*, mais plus petit, plus luisant, moins svelte et avec une pilosité un peu différente (autrement répartie, plus foncée, un peu plus longue et plus grossière). Je renvoie à la description du tableau.

E. r. *C. mitis* (Smith).

Formica ventralis (Smith) ☿
Formica timida (Jerdon) ?
Camponotus agnatus (Roger) ?

α var. *mitis* sens strict (Smith).

β var: *C. bacchus* (Smith).

Formica bacchus (Smith).

γ var : *fuscithorax* (Forel).

δ var : *dulcis* (Emery).

Ces quatres variétés sont repandues dans toute l'Inde, de l'Himalaya à Ceylan et de Bombay à Tenasserim.

ε var : *comottoi* (Emery).

Camponotus maculatus : r *comottoi* (Emery).

Burma (Comotto).

ζ var. *crassinodis* n. var (voir tableau).

Burma (Bingham).

F. r : *C. junctus* nov. st.

Je renvoie à la description du tableau. Cette race est distincte par sa forme trapue, ramassée. Elle est bien plus luisante que le *C. mitis*; elle a la couleur et l'éclat de l'*æthiops*. La pubescence est entièrement adjacente et fort espacée. Carène de l'épistome très distincte, lobe court. Les mandibules ont 7 dents chez la ☿ major et 6 chez la ☿ minor. Devant de la tête de la ☿ major simplement réticulé, sans gros points enfoncés ; par contre une ponctuation superposée petite, très espacée et fort effacée sur toute la tête. Mandibules ponctuées, très finement striolées entre les points. Ecaille à bord supérieur très convexe (subacuminé) tranchant. Barrackpore (Rothney).

G. r : *C. dichrous* (Forel).

vvr : *kattensis* nov. var. (voir tableau).

Katta P. 6000.′ N.-W. Himalaya (Wood-Mason) ; Dharmsala (Sage).

EXPLICATION DES FIGURES.

Planche A.

(*Figures tirées de — Forel, Fourmis de la Suisse*).

Fig. 1.

Brachymyrmex heeri ☿, vu de côté. Les pattes et les hanches des deux côtés, ainsi que les palpes et les antennes du côté gauche ont été enlevées pour simplifier le dessin. 1, 2, 3, 4, lames dorsales des quatre premier segments abdominaux. 1′, 2′, 3′, 4′, lames ventrales des dits. 5, *Pygidium*. *a*, anus (cilié). *p*, pédicule. *e* écaille. *s*, stigmates. *m t b*, face basale du metanotum. *m t d*, face déclive du metanotum. *m s n*, mesonotum. *p r n*, pronotum. *m s t*, metasternum. *mesost*,

mesosternum. *p s t*, prosternum. *p m*, palpe maxillaire droit. *p l*, palpe labial droit. *c*, éjustome. *Sc*, scape de l'antenne droite. *f g*, funicule de l'antenne droite.

Fig 2.

Aile supérieure et aile inférieure du *Tetramorium cæspitum* ♀.

A. aile supérieure. 1, nervure marginale. 2, nervure scapulaire. 3, nervure médiane. 4, nervure interne. 5, nervure séparante. 6, nervure basale. 7, nervure cubitale. 8, nervure récurrente. 9, nervure transverse. 10, rameau cubital externe. 11, rameau cubital externe. *s*, cellule scapulaire. *e*, cellule externo-moyenne. *i*, cellule interno-moyenne. *d*, cellule discoïdale. *c*, cellule cubitale. *r*, cellule radiale (fermée). *x*, tache marginale.

B. aile inférieure. *pc*, poils crochets qui la fixent à l'aile supérieure. 2′ à 7 nervures de mêmes noms que celles de l'aile supérieure qui sont numérotées par les mêmes chiffres.

Fig. 3.

Abdomen du *Bothriomyrmex meridionalis* ♀, vu de côté. 1, 2, 3, 4, lames dorsales des quatre premier segments abdominaux. 1′, 2′, 3′, 4′, lames ventrales des dits. 5, *Pygidium*. 5′, *Hypopygium*. *a*, anus, (non cilié, en fente transversale). *m*, membrane intersegmentaire. *p*, pédicule. *e*, écaille.

Fig. 4.

Aile supérieure de la *Pheidole pallidula* ♀. *c*, première cellule cubitale. *c′*, seconde cellule cubitale. *r*, cellule radiale (ouverte). Les autres lettres et chiffres ont la même signification que dans la figure 2 A.

Fig. 5.

Vessie et glandes à venin du *Camponotus ligniperdus* ♀. *v*, paroi (antérieure dilatée de la vessie qui est remplie de venin. *c*, conduit de sortie de la vessie. *couss*, coussinet formé par les replis du conduit excréteur de la glande, et constituant presque toute la paroi postérieure supérieure de la vessie lorsque celle-ci est vide *g g*, les deux tubes de la glande vénénifique qui se réunissent en un seul en *g a c c*, glande accessoire (bifide).

Fig. 6.

Gésier de la *Formica pratensis* ♀ vu de côté, entre deux lamelles dont les sépales sont un peu écartées. Les sépales des deux autres lamelles situées derrière sont par contre un peu rapprochées, et se voient grâce à cela entre les premières. *j*, jabot, *sep*, sépales du gésier. *boule*, boule du gésier. *m*, partie médiane, cylindrique du gésier. *p*, partie postérieure du gésier, laquelle se trouve dans l'estomac. *est*, extrémité antérieure de l'estomac, ouverte et vue de dedans pour laisser apercevoir la partie postérieur du gésier; la couche inférieure de cellules glandulaires a été enlevée, et il ne reste que la tunique externe avec les trachées. *musc*, couche de fibres musculaires qui entourent la partie antérieure du gésier jusqu'au jabot. *c m*, couche mamelonnée, gélatineuse qui recouvre chaque lamelle à l'extérieure.

Fig. 7.

Premier article du tarse et éperon de la patte antérieure de la *Formica pressilabris* ♀, s'articulant tous deux à l'extrémité inférieure du tibia. *tib*, tibia. *tars*, premier article du tarse. *e*, éperon.

Fig. 8.

Tête de la *Formica pratensis* ♀ vue de devant. *m*, mandibules. *c*, épistome. *j*, joue gauche. *f*, front. *v*, vertex. *o*, ocelles. *y*, aile gauche. *s*, sillon frontal. *a*, arête frontale gauche. *f a*, fosse antennaire droite (unie à la fosse clypéale). *Sc*, scape de l'antenne droit. *aire*, aire frontale.

Fig. 9.

Vessie et glande à venin du *Bothriomyrmex meridionalis* ♀. *v*, paroi de la vessie qui est remplie de venin. *c*, conduit de sortie de la vessie. *b*, bourrelet formé par les replis du conduit excréteur de la glande. *g g*, glande vénénifique. *c c*, glande accessoire (simple).

Fig. 10.

Gésier de la *Plagiolepis pygmæa* ♀ vu de côté, entre deux lamelles, mais un peu obliquement, de sorte qu'on aperçoit par transparence les deux autres qui sont derrière. La moitié antérieure des sépales est réfléchie. Dans leur partie réfléchie, la membrane qui les unit entre elles est chitineuse. Lettres comme dans la figure 6, mais l'estomac n'est pas ouvert.

Fig. 11.

Gésier du *Bothriomyrmex meridionalis* ♀, vu de côté, entre deux lamelles (ces deux lamelles, situées devant, cachent complètement les deux autres qui sont derrière). Les sépales sont entièrement réfléchies en forme d'ancre. Lettres comme dans la figure 6.

Fig. 12.

Valvule génitale extérieure de la *Formica sanguinea* ♂, attenante à l'écaille du même côté. *e e*, écaille. *v e*, valvule génitale extérieure.

Fig. 13.

Mandibule gauche de la *F. pratensis* ♀, grossie 20 fois, vue de sa face inférieure interne et postérieure. *s a*, surface articulaire. *b e*, bord externe. *b i*, bord interne. *b t*, bord terminal.

Fig. 14.

Valvule génitale moyenne de la *F. sanguinea* ♂.

Fig. 15.

Valvule génitale intérieure de la *F. sanguinea* ♂.

REVIEW

ON

* *The Mammalia of India*—(continued from page 107).

We dropped Mr. Blanford at the tail of the Elephant; after whom in his arrangement come the *Equidæ*. Now the Indian *Equidæ* have been lately discussed in these pages by our lamented member, Mr. Steel, who knew much more about them than either our author or his reviewer. It is only necessary to remark in this place that Mr. Blanford's printers have caused him to represent *Equus caballus* with four toes! (*vide* page 468, engraving), which liberality is balanced by allowing only *one* to the tapir! It is only fair to say that in very few instances has the correction of his proofs been so ludicrously overlooked. He puts all the Asiatic wild asses into on species, *Equus hemiconus*, and passes on to the *Rhinoceroses*, of which he allows us three. The chief is *R. unicornis*, which, Mr. Blanford says, "was common in the Panjab as far west as Peshawar in the time of the Emperor Baber." This story is everlastingly turning up: sometimes in very curious forms. It is not long since the President of our chum Society was reported as having informed it that the Emperor Baber "killed Hippopotamuses in Bannu," and really the one story is not much more unlikely than the other. The author of the Book of Job expressly mentions Behemoth as indifferent to the floods of Jordan, and, if we are to open our mouths for this sort of scientific diet, a Hippopotamus† might nearly as well have got from the Jordan to the Kuram as a Rhinoceros to Peshawar.

The whole evidence in both cases is contained in the following extract from the Memoirs of His late Majesty the Emperor Zahir-u'd-din Muhammad (commonly called Babar Khán, very much as our first Richard was called Cœur de Lion; and upon as good cause). The Emperor (to be) was in possession of Kabul and raiding in Afghanistan; and wishing to extend that operation to Hindustan, *i. e.*, across the Indus, he sent an officer to examine the banks of the river; and says he:—

"I myself set off for Sawate, which they likewise call Karak-Karreh, to hunt the Rhinoceros. We started many Rhinoceroses,

* Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by W.T. Blanford, F.R.S. Mammalia; by W. T. Blanford, F.R.S. Part II. (*Notice continued*).

† The Hippopotamus existed in India in the Pleistocene period.

but, as the country abounded in brushwood, we could not get at them. A she-Rhinoceros that had whelps came out and fled along the plain; many arrows were shot at her, but, as the wooded ground was near at hand, she gained cover. We set fire to the brushwood, but the Rhinoceros was not to be found. We got sight of another, that, having been scorched in the fire, was lamed, and unable to run. We killed it, and every one cut off a bit of it as a trophy of the chase."

This extract is from Leyden and Erskine's Translation of the Emperor's Turki Memoirs, and has been verified by the kindness of Miss Hughes of the Royal Asiatic Society.

It is worth examining as a piece of thoroughly bad evidence. In the first place the whole phrase, especially the word "whelps," shows that the passage is not from the hand of either Leyden or Erskine, but from that of one of their Munshis.

Further, the Emperor, the most vivacious memoir writer of his day, and perhaps the very best of any who ever wrote in any Asiatic language, dismisses the whole affair in the few words quoted. Had he really been relating his first encounter with a giant pachyderm, is it to be supposed that he would have dismissed it without any notice of its monstrous size, tough armour, and single horn of magic virtue? Until a Turki manuscript of the memoirs is examined by a competent scholar, with his eyes open and his mouth shut, we cannot tell what the Emperor really did write. Steps are being taken in that direction, and it is hoped that some reader of this notice (particularly any one at the British Museum, who could get it done in a fortnight) may take them on his own account.

Meanwhile, the most probable conjecture is that the game were "*Gonde*" or swamp deer (*Cervus duvauceli*) existing in the marshy jungles of the Indus within the present writer's time, under that name. The error of a Scribe (even of Erskine's Munshi) would easily turn "Gonda" into "Genda" (= a Rhinoceros), and that would (if the Turki word is really at all like either) explain the whole yarn. Baber evidently looked upon the whole affair as an almost blank day; and the present writer has seen a division of an insufficient spoil, such as he describes, carried out *as a joke* in the same region. The scene was apparently in the jungles near the

river, and there is not a scintilla of evidence to bring it near either Peshawar or Bannu. Up to the present, at any rate, all that is before us about the Trans-Indus Rhinoceros is a lot of careless quotations, probably at second hand, from an obviously bad translation of a probably corrupt manuscript.

After the Rhinoceroses, in Mr. Blanford's classification, come the Tapirs, which are not in our province. Only this writer would like to know where and when a Tapir was called a "Danta"? There is some reason for thinking it an American word, but it occurs in the Commentaries (so called) of the great Alfonso D'Albuquerque, as the name of some Malayan animal apparently resembling a Tapir, and any light on the subject would be welcome.

After the Tapirs, our author puts the genus *Bos*. We have only one species wild—the bison, lately and sufficiently discussed in these pages by Mr. Inverarity.

The Sheep and Goats come next in order, and we have only one of each, both confined to the Sind hills. Our goat or Ibex, *Capra ægagrus*, is interesting as the widest ranger of all wild goats, found from Crete to Sind, and probably the ancestor of most tame goats. The "Field" newspaper has lately published a perfect little monograph on the wild goats of the world, which has probably come within ken of most of our readers.

Our sheep, the "Gad" of the Sindis, was until now *Ovis cycloceros*, but Mr. Blanford identifies it with *Ovis vignei* of more northern lands.

On the whole, it too has very good claims to the honour of having begotten at least part of the tame sheep of the world. Otherwise it is not a "first sort buckrie," except in the item of *mutton*.

After all, a sheep which produces good mutton justifies its existence.

We regret to say that at this point Mr. Blanford's second volume begins to fall off. The next two names are "*Cemas goral*" and "*Boselaphus tragocamelus*," of which the first is a misspelling, and the second a mere barbarism. The man who rejected "*tibetanus*" and "*philippensis*" because they were not true, might fairly have been expected to reject such outrages on philology, as neither Greek nor Latin.

Boselaphus tragocamelus—save the mark, is nothing but our old friend *Portax pictus*: the Nilgai. The Maratha name "*Ruhí*" or "*Rohi*" is wrongly given as "*Rú-í*," and a name given as that used by the Gonds, "*Guraya*," cannot be universal, as Forsyth, an excellent authority, gives "*Rohi*" as the Gond name in the "Song of Lingo." The description is good, except that the animal is described as "rarely met with in thick forest." It was very common in the heaviest Khandesh forests twenty years ago, but does not inhabit actual thickets. Forsyth justly notices it as the biggest brute in Central India, except the bison. A very small (but mature and *blue*) bull, weighed piecemeal by the present writer, came to three hundredweight. His live-weight was probably little under four.

The sanctity attributed to this animal by the Hindus enables it to survive the other wild ruminants in some districts. The writer can remember its being held "not shikar" in Khandesh, and once actually stoned a herd out of his way there, so careless were they of the presence of man.

The practice of making enamelled shields of the neck skin, and the general decay of piety, have made the Nilgais a trifle shyer since those days, when Lord Mayo was Viceroy.

Mr. Blanford calls his next beast "*Tetracerus quadricornis*—the four-horned antelope," which is a foul barbarism, unless indeed we are to write Rhinoc*erus*, or to give up even the Latin grammar bodily. The rest of the article upon this creature that never did him any harm, is equally inaccurate. It begins with "Fur thin, harsh, and short." Now, although this description does apply to some skins, especially if compared with those of fine deer, the fur in Bombay specimens is often thicker and longer than that of any other Peninsular antelope, and scarcely more harsh than that of any but the gazelle.

In a chance specimen, brought to the writer a fortnight ago, the hair on the sides and back was nearly an inch long. In another, now picketed by the tent, it exceeds an inch. The little beast is almost shaggy, and this is its character amongst the strictly Indian antelopes of the Peninsula. The writer has shot many; and kept many alive; and the specimen now referred to will probably live to

contradict our author in the "Zoo." It haunts, says Mr. Blanford, "thin forest and bush and keeps chiefly to undulating and hilly ground," and elsewhere he speaks of it as found "throughout the Bombay Presidency."

As a matter of fact it is unknown in the plain regions forming the most part of this Presidency, but is pretty common in the forests of the Konkan and Khandesh, most of all in the heavy forests of Western Khandesh, where the writer has seen many in a morning's walk. In that region, too, it strays far from water (which Mr. Blanford thinks it never does).

On one occasion the water-bearers of a Bombay forest party, in the "Dry Jungle" of Khandesh, missed their way; and left the European leader, and a Bhil gun-bearer, to a very fair chance of death or lunacy—or both. The creepers and "bel" fruit failed to allay their burning thirst, and things looked very ugly indeed, when a four-horned antelope came before the rifle. The Bhil rushed in and sucked the blood as it spouted from the shot-hole. The white man lit a fire, grilled and sucked the fresh meat. But both of them were of the mind that the "bekri" was the saving of their lives, as they did not feel strong enough to struggle to the well some six miles away. For the "bekri" the nearest water was 9 miles distant.

Mr. Blanford, however, is doubtless right in allowing only one species of *Tetraceros* to India, and in utterly rejecting the name "Chinkara" as applied to it, stolen from the gazelle. Also in speaking a good word for its venison.

A large female of *Tetraceros quadricornis* merely "gralloched," that is with only the viscera removed, weighed exactly two stone. The live-weight of a full-grown buck would probably not exceed half a hundredweight.

It is commonly confounded with the barking deer (*Cervulus muntjac*) under the name of "bekri" or "bekad." But in Khandesh, at the period referred to, many native shikaris distinguished it as "ran mendi" (wild sheep). Mr. Blanford thinks that it has been sometimes mistaken for the hog-deer. But in the Bombay Presidency all errors to this effect have been due to confusion between the latter (*Cervus porcinus*) and the barking deer, or

more often, the mouse deer (*Tragulus memimna*). In several cases the present writer was able to ascertain this by actual conversation with the reporters of "hog deer" where no hog deer was—cross-examination of the witnesses; in fact, the error was not of observation but of nomenclature.

LIST OF BIRDS' EGGS OF NORTH CACHAR.

Presented to the Society by Mr. E. C. S. Baker, of North Cachar, April, 1892.

Hume's Nos.	Scientific Name.	Popular Name.	No. of Eggs.
41	Polioaëtus ichthyaëtus	White-tailed Sea Eagle	3
70	Bubo coromandus	Dusky Horned Owl	1
102	Cypsellus batassiensis	Palm Swift	2
148	Palæornis torquatus	Rose-ringed Parraket	2
195	Megalæma asiatica	Blue-throated Barbet	3
215	Rhopodytes tristis	Large Green-biled Malkoha	2
217	Centrococcyx rufipennis	Common Coucal	1
218	„ bengalensis	Lesser Indian Coucal	2
259	Lanius nigriceps	Black-headed Shrike	4
265	Tephrodornis pondicerianus	Common Wood Shrike	6
278	Dicrurus ater	The Black Drongo	2
280	„ longicaudata	Indian Ashy Drongo	1
282	Chaptia ænea	Bronzed Drongo	1
283	Bhringa remifer	Lesser Racket-tailed Drongo	5
291	Rhipidura albicollis	White-throated Fantail Fly-Catcher	1
344	Pitta nepalensis	Blue-naped Pitta	3
385	Pyctorhis sinensis	Yellow-eyed Babbler	5
388	Alcippe nepalensis	Nepal Babbler	14
393	Stachyrhidopsis ruficeps	Red-headed Babbler	1
412	Garrulax pectoralis	Black-gorgetted Laughing Thrush	3
413	„ moniliger	Neck-laced Laughing Thrush	8
421	Ianthocincla rufigularis	Rufous-chinned Laughing Thrush	1
428	Argea caudata	The Striated Bush Babbler	5
461	Molpastes burmanicus	Burmese Red-vented Bulbul	3
536	Franklinia gracilis	Franklin's Wren-Warbler	14
551	„ buchanani	Rufous-fronted Wren-Warbler	1
615	Mesia argentauris	Silver-eared Mesia	5
674	Dendrocitta rufa	Indian Tree-pie	5
676	„ himalayensis	Himalayan Tree-pie	13
686	Acridotheres fuscus	Southern Dusky Myna	4
694	Ploceus baya	The Baya	1
695	„ manyar	Striated Weaver-bird	4
696	„ bengalensis	Black-throated Weaver-bird	2
699	Uroloncha punctulata	Spotted Munia	4
702	„ acuticauda	The Himalayan Munia	1
703	„ malabarica	White-throated Munia	4
825 *quat*	Bambusicola flytchii	Western Bamboo Partridge	1
913	Hypotænidia striata	White-breasted Water Hen	1
926	Herodias intermedia	Smaller Egret	4
1004	Pelecanus philipensis	Grey Pelican	7
937	Nycticorax griseus	Night Heron	1
76	Carine brama	The Spotted Owlet	3
		Total number of Eggs.	2
			155

MISCELLANEOUS NOTES.

No. I.—A FROG SWALLOWING A SNIPE.

WHEN out Snipe-shooting on the Coast, on the 4th March last, I wounded a Snipe which then flew into a Palm garden. While I was hunting for it my attention was attracted by a rustling sound a few yards off. I prepared to fire, but nothing appeared, so I approached to the edge of a pond where I found the missing Snipe in the jaws of an enormous frog, in the act of being swallowed. The frog was driven off and dived to the bottom; the Snipe was recovered, but was found to be quite dead.

C. HUDSON, C.S.

GERSAPPA FALLS, *15th April, 1892.*

No. II.—NOTE ON THE BLACK-TAILED ROCK-CHAT.

Cercomela (Myrmecocichla) melanura, Rüpp.

JERDON'S sole authority for including the Black-tailed Rock-chat in his *Birds of India* appears to have been that among the drawings of Sir A. Burnes was one of a saxicoline bird, procured in Sind, which Mr. Blyth identified as *Cercomela melanura*, Rüpp.

No other observer appears to have met with it in that locality.

Mr. Hume was of opinion that the drawing represented his Red-tailed Wheat-ear, *(Saxicola kingi)*, but the birds differ so much that I cannot agree with him.

In the Black-tailed Rock-chat the upper parts are dark ashy-grey; much paler beneath, gradually passing into the sullied white of the vent; the tail is black throughout.

In the Red-tailed Wheat-ear the rump and upper tail coverts are bright rufous-fawn, and the tail more or less bright ferruginous, with a sub-terminal black band with rufous-white tippings.

Mr. Hume argues that when the wings of the Red-tailed Wheat-ear are closed, and the rump and upper tail coverts hidden by them, and only the black tips of the central tail feathers shown, it does bear a certain resemblance to the figure of the Black-tailed Rock-chat; but surely the artist would not have taken pains to conceal the only bright colour of the bird, on the contrary he would have certainly made the most of it.

I found the bird very common at Aden, where it is one of the very few resident species, and I consider that it is not at all unlikely that a specimen or two may occasionally wander so far east as Sind, and I think we may safely conclude that Blyth's identification was correct.

The bird, owing to its sober coloration, is not likely to attract the attention of any but the most practised Ornithologist.

The bird is of a bold and fearless nature, sprightly in habit, and where encouraged soon becomes familiar.

It frequents rocks, stables, verandahs, old buildings, &c., and often enters rooms in search of food.

It is fond of perching on rocks, walls, telegraph wires, and roofs of houses, and in the breeding season has a low, twittering, but pleasing song.

They breed from early in March to the end of June, some may perhaps breed earlier or later, as after I had procured one clutch of eggs, which was on the morning after I landed, I did not trouble to search for them, and only took notes of such nests that I accidentally met with, as I do not care to collect eggs of other than Indian birds.

The nests are placed in crevices of rocks, stone-walls, under the eaves of houses, and such like places.

The first nest I found was in a crevice, above the window of a dwelling house, in a much frequented street; the opening and shutting of the window did not discompose the birds in the least.

The nest is a mere pad, composed of grass, hair, pieces of rag, or anything suitable that the birds can find.

The eggs, three in number, are broadish oval in shape, pinched in a little at one end; the ground-colour is a faint greenish-white, and they are streaked, spotted and blotched with bright red-brown, having a few underlying specks of a pale inky-purple; the markings are bolder and denser at the large end, where they form a more or less well defined cap.

They measure 0·8 inches in length by about 0·6 in breadth.

H. E. BARNES.

KIRKEE, *April, 1892.*

No. III.—TIGERS EATING THEIR YOUNG.

Some time ago I was asked if Tigers and Lions were cannibals, and I replied that in an experience extending over nearly 35 years, although I had often known of instances of the young cubs being killed by their male parent I had never heard of their being afterwards eaten, and I still believe this to be the rule. A few days since, however, I found an exception to this rule, and look upon it as so unusual that thinking the incident may be of interest to some of the readers of our Journal I send particulars.

On the 17th instant I got *kubber* of a Tigress and two fine cubs in a small hill about 3 miles from my camp, and going out with a friend we had a beat for her and she was duly shot. The cubs did not appear in the beat at all, but

I ascertained from some Bhils that they were about the size of Panthers, and so thinking them too small to be shot at and too large to be caught alive, we determined to leave them alone, although a congregation of chattering monkeys round some rocks, half way up the hill, showed very plainly where they were.

On the 22nd instant, rather late in the afternoon, my Shikari sent in word that he had marked down a Tiger in the very same place in which the Tigress had been found. I started at once, as soon as I could collect men for a beat, and at the first sound of music out came the Tiger straight away for the place where I was posted, giving me an excellent shot, which I took advantage of, and the whole thing was over before the beaters had any idea of it. My Shikari, coming along with the beaters, when he reached the place where he had marked the Tiger down, went to have a look at it, and in a sort of hollow place under a rock close by, he came on a dead Tiger cub which had evidently been killed that morning, for it was quite fresh, and of which the whole of the right hind leg and quarter had been eaten.

There was not a trace of a bit of it left anywhere; the cub had evidently been killed by the Tiger, for there were the marks of his fangs in the throat. On looking about, my Shikari found, behind a rock, close by, the half-eaten remains of a large goat, and we afterwards found the tracks of the cub dragging the goat up the side of the hill to its hiding place. The theory is that the cub returned to the hill pretty early in the morning, bringing the goat with him, and whilst he was eating it the Tiger put in an appearance and a row ensued which ended in the death of the cub. So far all is perfectly natural until we come to the eating part of the business, which was certainly what I had never heard of before.

W. SCOTT, Colonel.

PALANPUR, *26th April, 1892.*

IV.—NOTES ON THE THAMIN.

RUCERVUS ELDI (*Panolia eldi* apud Jerdon), the Burmese or brow-antlered deer, seems to be peculiar to Burma and the Malayan Peninsula, though how far north it is found does not seem to be clearly known. It is called by the Burmese—*Thàmin*, the accent being on the last, and not as Jerdon says—*Té-min*.

The brow antlers of this deer are very long and project forwards, slightly inwards and downwards, the remainder of the horn curving scimitar-like outwards. In a symmetrical pair a line along the horn from the point of the brow-antler to the tip of the termin at snags will be almost the arc of a circle. Most heads have one line on the brow-antler and two or three on the top; an average head has 10 points, but 12 points are not uncommon; there is a fine head in the R. A. Mess here, which has 14 points. The length of the horns measured round the curve is, in an average head, 29 inches, greatest span 34 inches.

In height this deer is between the swamp and the spotted deer, being about 40 inches at the shoulder: its length is slightly under 6 feet—in colour a very dark brown, in old stags considerably darker than the Sambur—in fact in the distance when seen out in the open plains, they look not unlike a large black buck, so dark are they—the hinds are light-coloured, almost the same colour as a female Nilghai.

During the cold weather the *Thamin* frequents the jungles and hills, but about the beginning of April they come down into the large tracks of kine (elephant) grass which are found on the plains.

My acquaintance with this fine stag only commenced the other day on the open grass plains of the country bordering the Sittang in the Pegu Districts. They are there fairly numerous. The plan for shooting them is to start on elephants as soon as it is light, and go working through the elephant grass until stags are seen in the distance grazing on the edge of the grass; then get down from your elephant and stalk them. In this way you seldom get much nearer than 150 yards, and you must hold very straight, as the stags unless dropped in their tracks go off into the grass and you never see them again, and in this way a great number are lost. When the sun gets hot, the herds, which generally consist of about 6 or 8 individuals, retire into the grass to lie up for the day, then working back on your elephant you can put them up, and, if a good shot, bowl them over as they rush away through the high grass; you will also get running shots at hog-deer, which abound. The herds which I have seen, as I have said, only consist of 6 or 8 deer, but I am told that in some parts as many as 50 or 60 are found together.

In the rains these plains on the banks of the Sittang become an immense sheet of water with patches of grass standing up as islands, and in these the *Thámin* and hog-deer take refuge. I am told that then the villagers go out in their boats and cut down the deer with their dahs (swords).

I see it mentioned in the *Asian* of 1st April, that a pair of exceedingly rare horns have been found by the Irrawaddy column. "They resembled those of the African gnu, and were said to have come from the Mishmi Hills." These must be the horns of the Takin (*Budorcas taxicolor*), I should suppose, as that strange antelope is found in those parts.*

Since writing the above I have been able to take some measurements of the *Thàmin* from some good heads lately shot.

Length of horn measured	1	2	3	4	5	6	7	8
round the curve	37″	35″	32½″	33″	33″	34½″	27″	29″
Span at its broadest part	39½″	37″	29½″	30″	35″	32½″	36″	34″
Number of points	12	14	9	14	13	10	12	10
Length of brow antler	11½″	13½″	9″	13½″	10½″	12″	12½″	10½″

* *A large pair of these horns has lately been presented to this Society by Major Yule, Burmah.*

Of the above No. 2 stood 45 inches at the shoulder, the height of the others I was unable to ascertain, but there seems little doubt that the *Thàmin* stands from 11 hands to 11·2 in height.

The following notes have been kindly supplied by a gentleman of the A. V. D., who is also a good sportsman and has shot many.

"The *Panolia eldi*, *Thàmin* Burmese, *Sungrai* Munipur. Brow antlered deer. *Colour*.—Full-grown stag is a very dark brown about back and neck, underparts light. The old bucks in the distance look almost black. The females are much lighter in colour. *Horns*.—In the second year the males begin to get their horns; after two years they get two tines, and at seven are said to be in their prime, when they run to 12 or more tines, including the brow antler. The horns are perfect in March, and are shed in September."

"The rutting season is April and May; the female goes with young about 6½ months, and brings forth about October and November, usually one at a birth. The young are often spotted, but this soon disappears."

"They are very fond of the open and will not go into heavy bush jungle; they are difficult to approach, and a long swinging trot their pace; they can be seen grazing in numbers in the open quins, where the kine grass has been burnt."

The above writer also says he considers the weight of a good stag about 200 lbs. I should say it was considerably nearer 320 lbs., but I have never weighed one.

W. ST. JOHN RICHARDSON, Capt.

RANGOON, *10th May, 1892*.

V.—GEOGRAPHICAL DISTRIBUTION OF THE PIN-TAILED SNIPE.

I notice in the last journal (No. 4, Vol. VI.) a query by Captain Richardson as to the distribution of this snipe. The question is dealt with in *Hume and Marshall's Game-birds*, and the inference therein arrived at seems to be that the further south you go the more plentiful are the pin-tailed snipe, and certainly as between Guzerat and the Konkan, that is my experience. Seebhom, in his treatise on the *Charadriida*, does not go into this point, but he designates India as the locality wherein *S. stenura* was evolved from the original snipe type, whereas he lays down Europe as the home of *S. gallinago*. He alludes of course to the period of dispersion following the last but one glacial epoch. Anyhow it would be natural if we accept his views to imagine that *S. stenura* would go further south into India.

I see Hume seems to be ignorant of the breeding place of *S. stenura*.

Seebhom of course has cleared all this up in his researches in the Arctic Circle, where he found them breeding above 70° latitude.

H. D. OLIVIER, Major.

AHMEDABAD DISTRICT, *30th April, 1892*.

VI.—A NEST OF KING COBRA'S EGGS.

(*Naia bungarus.*)

It may be of interest to some of our members to hear how I obtained the eggs of the above deadly snake. Information was brought to me that a path into a village situated some 3 or 4 miles from here, was closed owing to a large and deadly snake having taken up his quarters close by the side of it. My informant also told me that the snake had made a *gadi*, upon the top of which it was sitting. This morning I went out to have a look at it, and sure enough within two yards of the path was a heap of dried leaves and on the top of them the snake. The head seemed to be down in the leaves, but two coils were visible. After throwing a few stones at the heap, one of which hit the snake, it erected its head and on seeing us distended the hood, when I fired and killed it. The eggs, thirty-three in number, we found at the bottom of the heap. I opened one to see the state of the embryo, which I found in an early state of development, but still the young snake was formed and could be seen breathing.

The snake which I killed had a good deal more yellow on the under surface of the head and neck than one which I shot last Sunday; it was also rather smaller, measuring only 9 feet 8 inches. The jungles, in which the two snakes were shot, were, I should say, 6 miles apart.

GEORGE K. WASEY.

CASTLE ROCK, *22nd May, 1892.*

PROCEEDINGS.

PROCEEDINGS OF THE MEETING HELD ON 5TH APRIL, 1892.

The usual monthly meeting of the members of this Society took place on Tuesday last, the 5th April, Mr. G. W. Terry presiding.

The following gentlemen were elected members of the Society:—

Lord Dormer (England); Mr. H. R. P. Carter, C.E. (Madras); Lieutenant E. G. Farquharson, R.E. (Bombay); Mr. M. P. Kharegat, C.S. (Broach); Major Aberigh-Mackay (Nowgong); The Hon'ble W. T. O'Brien (Bombay); Captain W. H. Hunter (Nagpore); Dr. Esmael Jan Mahomed (Bombay); Lieutenant R. J. Spurrell (Nagpore); Mr. W. Sutherland (Bombay); Mr. H. Godwin-Austen (Akola); Dr. John Pollen, C.S. (Bombay); Mr. Thos. H. Storer (Oodeypore); Mr. Mirza Abbas Ali Baig, C.S. (Tanna); Dr. Ratanjee Rustomjee Dadina (Kalian); Dr. Framroz Ardesir Moos (Tanna); Mr. Manecksha Dhanjisha (Tanna); and Doctor G. B. Prabhakar (Bombay).

Mr. H. M. Phipson acknowledged the following contributions to the Society's collections:—

CONTRIBUTIONS DURING MARCH, 1892.

Contribution.	Description.	Contributor.
1 Pair of Horns	Rucervus eldii	Mr. A. L. Barrett.
1 Emu's Egg	Dromœus irroratus	Vet. Capt. J. Mills.
1 Elephant's Musk	from Ceylon	Capt. Channer.
1 Bear's Skull	Melursus ursinus	Do.
2 Fish	Tetrodon stellatus. / Pterois miles	Genl. C. D. La Touche.
1 Mongoose (alive)	Herpestes mungo	Mr. George.
1 Panther	Felis pardus	Mr. Douglas Bennett.
1 Magpie Robin (alive)	Copsychus saularis	Miss Anne Gittens.
1 Four-legged Chicken	from Ahmedabad	Mr. W. Major.
1 Snake	Tropidonotus quincunctiatus	Mr. W. D. Graham.
2 pair Buffalo Horns	Bos bubalus	Mr. T. J. Campbell.
2 Chukor Partridges (alive)	Caccabis chukor	Mr. W. D. Cumming.
1 Lesser Brown Thrush	Zoothera monticola	Capt. H. B. Thornhill.
1 Thick-billed Flower-pecker.	Piprisoma squalidum	Do.
1 Panther Cub (alive)	Felis pardus	Mr. H. Godwin-Austen.
1 Lizard	Lygosoma lineatum	Vet. Capt. J. Mills.
1 King Cobra's Skin	Naga bungarus	Mr. E. H. Aitken.
1 Squirrel (alive)	Sciurus palmarum	Mr. P. Benn.
1 Crocodile's Skin	Crocodilus palustris	Mr. T. R. Fernandez.
1 Porcupine Fish	Diodon hystrix	Mr. E. M. Slater.
155 Birds' Eggs	of 42 species, from North Cachar.	Mr. E. C. S. Baker.

CONTRIBUTIONS TO THE LIBRARY.

"Museum Notes," Vol. II., No. 5. ..... From Trustees, Indian Museum.
"Proceedings of the Royal Society of N. S Wales," Vol. III ..... In Exchange.
"The Mammalian Game of British India" (Jas. Murray) ..... From the Author.
"Transactions of the Royal Society of Victoria," Vol. II.,
Part I., Vol. III., Part I. ..... In Exchange.
"The Canadian Entomologist," Vol. XXIV ..... In Exchange.
"Le Monde des Plantes," Vol. I., Part VI ..... From Mon. H. Léveillé.
"Proceedings of the California Academy of Science," Vol. III., Part I ..... In Exchange.
"The Zoological Record," Vol. XXVII ..... From Mr. W. F. Sinclair, C.S.
"Proceedings of the Asiatic Society of Bengal," No. 4 of 1891 ..... In Exchange.

EXHIBITS.

Colonel W. S. S. Bisset exhibited a Vanilla plant, in flower, not usually seen in Bombay; and a fern (*Nephrolepis*), one of the fronds of which had grown to the extraordinary length of 10 ft. 4 in.

THE BULBULS OF N. CACHAR.

The Honorary Secretary read the first part of a paper from the well-known Indian ornothologist, Mr. E. C. Stuart Baker, describing the different species of bulbuls found in his district. Sketches of the birds, with their nest, drawn by Mr. Baker, were exhibited and will be reproduced, as illustrations to his paper, in the Society's *Journal*.

A vote of thanks was passed to Mr. E. C. S. Baker for his communication and for his valuable contribution of birds' eggs recently received.

PROTECTIVE RESEMBLANCES.

A paper on the above subject, by Mr. W. E. Hart, was read, containing an interesting account of certain caterpillars which appear to obtain protection from their enemies by means of their resemblance to cobras, and by the manner in which they erect themselves and strike like snakes when alarmed.

OUR ANTS.

The Honorary Secretary also read extracts from a valuable paper, written for the Society's *Journal*, by Mr. Robert C. Wroughton, Deputy Conservator of Forests, Poona, containing a description of the Indian ants, with observations on their "ways and means," their nests, their domestic arrangements, and the "cattle" and "pets" which they keep for purposes best known to themselves.

THE POISONOUS PLANTS OF BOMBAY.

Surgeon-Major K. R. Kirtikar read the introduction to a series of papers which he is preparing for publication in the Society's *Journal*, describing the poisonous plants found in the Bombay Presidency. The series, which will be illustrated with coloured plates, will, when complete, form a valuable companion to Dr. Lyon's well-known work on Indian Medical Jurisprudence.

The sketches of the various plants, drawn from life by Mr. Isaac Benjamin, of the Bombay School of Art, were examined and greatly admired.

PROCEEDINGS OF THE MEETING HELD ON 3rd MAY, 1892.

The usual monthly meeting of the members took place at the Society's Rooms on Tuesday, the 3rd May, Mr. H. W. Buckland presiding.

The following gentlemen were duly elected members of the Society:—H. E. Rear-Admiral W. R. Kennedy (Bombay); Mr. Thomas Joseph Misquita (Madras); Mr. Hormusjee Muncherjee Chichgar (Bombay); Mr. H. T. Pease (Poona); Mr. R. P. Banerjee (Rajputana); Mr. W. T. Blanford (London); Mr. J. Clark, C. S. (Assam); Mr. R. R. Owen (Bombay); Mr. T. W. Bonner (Berars); and Capt. P. Z. Cox (Kolhapore).

Mr. H. M. Phipson, the Honorary Secretary, acknowledged the following contributions:—

CONTRIBUTIONS DURING APRIL, 1892.

Contribution.	Description.	Contributor.
1 Crocodile	Crocodilus palustris	Mr. Isaac David.
1 Wild Dog (alive)	Cyon dukhunensis	H. H. Maharajah Holkar.
5 Pairs Cheetal Horns	Cervus axis	Mr. T. R. D. Bell.
5 Pairs Sambur Horns	Cervus unicolor	Do.
5 Pairs Bison's Horns	Bos gaurus	Do.
3 Tigers' Skulls	Felis tigris	Do.
4 Panthers' Skulls	Felis pardus	Do.
1 Wild Dog's Skull	Cyon dukhunensis	Do.
1 Tickell's Blue Fly-Catcher	Cyornis tickelli	Capt. H. B. Thornhill.
A number of fresh-water Molluscs	From Tanna	Mr. W. F. Sinclair, C.S.
A Collection of Insects	From N. Lushai Hills	Mr. B. Aitken.
3 Jerboas	Alactaga indica	Born in Society's Rooms.
1 Snake (alive)	Eryx johnii	Col. W. S. Hore.
1 Indian Badger	Mellivora indica	Do.
1 Puff Adder's Skin.	Clotho arietans	Do.
1 Dhâman	Ptyas mucosus	Mr. E. H. Elsworthy.
1 Snake	Lycodon aulicus	Mr. C. James.
Spiders and Nests	From Rutnagherry	Mr. H. F. Aston, C.S.
1 Sarus Crane's Egg	Grus antigone	Vet.-Capt. G. Rayment.
1 Bird-Eating Spider (alive)	Mygale fasciata	Mr. H. R. P. Carter.
1 Large Brown-headed Kingfisher.	Pelargopsis gurial	Mr. W. F. Jardine.
1 Wild Cat's Skull	Felis chaus	Mr. W. F. Sinclair, C.S.

MINOR CONTRIBUTIONS.

From Mr. J. A. Betham and Mrs. Mursell.

CONTRIBUTIONS TO THE SOCIETY'S LIBRARY.

Records of the Geological Survey of India, Vol. XXV., Part I.....In exchange.

The Useful Plants of India (Drury).....From Mr. C. Gray.

The Journal of Comparative Medicine and Veterinary Archives, Vol. XIII., No. 3.....In exchange.

Annals of the Royal Botanic Gardens, Calcutta (Prain). From the Author.

The Vegetation of the Coco Group (Prain)..... Do.

On a Botanic Visit to the South Andamans and the Nicobars (Prain)..... Do.

List of Diamond Island Plants (Prain)..... Do.

Beasts and Man in India (Kipling).....From H. M. Phipson.

Animal Sketches (Morgan)..... Do.

A VALUABLE CONTRIBUTION.

The Honorary Secretary drew attention to two fine pairs of Wild Buffalo horns which had lately been received from Mr. T. J. Campbell, Deputy Conservator of

Forests, Assam. The horns are exceedingly massive, and one pair measures 10' 6" from tip to tip, outside measurement. The British India Steam Navigation Company had very kindly brought the horns round from Calcutta, free of charge.

A CURIOUS EXHIBIT.

Mr. W. F. Sinclair, C.S., the Collector of Tanna, exhibited a large tiger's skin together with the arrows with which the animal had been killed by natives in the Tanna District. The whole of the carcase had been withdrawn through the aperture of the mouth, very slightly enlarged, and the entire skin had then been stuffed with dry grass, producing a very grotesque appearance.

ALTERATION OF THE RULES.

In accordance with the notice given at the last meeting, the Honorary Secretary explained that the cost of producing the *Journal* was now so large that the Society could not afford to sell extra copies at the rate of Re. 1-4, as laid down in Rule No. 8. A copy of the *Journal* would still be supplied to every member *free of cost and of postage* so long as he resided in India and paid the full subscription, but the selling price of extra copies would have to be considerably increased. It was resolved that the last sentence of Rule No. 8 should in future read as follows:—"Members shall also be entitled to purchase back numbers of the *Journal* at a discount of 33½ per cent."

THE BLACK-TAILED ROCK-CHAT.

Lieutenant H. E. Barnes read a short note on the Black-tailed Rock-Chat (*Cercomela melanura*). He stated that Jerdon's sole authority for including this species in his Birds of India appears to have been that among the drawings of Sir A. Barnes was a sketch of this bird, procured by him in Sind, but its existence there has been doubted by Hume, who assumed that the sketch was made from a specimen of the Red-tailed Wheat-ear. Lieutenant Barnes stated that he had found the bird in large numbers at Aden, and that he considered it not at all unlikely that a few specimens may occasionally wander as far east as Sind.

HORSE-BREEDING IN INDIA.

The Honorary Secretary read an important paper on the above subject by Veterinary Captain G. Rayment, A. V. D.

F. C. S. Baker del. Mintern Bros. Chromo lith. London.

THE BENGAL RED-WHISKERED BULBUL.

(Otocompsa emeria).

JOURNAL

OF THE

BOMBAY

Natural History Society.

No. 3.] BOMBAY, 1892. [Vol. VII.

THE BULBULS OF NORTH CACHAR.

By E. C. Stuart-Baker.

Part III.

(With 1 Plate.)

(Read before the Bombay Natural History Society on 29th November, 1892).

Otocompsa emeria.

The Bengal Red-whiskered Bulbul.

Jerdon's "B. of I.," Vol. II., p. 92; Oates' "Avifauna of B. I.," Vol. I., p. 228; *id.*, Hume's "Nests and Eggs," Vol. I., p. 178; *id.*, "B. B. B.," Vol. I., p. 198; Murray's "Avifauna of B. I.," Vol. II., p. 44.

Description.—Forehead, crown and lores black; hinder part of cheeks and ear-coverts white surrounded with black; a tuft of crimson-scarlet feathers under the eye and extending over the lower ear-coverts. Lower plumage white, pure on the chin and throat, and suffused with fulvous-brown on the flanks and thighs, under tail-coverts crimson; a broad band across the breast, more or less broken in the centre, dark brown; whole upper plumage, wings, and tail brown, the feathers of the wing margined paler, and the tail having all

but the centre pair tipped with fulvous-white, purest on the outer feathers.

Length 7·8 in.; wing 3·5 in.; tail 3·5 in.; tarsus ·78 in.; bill at front ·6 in.; and from gape ·85 in.

The typical bird of North Cachar does not have the ear-coverts as dark a crimson as those of Manipur and further East, but many birds are met with these plumes of quite as dark a colour as any Burmese birds. Again, I find here that most birds have all but the centre tail feathers tipped with whitish, those with only four pairs so tipped being only about one to six of the others.

NIDIFICATION.—It is quite impossible for me to add anything of importance to the accounts already given of the nesting of this well-known bird, and I therefore merely note a few details about some abnormal clutches of eggs.

The most remarkable egg I have is one with a pale purplish-white ground and densely freckled with rather pale neutral tint, these frecklings forming a very distinct ring round the larger end. I have an egg of *Molpastes burmanicus*, which is quite undistinguishable from this one and might have been laid in the same clutch.

Another queer clutch has the ground-colour, which is a pale salmon, almost entirely concealed by bold blotches of deep reddish-brown, and another is marked just the same with pinkish-brown.

A fourth clutch resembles very closely the eggs of the genus *Serilophus*, the egg itself being white and the markings consist of tiny specks of inky black and lavender, sparsely scattered over the larger end and almost absent elsewhere.

A very common type of egg here is one with a pale salmon or pink ground rather boldly marked with blotches and spots of different shades of red.

I once got this bird's nest in a most unusual place, the very centre of a field of grass, not in a bush or even in a clump of grass but right on the ground among the roots of some grass rather coarser than that surrounding it. These birds often build in my garden, and I notice that long after the young are fully fledged, they return every night to roost in the nest. They breed up to 4,000 ft., and are sometimes found on the highest peaks, but they are most common below 2,500. In the cold weather they assemble in immense flocks

in company with *Molpastes burmanicus* and *bengalensis*, and the chattering and noise made by these flocks is very great—each bird seems to consider it necessary to hold forth on some subject, and no bird considers it right to pose as an auditor only. I have often seen them feeding on the ground, and on a few occasions I have observed them capturing White Ants on the wing.

I have found nests at all times from March until the end of September; on one occasion I found five eggs in a nest.

Hypsipetes psaroides.

Himalayan Black Bulbul.

Jerdon's "B. of I.," No. 444, Vol. II., p. 77; Oates' "B. B. B.," No. 165, Vol. I., p. 173; *id.*, "Avifauna of B. I.," Vol. I., p. 259; Hume's "Nests and Eggs," Vol. I., p. 164; Murray's "Avifauna of B. I.," Vol. II., p. 18.

Description.—Forehead, crown with full short crest, lores, base of lower mandible and extreme angle of chin black; an irregular patch below the ear-coverts, sometimes extending behind them and meeting the black of the crest, also black; ear-coverts light grey, sometimes slightly rufescent; remainder of upper plumage grey, darkest on the shoulders and lightest on the upper tail-coverts; the shoulders and scapularies are frequently tinged with brown in the centre of the feathers; visible parts of the wing the same colour as the back, the inner webs and invisible part of the outer webs of the quills brown; tail dark brown, narrowly edged with grey, on all but the outermost pair, for about seven-eighths of their length. Lower plumage grey, darkest on the throat and lightest on the abdomen; in the new plumage the feathers are very narrowly edged with white, giving the belly an albescent appearance; under tail-coverts dark grey with very broad white margins. Shafts of feathers above black; below light grey. Irides dark hazel; bill and feet coral red.

Male—Length 10·5 in.; tail 4·6 in.; wing 5·1 in.; tarsus ·7 in.; bill at front ·85 in. and from gape 1·2 in.

Female—Length 9·5 in. or rather less; tail 4·2 in.; wing 4·8 in.; other dimensions almost the same as in the male.

NIDIFICATION.—The nest is a true bulbul's in shape and general appearance. Four nests taken during June 1890 shew the differences of construction and material very well.

No. 1, taken on the first of June, was made principally of dead bamboo leaves, bound round about with fine stalks of weeds and a little bark, with here and there a tiny twig. These are all firmly fastened together with cobwebs. The lining is of coarse grass stems and fine bents. The nest is fairly neat, and all the leaves are kept in their places by the other materials. The internal dimensions are, diameter 3", depth 1·1".

The second nest is made entirely of stalks, small twigs and coarse grasses, lined with finer materials of the same kind. This nest, if held up to the light, can be seen through in places everywhere. It is rather larger than the last, the diameter being 3·3"; the depth is just the same.

No. 3 is exactly like No. 2 as regards materials, with the exception that there are two dead leaves in the base work, but it is much deeper. In diameter it is barely 3", whilst in depth it is fully 1·6". This is an unusually deep nest.

No. 4 is the most massive nest of all, and is composed of leaves, moss, grass and stalks, strongly though untidily intertwined, and still further secured by numerous cobwebs. The lining is very scanty, consisting of hardly a dozen fine grass stems and a couple of coarse, soft stalks. It is less than an inch deep, and is 3·2" in diameter internally; externally it is 4·9" by a little over 2".

In 1887 I took a nest of this bird which was lined with a small amount of sambhar hair. This shewed plainly by its appearance that it had been collected from the dried excretæ of a feline, and a short search discovered that the builder had got it from the roadside, about twenty yards from her nest. Another taken in 1888 was lined with buffalo hair. These are the only two, out of some twenty-five which I have taken, lined with anything but a little grass or some similar material.

Most nests are placed at a good height from the ground, somewhere between twenty-five and forty feet from it, but I have also taken them from much lower positions, and sometimes even from low bushes not above five feet up. They may be placed either in a horizontal

or upright fork, generally the former. Very little of the material is wound round the supporting branches, but a good many cobwebs are always used in order to render it sufficiently safe. It is generally built in fairly open country or the outskirts of forests, but I have taken one or two nests from deep jungle.

The normal number of eggs is three, often only two, and four is quite exceptional. In coloration they are merely enlarged facsimiles of many eggs of *P. pyaeus*. The ground-colour ranges from dead white to a very faint cream, a few, very few, eggs being rather darkish cream. The markings consist of numerous small blotches, spots and specks of different shades of reddish-brown and purple-brown; in some eggs one tint prevails, in others another colour. The secondary markings are of pale inky and pale purplish or lavender. In about four eggs in seven the markings are numerous everywhere, becoming more so towards the larger end; in a few they are nearly all crowded together there, forming a cap or zone, sparsely scattered elsewhere. In one or two clutches the superior spots are very few and the inferior, lavender ones, particularly numerous, giving the eggs a very grey tint. I have one handsome clutch in which both primary and secondary markings are few in number, and consist of rather bold dark blotches, forming a deep ring round the larger half.

There are two typical shapes—first and commonest, a regular rather broad oval, and secondly a long pointed oval, considerably drawn out towards the smaller end. Nine-tenths of my eggs are referable to one or the other type, the rest being either extermediate or exaggerated forms of these. They breed throughout May, June, and early July, a few as early as April, and very few late in July and early August. June is the principal month.

The average of thirty-two eggs is 1·05″ × ·77″

This bird is most common on the West and South of the hills, towards the East it is in a great measure replaced by *H. concolor*. Both birds are, however, found in this direction everywhere between 2,000 feet and the highest peaks of about 7,000 feet. They do not breed below 2,500 feet, though they may be found in the plains until late in April, when the last few birds retire into the more mountainous parts. During the cold season single birds are

never seen, and even in June, July and August I have noticed them in small flocks; perhaps in these cases they consisted of unmated males alone. The individuals of the flock often keep much scattered, occupying amongst them some six to a dozen trees, where they feed high up in the topmost boughs. In alighting on a tree they nearly always alight near the summit, thence making their way lower, if necessary. They have a great range of notes, the majority of them, and those principally used, being very loud and harsh. Their most musical note is a loud mellow whistle which is sometimes extended and subdued into a short warbling song. They seem but seldom to use either this call or the song; most frequently each member is heard calling loudly in a very harsh vibrating note, which is constantly repeated both perching and flying. It is one of the noisiest of bulbuls, and, unlike most, does not become more silent during the breeding season.

It is rather a shy bird, and, if a person approaches too near it, flies off, uttering its warning note to the others, who quickly follow.

It prefers open country, and especially scattered tree forest with but little undergrowth, except low scrub and grass. I have also seen it during the breeding season haunting high scrub jungle with a few dwarfed trees growing here and there. This was at a place about 6,500 feet high, and it was also here that I found them breeding in high bushes and scrub. Its flight is stronger and quicker than that of any other bulbul I know. They often, when flying overhead in company, make playful swoops at one another, and, not infrequently, two or three birds will join in a sort of follow-my-leader kind of game on the wing.

BOTANY OF THE LACCADIVES, BEING NATURAL HISTORY NOTES FROM H. M. I. M. SURVEY STEAMER "*INVESTIGATOR*," COMMANDER R. F. HOSKYN, R.N., COMMANDING.

Series II., No. 5. By D. PRAIN.

INTRODUCTION.

THE Laccadive Archipelago is situated at the south-eastern angle of the Arabian Sea, between Lat. 10° and 14° N. and Lon. 71° 40′ and 74° E., and is composed of 16 or 17 small coral islands,

the most easterly of which lies 120 miles to the westward of the Malabar Coast, while the most southerly is about the same distance to the north of the Maldive Archipelago. Between the Laccadive and the Maldive Archipelagos lies the island of Minikoi in Lat. 8° 30′ N., and Lon. 72° 40′ E. This island is sometimes spoken of as being one of the Maldives, owing to the fact of its being rather nearer to that Archipelago than to the Laccadives, and because its population is Maldive in language and in manners; usually, however, it is treated, as it will be in this paper, as a Laccadive Island, because its political allegiance has always, within historical times, been with the latter group. In reality, however, it cannot be precisely looked on as a member of either group, though being one of the atoll-crowned submarine peaks characteristic of the two archipelagos, it is clearly a link in the chain to which both belong. It was at one time supposed that the atolls of this chain were situated on a bank separated from the nearest mainland (the coast of Malabar) by an ocean trough.* This is now found to be incorrect, and the islands form in reality "a chain of peaks rising from a bed of 1,100 "fathoms, or are in themselves 6,600 feet above the bottom, "a height somewhat similar to that of the Western Ghâts in those "latitudes."†

The chief references to the Laccadive Archipelago are enumerated below:—

W. Hamilton.—Article "Laccadives," in *East India Gazetteer* [1815]: a very brief notice of the group.

J. Wood.—Extract from Lieut. Wood's Private Journal regarding the Lakeradeevh Archipelago, in *Journ. of the Roy. Geogr. Soc.*, vol. vi. [1836]: contains a full account of Anderut, and gives information concerning the other members of the group obtained from enquiries made by Lieut. Wood when in Anderut.

W. Robinson.—Description of the Laccadive Islands, in *Madras Journ. of Literature and Science*, n. s., vol. xiv. [1847]: contains full accounts of the British Islands of the Archipelago, and is preceded by an interesting and valuable historical preface, unfortunately

* Hume, "Stray Feathers," vol. iv., p. 459.

† Carpenter, "Administration Reports of the Marine Survey of India," year 1887-88, p. 7; year 1888-89, p. 6.

unsigned, drawn up by a member of the Madras Society's Editorial Committee.

A. O. Hume.—The Laccadives and the West Coast, in *Stray Feathers*, vol. iv., [1876]: an excellent account of the reefs and islands visited by Mr. Hume.

W. W. Hunter.—Article "Laccadives," in *Imp. Gazetteer of India*, ed. ii., vol. viii. [1886]: a somewhat inexact digest of previous notices based chiefly, however, on that by Mr. (afterwards Sir William) Robinson.

Administration Reports of the Marine Survey of India, 1887-8, 1888-9, 1889-90, 1890-1, 1891-2, Topographical and hydrographical notices by Commander **Carpenter**, R. N., and Commander **Hoskyn**, R. N., with biological notices by Surg. **Alcock**, I.M.S.

J. Shortt.—Monograph of the Cocoanut Palm [1888]: describes (p. 16) the process of coir-manufacture in the Laccadives.

G. Watt.—Article "Cocos nucifera," in *Dict. Econ. Prod. of India*, vol. ii. [1889]: describes the Laccadive coco-nut and coir trade.

D. Prain.—A list of Laccadive Plants, in *Sc. Mem. by Medical Officers of the Army of India*, part v. [1890]; **E. Roth**, in *Engler, Bot. Jahrb.*, vol. xii. [1890]; **W. B. Hemsley**, in *Nature*, vol. xlii. [1890].

On studying a chart of the Archipelago we find that the atolls are arranged in three lines, as if there were three chains of peaks; a western rather irregular chain, corresponding roughly to the meridian of Lon. 72° E., containing from north to south the reefs or islands of Cherbaniani, Cheriapani, Bitrapar, Pirmalpar, Akati, and Suhelipar, with, at the extreme north, the sunken bank of Koradivh; a central, corresponding roughly to the meridian of Lon. 72° 45′ E., containing from north to south the islands of Chitlac, Kiltán, Kadamum, Améni and Koráti with the Piti sandbank between the two latter, and with, at the extreme north, the sunken Bassas de Pedro bank; and an eastern, corresponding to Lon. 73° 40′ E., containing the islands of Anderut and Kalpéni, with, to the north-east of these, the sunken Elikalpéni bank: Minikoi, it will be seen, corresponds as to position with the central chain of peaks. The parallel of

Lat. 11° N. conveniently separates the Archipelago into two groups; the northern, containing the inhabited islands of Chitlac, Kiltán, Kadamum, and Améni with the uninhabited island of Bitra and the open reefs of Pirmalpar, Cheriapani and Cherbaniani, which are attached to the administrative district of South Kanara, and thus owe direct allegiance to British India; and the southern, containing the inhabited islands of Minikoi, Kalpéni, Anderut, Koráti and Akati, with the three uninhabited islands of Suheli (on the Suhelipar reef), and Bangáro and Tangáro (on the reef on which Akati is situated), which belong to the Bibi of Cannanore, and thus only indirectly acknowledge British suzerainty.* It will be observed that only one of the atolls of the western chain—that on which Akati stands—has an inhabited island, whereas of the other two the only one without an inhabited island is the Piti sandbank, which, however, is of a somewhat different nature from the other atolls mentioned, being in reality a sunken bank of the same type as Koradivh and Elikalpéni.

The earliest topographical account of any of the islands is a description of the Cannanore island of Anderut† by Lieut. Wood, who visited it in December, 1834, and who, from enquiries made in this one, drew up a table in which the names of all the islands, with their condition as to population and vegetation, are shown. A chart of the group had, however, already been prepared from a survey by Lieut. Moresby in 1828.‡ The group was more fully described by Mr. (afterwards Sir William) Robinson, of the Madras Civil Service, who in 1844 and 1845 visited the inhabited islands directly under British rule, and made enquiries of the people of Améni, Kadamum, Kiltán, and Chitlac regarding the condition of Bitrapar and of the inhabited islands belonging to the Cannanore

* Since, however, the people of Minikoi do thus acknowledge themselves Indian Subjects, and since, except for the accident of population, the island has no greater claim to be considered a member of the Maldive than of the Laccadive group, it is better to deal with Minikoi along with the Laccadives, which are patently Indian Arnds, than along with the Maldives, which acknowledge the suzerainty of Ceylon.

† Extract from Lieut. Wood's private Journal regarding the Lakeradeevh Archipelago; "Journ. of the Roy. Geogr. Soc." vol. vi., p. 29-33 (1836).

‡ A reduced reproduction of this chart is given in "Madr. Journ. of Lit. and Sc.," vol. xiv., plate 16 (1847).

Raj. Mr. Robinson's account * had prefixed to it by the Editorial Committee of the Madras Literary Society an admirable digest of the history of the islands down to 1845, and this preface, with the paper that follows it, has been made the basis of the official account of the group.† From the time of Mr. Robinson's visit till 1876 no account of the islands had been published, though in 1873 they were visited by Dr. Shortt.‡ Mr. Hume in 1875 paid a visit to the Archipelago, his object being mainly an ornithological survey, but with characteristic energy he made a botanical collection in some of the islands visited by him, and refers to the species that he collected or observed in his account of this visit.§ A series of scientific visits have recently been paid to this group by H. M. I. M. *Investigator*. In October, 1887, Chitlac was visited, but no botanical collecting was done.‖ Again in May, 1889, Anderut and Kiltán were visited, and collections of botanical specimens were made by Dr.

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* "Description of the Laccadive Islands," by W. Robinson, Esq., of the Civil Service; "Madras Journ. of Lit. and Science," vol. xiv., pp. 5-40 (1847).

† "Imperial Gazetteer of India," ed. ii., vol. viii., pp. 392-396 (1886). Much of this article is a paraphrase of Mr. Robinson's account, many sentences being taken *verbatim*, though without acknowledgment, from the Madras Journal. The compiler accredits to Mr. Robinson one passage in the paragraph on population; this passage, though enclosed within quotation commas, differs rather more than many of the unacknowledged sentences. The paper by Mr. Robinson being essentially "official," the writer of the *Gazetteer* may not have been technically bound to acknowledge the source of his information; this can hardly, however, apply to the editorial preface, which is appropriated without remark. In doing so the "Gazetteer" somewhat inexactly speaks of Kalpéni as the "'Kaluftee' of Ibn Batuta," although the writer of the paraphrased digest has been careful to say that "no distinct mention of the Laccadives occurs in Ibn Batuta" ("Madras Journ.," xiv. 2), and as carefully indicates that the passage in which Kaluftee is given as the name of one of the principal inhabited Laccadive Islands occurs in the *Tohfat-al-Mujahidin* ("Madras Journ.," xiv.3). The identification of Kaluftee with Kalpéni is altogether arbitrary; it is quite as likely that Koráti is intended.

‡ Shortt; Monograph of the Cocoanut Palm; or, *Cocos nucifera*, p. 16 (Mad 1888).

§ Hume, "The Laccadives and the West Coast"; "Stray Feathers," vol. iv., pp. 4 460 (1876).

‖ Carpenter, "Administration Report of the Marine Survey of India," year 1887-88, p. 7.

Alcock, Surgeon-Naturalist to the Marine Survey;* these collections were described in a preliminary notice of the Flora of the group by the writer.† In November, 1889, the *Investigator* visited Kalpéni‡ and Dr. Alcock again made a collection of the plants. Finally, in November and December, 1891, the vessel re-visited Kiltán, and visited Kadamum and Bitrapar, whence Mr. Hume had already sent specimens, as well as Akati and Minikoi, two islands from which specimens had not previously been obtained.§ During these 1891 visits, Dr. Alcock and his assistant, Mr. Fleming, Apothecary on the *Investigator*, collected most assiduously the plants that were met with, Mr. Fleming at the same time preparing a list of the species under cultivation in the four inhabited islands visited.

All the islands of the group are typical coral-islands, situated on atoll-rings, of which each forms but a small portion, generally on the eastern or leeward aspect of their respective reefs; Anderut, however, is situated on the windward side, the reef being to leeward instead of to windward‖, while Akati and its two little satellite islands, Bangáro and Tangáro, are inside a huge lagoon, formed by a separate barrier-reef.¶ Three of the atolls are mere open-reefs. The first of these is the Cherbaniani (called also the Beliapani) reef, situated at the extreme north-west corner of the Archipelago in Lon. 71° 55′ E. and Lat. 12° 20′ N., minutely described by Mr. Hume** as a long oval atoll, 6 miles in length by 2¼ miles across, the reef consisting of an almost unbroken line about 200 yards in width, just submerged at high-tide and more or less dry at low-water, with two narrow shallow channels through it on the eastern and one on the western side; in three places, at the extreme north, the extreme south, and about the middle of the eastern side are piled-up masses of coral débris forming islets even

* Alcock in Hoskyn, "Administration Report of the Marine Survey of India," year 1889-90, p. 13.

† Prain, "A List of Laccadive Plants"; "Scientific Mem. by Medical Officers of the Army of India," pt. v., pp. 47-70 (1889).

‡ Hoskyn, "Administration Report of the Marine Survey of India," 1889-90, p. 5.

§ Gunn, "Administration Report of the Marine Survey of India," 1891-92, p. 3.

‖ Wood, "Journ. of the Roy. Geogr. Soc.," vol. vi., p. 30.

¶ Hume, "Stray Feathers," vol. iv., p. 439.

** "Stray Feathers," vol. iv., p. 428, with map.

at high-water. There is no trace of vegetation on any of these tiny islets, the largest of which, that at the northern extremity, is about 200 yards long and about 50 yards across, its highest point not being more than 7 feet above high-water. The lagoon within this reef carries from 3 to 3½ fathoms at its deepest portion, shallowingto the reef all round.

This reef is apparently not included in Lieut. Wood's list;* his No. 10 (Tátácum) may indeed refer either to this or to Pirmalla, but cannot include both, and probably indicates the latter. If, however, this should be what is meant by his Tátácum, then the statement that it produces coco-nuts made to him at Anderut, is incorrect. Immediately to the south of Cherbaniani in Lon. 71°50′E. and Lat. 11°50′ N. lies the Cheriapani reef (Sheréah of Wood's list), called also the *Byramgore* reef, owing to the wreck there in 1827 of a Bombay vessel of that name. This is shown in the charts as completely submerged at high-water, but from what Mr. Hume was able to ascertain at Améni regarding it, this appears to have several islets like those on the Cherbaniani reef. The statement of the islanders of Anderut to Lieut. Wood, that it produces coco-nuts and is visited on that account, is doubtless incorrect; if visited at all it must be for birds' eggs, or for the purpose of fishing in the lagoon.

South-east of the *Byramgore* reef in Lon. 72° 10′E. and Lat. 11°30′N. lies Bitrapar, visited by Mr. Hume in 1875. Mr. Robinson had already given an account of the island.† This reef forms a large very regular oval 7 to 8 miles long and 4 to 5 miles across at the widest part. The island of Bitra, which is the only part of the atoll above high-water mark, occupies the north-east corner, and is about half-a-mile long and a quarter of a mile across, being nowhere more than 9 or 10 feet above high-water level. The lagoon is shallow at the north end and along the western side, but carries elsewhere 3 to 6 fathoms. The island itself is not, like the islets on

* "Journ. Roy. Geogr. Soc.," vol. vi., p. 30.

† Mr. Hume speaks inadvertently ("Stray Feathers," iv., p. 435) of Mr. Robinson having visited this island. Mr. Robinson says ("Madras Journ.," xiv., p. 27) that he was unable to visit it himself, though he obtained all the particulars he could concerning it. Mr. Hume's own account is, therefore, the first description of the island that has been made from personal observation.

Cherbaniani, a mere pile of coral blocks,* but exhibits the structure characteristic of the larger formed-islands of the group; that is to say, it consists of a soil of coral-sand mixed with a greater or less amount of humus derived from decaying vegetation, this soil overlying a friable calcareous rock with a coarse oolitic structure, one foot to eighteen inches thick, beneath which is found a loose wet sand from whence, if the crust be broken through, and a few spadefuls of it be removed, water percolates and accumulates in the hollow so formed.† In Bitra, however, though the overlying soil is said to be excellent and the coco-nut grows luxuriantly, it is impossible for the people to occupy the island permanently because the water which accumulates in the wells made by sinking short shafts through this coral crust, in place of being fresh and drinkable, as in the inhabited islands, is so salt that the fishermen who visit the place, when they run short of water, dig a hole in the sand near the sea and drink the brackish percolations thus obtained in preference to the well-water.‡ The island is sacred to a *Pir* whose tomb, Mr. Robinson was told, has about 200 coco-nut trees planted round it as votive offerings to his name. Mr. Hume speaks of the coco-nut trees but does not mention the tomb. It stands, Dr. Alcock informs the writer, near the north end of the island in the middle of the Coco-nut grove, surrounded also by patches of one of the *Tulsi* plants. An indication that the island is often visited is the presence in the *Investigator* collection of specimens of *Ricinus communis* which is frequent as a weed. Besides the Castor-Oil, the *Tulsi*, and the Coco-nut, the collections of Mr. Hume and Dr. Alcock contain 16 species, all but three of which are undoubtedly plants of the littoral, sea-introduced class. It is important to note that the Coco-nut does not occur in a fringe round the coast as would probably be the case were that species here introduced by the sea; besides their being confined to the middle of the island we have the express statement of the islanders to Mr. Robinson that the trees were deliberately planted during their fishing and egg-collecting visits.

* Hume, "Stray Feathers," vol. iv., p. 431.

† Robinson, "Madras Journal of Lit. and Science," vol. xiv., p. 7; Alcock in Hoskyn, "Marine Survey Report," 1889-90, p. 12.

‡ Robinson, "Madr. Journ." vol. xiv., p. 27.

The most interesting species on the island is *Pisonia alba*, here clearly sea-introduced, which has not been reported from any other member of the group, and has never indeed been found growing undoubtedly wild either in India or in Ceylon.

To the south and a little west of Bitrapar, in Lon. 72° E. and Lat. 11° 10′ N., is situated the third open reef of Pirmalpar which has been visited by Mr. Hume, who describes it * as a huge triangular atoll with only one small bank, at the north-east corner, about 200 yards long and 50 yards across, uncovered at high water but with the greater portion of the reef visible at low tide. The islet—which derives its name of Pirmalla from a tradition of the people that their ancestors, the original settlers in the archipelago, formed part of an expedition which set out from Malayala (the Malabar coast) for Mecca in search of their apostate King Barman Pirmal, but was wrecked in these islands†—is not composed, like those on the Cherbaniani reef, of accumulations of coral débris, but is a bare, smooth, wind-swept sand-bank absolutely devoid of any vegetation.‡ It is therefore clear that, whether the *Tátácum* of Lieut. Wood's list refers to this reef or to Cherbaniani, the islanders misinformed him when they assured him that it produced coco-nuts. Perhaps, however, the people of Anderut, who probably do not themselves visit this reef, seeing this is a British and not a Cannanore possession, only knew that the island was visited periodically, without being aware whether the visits were paid in order to obtain coco-nuts or merely for fishing and egg-collecting.

South-east of Pirmalpar between Lon. 72° 10′ and 72° 20′ E. and between Lat. 10° 50′ and 10° 57′ N. lies the large atoll of Akati, the most westerly of the inhabited islands and the only inhabited island of the western chain of peaks. This atoll, which encloses a large lagoon inside which vessels of some size find an anchorage, was visited in 1875 by Mr. Hume, who describes the reef as somewhat "shoulder-of-mutton" shaped, the knuckle to the south-west with Akati itself in the middle of the knuckle, and with two small uninhabited islands, Bangáro and Tangáro, towards the edge of the

* "Stray Feathers," vol. iv., p. 450.

† Robinson, "Madr. Journ.," vol. xiv., p. 8.

‡ Hume, "Stray Feathers," vol. iv., p. 451.

blade at the north-east corner. The barrier reef is high and strongly marked on the north, north-east and more than half the eastern side, where, Mr. Hume thinks, there are some points bare at high water; elsewhere it is much lower, a considerable portion being covered even at low tide, and being pierced by deep ship-channels in several places.* Mr. Hume also mentions a sandbank which is devoid of vegetation; this is probably the Akati Féti (No. 17) of Wood's list. Mr. Hume landed on Bangáro (Bangâram, *Wood*) which he describes as "a mass of vegetation down to the "water's edge, dense with cocoanuts above and screw pines below," the undergrowth being also very dense; the plants growing with a luxuriance that "contrasted strongly with the generally-stunted "growth of the same species on Betrapar." The plants that Mr. Hume collected were mainly those he had not already obtained or noted in Bitrapar; the specimens belong to 10 species, all save one of which (*Setaria verticillata*) might have been introduced by the sea. The interior of the island was found to be an almost impenetrable thicket, largely composed of *Caesalpinia Bonducella* bushes.† This account of the zone of coco-nuts points clearly to their having been here introduced by the sea.

Tangáro (Tenâkerry, *Wood*), the other minor island on the reef, was also visited by Mr. Hume, who describes it as less wooded than Bangáro; he did not collect any specimens. According to Lieut. Wood's table this, like the last, is visited on account of its coconuts, which is doubtless correct.

On Akati itself Mr. Hume was unable to land, but it was visited in 1891 by Dr. Alcock and Mr. Fleming. The plants collected—which include 32 weeds of cultivation or garden-escapes, and 13 sea-shore species, with only one plant (*Tylophora asthmatica*) that may be a wind-introduced species—show that there is no true jungle, but that the whole of the island is under cultivation. Mr. Fleming's list of cultivated species includes *Calophyllum inophyllum* (of which there is but one tree, planted); *Thespesia populnea* (planted, but also occurring wild); *Sesbania grandiflora* (planted to support the Pepper-

* Hume, "Stray Feathers," vol. iv., 451.

† Hume, "Stray Feathers," vol. iv., 452.

vine); the Tamarind; the Pomegranate (about half-a-dozen plants bearing good fruit); the Papaya; the Sweet-Potato (only one small plot); the Bird's-eye Chillie (only in a 'wild' condition); *Datura* (which occurs pretty frequently, but also only in a 'wild' condition); *Mirabilis Jalapa;* the Pepper-vine (an object of great care); the Bread-fruit (only one tree, in a garden); *Tacca pinnatifida* (cultivated only); *Colocasia antiquorum* (only in a 'wild' condition). Mr. Fleming's list omits the Supari (*Areca catechu*); from a similar list for Kiltán, where it *does* occur, it is also omitted, perhaps therefore the omission here is only an oversight. The island is covered with Coco-nut palms and there are several large fresh-water tanks, paved and terraced and walled with slabs of coral-volite; in these occurs the universal water-weed *Chara*.*

Due south of Akati, in Lon. 72° 12′ E. and Lat. 10° N., lies the Suhelipar reef which is shown on Lieut. Moresby's Chart as an oval atoll with an opening in the reef at the north-end and with the uninhabited island of Suheli '(Soilee, *Wood*) near the centre of its south-eastern side. According to Lieut. Wood's list, this island is visited on account of its coco-nuts, but no topographical account of the atoll being available, it is impossible to say with certainty whether Suheli is a sand-bank like Pirmalla, an accumulation of coral debris like the islets on Cherbaniani, or a formed-island like Bitrapar.

The most northerly of the formed islands and the northmost member of the central chain is the inhabited island of Chitlac (Lon. 72° 45′ E., Lat. 11° 45′ N.), visited and described by Mr. Robinson. Mr. Hume was unable to land in 1875,† and Dr. Giles, who landed during the *Investigator* visit in 1887, confined his attention to the marine fauna.‡ Mr. Robinson describes the island as two to two and a half miles long and about three-quarters of a mile wide, situated on the eastern side of a large and perfect atoll. The surface is less even than in the other islands, owing to a ridge of sanddrift that runs up the middle, rendering the

* Alcock, "Administration Report of Marine Survey of India," year 1891-2, p. 10.
† Hume, "Stray Feathers," vol. iv. p. 436.
‡ Carpenter, "Administration Report of Marine Survey of India," year 1887-8, p. 7.

soil so poor that the growth of coco-nut tree is slow and their outturn poor. "Low mounds of sand occupy a great part of the "centre and best protected parts of the island on which nothing "grows, except scanty crops of a plant called *Teerny*, on the roots of "which a small ball about the size of a pea grows; after the plant "has withered, these are gathered from among the loose sand and "used by the islanders. Dry cultivation on this island is very in-"significant."* The *Teerny* is obviously *Tacca pinnatifida*, which we know from Lieut. Wood to be cultivated in Anderut, and from specimens in the *Investigator* collections to be grown in Akati and in Minikoi. The tubers, however, are apparently unusually small in Chitlac, for the specimens of those grown in Akati and Minikoi sent to Calcutta are as large as plums. Still even these latter compare very unfavourably with the tubers of *Tacca* as it occurs wild on the shores of the Andaman Sea; there they are usually larger than a man's fist, and are often as large as the human head.

South-east of Chitlac, in Lon. 73° E. and Lat. 11°28′ N., lies Kiltán, the smallest inhabited island of the group. It has been visited and described by Mr. Robinson,† by Mr. Hume,‡ who also has published a map of the island, and by Dr. Alcock.§ Both Mr. Hume and Dr. Alcock have made collections, and a third collection has been obtained by Dr. Alcock and Mr. Fleming during the second *Investigator* visit in 1891. The atoll of Kiltán "is a "long oval reef enclosing the usual lagoon with one entrance at the "north-west corner, surrounded by the usual shelving bank, varying "from one-eighth to half a mile in breadth, beyond the edge of which "the lead drops at once into very deep water, and with the whole "eastern side of the reef converted into an island which is nearly two "miles in length, and may average nearly a quarter of a mile in "width."‖ "The lagoon is large but shallow, and is nearly dry at low "water. The whole island is devoted to the cultivation of the coco-

* Robinson, "Madr. Journ.," vol. xiv., p. 26.

† Robinson, "Madr. Journ.," vol. xiv., p. 23.

‡ Hume, "Stray Feathers," vol. iv., p. 436, with Map.

§ Alcock, in Hoskyn, "Administration Report of Marine Survey of India," year 1889-90, p. 12.

‖ Hume, "Stray Feathers," vol. xiv., p. 436.

vine); the Tamarind; the Pomegranate (about half-a-dozen plants bearing good fruit); the Papaya; the Sweet-Potato (only one small plot); the Bird's-eye Chillie (only in a 'wild' condition); *Datura* (which occurs pretty frequently, but also only in a 'wild' condition); *Mirabilis Jalapa;* the Pepper-vine (an object of great care); the Bread-fruit (only one tree, in a garden); *Tacca pinnatifida* (cultivated only); *Colocasia antiquorum* (only in a 'wild' condition). Mr. Fleming's list omits the Supari (*Areca catechu*); from a similar list for Kiltán, where it *does* occur, it is also omitted, perhaps therefore the omission here is only an oversight. The island is covered with Coco-nut palms and there are several large fresh-water tanks, paved and terraced and walled with slabs of coral-volite; in these occurs the universal water-weed *Chara*.*

Due south of Akati, in Lon. 72° 12′ E. and Lat. 10° N., lies the Suhelipar reef which is shown on Lieut. Moresby's Chart as an oval atoll with an opening in the reef at the north-end and with the uninhabited island of Suheli '(Soilee, *Wood*) near the centre of its south-eastern side. According to Lieut. Wood's list, this island is visited on account of its coco-nuts, but no topographical account of the atoll being available, it is impossible to say with certainty whether Suheli is a sand-bank like Pirmalla, an accumulation of coral debris like the islets on Cherbaniani, or a formed-island like Bitrapar.

The most northerly of the formed islands and the northmost member of the central chain is the inhabited island of Chitlac (Lon. 72° 45′ E., Lat. 11° 45′ N.), visited and described by Mr. Robinson. Mr. Hume was unable to land in 1875,† and Dr. Giles, who landed during the *Investigator* visit in 1887, confined his attention to the marine fauna.‡ Mr. Robinson describes the island as two to two and a half miles long and about three-quarters of a mile wide, situated on the eastern side of a large and perfect atoll. The surface is less even than in the other islands, owing to a ridge of sanddrift that runs up the middle, rendering the

* Alcock, "Administration Report of Marine Survey of India," year 1891-2, p. 10.

† Hume, "Stray Feathers," vol. iv. p. 436.

‡ Carpenter, "Administration Report of Marine Survey of India," year 1887-8, p. 7.

soil so poor that the growth of coco-nut tree is slow and their outturn poor. "Low mounds of sand occupy a great part of the "centre and best protected parts of the island on which nothing "grows, except scanty crops of a plant called *Teerny*, on the roots of "which a small ball about the size of a pea grows; after the plant "has withered, these are gathered from among the loose sand and "used by the islanders. Dry cultivation on this island is very in-"significant."* The *Teerny* is obviously *Tacca pinnatifida*, which we know from Lieut. Wood to be cultivated in Anderut, and from specimens in the *Investigator* collections to be grown in Akati and in Minikoi. The tubers, however, are apparently unusually small in Chitlac, for the specimens of those grown in Akati and Minikoi sent to Calcutta are as large as plums. Still even these latter compare very unfavourably with the tubers of *Tacca* as it occurs wild on the shores of the Andaman Sea; there they are usually larger than a man's fist, and are often as large as the human head.

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‡ Hume, "Stray Feathers," vol. iv., p. 436, with Map.

§ Alcock, in Hoskyn, "Administration Report of Marine Survey of India," year 1889-90, p. 12.

‖ Hume, "Stray Feathers," vol. xiv., p. 436.

"nut, the trees being planted down to the water's edge on every side; "the substratum of coral-rock is nowhere broken up for grain culti- "vation, which therefore hardly exists on the island. The population "being too limited to consume the coco-nut leaves, the ground in "some parts is covered with decaying vegetable matter, most bene- "ficial to the trees. In other islands it is necessary to rear plants for "one year with care and then transplant them; in this, a nut buried "with a knife will grow, requires no attention, and comes into bearing "early."* Mr. Robinson mentions the Bread-fruit, Areca-nut, and Lime as trees that are planted by the islanders, but says that they do not thrive; in addition to these Mr. Hume mentions the Papaya, the Horse-radish tree, the Plantain and the Castor-oil plant; beside, these, Mr. Fleming also enumerates the Agati (*Sesbania grandiflora*) which is grown as a support for the Pepper-vine, a plant on which the people bestow much attention; the Melon too is reported by Mr. Fleming as 'only cultivated,' as perhaps is the Cucumber, of which Mr. Fleming has communicated one specimen, found growing 'wild.' He also found a hummock of Khus-khus grass (*Andropogon muricatus*), no doubt planted, growing near the mosque, and noted the American Aloe, introduced from the mainland, and growing well.

The indigenous vegetation belongs almost entirely to the class of 'littoral' species, of which Mr. Hume's, Dr. Alcock's and Mr. Fleming's collections contain ten; the only noticeable points concerning this group are that the whole lagoon-face of the island is described by Hume as lined with a hedge of *Scaevola Koenigii*, and that *Thespesia populnea* is reported by Fleming as here only an indigenous, never a planted tree.

There is, says Dr. Alcock, no true jungle in the interior,† and the only species that cannot be classed either as 'weeds,' or as 'littoral species' are *Vitis carnosa* (probably bird-introduced), and *Tylophora asthmatica* and *Leptadenia reticulata* (probably both wind-introduced).

As in the case of Akati, the majority of the species present are either weeds or escapes, plants unintentionally introduced by man; of these, the three collections together contain thirty-one species.

* Robinson, "Madras Journal," vol. xiv., p. 24.

† Alcock, in Hoskyn, "Administration Report of Marine Survey of India," year 1889-90, p. 13.

Kadamum lies south-west of Kiltán and due south of Chitlac in Lon. 72° 44′ E. and Lat.° 11° 12′ N. Of this island topographical accounts have been given by Mr. Robinson who visited it in 1844 and 1845, and by Mr. Hume who visited it and made a botanical collection in 1875, while Dr. Alcock and Mr. Fleming made a second and very exhaustive botanical collection in 1891. Kadamum is the largest island of the group and is situated on a long oval atoll like that of Kiltán; the reef here is, however, about 4½ miles long, and the island itself 3½ miles long and about three-quarters of a mile across the widest portion. The lagoon is also larger and much deeper than that of Kiltán, but with no good passage through the reef.*

"The body of the island appears generally lower than that of any "of the others, and has an excellent natural protection in a ridge of "low sand-drift which runs down the west side."† The soil is naturally fertile, being damper and firmer than in some of the other islands, but the coco-nut cultivation is limited to a strip across the middle, leaving more than three-fourths of the island, divided into two nearly equal parts on either side of this strip, covered with natural jungle, the southern portion of the island being occupied by a thick low scrubby undergrowth in which the Screw-pine is conspicuous, the western part being an open plain covered with grassy weeds and low bushes. The island, "especially in its "northern half, has a deserted and neglected air, and the coco-nuts, "instead of dominating the scene and monopolising attention, are "almost lost sight of in the surrounding jungle".‡ There is no area specially prepared for grain-tillage, but the natural soil being better adapted for the purpose than in the other islands, a considerable portion of the dry-grain raised in the group is produced in this island. The people of Améni go there and cultivate during the monsoon, *rági* (*Eleusine Coracana*), *jowári* (*Sorghum vulgare*), and *loba* (*Vigna Catjang*).§ Mr. Hume mentions two species of the cultivated class, viz.: *Indigofera tinctoria*, which he speaks of as 'wild'; Dr. Alcock also sends specimens of this without any

* Hume, "Stray Feathers," vol. vi., pp. 443, 444.

† Robinson, "Madr. Journ.," vol. xiv., p. 20.

‡ Alcock, "Administration Report of Marine Survey of India," year 1891-2, p. 9.

§ Robinson, "Madr. Journ.," vol. xiv., p. 22.

remark, as if he too had found it in a 'wild' state: also *Ixora Bandhuca*, which was common at the time of Mr. Hume's visit, but which Dr. Alcock does not appear to have met with. Mr. Fleming's list of cultivated plants includes *Sesbania grandiflora*, with the Pepper-vine it is grown to support; the Papaya; the Cape Gooseberry (*Physalis peruviana*, also reported by Mr. Hume from the adjacent island of Améni); the Castor-oil plant; the Banyan (of which four examples occur, planted near some deserted huts); the Plantain (of which four were seen in the neighbourhood of the Banyans). Mr. Fleming does not report *Tacca pinnatifida*, though probably this, as in the other islands, is the *Taro* that is cultivated—the other *Taro* (*Colocasia antiquorum*) he reports as present here, as it is in all the other islands, but, as in these, only in a 'wild' condition.

The littoral species reported from Kadamum are 19 in number. These include *Thespesia populnea*, which, planted in some of the islands, occurs here as an undoubtedly indigenous, sea-introduced tree, and *Guettarda speciosa*, occurring in large clumps, not recorded from any other member of the group. *Scaevola Koenigii* is very abundant all round the coast, as is the Screw-pine, but *Ipomoea biloba*, very abundant on some of the islands, *e.g.*, in Bitrapar, where it covers the whole beach, and in Akati, where it also extends into the interior of the island, is here confined to the shore, and is not very common even there. *Wedelia scandens* is one of the most common plants, and is spread all over the interior as well as round the coast; the same is true of *Cassytha filiformis*, which, in some parts, loads the scrubby undergrowth. Two other sea-coast species that here extend inland from the shore, and form a large part of the shrubby interior jungle, are *Morinda bracteata* and *Premna integrifolia*. In strong contrast with Bangáro, where *Caesalpinia Bonducella* is so common as to form the basis of the jungle, it is noted in the *Investigator* collections that only one plant of this species was met with in Kadamum.

Truly inland species that combine with *Pandanus*, *Premna*, and *Morinda* to form the shrubby part of the jungle are *Flacourtia sepiaria*, *Pavetta indica*, and *Pleurostylia Wightii*. All these are noted as "very common throughout the island." The last-named

is a particularly interesting addition to the Laccadive Flora; all three are very likely bird-introduced species.

Two creepers, almost certainly wind-introduced, occur both inland and along the shore, these are *Leptadenia reticulata* and *Tylophora asthmatica*; "a tall loose-flowering grass (*Apluda aristata*) fills "all the outskirts of the jungle."*

The weeds and escapes from cultivation that occur number 42; some of these may perhaps be bird-introduced species; probably, however, most of them have been unintentionally introduced by man, and the high total is obviously the result of the fact mentioned by Mr. Robinson, that this is the island where the Améni people grow the greater part of what grain-crops they raise. The most "interesting of these weeds is the Mudár (*Calotropis gigantea*), "very "common in the centre of the island near the huts" (*Investigator* note), and therefore possibly, though not a cultivated species, one originally deliberately introduced because of the excellent quality of the fibre it yields, which is used, by the Mapilla population of the mainland at least, for making fishing-lines. Another interesting weed is a rather insignificant, but very rare sedge (*Cyperus hyalinus*). The most interesting "escape" is undoubtedly the Indigo plant which forms whole fields, broken only by patches of *Ixora coccinea* (*I. Bandhuca*).†

A short distance to the south of Kadamum (Lon. 72° 43′ E., Lat. 11° 8′ N.) lies Améni, the most important of the British Laccadives. This island, about two miles long and three-quarters of a mile across, is low, with a very uneven surface. Situated originally on the eastern side of its atoll, the island has grown westward into the lagoon, till now no lagoon-space is left, and the island is consequently so ill-protected from the sea that the soaking of coco-nut coir among the sand, practised in all the other islands, is here impossible. The soil in this island is naturally poorer, according to Mr. Robinson, who, as well as Mr. Hume, has visited and described it, than it is in Kiltán or Kadamum, a fact which Mr. Robinson explains‡ by the consumption in various ways, by its dense population, of the fallen

* Hume, "Stray Feathers," vol. iv., p. 445.

† Hume, "Stray Feathers," vol. iv., p. 445.

‡ Robinson, "Madr. Journ.," vol. xiv., p. 16.

coco-nut leaves, thus depriving the ground to some extent of the advantage of the natural manure that the soil of the other islands receives. The whole island is under cultivation, principally coco-nut, and there is no underwood. The coco-nut plantation runs down to the sea-side on the east and the north, but along the western, more exposed side, a strip of waste land 200 yards wide is interposed between the plantation and the shore, while at the south-west corner and south end of the island, where the exposure is too great for young trees and the dry sand is deeper than elsewhere many acres are lying waste.

The structure of the island is like that of the other formed islands already described; the soil is of light coral sand, finer than, and quite as dry as, common sea-sand, or, in some parts, of small loose pieces of coral. This soil varies in thickness from two to six or eight feet, and has a bare sandy surface, which gets wind-blown unless covered with undergrowth; where the soil is under coco-nut or other cultivation this sand is hidden by the humus, of variable thickness and richness, that has accumulated. Underneath this surface soil of sand and humus is the bed of coral-rock already mentioned in the account of Bitrapar. This layer, a foot to two feet thick, appears to be just above water-level and stretches uniformly throughout the island. Underneath this layer lies a bed of wet sand and when the crust is cut through and wells or small tanks are dug in the damp subsoil the people obtain a constant supply of water, slightly brackish but still potable, except in the case of Bitra, where, as has been already said, the wells yield water which is quite salt. The water in these tanks and wells rises and falls a little with the tide.

In the middle of Améni, however, unlike any of the islands yet described, the upper soil and the coral-crust have been completely removed from about 50 acres of ground, the surface of the soi thus left being hardly above the level of the sea. This carefully prepared area, termed locally the *kât*, has a poor, light, sandy soil, but is fertile on account of having the subsoil water within a foot or so of its surface. This *kat* is reserved practically for the cultivation of grain and vegetables. "The "coco-nut trees planted in or about its edges are exceedingly

"fine;"* the Bread-fruit trees, which are numerous in Améni, grow most luxuriantly here, while considerable numbers of Betel-nut trees occupy the same situation. The cultivated plants enumerated by Mr. Robinson include, besides the coco-nut, betel-nut and bread-fruit, the *rági* (*Eleusine Coracana*), *jowári* (*Sorghum vulgare*), *baday* (*Setaria verticillata*), Sweet-Potato, Yam, Plantain, Castor-oil plant (cultivated for its oil) and Anatto (grown for its dye, several hundredweights of fruit of *Bixa Orellana* being annually exported to Malabar); the Lime is also mentioned by him as being of excellent quality and the trees as numerous. In addition to these Mr. Hume mentions the Pomegranate, Papaya, and Horse-radish tree as common; he observed also some Banyans, some Tamarind trees, some Amla (*Emblica officinalis*), and a number of Poon-trees (*Calophyllum inophyllum*), planted. He further enumerates among cultivated vegetables *Colocasia antiquorum*, which in all the other islands appears to be in a 'wild' condition. He notes having observed all the sea-shore species obtained in Bitrapar except a sedge (*Cyperus pachyrhizus*), and his specimens include *Euphorbia Atoto* which has not been found on the coasts of any of the other islands.

Mr. Hume's is the only collection made in Améni; it includes eleven species that may be classed as weeds as well as the following species that should probably be considered as 'escapes from cultivation':—*Datura fastuosa*, *Physalis peruviana*, *Mucuna capitata*, *Clitoria ternatea*, and *Barleria Prionitis*; all these are garden or hedge plants well known in India, here they all appear to be growing in a 'wild' state.

The Piti sand-bank, situated in Lon. 72° 35′ E. and Lat. 10° 45′ N., is on the extreme southern edge of a large sunken bank twenty miles long, that extends to this point from the vicinity of Ameni.† The rest of the bank carries from six to twenty fathoms of water, the subaërial patch is about 300 yards long and 200 yards across, standing about 6 or 7 feet above high-water mark, and is quite devoid of vegetation. It evidently occupies the south-eastern corner of a sunken atoll, for, whereas on all other sides bottom is

* Robinson, "Madr. Journ.," vol.. xiv., p. 18.

† Hume, "Stray Feathers," vol. vi., p. 453.

found at 10 or 12 fathoms, on the south-east side one finds 100 fathoms close up to the bank and immediately beyond are deep-sea soundings. Quite like this bank, it may be remarked, is that of Elikalpéni (Lon. 74° 5′ E. Lat. 11° 15′ N.), a peak about 35 miles north-east of Anderut, which does not, however, become subaërial at all. This peak, the nearest of the Laccadive Group to India, is a small dead-coral bank with a few bunches of live-coral on it, carrying 7 to 8 fathoms and with no sign of shoal water.* Similar also, though of larger size, especially the first named of the three, and giving rather deeper soundings, are the dead-coral banks of Bassas de Pedro (20-30 fathoms)†, Sesostris Bank (11-30 fathoms), and Koradivh (23-26 fathoms), lying to the north of the Laccadive Archipelago. It is curious to note that the *name* of the last mentioned bank appears to be applied by the author of the *Tohfat-al-Mujahidin* to one of the *inhabited* islands of the archipelago. ‡

South of the Piti Bank lies Koráti, a large inhabited island in Lon. 72° 40′ E. and Lat. 10° 35′ N., visited by Mr. Hume. He speaks of it § as a fine island of the usual type with a fair lagoon. The soil appears to be better than that of Améni, the cultivation practically identical; the only wild species that Mr. Hume collected was the sea-shore laurel, *Hernandia peltata*; this he did because he observed it here for the first time. The species is now also reported from Minikoi, whence Dr. Alcock sends specimens, but so far it has not been obtained in any of the true Laccadive Islands except Koráti. A small islet, Koráti Féti, which, according to Lieut. Wood's table has coco-nut trees, occurs on the same reef.

Besides the Elikálpéni Bank, already described, the peaks of the Eastern chain are the atolls of Anderut and Kalpéni.

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* Carpenter, "Administration Report of the Marine Survey of India," year 1888-89, p. 6.

† Hume, "Stray Feathers," vol. vi., p. 428.

‡ "Madr. Journ. of Lit. and Sc.," vol. xiv., p. 3. Kordeeb (Koradivh?) is given as one of the five principal islands which contain "cities;" probably, however, Kiltán is intended by the historian, though the name he gives is apparently that by which this sunken bank is known.

§ Hume, "Stray Feathers," vol. vi., p. 454.

—Anderut, Lon. 73° 35′ E. and Lat. 10° 45′ N., is a large island occupying the southern face of a very extensive reef of the usual type. According to Lieut. Wood, who visited it in 1834, the island presents a bold front to windward ; that front being, not a reef as is usually the case, but one side of the island itself, while the coral-reef on which it is based and the lagoon which the reef encloses project to leeward. He describes it further* as "low, well planted "with cocoanut trees, and free from underwood. Its medium height "above the sea is about 9 feet, but towards the centre of the island, "and on its southern side, the surface is lower, and in no part does "it exceed the height of 12 or 15 feet."

"The northern side of the island is low, the centre gently undulat-"ing and the south side one continuous sandy plain, with large "detached masses of coral-rock scattered over it. The little valleys "formed by these clumps, of various figures, are under cultivation "and produce, amongst other things, a plant not unlike our rhubarb, "of a most acrid, pungent taste. It is reared as we do Jerusalem arti-"chokes, set in rows, and covered with a manure of decayed vegeta-"tion. They have also the Sweet-potato, but of such an inferior "growth that we can scarcely recognise in it the root we meet in "India. A small quantity of rice is grown in the rainy season ; not "more than 15 or 20 days' consumption. The rhubarb-looking plant "appears to prefer a damp moist soil, for on the more elevated parts "of the island there was none to be seen."

"Of the soil the most elevated is the richest. In the valleys the "coarse sand which forms the lower stratum is but scantily covered "with a thin coating of vegetable matter; sterile in many places, "and presenting a similar appearance to a field on which a compost "of lime has been partially thrown; but at the higher parts of the "island, where the cocoanut palm has flourished for ages, a deep "soil is already formed, which every succeeding season must "increase and render more fertile."

"There are many wells on the island, and one small tank, but "good fresh water is to be had all over Anderut by digging to "a moderate depth. Firewood is rather a scarce article, but

* Wood, "Journ. Roy. Geogr. Soc.," vol. vi., p. 31.

"where the cocoanut forms the chief article of food this matters "little."

"In my ramble over the island I found the Plantain, Orange, "Papaw and Lime-trees, Betel-nut, and two species of Cotton-tree, "besides a fine stately-looking tree, with dark green foliage, not "unlike the broad-leafed Elm; this tree yields fruit, but as it was "not then in season I know not its nature. The Cocoanut, Plantain "and Papaw are the only cultivated fruits; the others are growing in "a wild state, and the Betel-nut excepted, occupy but little atten- "tion. Although you meet with nothing amongst the trees which "you can term brushwood, there are plenty of creepers and coarse "grass."

Dr. Alcock, who has likewise visited Anderut says, "there is no "true jungle, the island being covered with cocoanut palms, with "a few curiously excavated areas under tillage (rági, sweet-potato "and a species of arrow-root), and wild plants were therefore "scarce."*

It is somewhat remarkable that Lieut. Wood does not mention the existence in 1834 of the excavated areas, the *kat*, indicated by Dr. Alcock; perhaps they have been formed since the time of Lieut. Wood's visit. The "rhubarb-looking plant" of Lieut. Wood's account is the Polynesian Taro, *Tacca pinnatifida*.

Dr. Alcock's collection includes 16 weeds and escapes from cultivation, two of these (*Dentella repens* and *Herpestis Monnieria*), being weeds of wet places not recorded from any of the other islands. His 'wild' species that are not weeds include *Gloriosa superba*, not reported from any other island; perhaps, however, like *Stachytarpheta indica*, which he also reports and which also seems confined to Anderut, the *Gloriosa* may be here only an escape. It is, however, a common littoral species elsewhere, so it may quite well have been introduced by the sea. *Thespesia populnea* he notes as here planted only; he notes the Bread-fruit, not recorded by Lieut. Wood, and the American Aloe, apparently quite a recent introduction into the Archipelago; this is present now in Kiltán, however, as well as in

* Alcock, in Hoskyn, "Administration Report of the Marine Survey of India," year 1889-90, p. 13.

Anderut. Lieut. Wood records two species of *Gossypium* as cultivated; these are not grown in any of the other Laccadive Islands proper; specimens of *G. barbadense* have, however, been sent from Minikoi, and Mr. Fleming enumerates *G. herbaceum* as one of the cultivated species in that island. Lieut. Wood also notes that Rice is, or earlier in the present century was, grown to a small extent. He also notes having seen the Orange as well as the Lime cultivated. This no one else has reported, though Mr. Fleming reports the Pomelo as well as the Lime from Minikoi.

The "stately-looking tree with dark green foliage not unlike the "broad-leafed elm" is probably the Jack (*Artocarpus integrifolia*); it has not, however, been met with in any of the other islands.

One of the most noteworthy features of the Anderut flora is that it is in this island only that any ferns appear to occur; Dr. Alcock has sent specimens of two species, *Nephrodium molle* and *Nephrolepis cordifolia* from here, though neither he nor Mr. Hume have seen any ferns elsewhere in the Archipelago.

South of Anderut, in Lon. 73° 35′ E. and Lat. 10° 5′ N. lies the last true Laccadive atoll of Kalpéni. This island is situated on the eastern side of its reef, on which there is besides, according to Wood's table, a sandbank, Kalpéni Féti, unstocked with vegetation. Kalpéni was visited by Dr. Alcock in November, 1889. He speaks of it * as "a typical coral island, in almost every respect like Anderut and "Kiltán."

His collection includes 19 weeds and escapes from cultivation, the most interesting weeds being *Urena sinuata* not recorded from any other island, and *Ammania baccifera* and *Polygonum barbatum*, two marsh-weeds not reported from any other island; the most interesting escape being *Ocimum gratissimun*, which, however, he mentions as occurring in Bitrapar, and which he has also collected both in Akati and in Minikoi.

The coast species number 11, including *Calophyllum inophyllum*, here *not* planted, and *Clerodendron inerme*, not reported from any other island, not even from Minikoi. *Vitis quadrangularis* too, only

* Alcock, in Hoskyn, "Administration Report of the Marine Survey of India," year 1889-90, p. 13.

reported from this island, is common on the sea-face jungle, which is here much denser than it is in Améni, Anderut, or Kiltán.

The usual cultivated species are reported, and there is a *kat* in which *rági* and other grains and vegetables are grown.

The last island to be noticed is Minikoi, the position of which has been already indicated. The atoll is nearly circular and emerges from the sea on the eastern and southern sides to form a long narrow almost semi-circular island about 5 miles long and half a mile broad. The rest of the atoll is a reef that dries in places at low water and with the island encloses a lagoon that in places carries over 6 fathoms. The island stands only a few feet above the sea; its structure is identical with that of the true Laccadive islands. The water in the wells is clear and pleasant to drink; it contains roughly about 40 grs. of Chlorine per gallon.*

The island is covered with coco-nut palms and subordinate jungle and the vegetation exhibits the general characters of that of the true Laccadive islands, but is more luxuriant and is richer both in indigenous and cultivated species than any of these. Dr. Alcock and Mr. Fleming have made a very extensive collection, including 40 weeds and garden escapes, ten of these (eight weeds and two escapes) not occurring in any of the true Laccadive Islands, with 28 littoral species of which the following eight, *Canavalia turgida* and *Canavalia obtusifolia*, *Vigna lutea*, *Terminalia Catappa* (which is ubiquitous), *Sesuvium Portulacastrum*, *Ochrosia borbonica*, *Ipomoea denticulata*, and *Convolculus parviflorus* are not found in any of the other islands of the group.

The inland 'wild' species include the following not recorded from any other island of the group:—*Allophylus Cobbe*, *Ruellia prostrata*, *Pancratium zeylanicum*, *Dioscorea bulbifera*, *Psilotum triquetrum*, *Calymperes Dozyanum*, *Physcia leucomelas* and *Physcia obscura*, *Pleurotus cuneatus* and *Pleurotus tenuissimus*, *Polyporus igniarius*, *Trametes Muelleri*, *Hirneola polytricha* and *Nostoc verrucosum*.

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* Alcock, *in* 'Administration Report of Marine Survey of India," year 1891-2, p. 11.

There are, it should be noted, none of the shrubby wild species reported from Kadamum, the whole island, excepting the coast zone, which has, however, a very distinct sea-fence of *Pandanus*, &c., being under cultivation.

The cultivated or planted species are numerous, reaching a total of 42, and include the following, not to be met with in any of the other islands:—*Anona muricata* (one tree); *Hibiscus Rosa-sinensis*; *Murraya Koenigii* (carefully cultivated); *Citrus decumana* (one ree on the island); *Mangifera indica* (only one tree); *Arachis hypogæa*; *Psidium Guayava*; *Eugenia Jambos*; *Eugenia Jambolana*; *Lawsonia alba*; *Luffa aegyptiaca*; *Momordica Charantia*; *Cucurbita maxima*; *Capsicum frutescens*; *Phyllanthus distichus*; *Ficus nitida*.

Calophyllum inophyllum and *Terminalia Catappa* are planted, though both occur indigenously as well; *Ægle Marmelos* is perhaps a species originally deliberately planted; *Datura fastuosa* is scarce here, Mr. Fleming only noting it once and then finding it cultivated in a garden; *Gossypium barbadense* is cultivated pretty frequently and grows well; *Sorghum vulgare* grows well, but is very little cultivated. The most striking features in the vegetation of Minikoi, as compared with the other Laccadive Islands, are the presence of thick sheets of the gelatinous *Nostoc* on the ground at the south-west end of the island, where also the trunks of the trees are encrusted with lichen and covered with moss; the number of *Fungi* present; and the presence of *Algae* on the reefs of the surf-beaten weather-side of the island. Of these last unfortunately no specimens were collected.

Two tables are appended to this topographical sketch; in the first the various components of the Laccadive Group are shown; this table is a modification of the similar one prepared in 1834 by Lieutenant Wood (*Journ. Roy. Geogr. Soc.* vi., 30). In the second table, in order to facilitate reference, the spelling adopted by the various authors who have mentioned or described the Archipelago is given; the first column contains the forms adopted by the writer.

TABLE I.—List of Laccadive Banks, Reefs and Islands.

Chain of Peaks.	Name.	Nature.
Western	Koradivh	Sunken bank of dead coral carrying 23-26 fathoms
Ditto	Sesostris Bank...	Sunken bank of dead coral carrying 11-30 fathoms.
Ditto	Cherbaniani	Open reef with three small islets of coral débris devoid of vegetation.
Ditto	Cheriapani	Open reef with (?) several small islets of coral débris, devoid of vegetation.
Ditto	Bitrapar	Reef with one formed-island (Bitra), clothed with vegetation and with coco-nut trees in centre, but without inhabitants.
Ditto	Pirmalpar	Open reef with one large subaërial sand-bank (Pirmalla), devoid of vegetation.
Ditto	Akati.....	Reef with three islands, one inhabited (Akati), and two clothed with vegetation but not inhabited (Bangáro and Tangáro), also a sand-bank without vegetation (Akati Féti).
Ditto	Suhelipar	Reef, probably open, with one island (Suheli), probably clothed with vegetation but not inhabited.
Central	Bassas de Pedro.	Sunken bank of dead coral carrying 20-30 fathoms.
Ditto	Chitlac	Reef with one island (Chitlac), inhabited.
Ditto	Kiltán	Reef with one island (Kiltán), inhabited.
Ditto	Kadamum	Reef with one island (Kadamum), inhabited.
Ditto	Améni	Inhabited island (Améni) occupying the whole reef.
Ditto	Piti	Sunken bank of dead coral carrying 6-15 fathoms, with one subaërial sand-bank (Piti), devoid of vegetation.
Ditto	Koráti	Reef with one inhabited island (Koráti) and a sand-bank devoid of vegetation (Koráti Féti).
Ditto	Minikoi	Inhabited island (Minikoi); in this island the population is Maldive, though the island is politically a Laccadive one: in position this atoll is intermediate between the Laccadive and Maldive Archipelagos.
Eastern	Elikalpéni	Sunken bank of dead coral carrying 7-8 fathoms.
Ditto	Anderut	Reef with one inhabited island (Anderut).
Ditto	Kalpéni	Reef with one inhabited island (Kalpéni) and a small islet (Kalpéni Féti).

TABLE II.—*Names of Laccadive Reefs and Islands according to various authorities.*

	Tohfat-al-Mujahidin.	Moresby.	Wood.	Robinson.	Hume.	Hunter.	"Investigator."
Cherbaniani	.....	Cherbaniani Reef (*Belyapany reefs.*)	.....	Bellyapany	Cherbaniani	.....	Beleapani.
Cheriapani	.....	Byramgore Reef (*Cheryapany reefs*).	Sherćah	Cheryapany	Chereapani	.....	Byramgore.
Bitrapar	.....	Betrapar (*Bitra*)	Bâttera	Betra	Bitra-par and Betrapar.	Bitra	Betrapar.
Pirmalpar	.....	Pere-mul-par Reef (*Permalla*).	? Tâtâcum	Permalla	Pere Mullpar	.....	Paremulpar.
Akati	Accanee	Aucutta (*Akaty*)	Ākhatœ	Akaty	Aucuttee or Agalty.	Agatti	Aukutta.
Bangáro	.....	Bingaro	Bangâram	.....	Bingaroo	.....	.....
Tangáro	.....	Tingaro	Tenâkerry	.....	Tingaroo	.....	.....
Suhelipar	.....	Seuhelipar Islands (*Sahelee*).	Soilee	Suheli	Suhelipar	Suheli	.....
Chitlac	Shatelakum	Chittac (*Chetlat*)	Shâit-tu-lacum.	Chetlat	Chitlac or Chetlat	Chetlat	Chitlac.
Kiltán	? Kordeeb	Kiltan (*Keltan*)	Kerten	Keltan	Kiltan	Kiltan	Kiltán.
Kadamum	Kunjamunjula	Cardamum (*Kadamat*).	Kadgong	Kadamat	Cardamum or Kadamut.	Kadam	Cardamum.
Améni	Ameni	Ameni (*Ameendevy*).	Ākumânœ	Ameendevy	Amini	Améni or Amindivi.	.....
Piti	.....	Pittie (*Puttee*)	.....	.....	Pitti	.....	Piti.
Koráti	Kaluftee	Cabrutee (*Kauratee*).	Cábârettœ	Kouraty	Cowrattee or Kabruttee.	Kavaratti	.....
Anderut	Anderoo	Underoo (*Androt*)	Ānderot	Androt	Androt or Underoo.	Androth	Anderut.
Kalpéni	.....	Kalpeni (*Kalpiny*).	Kâlpânœ	Kalpiny	Kalpini	Kalpeni	Kalpéni.
Minikoi	Mulkee ?	.....	.....	Meenkat	Minecoy or Munkat.	Minikoi (Minkat).	Minikoi.

Systematic List of Laccadive Plants.

Subjoined is given an enlarged edition of the Laccadive list already published by the writer.* This new list includes, besides the species recorded in the former one, all those contained in the collections made during the two visits paid by the *Investigator* subsequently to its publication and all those mentioned by Lieutenant Wood and Mr. Robinson in their accounts of the Archipelago. As a complete set of the specimens collected by Mr. Hume, Dr. Alcock and Mr. Fleming is preserved in the Calcutta Herbarium, the writer has been in a position to authenticate the whole of their species; these are indicated in the list by an (!). Those names to which no mark of verification is appended belong to the species mentioned by Lieutenant Wood and Mr. Robinson, mentioned but not collected by Mr. Hume, or enumerated in Mr. Fleming's list of cultivated plants, without specimens having been sent. In the preparation of the list, the writer has received much assistance from Dr. G. King, F.R.S.; Mr. W. B. Hemsley, F.R.S., who has kindly verified some dubious species at Kew; Mr. J. F. Duthie, F.L.S., who kindly named the grasses; Mr. G. Massée, F.L.S., who equally kindly named the *Lichens* and *Fungi*, and Mr. G. R. M. Murray, F.L.S., who kindly named an *Ascothamnion* (*A. intricatum*) collected by Dr. Alcock in the lagoon at Kadamum, and who has, from these specimens, been enabled for the first time to state definitely that *Ascothamnion* is not a vegetable at all, but is the same thing as *Zoobotryon pellucidum* of Ehrenb., an animal. He wishes to express his great obligation to all these gentlemen, and especially to his friend, Dr. A. Alcock, of the Indian Marine Survey, for the enthusiasm with which he has taken up the subject of the Laccadive Flora and for the thoroughness with which he and his assistant Mr. J. Fleming, Apothecary on board H. M. I. M. *Investigator*, have made the collections on which this list is mainly based. To Captain Hoskyn,† Commander of the *Investigator*, who has

* "Scientific Memoirs by Medical Officers of the Army of India," part V.

† The sad death of this talented Officer, which has occurred since the last of these collections was made, has removed from the Naval Service one of its most brilliant surveyors. The event is one to be deplored not alone by his own Service, and not only

also been most enthusiastic in this matter, the thanks of all who are interested in the subject of island-floras are equally due, for having so kindly afforded his officers these opportunities of landing on, and investigating the botany of, the islands of this group.

In the list itself purely cultivated species are indicated by a distinctive type; species that have become 'escapes,' even though they may at the same time be 'cultivated,' and trees that, though they may be 'planted,' occur also as 'indigenous' species, are not distinguished in this way. The references in the list are mainly to Dr. Roxburgh's *Flora Indica* and to Sir J. D. Hooker's *Flora of British India*, and as regards cultivated and economic species also to Dr. Watt's *Dictionary of the Economic Products of India*.

(*To be continued.*)

REPORT UPON A SMALL COLLECTION OF SCORPIONS SENT TO THE BRITISH MUSEUM BY MR. EDGAR THURSTON, OF THE GOVERNMEMT CENTRAL MUSEUM, MADRAS.

By R. I. Pocock, of the British Museum, (Nat. Hist. Dept.)

(*Read before the Bombay Natural History Society, 29th November 1892.*)

The Scorpions discussed in the present paper are referable to two families—the *Buthidæ* and the *Scorpionidæ*.

Of the *Buthidæ*, a family which is characterised by a small triangular sternum, only two genera are known to occur in India—namely *Buthus* and *Isometrus*. The former, containing but one species that is recorded below, may be recognised from the latter by having the cephalothorax distinctly keeled, two teeth on the lower edge of the

by those outside it who, like the writer, had the privilege of enjoying his personal friendship, but by every zoologist and botanist in the East, because of the interest he took in, and the great practical sympathy he always showed for, every branch of biological research.

immovable digit of the cheliceræ* or mandibles, and no spine beneath the aculeus on the poison vesicle of the tail. The characters of *Isometrus* Mr. Oates has already pointed out, and in connexion with this genus it only remains to be said that it has recently been split into two by Prof. Kraepelin of Hamburg, who thinks that those species which have the proximal tibial segment of the 3rd and 4th pairs of legs spurred at the apex, should be regarded as a distinct genus, to which he has given the name *Archisometrus*.

Mr. Oates' list of the Indian and Burmese species of *Isometrus* was complete to date. Subsequently Dr. Thorell has described one more species (*I. feæ*) from Burma; and I have been compelled to relegate to the world of synonyms Mr. Oates' species *I. phipsoni*, which was described from Tenasserim. It is certainly identical with *messor* Simon (1884), *weberi* of Karsch (1882) and almost certainly with *scutilus* of Koch (1842). With regard to the remainder of Mr. Oates' paper I have only to say that the specimens that he identified as *atomarius* of Simon are not to my mind distinct from his examples of *varius*, and that the species that he has termed *varius* is the one that I, following Dr. Thorell, look upon as *mucronatus* of Fabricius. In any case *curvidigital* of Gervais is an older name for it than *varius* of Koch†.

It will thus be seen that there are only some nine or ten species of this family recorded from the whole of India, Ceylon, and British Burma. Judging from other countries, similarly situated, this number is very small. But I do not for a moment doubt that with a little diligent collecting it could be more than doubled in a very short time. For next to nothing has been published on the scorpions of the centre of Hindostan.

In the family *Scorpionidæ* the sternum is not triangular but pentagonal.

Mr. Thurston has sent to the British Museum representatives of only two genera—namely, *Hormurus* and *Scorpio*. *Hormurus* belongs

* In his paper on the Indian species of *Isometrus*, Mr. Oates applies the term cheliceræ to the palpi or chelæ.

† I trust it will be understood that my remarks concerning my friend Mr. Oates' paper, have not been made with any ill-becoming feeling of criticism. It has simply been my wish to give a brief *résumé* of the work done in Indian scorpions during the past three years.

to the group of flat scorpions in which the tail is small and strongly compressed, and the hand very flat, with a strongly defined external surface.

The genus *Scorpio* may be considered as typical of the family. The species are *par excellence* the 'big black scorpions' of travellers. The genus is confined to the Old World,* being widely distributed in tropical and sub-tropical Africa, India, and Ceylon and Java. The only genus in the Oriental Region with which it is likely to be confounded—and the likelihood it must be confessed is not slight—is *Palamnœus* of Thorell. *Palamnœus* is in appearance very like *Scorpio*, being of large size and of a piceous or olivaceous tint; it may be recognised, however, by the fact that the movable dactylus of the cheliceræ is bifid at the extremity, the superior terminal fang being of large size; the inner border of the hand, moreover, is much thicker. In *Scorpio* this fang is small and the hand is internally more compressed.

This genus *Palamnœus* largely takes the place of *Scorpio* in the Indo-Malayan area. One species only has been recorded from India and that without definite locality. This is *Palamnœus spinifer* (Hempr. and Ehrb.) with which *P. petersii* of Thorell seems to be synonymous. The British Museum, however, has several examples of this species from Bengal, and from this locality it spreads in a southerly direction to Singapore. But in Burma there is found a second species, about which there has been much discussion. This has been named *thorellii*, and judging from the numbers of it that Mr. Oates brought to England, it is far more commonly met with than *spinifer*.

For a consideration of these two species reference may be made to the *Annals and Mag. of Natural History*, ser. 6, vol. ix., pp. 38-43 (1892).

Family *Buthidæ*.

(1) *Isometrus thurstoni*, sp. n. (? *var. nov.*)

♀. *Colour* very like that of *I. maculatus*, ochraceous, variegated with black; cephalothorax with its lateral margins black, ocular tubercle, region of lateral eyes and ante-ocular portion black, a narrow median

* C. Koch has described one species from Mexico.

pale band, however, runs from the tubercle towards the anterior border; the rest of the cephalothorax ochraceous with symmetrically arranged black patches, the posterior border being marked with three patches, one median and one on each side near the lateral angle; each of the tergites, except the last, marked with three longitudinal black bands, the lateral being complete, and the median interrupted in the centre; there is in addition a smaller spot on the posterior border on each side of the middle between the median and lateral bands; the last tergite with an anterior median spot and on each side two anteriorly abbreviated posterior bands, the edges of the tergites anteriorly black; tail with black patches along the keels, the vesicle without spots, the apex of the aculeus black; legs and palpi spotted as in *maculatus*.

Cephalothorax with its anterior border widely and angularly excised in front, mostly granular throughout, very closely granular in the ante-ocular portion.

Tergites granular throughout, the granules being a little coarser in the posterior half of the body; the lateral keels of the seventh tergite complete behind, abbreviated in front where they are united by a few larger granules.

Tail slender, parallel-sided, long, about seven times as long as the cephalothorax; the keels prominent and conspicuously and evenly denticulate throughout, the posterior denticle of the superior keels of the 1st, 2nd, 3rd and 4th segments only being larger than the rest, the intercarical spaces weakly and sparsely granular, the median lateral keel complete on the first segment, entirely absent on the others, the fifth segment with its upper surface lightly convex, excavated only posteriorly and very shallowly in the middle line; vesicle serially granular and sub-carinate beneath, a conspicuous triangular spine beneath the aculeus which is only gently curved.

Sternites mostly smooth, the 4th and 5th feebly granular laterally, the 5th furnished with four conspicuous anteriorly abbreviated granular keels, of which the external are posteriorly abbreviated and the internal posteriorly complete.

Palpi, long; the humerus furnished with five granular keels, two posterior, an upper and a lower; three anterior, an upper, a median and a lower, intercarinal spaces also granular, lower surface nearly

smooth; brachium furnished above with three granular keels and in front with about six dentiform tubercles, longer than the humerus and considerably thicker; manus thick, considerably thicker than the brachium, its width equal to half the length of the hand-back, and considerably more than a third of the length of the movable dactylus; not rounded internally but nearly parallel-sided; the dactyli separated at the base owing to the sinuation of the immovable one.

Legs as in *I. maculatus*, the two posterior tibia not spurred.

Pectines, short, not extending to the extremity of the posterior coxæ, armed with 16 teeth. *Measurements in mm.* Total lg. 67; cephalothorax lg. and width 6; tail lg. 45, lg. of 1st segment 4·5, of 2nd 6·5, of 3rd 7, of 4th 8·3, of 5th 10, of vesicle 4·5, width of 1st segment (at distal end) 2·5, of 5th 2·3, of vesicle 2·5; Palp.; humerus lg. 8·3, width 1·5; brachium lg. 8·6, width 1·9; manus lg. (along back) 5·5, width 2·8; movable dactylus lg. 8.

Locality, Madras and the Sheveroy Hills.

This species that I previously recorded from Madras at *I. maculatus* proves in reality to be a different form, but whether a variety or a species must for the present be left undecided. I gladly dedicate it to its discoverer, Mr. Edgar Thurston.

It is very closely related to *I. maculatus*, of which a fairly good figure was published by Mr. Oates in the 4th number of the 3rd vol. of this Journal. Indeed before the male sexual characters are declared, the two species are difficult to separate—a circumstance which led me, not knowing the adult male, to identify the species as *maculatus*. Apart, however, from sexual features, the two species may be recognised by certain differences in colour. Thus in *I. maculatus* there is a triangular fulvous patch on the cephalothorax extending from the ocular tubercle to the anterior margin and sensibly dilating from behind forwards, and the fifth segment and the poison vesicle of the tail are flavous and spotted with fuscous. Moreover the pectines or ventral combs, have from 17 to 19 (usually 18) teeth. In *I. thurstoni*, on the other hand, the ante-ocular flavous patch is, although present, very much smaller, is not sensibly triangular in shape and does not reach at least the middle of the anterior border—the poison vesicle and fifth caudal segment too are rather clouded with fuscous or even ferruginous, and lastly there are only 15 or 16

pectinal teeth. These characters by themselves, however, would hardly justify the formation of a new species; but when they are correlated with a marked difference in the shape of the hand in the adult male, their value is of course enormously enhanced. In the adult male of *maculatus*—a cosmopolitan species of which I have seen very many examples from almost all tropical and sub-tropical regions—the width of the hand is about equal to the width of the brachium or fore-arm, is about one-third the length of the hand-back, *i.e.*, the area between the joint of the movable dactylus and the joint of the wrist, and about one-quarter the length of the movable dactylus. Whereas, as stated above, in the single adult male of *I. thurstoni* from the Sheveroy Hills the hand is much thicker than the brachium (cf. measurements), its width is equal to half the length of the hand-back, and considerably more than a third the length of the movable dactylus.

In addition to *I. maculatus* this species is closely related to a second Indian species of the genus, namely *I. assamensis*, described and figured by Mr. Oates in his paper in this Journal, which has been previously mentioned. The three species in fact agree in the entire absence of a spur on the apex of the proximal segment of the tibia of the 3rd and 4th pairs of legs. *I. assamensis*, however, in addition to two other characters to which Mr. Oates has referred, may be recognized from both those here discussed by the presence of only two, instead of four, granular keels on the last abdominal sternite.

(2) *Isometrus (Archisometrus) scaber*, sp. n.

*Colour**; cephalothorax obscurely ochraceous, very indistinctly variegated with fuscous, the lateral margin and the ante-ocular portion fuscous, the ocular tubercle and the eyes black; tergites obscurely variegated, with two indistinct posterior yellow spots and an anterior-shaped yellow mark on each side; palpi and legs ochraceous, very indistinctly clouded with darker patches; tail, like the legs nearly concolorous, ochraceous, deeper on the fifth segment.

Cephalothorax a little wider than long, about as long as the 1st caudal segment and ½ the 2nd; not carinate, coarsely and evenly granular almost throughout, the granules finest in the middle of the

* This specimen shows signs of having lost its colour. Fresh examples would probably be much more brightly tinted.

ante-ocular portion, the tubercle and surrounding area smooth or nearly so, the anterior border widely emarginate.

Tergites with a conspicuous granular median keel, but without traces of lateral keels, coarsely granular throughout; the last with the median and lateral keels well developed.

Sternites, except the last, smooth and shining, the last granular throughout, the median keels conspicuous, the lateral keels short, each composed of about 6 serially arranged granules.

Tail moderately robust, nearly five times as long as the cephalothorax, thicker at the base; moderately excavated above, the intercarinal spaces granular, the 1st segment furnished with 10 granular keels, the 2nd also with 10 keels, but the median lateral weaker than on the 1st segment, the terminal granules not enlarged, the 3rd and 4th segments with 8 keels, the 5th with 5 feeble and weakly granular keels, and its upper surface posteriorly excavated; *vesicle* of normal form, marked below with feeble, weakly granular keels, the spine long and strong, the aculeus also moderately long and strong.

Palpi: humerus furnished with the usual keels, granular above, in front and behind; brachium also normally keeled and weakly granular; manus rounded narrower than the brachium, the length of the hand-back greater than its width, nearly smooth, weakly carinate above; dactyli long, slender, curved, in contact throughout, the movable more than twice the length of the hand-back.

Legs, granular and granularly carinate; spurs short.

Pectines furnished with 17-18 similar teeth.

Measurements in millimetres:—Total length 36; cephalothorax length 4·5, width 5; length of tail 22, of 1st segment 2·5, of 2nd 3, of 5th 5·3, width of 1st (at base) 2·2, of 5th (at extremity) 1·2; length of vesicle and aculeus 4·4; humerus, length 4, brachium, length 4·5, width 1·6; manus, width 1·3, length along back 2·3, length of movable dactylus 5.

A single female specimen from Madras.

This species is naturally enough closely related to the two other Indian forms *shoplandi* of Oates and *tricarinatus* of Simon.

The former was obtained in Burma and was figured and described by Mr. Oates in his paper in this Journal; the latter was recorded om Pondicherry. In Vol. XXIII. of the Journal of the Linnæan

Society (1891), I have pointed out the resemblances and the differences between these two species—the two being unquestionably very closely related. I have, moreover, given a figure of the male of *tricarinatus* taken from a specimen in the British Museum that was sent from Madras. Mr. Oates had not seen this species; otherwise no doubt he would have recognised how nearly allied to it his *shoplandi* is. Again, in the paper above referred to I have mentioned the occurrence of *shoplandi* at Calcutta. The specimen of it, however, that the museum possesses from this locality differs slightly, though not to my mind specifically, from one of Mr. Oates' typical examples. It will be of great interest, therefore, to discover the variations to which the species is liable, and to what extent specimens from other localities bridge over the interval between it and *tricarinatus*.

This new form, as already stated, is related to both *tricarinatus* and *shoplandi*, but it may be recognised at once by the shortness of the spurs on the tibiæ of the posterior pairs of legs—the spurs being remarkably long in the other two. From *tricarinatus* it may be further separated by the entire absence of lateral tergal keels and by its much longer dactyli, &c. In both these particulars, too, it differs from the Burmese example of *shoplandi*, but not from the above-mentioned Calcutta specimen in which the dactyli are longer, (though not so long as in *scaber*) and there are no traces of lateral tergal keels. It is, however, much more granular than both these individuals, has only 8 keels on the 3rd caudal segment and from 17 to 18 pectinal teeth, whereas in *shoplandi* there are 22 pectinal teeth and 10 keels on the third caudal segment.

The most notable points of resemblance and of difference between the three may be more clearly shown as follows :—

A. The 2nd caudal segment with 10 keels; the last abdominal sternite with 4 keels.

a The spurs on the posterior tibiæ very long, considerably longer than the hairs that surround them; dactyli shorter, the movable not more, usually much less, than twice the length of the hand-back; tail much thicker, pectinal teeth 21-25 (usually 22-23).

a Tergites with distinct lateral keels composed of three or four granules; 3rd caudal segment with 8 keels, with, at most,

merely traces of the median lateral keel; cephalothorax anteriorly evenly granular and very slightly emarginate. .... *tricarinatus*, Simon.

b Tergites with lateral keels absent or composed of one tubercle, 3rd caudal segment with 10 keels; cephalothorax smooth in front and angularly emarginate .....*shoplandi*, Oates.

B The posterior tibial spurs very short, not longer than the hairs; movable dactylus more than twice the length of the hand-back; tail more slender; pectinal teeth 17-18 .....*scaber*, sp. n.

(3) *Buthus martensii*, Karsch.

B. martensii, Karsch, Mitth. Münch. ent. ver., 1879, p. 112; Pocock, Ann. and Mag. Nat. Hist. 1889, iii., p. 335.

B. grammurus, Thorell, Ann. Mus. Genov., 1889, pp. 567-570.

Scorpio tamulus, Fabr., Suppl. Ent. p. 294.

I here repeat the synonymy that I published in the Ann. and Mag. of Nat. Hist. 1890, 236. Subsequently Prof. Kraepelin has given *martensii* as a synonym of the African form *B. hottentotta*; the two are certainly very closely allied, but the question of their absolute identity is one upon which for the present I wish to suspend judgment.

This species, the common yellow house Scorpion, is widely distributed in India, having been already recorded by me from Sikkim, Umballa, Bengal, Madras, and Bombay; and Mr. Thurston has just sent others from Chingleput and Mysore. It has not yet been recorded from Ceylon or Burma.

Family *Scorpionidæ*.

(4) *Hormurus læviceps*, Pocock.

Ann. Mag. Nat. Hist., 1890, pp. 242-244, pl. xii, fig. 1.

Sent originally from Madras and subsequently one specimen from Tranquebar. Mr. Henderson, of Madras, who has collected this Scorpion on the Nilgiri Hills, informs me that he has never seen it in the plains.

In the original description of this species I stated that the dactyli of the palpi have the same form in the two sexes. But this proves to be an error; for this example from Tranquebar is a male, and has the movable dactylus lobate and the immovable correspondingly sinuate

The males of the series from Madras were clearly not quite adult. Another differential character for this species, which I did not before notice, is the presence of only two setigerous pores on the upper surface of the base of the immovable dactylus, in the other species of the genus there are typically three of these pores.

(5) *Scorpio swammerdami* Simon.

Buthus afer, C. Koch, Die. Arachn., iii, pp. 17-18, fig. 175 (not *afer* of Linn.)

Heterometrus swammerdami, Simon, Rev. Mag. Zool., 1872, p. 56, pl. vi, fig. 3.

Panninus aepsr, Thorell, Ann. Soc. Ital. Sci. Nat., xix., pp. 199-202 (pp. 125-128 of Extract), 1876.

Pandinus kochii, Karsch, Mitth. Munch. ent. Ver., 1879, p. 127.

Scorpio lucidipes, Simon, Bull. Soc. Zool. Fr., x, p. 38 (1885).

In the Ann. Mag. Nat. Hist., 1890, pp. 237-241, I have already explained my reasons for giving the above synonymy; and it is needless here to repeat what was there said with regard to the sexual characters of this species and of the variations it is subject to during growth.

This is the largest Indian Scorpion, attaining a length of 176 millimetres (about 7 inches). It may be easily recognised by the great length of the tail, this organ in the adult being more than four times the length of the cephalothorax. In all the other Indian species known to me the tail is less, sometimes much less than four times as long as the cephalothorax. I have seen examples of this species from Ceylon, Madras, Coonoor and Burdwan.

I have added *afer* of C. Koch to the synonyms of this species, for this author's figure appears to me to agree far better with *swammerdami* than with *roseli* of Simon—the large W. African species to which Simon referred it. C. Koch may have confounded the two species, but his figure at least is that of *swammerdami*.

(6) *Scorpio fulvipes* C. Koch.

Scorpio afer, Herbst Ungeflugelt. Ins., iv. Skorpionen, pp. 38-42, pl. i, fig. i. (1800).

C. Koch, Die Arachniden, iv, p. 45, fig. 278 (1838).

Karsch, Abh. Nat. Bremen., ix, p. 68 (1884).

Simon, Bull. Soc., Zool. F., x, pp. 23-24 (1885).

This species is very unmistakable. Hence the absence of synonyms. For the sake of those who have not access to C. Koch's work, I give the following short diagnosis:

Colour, upper surface piceous, rufo- or olivaceo-piceous; legs and caudal vesicle clear yellow, ochraceous, or ferruginous.

Cephalothoraæ usually about as wide as long, sometimes a little longer than wide or *vice versâ*; in ♀ as long as the 1st + 2nd + ⅓ of 3rd caudal segments, in ♂ a very little longer than the 1st + 2nd; the frontal lobes and sloped lateral portions sharply granular, the upper portion mostly smooth; the ocular tubercle in the middle or a little behind the middle, manifestly cleft, smooth, the eyes small, separated by a space a little less than a diameter; the lateral eyes sub-equal in size, either nearly evenly spaced or (usually) the posterior more separated from the median than the anterior.

Tergites more or less finely granular postero-laterally, the last more coarsely granular, with sometimes indications of the lateral keels.

Sternites entirely smooth.

Tail robust, in ♂ about 3¾ or 3⅞ the length of the cephalothorax, in ♀ a little more than 3⅛, the superior and supero-lateral keels denticulate or granular, the lateral area sparsely granular, the lower surface of the first 3 segments entirely smooth, of the 4th granular or sub-denticulate on the keels, the 5th with strongly denticulated keels and a few sharp tubercles on the inter-carinal areas; the vesicle moderately large, furnished beneath with strongly granular keels.

Palpi robust in ♀, generally more slender in ♂, the *humerus* sparsely but coarsely granular above in the proximal two-thirds of its surface, the keels in front and behind denticulate; *brachium* subcostate and rugulose, sometimes weakly granular above, denticulate in front; *manus* covered above with smooth, rounded, sometimes slightly anastomosing tubercles, the inner border denticulate, the lower surface sparsely but coarsely granular, some of the granules forming two distinct series or keels; the upper surface either convex or nearly flat, the sharpness of the inner edge varying with the convexity, the area immediately above the keel of the 'hand-back' nearly at right angles to the plane of the upper surface and more or

less completely separated from it by a distinct though irregular ridge, formed by the fusion of tubercles; the inner border of the hand strongly rounded in ♀ and some ♂, the length of the 'hand-back' either much less than the width of the hand (♀ and some ♂) or nearly or quite equal to it (some ♂), in some ♀ the width of the hand is equal to the length of the movable dactylus, as a rule, however, it is less.

Legs smooth, the lower edge of the femora alone being furnished with a row of granules.

Pectines furnished with from 13 to 18 teeth; usually there are 14 or 15, one ♂ alone that I have seen has 18.

Measurement in millimetres:—♀ adult. Total length about 100, of cephalothorax 16·5, of tail 55, of first two segments 14·5, of 5th 12·5, of vesicle and aculeus 11·5, width of 1st 7, of 5th 5, of vesicle 5; length of humerus 11, of brachium 12, of hand-back 10·5, of movable dactylus 16, width of hand 13·5.

♂ adult *a*. Total length 84, of cephalothorax 13, of tail 49, of first two segments 12·3; length of humerus 12, of brachium 13, of 'hand-back' 10·5, of movable dactylus 14, width of hand 10.

♂ adult *b*. Total length 101, of cephalothorax 15·2, of tail 54, of humerus 13, of brachium 14, of hand-back 11, of movable dactylus 16, width of hand 13.

These measurements show how the two sexes differ with regard to the length of the tail and of the segments of the palpi or chelæ. They also show that the hand of the ♂ may or may not be slender in the adult. In all the males, however, that I have seen the hand if it be not more slender is much flatter than in the ♀. Apart from these characters, however, the ♂ may be recognised from the ♀ by his cleft genital operculum and much longer pectinal teeth.

I have seen 17 examples of this species. Many of these are ticketed India without further locality; the others are from Madras and Malabar. Simon has recorded it from Bellary, and Mr. Thurston has sent specimens from Madras and Tranquebar. It thus appears to be widely spread in S. India. The British Museum has other examples, which are doubtfully from Rangoon and C. Koch's

type-specimen was recorded from Java. Both these localities, however, need, to my mind, confirmation. But if only one of them can be shown to be correct; it is probable that both are. Thorell (loc. cit., p. 210) has suggested that *afer* of Herbst may be *megacephalus* of C. Koch. The figure and description, however, appear to me to agree better with *fulvipes*, the most marked difference being only in the size. Herbst declares that his largest specimen measured 5 inches (German) in length. Whereas the largest example that I have seen is less than 4 (German) inches. But since this species is known to occur at Tranquebar whence the types of Herbst's *afer* came, it is probable, I think, that the two are the same species.

Apart from its conspicuous colouring, *Sc. fulvipes* may be recognized by the smooth ridge, resulting from the fusion of the tubercles, that runs along the external edge of the upper surface of the manus

(7) *Scorpio phipsoni*, sp. n.

Colour mostly a deep shining green, sometimes olivaceo-ferruginous; tarsi and caudal vesicle ferruginous; pectines ochraceous.

Cephalothorax, about as long as the first two caudal segments and $\frac{1}{2}$ the third, usually a little longer than wide, sometimes as wide as long, sometimes a little wider than long, quite smooth above, weakly granular at the sides and sometimes on the frontal lobes; ocular tubercle low, the surrounding area being slightly depressed, distinctly cleft, eyes small, about a diameter apart, lateral eyes sub-equal in size, the distance between the posterior and the median greater than between the median and anterior.

Tergites either entirely smooth or weakly granular postero-laterally; the last granular at the sides with one or more sharp tubercles marking the position of the lateral keels.

Sternites entirely smooth.

Tail moderately powerful, but somewhat short, in the ♂ up to $3\frac{1}{2}$ times the length of the cephalothorax, but generally $3\frac{1}{3}$ times or less, in ♀ about 3 times the length or less, more powerful also in ♂ than in ♀; the intercarinal spaces nearly smooth, the superior and supero-lateral keels well developed and denticulate, the inferior keels entirely smooth (weakly granular on the 4th) nearly obsolete or more or less manifest; 5th segment with its margins denticulate;

vesicle granularly carinate beneath, larger in the adult ♂ than in the ♀.

Palpi; humerus coarsely granular above, smooth at the distal end; *brachium* subcostate, somewhat coarsely granular or sub-granular behind, denticulate in front; *manus* convex, thickly covered above with smooth, slightly anastomosing, tubercles, nearly smooth or weakly granular beneath, with two more or less distinct rows of larger sharper granules, the inner border closely denticulate, convex, the hand but little produced posteriorly, the movable dactylus greater than the length of the 'hand-back,' length of the 'hand-back' a little less than the width of the hand in ♀ or much greater than it is in adult ♂.

Legs, nearly smooth, the femora granular beneath.

Pectines in ♀ 11-12 teeth, in ♂ 13-15 teeth.

Measurements in Millimetres :—

♀ Total length about 97, length of cephalothorax 14·5, width 14; length of tail 45, of 1st segment 5, of 2nd 6 (of both 11·5), of 4th 7·2, of 5th 10, of vesicle and aculeus 9·5; width of 1st 6, of 5th 4; of vesicle 3·5; length of humerus 11, of brachium 12, of hand 13·5, of 'hand-back' 10·5, of movable dactylus 13; greatest width of manus 11, smallest width 8.

♂ Total length 104; length and width of cephalothorax 17; length of tail 68, of first two segments 14, of 4th 9·2, of 5th 13·5, vesicle and aculeus 13, width of 1st 7·3, of 5th 5·2, of vesicle 5·2; length of humerus 16, of brachium 17·5, of manus 18·3, of 'hand-back' 15, of movable dactylus 17·5, greatest width of hand 12, smallest 9·5.

The museum has specimens of this species from Madras. Mr. Thurston has sent a male example from this locality and a female from the Sheveroy Hills. In the form of the palpus this male agrees closely with the one I have described, but the tail is certainly shorter.

The following measurements may be compared :—

Length of cephalothorax 16·5, of first two caudal segments 12, of 4th 7·5, of 5th 10.

The largest example in the Museum collection measures 110 mm. in length. This is a ♂.

This species may prove to be synonymous with *Sc. ceylonicus*, Herbst (loc. cit. pp. 83-84, pl. v., fig. 1)—a species that seems to me

to have been established upon immature specimens that are possibly referable to more than one true species. May be some of them are *megacephalus* of Koch.

The species described by C. Koch (loc. cit. ix. pp. 9-11) as *ceylonicus*, Herbst, is, judging by the length of the tail, still another species. Possibly it may be the young of *swammerdami*.

Whether Dr. Karsch (Abh. Nat. Ver. Brem., ix., pp. 68-69) in his synopsis of this genus is discussing Herbst's species or Koch's or both, I am unable to surmise.

This new species, *phipsoni*, which I have great pleasure in dedicating to the secretary of this Society, perhaps comes nearest to *Sc. megacephalus* of C. Koch (loc. cit., iii., p. 73, fig. 224) of which the Museum has examples from both India and Ceylon. The two agree pretty closely in smoothness, in the shortness of the tail, &c.; but in *megacephalus* the manus is much larger, its width being much greater than the length of the back of the hand, moreover the tubercles on its upper surface are lower and more anastomosed; the upper caudal keels too are nearly smooth. The largest example that I have seen of *megacephalus* measures 122 mm. in length.

It also closely approaches *bengalensis* of C. Koch; but the manus is much flatter and much more distinctly tubercular.

The following synopsis may prove of some use to those who are in difficulties over the Indian species of this genus:—

SYNOPSIS OF THE INDIAN SPECIES OF *Scorpio*.

a. Tail in ♂ and ♀ more than four times the length of the cephalothorax; the cephalothorax in ♂ and ♀ shorter than the first two caudal segments; manus strongly produced posteriorly, with its inner edge nearly straight.....*swammerdami* (Simon).

b. Tail in ♂ and ♀ less, in ♀ always much less, than four times the length of the cephalothorax; the cephalothorax in ♀ always, in the ♂ usually considerably shorter than the first two segments; inner border of the manus more convex.

*a*¹. The external area of the upper surface of the hand nearly vertical and separated from the rest of the surface by a distinct though sometimes irregular ridge formed by the linear anastomosis of tubercles; legs, cheliceræ and vesicle clear fulvous or ferruginous .....*fulvipes* (C. Koch).

Scorpio bengalensis of C. Koch (loc. cit. ix., pp. 3-5, fig. 696) from Bengal, was by Simon referred to the genus *Palamnæus*. The British Museum has, however, five examples (2 ♀ 3 ♂) of a scorpion from Bengal which, to my mind, is certainly the species described by Koch Two of these specimens present the reddish-brown colouring of C. Koch's example, but this colouring is purely a question of date from the time of moulting; the others have the characteristic deep green tint more or less shaded with ferruginous.

The sculpturing of the hand in this species calls to mind the reticulated pattern of this segment in *Sc. indicus*, but the ornamentation is much coarser and more distinctly tubercular.

Scorpio indicus, Linn. (Thorell, Ann. Mus. Genov., (2), VI, pp. 412-414) (=*cyaneus* and *reticulatus*, C. Koch, op. cit., III., p. 75 and IV., p. 25) is typically a Javan species. I have merely included it in the accompanying table on the strength of a specimen in the British Museum collection, which is ticketed Ceylon.

The only described oriental species of this genus which has not been here considered, is *Scorpio humilis* of Simon (Ann. Soc. Ent. Fr., (5), VII. (1877) p. 94-95) from Manilla. But judging from its distribution and from certain characters that are mentioned in the description, I am inclined to suspect that it is a young *Palamnæus* and not a *Scorpio*.

THE POISONOUS PLANTS OF BOMBAY.

By Surgeon-Major K. R. Kirtikar, I.M.S.

PART III.

(With Plate D.)

(Read before the Bombay Natural History Society on November 29th, 1892.)

PYTHONIUM WALLICHIANUM—(*Kunth.*)

(Natural Order—Aroideæ.)

Marathi—शेवळें.

An annual plant, erect, glabrous; the flower-stalk appearing at the end of the hot-weather, just before the outburst of the monsoons; very common in the Thana jungles; leaf-stalk appears in the rains.

THE POISONOUS P
ANTS OF BOMBAY.

TUBER.—Large, placentiform, fleshy, containing plenty of starch; rounded, with a depression on the top where the scape and petiole arise: whence also several cylindrical, fleshy, thickish roots arise, divided into numerous fine filamentous rootlets. Colour, yellowish-brown; size, varying from two to six inches or even eight in diameter from side to side; two to four inches from top to bottom. Epidermis rough, pitted, inseparable. Tuber-substance on section whitish, firm.

LEAF.—Large, radical, solitary, petiolate, glabrous, umbrella-shaped; tripartitely decompound. *Lobes* deeply pinnatifid; secondary segments or leaflets of the tripartite lobes (pinnæ) lanceolate, acuminate, four to six inches long, narrow at the base; deep green in colour; the ribs or principal veins running straight from the mid-rib to the margins at equal distances, yellow in colour on the under-surface of the leaflets, and very prominently marked; these principal veins are ultimately reticulate. The outermost lobes are pinnatipartite. The middle lobe slightly pinnate, or sometimes, as in the accompanying plate, a solitary simple leaflet, ovate, acuminate. Margins of the leaflets entire, sinuated. *Petiole*, solid, succulent, cylindrical; shorter than the scape, dividing into three sub-divisions, each called by Blume (*Rumphia*) a "rachis," although the term "rachis," according to Lindley, is strictly confined to the divisions of the petiole of the leaves (*sic*) of Ferns, as also to the axis of an inflorescence. The so-called "Rachis" of Blume is deeply sulcate, bordered with a decurrent expansion of the lower margins of the lateral leaflets.

SCAPE.—One or two feet long, cylindrical; oftener compressed about the mid-part; ½—1 inch in diameter, or of the size of the thumb at the apex of the tuber, where it is loosely enfolded by two membranaceous greenish-red scales; the scape of the size of the little finger at the most at the top. Colour variegated, with linear streaks of white, purple, pink, green and brown.

SPATHE.—Terminal, solitary, erect, clavate, ten to twelve inches long, thick coriaceous convolute below, *cucullate* above (cucullate meaning—upper margins curved inward so as to resemble the point of a slipper or a hood). The spathe as a whole is cymbiform, or boat-shaped, opening about the middle; greenish-yellowish, brown

or purplish ; dull opaque outside ; minutely reticulate, and pinkish or purplish inside.

SPADIX.—Erect, clavate, of the thickness of the middle finger ordinarily, at its broadest part ; of the length of the spathe, and completely covered by it ; for about an inch from the base bearing the female organs ; thence up to about the middle bearing the male organs ; for six inches above that densely covered with numerous rough, irregular, spongy, parallel unequal crests or tubercles tinged whitish, yellowish or brown.

ANTHERS.—Sessile [or placed on very short filaments (*Kunth, En. Pl.*, Vol. III., p. 30)], very densely aggregate in four or five stellate fascicles, oblong, fleshy, yellowish, slightly compressed ; apex somewhat abrupt ; quadrilocular. *Loculi* narrow, tubular ; in opposite pair ; dehiscing from the apex (*Wallich*). *Pollen* composed of large ovate granules.

OVARIES.—Numerous, close-packed, ovoid, hidden in the convoluted base of the spathe ; about fifteen in number, arranged in a spiral manner ; unilocular, containing an erect, ovate, solitary orthrotropous ovule, enclosed in a soft fleshy indusium.

Style, cylindrical, somewhat incurved ; scarcely longer than the ovary.

Stigma, thick, fleshy, somewhat lateral, and looking downward ; trilobate : lobes equal ; triangular, acute, with tumid margins, closing upon each other in a somewhat valvate manner ; two lateral ; one superior.

FRUIT.—A *Bacca* or berry changing in colour from green to yellow and subsequently rich scarlet as it matures ; monospermous ; scarcely seen. *Seed*—unseen ; exalbuminous ? (*K. R. K.*).

REMARKS.

Wallich classes this plant synonymous with *Thomsonia Nepalensis* (*vide* Wallich's *Pl. As. Rar. P. I.* 83, T. 99), also Blume (*Rumphia*, I., 150). Kunth refers this plant to the genus *Pythonium* ; the plant itself he names after Wallich. The species is a solitary instance of the genus. I am decidedly disposed to retain the name Kunth gives, as it truly represents its natural appearance. The purple marking of the stem at once recalls to mind the mottled

skin of the Python. Wallich names the genus "*Thomsonia*," after the celebrated Dr. Anthony Todd Thomson, for a long time Professor of Materia Medica in University College, London, and distinguished for his botanical tastes and for his genuine pharmacological researches in the early days of that Institution. Wallich, however, adds a note, which is well worth remembering, that the genus so named after Dr. Todd Thomson should not be confounded with another genus similarly named, but differently spelt—*Thompsonia*. The latter genus was formed by Mr. Brown and classed as a genus under the Natural Order *Passifloreæ*, in honor of Mr. John Vaughan Thompson.

The genus *Pythonium* is allied to *Arum* and *Caladium*, but differs from them in having its spadix entirely covered by the spathe in the base of the spadix being pistilliferous, its middle part being anther-bearing, and its apex verrucose; the loculi of the anthers tubiform and vertically dehiscing at the apex; styles manifest; stigma three-lobed, subvalvate. Blume in his *Rumphia* (Vol. I., p. 146) notes that the genus *Pythonium* is intimately allied to the genus *Amorphophallus*, from which it cannot be distinguished except by its quadriporus anthers and uni-ovuled ovary, the ovary of the *Amorphophallus* being, bi-, tri- or quadri-locular. I may also add that the berry of the *Amorphophallus* is monospermous (one-seeded) or oligo-spermous (with only a few seeds), whereas *Pythonium* is always one-seeded.

The flower-stalks are seldom if ever allowed to remain in our jungles sufficiently long to bear fruit; long before even the stamens and pistils develop, the flower-stalks are cut down by our jungle-haunters as soon as they appear above the ground and sold in the bazaars with a bunch of the fruits of Kâkad (*Garuga pinnata*). These stalks are used in cookery. Curries are made of it, finely chopped, mixed with slices of Kâkad as an adjunct. The strongly acid quality of this fruit is decidedly destructive of the acrid property of the flower-stalk. The highly acid fruit of Bilimbi (*Averrhoa Bilimbi*) is also used in the curries of the flower-stalk for a similar purpose. The Oxalate of Potassium which the Bilimbi contains has no doubt the power of destroying the taste and the potency of the acrid juice. Boiling also with a pinch of common salt removes

the acridity. When the flower-stalk matures, it emits the offensive odour of a rotting carcass, and attracts swarms of blue-bottles.

The Poisonous Properties of the Plant.

The whole plant is acrid. It has never been used for criminal purposes, but when used for culinary purposes, it has often irritated the mouth, fauces and pharynx to an alarming extent. The late Dr. Vinayak Govind Gidha, L.M. & S., saw, in conjunction with the late Dr. Sakharam Arjun, some cases wherein much irritation of the mouth and throat followed the culinary use of the flower-stalk. The bulb is acrid likewise; but I am not aware of its ever being used for culinary purposes. Nor do I know of its ever being used as food in famine times when people are hard pressed and eat whatever can keep off hunger, although in the late Dekkan Famine of 1877-78, in the Nasik District, *Teri Alu* (*Colocasia antiquorum*) appears to have been used. It is well known that the English Cuckoo-pint (*Arum maculatum*) of this order is so poisonous that even a small piece of its leaf when eaten by children has been known to produce convulsions. But the chief point I wish to note in connection with it is, that although the root and the plant are highly poisonous, the poison may be removed from them, and a wholesome flour made from the root.—(*Anne Pratt.*) The other representatives of the Arad order, such, for instance, as the plant I am now describing, are equally noted for the readiness with which they part with the acrid element they contain, especially by means of heat. Long boiling before using the flower-stalks renders them harmless, though even sometimes the acridity is perceptible. It is not, therefore, always agreeable to eat curried Shewla, though it may not be always positively unsafe to do so. The fact of the acridity disappearing on boiling is indicative of the volatile nature of the acrid element. Dr. Sakharam Arjun has noted his experience regarding the poisonous properties of the root of *Pythonium Wallichianum* in a paper which, if I remember right, he read some years ago before the Grant Medical College Society. But not having all the numbers of the Society's Transactions and printed Proceedings, I regret I am unable to cite the cases he mentions. I know from my own practice that in several instances severe irritation of the

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BUFO FERGUSONII.
A New Toad from Travancore.

fauces has followed the internal use of the flower-stalk followed by a temporary œdema of the mucous membrane of the uvula and pharynx. In Dr. Sakharam's and Dr. Vinayak Gidha's practice the tongue was noted to have become rapidly swollen, a phenomenon not unknown in the poisonous symptoms following the ingestion of the leaves of the English Cuckoo-pint, a congener of the Bombay Shewla. The curried Shewla, when not acrid, or when the acridity is "just passable," or faint, is by no means an unattractive or unpalatable table delicacy, but you can never know when the throat or the tongue may not have to pay the penalty of even a careful or moderate indulgence in a delicious but treacherous curry.

EXPLANATION OF PLATE D.

From the left of the reader to the right.

(1) Spadix exposed; spathe drawn down over the upper part of the scape. (2) Bulb, roots, and rootlets; two membranous scales seen on either side of the dark-mottled petiole (cut across); these membranous scales were originally round the scape which falls before the petiole appears. (3) Boat-shaped spathe, exposing spadix. (4) Leaf on petiole; tripartitely decompound.

DESCRIPTION OF A NEW TOAD FROM TRAVANCORE.

By G. A. Boulenger.

Bufo fergusonii.

Crown with weak bony ridges, *viz*, canthal, pra-supra and postorbital, supratympanic, and parietal, the latter directed obliquely inwards; snout short, obtuse; interorbital space broader than upper eyelid; tympanum very distinct, close to the eye and about three-fifths its diameter. First finger not extending beyond second; toes hardly half-webbed; no enlarged subarticular tubercles; metatarsal tubercles feeble; no tarsal fold. Tarso-metatarsal articulation reaching tympanum. Upper surfaces entirely covered with small spinose warts; parotoids scarcely prominent, as long as broad, half

as long as the hand. Pale olive-brown above, with a few irregular darker blotches.

A single specimen, a gravid female, measuring 46 millim. from snout to vent, was found by Mr. H. S. Ferguson at Trevandrum, on the Cavalry Parade ground, in August, 1891, and presented by him to the British Museum.

DESCRIPTION OF A NEW EARTH-SNAKE FROM TRAVANCORE.

By G. A. Boulenger.

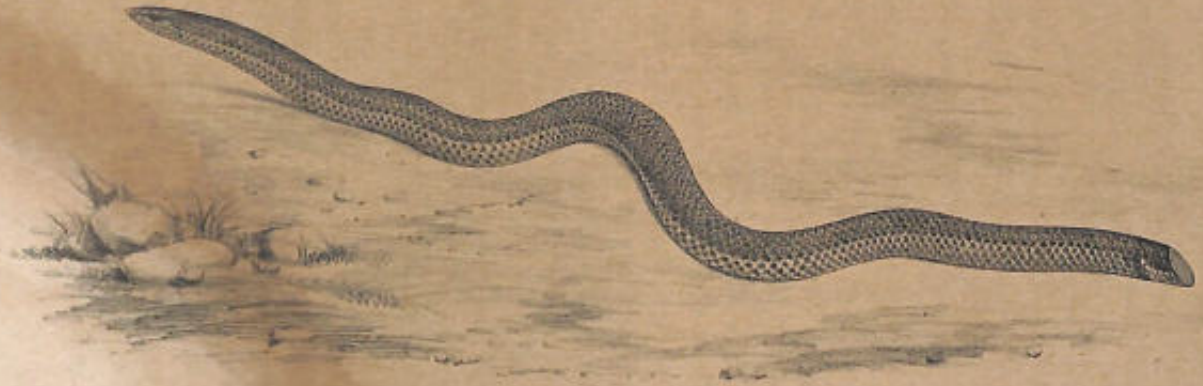
Rhinophis travancoricus.

Head very small, with acutely pointed and compressed, but not keeled, snout; rostral shield about one-third the length of the shielded part of the head, wedged in between the præ-frontals and narrowly separated from the frontal; latter shield once and one-third as long as broad, and slightly shorter than the parietals; eyes hardly half as long as the ocular shield; four upper labials, first very short, fourth nearly as long as second and third together. Diameter of body 34 times in the total length. 17 scales round the middle of the body, 19 behind the head. Ventrals, about once and a half the size of the contiguous scales, 146; subcaudals 6; caudal disk a little shorter than the shielded part of the head. Dark purplish-brown, the scales on the sides and belly edged with whitish; anal region black; tips and lower surface of tail yellow.

Total length, 170 millim.

The single specimen sent to the British Museum by Mr. H. S. Ferguson was obtained near Trevandrum, at the 6th mile-stone towards Vambayam, in June, 1892.

Distinguished from the other S. Indian species of this genus, *R. sanguineus*, Bedd., by having 17 instead of 15 scales round the middle of the body, by the low number of ventral scales, and by the coloration. In the Ceylonese species, the rostral is keeled above, or, if not, the caudal disk is very short.



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RHINOPHIS TRAVANCORICUS.

A New Earth-snake from Travancore.

E. C. S. Baker del. Mintern Bros. Chromo. Lith. Lond.

THE PLAIN BROWN WREN.

Elachura immaculata, (Baker).

A new species discovered in North Cachar, Assam, in May 1891.

NOTES ON A NEW SPECIES OF WREN FOUND IN NORTH CACHAR, ASSAM.

By E. C. Stuart Baker.

(*With 1 Plate.*)

* Elachura haplonota, sp. nov.

(Plain Brown Wren.)

Description.—Whole upper plumage and wing-coverts dark umber-brown, rather lighter on the rump and upper tail-coverts, the feathers obsoletely edged rather pale sienna-brown; wings dark cinnamon-brown on the exposed parts and dark brown where unexposed (in the closed wing); tail brown, tinged with cinnamon-red, but not so strongly as are the wing quills; lores fulvous-brown, dusky next the eyes; chin and throat white tinged with fulvous, and the feathers, except in the centre, tipped dusky; breast and sides of neck fulvous-brown, the feathers tipped brown and sub-tipped white, the white being most prominent in the centre of the breast; centre of abdomen and belly white; flanks and under tail-coverts fulvous-brown, some of the feathers of the former tipped white; thighs greyish-brown, the feathers with the shafts slightly paler; under wing-coverts grey; axiliaries dark fulvous-brown.

Bill dark horny, slightly paler at the commissure and tip; gape black, mouth bluish, fleshy; irides light red; legs sanguineous, fleshy; claws very pale.

Length, measured in the flesh immediately after death, 4·15″; wing 1·95″; tail 1·58″; bill at front ·41″ and from gape ·52″; tarsus barely ·6″; length of hind claw nearly ·28″. First primary, ·72″; second, 1·02″; third, 1·25″; fourth to secondaries, 1·3″.

Mr. Sclater (British Museum), to whom the bird was sent for identification, gives the following short diagnosis of it:—

"*Elachura*—

"Similis *E. punctata*, sed supra concolor, minime albo punctata "(dorsi punctis albis nullis) et remigibus caudaque unicoloribus nec "nigro transfasciatis."

* A description of this new Bird appeared in the *Ibis* in January, 1892.

In addition, the measurements of the two birds are also very different; Oates (*vide* "Fauna of British India Birds," Vol I., p. 340) gives the following as the dimensions of *E. punctata*—"Length about 4·5", tail 1·2", wing 1·8"," so that *E. punctata* would appear to be a larger bird with shorter wing and tail. The bird above described was obtained on the Hungrum Peak in the North Cachar Hills and at an elevation of about 6,400 feet.

It was trapped on its nest under the following circumstances: On the 11th of May, 1891, I was engaged in visiting numerous nests which had been previously marked down for me by some Naga boys. On being shewn a nest built under a big log, which had fallen so as to rest on two rocks, and was thus slightly raised from the ground, I at once saw that it was new to me, so instead of taking the eggs, I sat down a short distance away from it, to watch for and shoot the parent bird. I sat thus for fully half an hour, but no bird visited the nest, though two small brown birds kept scuttling backwards and forwards over the log, now hidden in the moss, now perched for a moment on one of the bunches of orchids which grew all over it. In their actions they closely resembled *Pnoepyga pusilla*, and, as that bird is very common about Hungrum, I thought they were of that species, though every now and then they uttered a long clear whistle which I did not recognise as a note of *Pnoepyga*. No bird actually approaching the nest, and not thinking that the pair on the log were the owners of it, I got up and went close up to it, whereupon the two birds flew off a yard or two with a jerky fluttering flight into some long grass, and then crept rapidly from stalk to stalk until they were out of sight, keeping up a continuous loud "chir chir" all the time we were near the log, though they did not again show themselves.

The Naga, who was with me, set some mithna-hair nooses on the nest before leaving it, and that same evening we found one of the birds caught in them, and they were again set in hopes that the pair might be also caught. On the morning of the 12th, on visiting the nest, we found that the other bird had not returned, and, though I waited about a long time in the hope of obtaining a shot at it, it did not appear, so we took the nest and eggs, of which latter there were three only.

The nest was placed on a pile of dead leaves, bracken and branches which filled up the hollow below the fallen tree, and it was supported on either side by a broken branch. The major part of the materials consisted of skeleton leaves bound together with dark, coarse fern-roots, a few bents, and also one or two fine elastic twigs; the outermost part of the nest was of dead leaves of all kinds, very loosely bound together and contrasting with the inner part which was very compactly lined with skeleton leaves alone. In shape the nest is a deep cup with the back-wall much prolonged, though not enough so to form a roof or porch. The measurements of the nest are as follows: Outside, not including the looser twigs and leaves, the broadest part is 3·3″; the height of the back-wall, 5·4″; of the front-wall, 2·44″; depth of the interior, from level of top of front-wall, 1·4″; diameter as nearly as possible ·2″.

The nest when first taken was soaked through more than half-way, the lining of skeleton leaves alone being dry. It was beautifully hidden amongst the dead branches and ferns, and I don't think I should have ever found it myself. The ground on which it was found had some eight or ten years previously been cleared for cultivation, and was again overgrown with fairly thick scrub jungle, but there were no trees about, except dead ones, and most of these had long fallen to the ground and were all covered with a dense mass of tree-ferns, moss and orchids. A road ran within some ten feet of where the nest was found, and the Naga boy, who found it told me he saw the male bird taking food to the female as she sat on the nest.

The eggs, of which, as I have already said, there were three, were very large in proportion to the size of the bird, measuring respectively ·67″ × ·50″, ·66″ × ·50″, and ·65″ × ·51″. One egg appears to be quite pure white, unless it is very closely and carefully examined, when a few excessively minute, pale reddish marks may be discovered about the larger end; another egg has these marks quite distinct, though still very few in number and very tiny; the third has the marks somewhat more numerous, decidedly larger, so much so that some of them indeed might almost be designated blotches. They are of the same pale reddish-brown as in the other eggs, and they form a very ill-defined ring at the very extremity of the

larger end, whilst about a dozen or so freckles are scattered about the rest of the egg. The surface of the eggs is close, hard, and rather glossy, and the shell is decidedly stout. In shape they are rather broad ovals, considerably depressed and pointed towards the smaller end.

When taken the eggs were perfectly fresh.

I examined the stomach of the bird, which was trapped on the nest, and found it to contain a few ants and a mass of small bright blue beetles of a kind which seem to be very numerous on the flowers of orchids growing near the ground.

ON NEW AND LITTLE-KNOWN BUTTERFLIES FROM THE INDO-MALAYAN REGION.

By Lionel de Nicéville, F. E. S., C. M. Z. S., &c.

(*With Plates H, I and J.*)

Family NYMPHALIDÆ.

Subfamily Satyrinæ.

1. RAGADIA CRITOLAUS, n. sp. Pl. H, Fig. 1, ♂.

Habitat: Burma.

Expanse: ♂, 1·5 to 1·7; ♀, 1·6 inches.

Description: Male. Upperside, *both wings* with the ground-colour about equally divided between black and white. *Forewing* with the white area commencing on the inner margin about half its length from the base of the wing and almost reaching the anal angle, extending towards the apex of the wing, which it does not reach, in a triangular or wedge-shaped figure, bearing a series of five round black spots between the veins, of which the three posterior ones are well-formed and separated, the two anterior ones have their outer edges more or less merged into the outer black border of the wing; the base of the wing is occupied very obliquely by two streaks a little darker than the blackish ground-colour; there is also

L. DE NICÉVILLE, Journ. Bomb. Nat. Hist. Soc.

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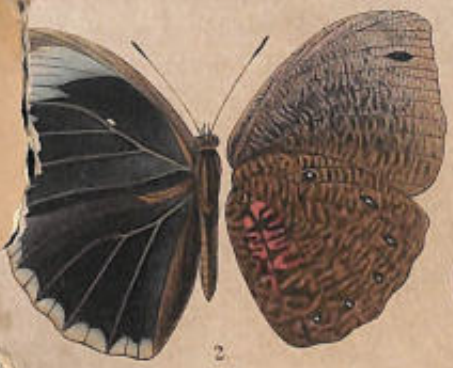
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Mintern Bros. Chromo Lith. London.

INDO-MALAYAN BUTTERFLIES.

L. DE NICÉVILLE, Journ Bomb. Nat Hist. Soc.

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G. C. Chuckrabutty del.

INDO-MALAYAN BUTTERFLIES.

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S.C. Chakravarty del.

INDO-MALAYAN BUTTERFLIES.

a narrow whitish streak below the costa ; the outer margin is broadly black, with its inner edge festooned. *Hindwing* with the dusky basal area crossed by two straight dark lines ; a broad discal black band touching the costa but not quite reaching the abdominal margin, broadest in the middle, narrowing towards both ends ; the outer margin broadly black, bearing a slightly paler line. UNDERSIDE, *both wings* precisely as in *R. crito, mihi*,* from Bhutan, but all the black bands narrower, the white ground being consequently more extensive. FEMALE differs from the male only in its slightly broader and more rounded wings.

Nearest to *R. crito*, from which it may be known at a glance by the greater extent of the white ground-colour on the upperside of both wings, that character will also separate it from *R. crisilda* Hewitson, equally well, which from the figure I judge the type specimen to be taken from a female, and it differs markedly from the same sex of *R. critolaus* in having on the upperside of both wings the outer discal black band (which on the underside bears the ocelli) twice as broad, thus considerably reducing the white area on each side of it. *R. latifasciata*, Leech,† from Moupin, Western China, is also an allied species, but from the description differs in several details of the markings, and is much larger.

Major C. T. Bingham and I captured this species in considerable numbers in October, 1891, and 1892, in the virgin forests at the foot of the Daunat Range, Middle Tenasserim. The butterfly always keeps in the shade of the great trees, and flies amongst the bushes and brushwood, on which it often settles. Its flight is only equalled in weakness and gentleness by *Leptosia xiphia*, Fabricius.

Subfamily ELYMNIINÆ.

2. DYCTIS ESACOIDES, n. sp., Pl. H, Fig. 2, ♂.

HABITAT : Perak, Malay Peninsula ; Battak Mountains, Sumatra.

EXPANSE : ♂, 2·6 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* very deep indigo-

* Journ. Bombay Natural History Society, vol. v, p. 199, n. 1, pl. D, figs. 1, *male* ; 2, *female* (1890).

† The Entomologist, vol. xxiv, Suppl. p. 25 (1891).

blue, paler towards the base. *Forewing* with a curved decreasing marginal bluish-grey band, broadest at the costa, continuous as far as the third median nervule, posteriorly broken up into three large rounded inwardly-pointed spots. *Hindwing* with a series of large lunular bluish-grey spots placed on the margin, one in each interspace. UNDERSIDE, *both wings* fuscous, very thickly reticulated with black, the mottling coarser on the hindwing. *Forewing* with the ground-colour of the apical half of the wing pale violet; an oval black spot towards the outer margin in the upper discoidal interspace. *Hindwing* with a submarginal series of six round black spots, pupilled with white, the two anterior ones the largest, the fourth very minute, the one in the submedian interspace geminated; in the submedian and internal interspaces, especially towards the base of the wing, are some large vermilion-coloured blotches, which take the place of the fuscous ground-colour.

Nearest to *D. esaca*, Westwood, which is known to me by Professor Westwood's short description only, and by Mr. Hewitson's figure. These two writers give the habitat of that species as the East Indies, and Mr. Butler says that the type specimen came from Assam, and was collected by Mr. Warwick. Messrs. Wallace and Moore record it from Borneo. *D. esacoides* differs from *D. esaca* in the colour of the ground of the upperside. The underside also differs in coloration, being fuscous irrorated with black instead of red-brown as described and figured by Hewitson, and markedly in the presence of the vermilion-coloured blotches on the abdominal area of the hindwing, these being entirely absent in *D. esaca*. It also differs from the type of *D. andersonii*, Moore, from the Mergui Archipelago, in its larger size, darker coloration, especially on the underside, the latter possessing a well-marked whitish exterior marginal area to the hindwing, which is wholly lacking in *D. esacoides*. From Herr Georg Semper's figure of the male of *D. egialina*, Felder, in his work on the Butterflies of the Philippine Islands, pl. xii, figs. 7, 8, *D. esacoides* would appear to be an allied species, differing however in possessing a black spot on the underside of the forewing near the apex, and lacking the series of white spots towards the outer margin on the underside of the hindwing which are found in *D. egialina*. The female of *D. egialina* is figured by Felder in Reise Novara, Lep., pl. lxi, figs. 7, 8, and is

evidently allied to *E. godferyi*, Distant, Rhop. Malay., p. 423, n. 10, pl. xxxix, fig. 5, *female* (1886), and, but for the fact that Mr. Distant says he possesses males of the latter species from North Borneo, and describes them as being very similar to the female, while *D. esacoides* s markedly different both in coloration and markings, I should have come to the conclusion that *E. godferyi* was the female and *D. esacoides* the male of one and the same species.

Described from a single specimen collected in Perak by Mr. J. Wray, Jr., and kindly presented to me by him. Dr. L. Martin, of Deli, Sumatra, has sent me a coloured drawing of two specimens of this species taken by him in that island in the Battak mountains, which appears to agree absolutely with the type.

Subfamily MORPHINÆ.

3. DISCOPHORA DIS, n. sp., Pl. H, Fig. 3, ♂.

HABITAT : Deli, N.-E. Sumatra, Borneo.

EXPANSE : ♂, 3·9 ; ♀, 4·2 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* rich dark indigo-blue, somewhat paler towards the margins, tinted with ferruginous at the base. *Forewing* with a curved discal macular band, consisting of five shining light blue spots, the uppermost in the upper discoidal interspace squarish and whitish ; the spot posterior to this occupying the whole breadth of the interspace ; the two following highly lunulated ; the posterior spot of all incomplete, consisting of the anterior half of a lunule only ; beyond the discal is a submarginal series of four spots, the uppermost in the lower discoidal interspace rounded, the three following lunular. *Hindwing* with the costa broadly pale, the usual discal velvety black spot. UNDERSIDE, *both wings* precisely as in *D. celinde*, Stoll, but the ground-colour of a darker and richer shade. FEMALE. Almost precisely similar to the same sex of *D. celinde*, but the inner edge of the broad discal ochreous band a little nearer the disco-cellular nervules on the UPPERSIDE of the *forewing;* no ochreous discal spots posterior to this band ; the *hindwing* darker than in *D. celinde*, lacking all markings. UNDERSIDE, *both wings* with the ground-colour darker than in *D. celinde*.

As far as I can discover, no species of *Discophora* has been described as endemic to Sumatra, but Herr Georg Semper incidentally

mentions *D. celinde*, Stoll, and *D. cheops*, Felder, while Mr. Distant cites *D. sondaica*, Boisduval, as occurring in that island. The latter species belongs to the group of *D. tullia*, Cramer, which is quite distinct from the group of *D. celinde*, Stoll. *D. dis* in the male is a species abundantly distinct from any species of the latter group, a list of which, as far as I have been able to make them out, is given below :—

1. *Discophora celinde*, from Java (Stoll) = *aristides*, from the Indies (Fabricius) = *timora*, from Timor (Doubleday and Hewitson).
1*a*. *D. celinde*, var. *continentalis*, from India (Staudinger).
1*b*. *D. celinde*, var. *andamensis*, from the South Andaman Isles (Staudinger).
2. *D. menetho*, from India (Fabricius).
3. *D. necho*, from Java (Felder).
4. *D. cheops*, from Borneo (Felder).
5. *D. dis*, from Sumatra and Borneo (de Nicéville).
6. *D. ogina*, from.....(Hübner). Godart describes the male of *D. ogina* from Java, but does not refer to the species as being Hübner's. The latter figures a male, while Semper figures a female from the Philippines = *melinda* (*teste* Semper), from Luzon (Felder).
7. *D. bambusæ*, from Halmaheira (Gilolo) (Felder) = *celebensis* (*teste* Rothschild) from Celebes (Holland).

Nos. 6 and 7 of the above list differ from the other five species in having more than two ocelli to the hindwing on the underside. The genus sadly requires to be monographed; it is highly improbable that all the species given above as distinct are really so. Both Butler and Semper retain the *D. menetho* of Fabricius as distinct, while Kirby and Distant place it as a synonym of *D. celinde*. If Donovan's figure of it (female) is correct, I possess a specimen from Java agreeing closely with the figure, and the species appears to be distinct from *D. celinde*.

D. dis is described from two pairs kindly sent me by Dr. L. Martin, of Deli, Sumatra, and one male subsequently received from Mons. A. de Plason, from Nanga Badau, Borneo (1886). Dr. Martin has bred the larva on *Imperata arundinacea* and *Saccharum officinale* (sugar-cane). The larvæ invariably keep in pairs.

Family LYCÆNIDÆ.

4. PITHECOPS BASSARIS, n. sp., Pl. H, Figs. 4, ♂; 5, ♀.

HABITAT: Ké Islands.

EXPANSE: ♂, 1·25; ♀, 1·40 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* with the base and the outer margin broadly black—the black basal portion extends to about half the length of the discoidal cell, the outer black portion commences near the costa a little beyond half its length from the base of the wing, and sweeps round in a regular curve to the anal angle where it is about a millimeter in breadth; the costa narrowly black; the rest of the wing pure white. *Hindwing* black all except a large patch of pure white which occupies the apex of the wing to about the middle (or rather beyond) of the costa and extends on the disc as far as the third median nervule. UNDERSIDE, *forewing* with a black costal thread, the outer margin blackish, but less broadly so than on the upperside, bearing a series of five increasing submarginal white lunules, and a marginal series of very fine linear white spots. *Hindwing* with a very large round intensely black spot on the costa just before its middle, the outer margin broadly black not reaching the apex, decreasing somewhat towards the anal angle, bearing a series of white lunules and another of white spots much as in the forewing, these two series of markings almost coalescing and thus giving the appearance of a series of marginal round black spots incompletely surrounded each by a white line. FEMALE. Differs from the male in being larger and blacker. *Forewing* with the costa broadly black, the black area reaching as far as the subcostal nervure; the outer black area much larger, being about three millimeters wide at the anal angle. *Hindwing* as in the male. UNDERSIDE, *both wings* with the white markings in the outer black marginal area more prominent. *Antennæ* black, the shaft prominently spotted (not annulated) with white below.

From *P. dionisius*, Boisduval,* as figured by Mr. Druce, both

* *Lycæna dionisius*, Boisduval, Dumont D'Urville's Voyage de l'Astrolabe, Faune Ent., pt. i, p. 82, n. 11 (1832); *Pithecops dionisius*, Druce, Proc. Zool. Soc. Lond.), 1891, p. 358, pl. xxxi, fig. i, from New Guinea and the Solomon Isles (*Druce*); Aru, Islands and Batjan (*Ribbe*); *Eupsychellus dionisius*, Röber, Tijd. voor Ent., vol. xxxiv, p. 316 (1891), from Ceram, Goram, and Key.

sexes (but more especially the female) differ in having the black area more extensive on the upperside of the forewing, and on both wings on the underside. It differs from *P. dionisius*, var. *steirema*, Druce,* in having in both sexes the white area of the hindwing on the upperside very much larger, extending to the third median nervule, while in *P. steirema* it reaches to the second subcostal nervule only; *P. bassaris* also lacks the small black spots on the costal margin of the forewing on the underside found in both *P. dionisius* and *P. steirema*.

In *Pithecops hylax*, Fabricius, the first subcostal nervule is entirely anastomosed with the costal nervure except a short portion of the base which is free. In the male of *P. bassaris* the first subcostal nervule appears to cut straight through the costal nervure instead of anastomosing with it, while in the female it anastomoses for a short distance, and then again becomes free and reaches the costa. Herr Röber's genus *Eupsychellus* proposed for *L. dionisius* should I think fall before *Pithecops*.

Described from five male and one female specimen kindly presented to me by Herr Georg Semper of Altona.

5. CYANIRIS CEYX, n. sp., Pl. H, Figs. 6, ♂; 7, ♀.

HABITAT: Java.

EXPANSE: ♂, ♀, 1·2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* somewhat pale blue. *Forewing* with the costa very narrowly, the outer margin more widely but decreasingly towards the anal angle black; an obscure irrotated patch of white on the disc between the median nervules. *Cilia* at the apex black, becoming white at the anal angle. *Hindwing* with the outer two-thirds white, glossed with blue in some lights, crossed by the dark veins; a series of obscure small round dusky spots on the outer margin, one in each interspace. *Cilia* pure white, bounded within by a very fine black thread. UNDERSIDE, *both wings* white, of a slightly bluish shade. *Forewing* with a narrow dusky line defining the disco-cellular nervules; a curved discal series of five spots, and a similar number of smaller rounded marginal spots.

* *Pithecops steirema*, Druce, Ann. and Mag. of Nat. Hist., sixth series, vol. v, p. 25, n. 3 (1890); *P. dionisius*, var. *steirema*, id., Proc. Zool. Soc. Lond., 1891, p. 358, pl. xxxi, fig. 4, from the Solomon Isles (*Druce*).

Hindwing with the usual spots scattered over the disc, but all very small; a marginal series of seven small round prominent spots. FEMALE. UPPERSIDE, *forewing* with the outer black margin very much wider than in the male. *Hindwing* with the costa broadly dusky. Otherwise similar to the male.

Perhaps nearest to *C. akasa*, Horsfield, from South India, Ceylon, Java, and Sambawa, from which it differs in the far greater extent and different shade of blue on the upperside, and the narrower outer black border to the forewing: the two species agree absolutely on the underside. It is also near to *C. albocæruleus*, Moore, from the Khasi Hills and Himalayas, but has more blue coloration and a narrower black border on the forewing on the upperside.

At present the genus *Cyaniris* is represented in my collection by five species only from Java, *viz.*:—*C. akasa*, Horsfield, *C. puspa*, Horsfield, *C. huegelii*, Moore, apparently identical with Western Himalayan specimens, *C. coalita*, de Nicéville, and *C. ceyx*, de Nicéville. Mr. Doherty speaks of capturing seven species in the mountains of Eastern Java.*

C. ceyx is described from two male and one female specimen sent to me by Heer M. C. Piepers.

6. ARHOPALA ACE, n. sp., Pl. H, Fig. 13, ♂.

HABITAT: Perak, Malay Peninsula.

EXPANSE: ♂, 1·9.

DESCRIPTION: MALE. UPPERSIDE, *both wings* rich violet-blue,† the outer margins very narrowly black. *Hindwing* with the costa broadly black, the abdominal margin fuscous; the anal lobe small, black; the tail moderately long, black tipped with white. UNDERSIDE, *both wings* dull fuscous- or hair-brown, without any gloss, all the macular markings but very slightly darker than the ground-colour, their outer whitish narrow bounding lines alone somewhat prominent. *Forewing* with the three usual increasing spots in the discoidal cell and two below it divided by the first median nervule; the discal band broad, consisting of six portions, the two lower

* Journ. A. S. B., vol. lviii, pt. 2, p. 435 (1889).

† Of the exact shade of the male of the extremely common butterfly from Singapore, which I have identified a little doubtfully as *Arhopala aroa*, Hewitson.

portions in one straight line but dislocated and shifted towards the base of the wing posterior to the third median nervule; the four upper portions of almost equal size, and all but the anteriormost smallest portion (which is shifted inwardly) in one straight line; an obscure submarginal fascia; inner margin of the wing as far as the first median nervule rather paler than the rest of the surface. *Hindwing* with the markings as usual; the anal lobe and spot beyond the base of the tail small and black; the anal area somewhat extensively sprinkled with dull metallic green scales.

A. ace appears to be nearest to *A. adorea, mihi*, from typical specimens of which from Singapore it differs in the ground-colour of the upperside being rich violet- (almost ultramarine-) blue instead of deep bluish-purple, the outer black margins even narrower, the ground-colour of the underside much duller brown, the spots and bands but very slightly darker than the ground-colour, and the forewing lacks the costal spot anterior to the spot at the end of the discoidal cell. From *A. arva*, Hewitson (as identified by me), it may be known by its larger size, and by the same differences on the underside as are found between it and *A. adorea*.

Described from a single example from Perak kindly given to me by Mr. J. Wray, Jr.

7. ARHOPALA ACESTES, n. sp., Pl. H, Fig. 14, ♂.

HABITAT: Perak.

EXPANSE: ♂, 2·0 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* very deep violet-blue of the exact shade found in the male of *A. diardi*, Hewitson, from the Khasi Hills, and agreeing therewith also in size and outline, except that *A. acestes* lacks the tooth-like projections from both sides of the tail of the hindwing seen in *A. diardi*, and the tail is longer and narrower; outer margins very narrowly black. *Hindwing* with the costa and abdominal margin broadly black; anal lobe very small; tail of moderate length, black tipped with white. UNDERSIDE, *both wings* rich brown, very strongly, especially on the hindwing, glossed with purple; all the markings prominent, darker than the ground-colour, outwardly defined with grey tinted with the purple gloss. *Forewing* with the inner margin as far as the submedian nervure grey, with a large

patch of grey also in the interno-median interspace, sharply inwardly defined opposite the origin of the first median nervule by the waved outer margin of the patch of the ground-colour which occupies the basal half of the interno-median interspace; the usual three increasing spots in the discoidal cell, a spot at the base of the first median interspace, a discal band of five spots, the upper three of equal size, in one straight line, the lower two a little larger, increasing, slightly shifted inwardly; a well-marked distinct submarginal series of six quadrate spots, each spot defined on both sides with whitish. *Hindwing* with the four anterior basal spots very prominent, the discal spots and bands as usual, a well-marked submarginal series of five spots, followed by three jet-black spots broadly crowned with rich metallic green scales.

This is a very beautiful and distinct species, startlingly like *A. diardi* on the upperside, but like no species with which I am acquainted on the underside. The absence of any costal spots on the forewing allies it to *A. ace*, *mihi*, to *A. ate*, Hewitson, and to figs. 29 and 30 of *A. adatha*, Hewitson, but the purple glossing of the underside will instantly distinguish it from all these species, but apparently allies it to *A. achelous*, Hewitson (a species I have not seen); the latter, however, has three costal spots to the forewing on the underside.

Described from a single specimen from Perak kindly presented to me by Mr. J. Wray, Jr.

8. ARHOPALA ARCA, n. sp., Pl. H, Fig. 15, ♀.

Habitat: Celebes.

Expanse: ♀, 1·9 inches.

Description: Female. Upperside, *both wings* shining purplish-fuscous, bronzy in some lights. *Forewing* with the discoidal cell entirely light non-iridescent blue, two similar narrow streaks in the median interspaces reaching half-way to the margin, and the area behind the discoidal cell as far as the inner margin of the same colour, filling the basal half of the interspace. *Cilia* anteriorly fuscous, posteriorly from the first median nervule white. *Hindwing* with the discoidal cell and the area immediately around it blue; with three *tails*, all tipped with white, the one at the termination of the first median nervule long, the others, one on each side of the long tail, short. *Cilia* white. Underside, *both wings* creamy-white.

Forewing with the costal and basal areas entirely rich dark brown, a very broad even brown band occupying the end of the discoidal cell and extending a considerable distance beyond it, commencing in the dark costal area and ending abruptly on the first median nervule, this disco-cellular band is separated from the basal area by a very narrow streak of the ground-colour; a very broad (as broad as the disco-cellular band) discal band, commencing on the costa, ending on the first median nervule, below which in the submedian interspace is a diffused dark spot; a narrow submarginal band; an anteciliary dark line. *Hindwing* with a broad rich dark brown basal area sharply defined against the creamy-white ground-colour; a double line defining the disco-cellular nervules, with two round spots in continuation one each in the median interspaces; beyond these is another broad dark brown area, which reaches almost to the outer margin, and bears inwardly traces of the usual discal maculated band; a lunular deep black spot on the margin in the first median interspace crowned with metallic green scales; some similar scales in the interspace behind; the anal lobe small, bearing a round deep black spot also crowned with metallic green scales; an anteciliary black line.

This very beautiful and distinct species clearly belongs to the group of which *A. apidanus*, Cramer, which occurs in Burma, the Malay Peninsula, Sumatra, Java, Borneo, Billitan, and Sambawa, is the type, and to which the "*Flos*" *artegal*, Doherty, from Burma and Perak, and "*Flos*" *ahamus*, Doherty, from Margherita in Upper Assam, are allies. The latter species may indeed be synonymous with *A. apidanus*. *A. arca* is however quite distinct from any of these, having the discal band of the forewing on the underside at least twice as wide, and the dark basal area of both wings strongly contrasted with the creamy-white ground-colour beyond; in *A. apidanus* the ground-colour is much darker. The strongly contrasted colours of the underside is a marked feature in the hindwing of "*Panchala*" *morphina*, Distant, from Perak in the the Malay Peninsula, an otherwise abundantly distinct tailless species. *A. arca* differs also from *A. apidanus* and allies in having the blue coloration of the upperside far more restricted, and in the prominently white cilia.

Described from a single specimen received from Heer M. C. Piepers, of Batavia, Java.

9. ARHOPALA ASIA, n. sp., Pl. H, Fig. 16, ♂.

HABITAT: Quang, Malay Peninsula.

EXPANSE: ♂, 1·8 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* deep dull purple without any gloss. *Forewing* with the costa and outer margin most narrowly black. *Hindwing* with the outer margin most narrowly black, the abdominal margin up to the submedian nervure fuscous. UNDERSIDE, *both wings* dull pale brown, all the markings inconspicuous, of a slightly darker colour than the ground, outwardly defined with gray. *Forewing* with a small round spot towards the base of the discoidal cell, a larger oval one across its middle, a quadrate one at its end, a spot at the base of the first median interspace, a broad regular discal band consisting of seven spots, gradually increasing to the sixth spot, the seventh in the interno-median interspace small; an indistinct submarginal fascia. *Hindwing* with six rounded basal spots, an oblong spot at the end of the cell, the usual macular discal band, recurved posteriorly to the abdominal margin; a double series of submarginal lunules, faint traces of metallic blue scales on the margin in the first median interspace, and a large patch of similar scales at the anal angle, a small deep black round spot on the small anal lobe.

This belongs to a very difficult group of the genus, all the species of which are tailless. It appears to be very close to *A. amphimuta*, Felder, which is known to me by the description and figure of the underside only, and with which it appears to agree on the upperside, but differs on the underside of the forewing in having the inner margin very slightly paler instead of much paler than the rest of the surface, the discal band also much more extended at each end and not prominently dislocated at the first median nervule.

Described from a single example in my collection.

10. ARHOPALA ÆETA, n. sp., Pl. H, Fig. 17, ♀.

HABITAT: Burma.

EXPANSE: ♀, 1·6 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* bluish-purple. *Forewing* with the costa broadly reaching to the subcostal nervure, a prominent tooth-shaped mark at the end of the discoidal cell, and the outer margin (widest at the apex) broadly fuscous. *Hindwing* with more than half the surface dull brownish-fuscous, the purple coloration hardly extending beyond the discoidal cell. UNDERSIDE, *both wings* grey, the markings dark brown, outwardly defined with whitish of a lighter shade than the grey ground-colour. *Forewing* with a small oval spot towards the base of the cell, a larger one at its middle, a still larger increasing one at its end which is continued widely to the first median nervule, filling the bases of the median interspaces; a large dark brown patch occupying the basal half of the interno-median interspace, its outer edge sharply defined and inclined inwardly obliquely; a broad even almost straight discal unbroken macular fascia, commencing on the costa, ending on the first median nervule; a very indistinct pale brown spot inwardly below it in the interno-median interspace; a broad well-marked increasing submarginal fascia. *Hindwing* with all the macular markings paler than in the forewing, but standing out particularly clearly on the gray ground, small, arranged as usual; a well-marked lunulated submarginal fascia, broad anterior to, narrow posterior to, the second median nervule; no anal lobe, metallic anal sprinklings, or tail, but the apices of all the veins slightly extended beyond the general outline of the outer margin of the wing, the apex of the first median nervule slightly more produced tooth-like than the rest.

On the upperside, omitting the lack of tail, this species very closely resembles the same sex of *A. rama*, Kollar; on the underside it is most like *A. dodonæa*, Moore, but is whiter and with no silky gloss whatever, the markings more prominent, especially on the hindwing. To judge from the description and figure alone it is nearest to *A. asopia*, Hewitson, from Maulmain, which, as described, has the ground-colour of the underside "rufous," but is perhaps better defined as "of a very unusual tint of reddish-ochreous," all the markings less distinct than in *A. æeta*.

Described from a single example captured in June in the

Thaungyin Valley, Middle Tenasserim, by Major C. T. Bingham, who has generously presented the specimen to me.

11. THECLA LEECHII, n. sp.

Habitat: Khasi Hills (*Hamilton*); Western China (*Leech*).

In the Journal of the Bombay Natural History Society, vol. vi, p. 374 *et seq.*, pl. F, fig. 17 (1891), I described and figured the female of a species of *Satsuma* (=*Thecla*) from the Khasi Hills, but did not name it, as my unique specimen was damaged. I have since received another female in perfect condition from the same region through the kindness of the Rev. Walter A. Hamilton, and propose now to name the species *Thecla leechii* after my friend Mr. J. H. Leech, the author of many papers on palæarctic Lepidoptera, and of "Butterflies from China, Japan, and Corea." He informs me that the species occurs also in Western China, and that it is quite distinct from *Thecla* (*Satsuma*) *chalybeia*, Leech, and *T.* (*S.*) *pratti*, Leech, both of which were described from unique male examples.

My friend Heer P. C. T. Snellen of Rotterdam is quite of my opinion that *Satsuma* is a genus which should be sunk under *Thecla*, and writes to me that *Thecla frivaldszkyi*, of Lederer, which is the type of *Satsuma*, agrees absolutely in structure with the British "Green Hairstreak," *Thecla rubi*, Linnæus.

12. CAMENA CARMENTALIS, n. sp., Pl. H, Fig. 10, ♂.

Habitat: Khasi Hills.

Expanse: ♂, 1·25 inches.

Description: Male. Upperside, *both wings* black. *Forewing* with the whole of the discoidal cell, a considerable area at the base of the first median interspace, and the interno-median and sutural areas to near the outer margin shining bluish-purple. *Hindwing* with a large glossy black patch from the costal base of the wing occupying the whole of the discoidal cell; the disc shining bluish-purple; the anal lobe bearing a deep black spot, outwardly with a few turquoise-blue scales, anteriorly broadly crowned with dull ochreous. *Tails* black, tipped with white. Underside, *both wings* French-grey washed with ochreous; a very fine indistinct discal

dark line, outwardly defined with whitish, broken and lunulated in the hindwing; an obsolete marginal fascia. *Forewing* with the usual tuft of long setæ attached to the inner margin and turned under and backwards concolorous with the ground-colour. *Hindwing* with the usual oval black spot on the outer margin in the first median interspace, very broadly surrounded with ochreous, which colour is continued in a lunulated line to the abdominal margin; anal lobe deep black outwardly bearing some metallic blue scales; a short streak of metallic blue scales placed outwardly against the submedian nervure towards its termination; a fine black anteciliary line inwardly defined by a narrow white line as far as the third median nervule.

Near to *C. lila*, Moore, from Sylhet, but much smaller (1·25 as against 1·80 inches), this species being known to me by the description and figure only; the bluish-purple area reaching to nearer the outer margin on the upperside of the forewing; the discal line on the underside much less prominent than in some specimens of *C. deva*, Moore, *C. lila* being said to have this line "much more prominent"—this, however, is probably a variable character. Also near to *C. ister*, Hewitson, from "India," the female of which only is known, and which is described as being cerulean-blue on the upperside of both wings, that colour on the hindwing reaching much closer to the outer margin than in *C. carmentalis*. The underside of the two species agree very closely, and *C. carmentalis* is not improbably the opposite sex of *C. ister*, unless the latter should be, as I have supposed, a varietal form of the female of *C. cleobis*, Godart.

Described from two examples from the Khasi Hills kindly given to me by the Rev. Walter A. Hamilton, by whose native collectors they were obtained.

13. TAJURIA THYIA, n. sp., Pl. H, Fig. 11, ♂.

Habitat: Khasi Hills.

Expanse: ♂, 1·5 inches.

Description: Male. Upperside, *both wings* black. *Forewing* with the posterior half of the discoidal cell, a small portion of the base of the first median interspace, and the interno-median and sutural areas to near the outer margin bluish-purple of the same shade as

in *T. diæus*, Hewitson. *Hindwing* with all except the costa broadly and the abdominal margin (which latter is grey) bluish-purple; a very small black anal lobe; the outer margin very narrowly black. *Tails* black, tipped with white. UNDERSIDE, *both wings* French-grey; a fine anteciliary black thread. *Forewing* with a fine discal straight broken blackish line, ending anteriorly on the subcostal, posteriorly on the submedian nervure; an indistinct submarginal pale broken line. *Hindwing* with a much broken discal line, posteriorly recurved to the abdominal margin; a submarginal pale broken line; a marginal white line from the anal angle to the third median nervule; an oval deep black spot near the outer margin in the first median interspace, surrounded by an ochreous ring; two lunular marks in the submedian interspace made up of mixed black and blue scales; a small deep black spot on the anal lobe, outwardly bearing a few turquoise-blue scales, anteriorly defined with a small rich ochreous patch.

Near to *T. diæus*, Hewitson, from the Western Himalayas, Sikkim and Khasi Hills, from which it differs on the underside in the discal line of the forewing being broken and not reaching the costa, that line on the hindwing also being broken and placed nearer to and parallel with the outer margin. Still nearer to *T. albiplaga, mihi*, from Sikkim, differing therefrom in the purplish-blue instead of cerulean-blue of the upperside of both wings; the much smaller extent of the blue colour on the forewing; and on the underside of both wings in the absence of the dark lines defining the disco-cellular nervules.

Described from a single example kindly placed at my disposal by the Rev. Walter A. Hamilton, by whose native collectors it was obtained.

14. SUASA SUESSA, n. sp., Pl. H, Figs. 8, ♂; 9, ♀.

HABITAT: Perak, Selangor—both in the Malay Peninsula.

EXPANSE: ♂, ·8 to 1·0; ♀, 1·1 inch.

DESCRIPTION: MALE. UPPERSIDE, *both wings* bronzy-fuscous. *Forewing* with the basal area bluish-violet, this area anteriorly bounded by the subcostal nurvure, posteriorly reaching to the inner margin. *Cilia* fuscous, becoming white at the anal angle. *Hindwing* with the posterior two-thirds bluish-violet; a large rounded spot on the outer margin in the first median interspace, the anal lobe, and a spot

placed between them but a little removed from the margin, all deep black; a black anteciliary thread from the anal angle to the second median nervule. *Cilia* white. *Tails* white, anteriorly black in the middle. UNDERSIDE, *both wings* of the purest china white. *Forewing* with the apical third of the wing ochreous, bearing inwardly a band of the ground-colour from the inner margin to the lower discoidal nervule, and a short white line beyond in the submedian interspace. *Hindwing* with two prominent round subcostal black spots, the inner the larger; two fine broken submarginal black threads, the outer consisting of five detached portions, one in each interspace from the costa to the second median nervule, the inner continuous, extending from the first subcostal nervule to the internal nervure; the three black spots at the anal angle as on the upperside; a fine black line extends from just above the anal lobe to the abdominal margins. FEMALE. UPPERSIDE, *both wings* shining brown. *Forewing* unmarked. *Hindwing* with the anal area broadly white, the inner edge of this area scalloped, bearing the three black spots and the black anteciliary thread as in the male. UNDERSIDE, *forewing* as in the male. *Hindwing* lacking the internal of the subcostal black spots, otherwise as in the male.

Closely allied to *S. lisides*, Hewitson, which occurs in Sylhet, the Khasi Hills, the Tenasserim Valley, and the Mergui Archipelago, being replaced apparently to the southwards by the above-described species, which differs from it in the entire absence in both sexes of the rufous area on the upperside of the forewing. In "The Butterflies of India, Burmah and Ceylon," vol. iii, p. 387, n. 942 (1890), I identified the type female of *S. suessa* as an aberrational form of *S. lisides*, and described it as follows:—"A female from Selangor in the Malay Peninsula differs from two females from Burma in having the upperside of the forewing entirely smoky-brown, the orange patch being wholly wanting; on the hindwing the white irroration at the anal angle is much reduced."

Described from two male examples from Perak, and a female from Selangor.

15. DEUDORIX GÆTULIA, n. sp., Pl. H, Fig. 12, ♂.

HABITAT: Khasi Hills.

EXPANSE: ♂, 1·9 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black, glossed in certain lights over the black area with rich purple. *Cilia* black. *Forewing* with a large triangular coppery-red discal area, anteriorly bounded by the median nervure and third median nervule, posteriorly by the submedian nervure, its outer edge irregular, well removed from the outer margin. *Hindwing* with all except the costa broadly, the base, the abdominal margin broadly, and the outer margin narrowly coppery-red, the veins crossing the red area being black; *anal lobe* coppery-red; *tail* black, tipped with white. UNDERSIDE, *both wings* fawn-colour with a somewhat silvery sheen, especially on the hindwing; the disco-cellular nervules marked on both sides by a fine white line; a narrow outer-discal catenulated band composed of oval spots a little darker than the ground-colour, outwardly defined with white, the portion of the band on the forewing nearly straight, anteriorly ending on the upper discoidal nervule, posteriorly on the submedian nervure; on the hindwing the band is very irregular and broken, posteriorly recurved and terminating on the abdominal margin. *Hindwing* with a large round black spot near the outer margin in the first median interspace, interiorly broadly surrounded by orange colour; anal lobe black; a very fine black anteciliary thread, bounded on each side by an equally fine white thread. *Antennæ* black, beneath towards the club white, and slightly marked with whitish at the joints for a short distance posterior to the white portion, the remains of obsolescent annulations. *Head* black; the face and a line round the eyes white. *Palpi* white below, black above, the third joint entirely black. *Thorax* above black, beneath white. *Abdomen* anteriorly black, posteriorly coppery-red above, beneath pale ochreous.

Nearest to *D. epijarbas*, Moore, from which it differs on the upperside of the forewing in having that portion of the coppery-red area in the interno-median interspace posteriorly cut away; on the hindwing in having a well defined outer black margin, in *D. epijarbas* the black margin is reduced to a mere thread; the anal lobe also is entirely red—in *D. epijarbas* it is ochreous, bearing a black spot in the middle, this latter marked outwardly with some metallic turquoise-blue scales; on the underside the ground-colour is different, being hair-brown in *D. epijarbas*, and fawn-colour strongly washed with

silvery in *D. gætulia*; the lines defining the disco-cellular nervules and those forming the discal band much closer together; there are also no metallic green scales on the outer margin of the hindwing in the first median interspace and anterior to the anal lobe usually found in *D. epijarbas*. It is also allied to *D. diovis*, Hewitson, from Australia, to *D. woodfordi*, Druce,* and to *D. viridens*, Druce,† both from the Solomon Islands, but the broad black margin to the hindwing on the upperside and the entirely red anal lobe will at once distinguish it from those species. Another allied species is the *D. calderon* of Kheil,‡ from Nias Island, but it has the scarlet areas on the upperside smaller, and from the description there does not appear to be any discal fascia on the underside of the forewing. Still other allied species are *D. ribbei*, Röber,§ and *D. affinis*, Röber,‖ both from South Celebes, but the former has far more, while the latter has considerably less, scarlet on the upperside of both wings than *D. gætulia*.

Described from two specimens, one (the wings of which have been placed between talc) in the collection of the Rev. Walter H. Hamilton, the other in my own collection, and kindly presented to me by that gentleman, both obtained in the Khasi Hills by Mr. Hamilton's native collectors.

P. S.—Since the above was written I have seen the MS. type male specimen of Mr. Elwes' "*Rapala*" *hypargyria* from the Karen Hills, East Pegu. On the upperside of the forewing in *D. gætulia* the coppery-red discal area extends just anterior to the third median nervule, in "*R.*" *hypargyria* it barely reaches that vein; on the hindwing in *D. gætulia* the anal lobe is coppery-red, in "*R.*" *hypargyria* it is jet-black crowned with snow-white. On the underside "*R.*" *hypargyria* is paler, much more silvery-white, on the forewing there are no disco-cellular lines or discal macular band, and on the hindwing also the disco-cellular lines are absent, and the

* *Deudorya woodfordi*, Druce, Proc. Zool. Soc., Lond., 1891, p. 371, pl. xxxii, figs. 13, *male*; 14, *female*.

† *Deudorya viridens*, Druce, Proc. Zool. Soc., Lond., 1891, p. 371, pl. xxxii, fig. 15, *male*.

‡ *D. calderon*, Kheil, Rhop. Insel Nias, p. 33, n. 116, pl. iv, fig. 25, *male* (1884).

§ *D. ribbei*, Röber, Iris, vol. i, p. 68, pl. v, figs 11, *male*; 10, *female* (1886).

‖ *D. affinis*, Röber, Iris, vol. i, p. 69, pl. v, figs. 13, *male*; 8, *female* (1886).

discal band much shorter, reduced to three spots one each in the discoidal and median interspaces and the recurved abdominal portion, the black submarginal spot in the first median interspace not crowned with orange. The two species are closely allied, but are, I believe, distinct—at any rate the type specimens can be separated at a glance.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

16. METAPORIA HARRIETÆ, n. sp., Pl. I, Figs. 3, ♂; 4, ♀.

HABITAT: Bhutan.

EXPANSE: ♂, 2·9; ♀, 3·0 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black. *Forewing* with a thin white streak at the base of the costa; a large creamy-white patch occupying the basal three-fourths of the discoidal cell, its outer end produced to a point; a large patch occupying the basal two-thirds of the interno-median interspace; a discal series of five more or less oval spots curving evenly round the outer end of the cell, of which the anterior one is rather elongated and narrow, the three following are equal-sized elongated ovals, the posterior one in the first median interspace is the largest and occupies the base of the interspace; the outer margin bears, one on each interspace at its middle, a series of somewhat diffused white spots. *Hind-wing* has the veins on the basal half of the wing defined with white, broadly margined on both sides with black; the discoidal cell almost entirely creamy-white; there is a very narrow costal and a wide subcostal streak, then five spots—one in each interspace—beyond the cell, that in the second median interspace the smallest; two elongated streaks in the submedian interspace, the inner one almost reaching to the margin of the wing, the outer one reached to about half way between the base of the wing and the margin; two basal white streaks occupying the whole of the interspaces divided by the internal nervure; marginal diffused spots as in the forewing, but each spot divided into two portions by the black internervular fold. UNDERSIDE, *forewing* differs from the upperside only in having on the outer margin from the costa to the second median nervule a decreasing series of duplicated white streaks, one pair in

each interspace; a small white spot in the two following interspaces *Hindwing* has at the extreme base of the wing within the precostal nervure the usual bright yellow patch characteristic of the genus; all the creamy-white markings of the upperside are pale yellow; the markings differ from those on the upperside in the presence of a pair of elongated wedge-shaped pale yellow streaks in each interspace, each streak has its apex pointed, its base (which is placed on the outer margin) broad. *Cilia* of both wings on both sides black. FEMALE. Differs from the male only in being somewhat paler throughout.

This species belongs to a newly-discovered and rapidly-increasing group of the genus which has lately been described by Messrs. Charles Oberthür and J. H. Leech, all the species of which occur in Central and Western China.* I submitted the drawings of *M. harrietæ* here reproduced to the former; in reply he kindly sends me specimens of several of the allied species, and writes "On my part I am forced to believe that all these species—*oberthuri, acræa, larraldei*, and their varieties—are only forms of one single very variable species, which approaches *phryxe*." Mr. Leech writes on seeing the same drawings, "Your species is nearest to my *lotis*, it

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* *Pieris larraldei*, Oberthür, Études d'Ent., vol. ii, p. 19, n. 6, pl. i, figs. 2*a*, 2*b*, *male* (1876), from Moupin.

Pieris larraldei, Oberthür, forma *melania*, Oberthür, Études d' Ent., vol. xvi, p. 5, pl. i, fig. 5, *male* (1892), from Tâ-Tsien-Loù.

Pieris larraldei, Oberthür, forma *nutans*, Oberthür, Études d'Ent., vol. xvi, p. 6, pl. i, fig. 3 (1892), from Ta-pin-tze (Yunnan).

Pieris laryeteaui, Oberthür, Études d'Ent., vol. vi, p. 12, n. 2, pl. vii, fig. 1, *male* (1881), from Kouy-Tchéou, China.

Pieris acræa, Oberthür, Bull. Soc. Ent. France, sixth series, vol. v, p. ccxxvi (1885); idem, id., Études d'Ent., vol. xi, p. 15, pl. ii, fig. 7, *female* (1886), from Thibet.

Pieris goutellei, Oberthür, Études d'Ent., vol. xi, p. 15, pl. ii, fig. 11 (1886), from Tsé-kou, Thibet.

Pieris oberthuri, Leech, The Entomologist, vol. xxiii, p. 46 (1890); id., Oberthür, Études d'Ent., vol. xvi, p. 5, pl. i, fig. 2, *male* (1892), from Chang Yang, Central China.

Pieris lotis, Leech, The Entomologist, vol. xxiii, p. 192 (1890), from Wa-shan and Ta-Chien-Lu, North-West China.

Pieris hastata, Oberthür, Études d'Ent., vol. xvi, p. 5, pl. i, fig. 6 (1892), from Yunnan.

also has many characters in common with my *oberthuri*, but is quite distinct from either. *P. oberthuri* is to be figured in the next part to be issued of M. Oberthür's 'Études d'Entomologie,' of which I have seen a proof of the plates, and both species will be figured in my 'Butterflies from China, Japan, and Corea.'" As, therefore, *M. harrietæ* is, as far as I can tell from the descriptions of the allied species and the figures so far published, distinct from all of them, I will not attempt a comparative description; when figures of all the species are available, it will be easy for any one to distinguish between them for himself. In the sequel it will, I think, probably be found that M. Oberthür is right, and that all these species will be found to be but geographical races of one species, which grade almost imperceptibly one into the other as do the Indian forms of the genus.

Described from a single pair obtained by Mr. F. A. Möller's native collectors in Bhutan, but the exact locality is unknown. Mr. H. J. Elwes records a single specimen of *Pieris* (*Aporia*) *agathon*, Gray, from the interior towards Bhutan,* this being the only other species of the genus hitherto known from this region. Mr. Möller obtained at the same time as he received the *M. harrietæ* a single male of *M. agathon*, so the two species (which belong to different groups of the genus) appear to meet and occur together here.

Subfamily PAPILIONINÆ.

PAPILIO (*Achillides*) DISCORDIA, n. sp., Pl. I, Fig. 2, ♂.

HABITAT: Gayœs and Battak mountains, Sumatra.

EXPANSE: ♂, 5·0 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* deep black. *Forewing* thickly and evenly sprinkled throughout with rich green-coloured scales. *Cilia* black. *Hindwing* similarly sprinked, but with the area between the large blue-green outer-discal patch and the three submarginal green lunules free from the green sprinkling, as also is the costal area as far as the first subcostal nervule; a large outer-discal patch rich emerald-green in some lights and cobalt-blue in others, its inner edge almost straight, slightly bowed inwards towards the base

* Trans. Ent. Soc., Lond., 1888, p. 415, n. 374.

of the wing, separated from the outer end of the discoidal cell by about three millemeters' length of the ground-colour, not reaching the outer margin between the first subcostal and discoidal nervules, anteriorly bounded by the first subcostal nervule, anterior to which is a blue-green lunule, the patch rapidly attenuated to the second median nervule, beyond which it is continued to the abdominal margin anterior to the red subanal ocellus by a narrow green curved line; the subanal ocellus large, oval, dragon's-blood-red coloured, bearing anteriorly a thin bluish-purple line, with a large central oval black spot, three prominent submarginal green lunules extending one in each interspace from the discoidal to the first median nervule. *Tail* long; rather narrow, slightly constricted anteriorly, sprinkled throughout with rich green-coloured scales. *Cilia* black, white at the interspacal incisures. UNDERSIDE, *both wings* deep black. *Forewing* with the anterior half of the cell and the costal area sparsely sprinkled with ochreous scales; a broad discal white fascia crossed by the black veins and internervular folds, commencing widely on the costa, rapidly attenuating to the anal angle, reaching almost to the outer margin anteriorly, but posteriorly separated from it by about two millimeters. *Hindwing* with the basal half of the wing sparsely sprinkled with ochreous scales; three submarginal ocelli like the subanal one on the upperside, one in the costal interspace, and one each in the first median and submedian interspaces; placed between th[illegible] are four red lunules, one in each interspace, inwardly defined thin bluish-purple line. *Tail* sparsely sprinkled with dull gr[illegible] scales. *Antennæ* black. *Head, thorax* and *abdomen* black, spri[illegible] thickly with rich green scales.

This species belongs to the group of *P. paris*, Linnæus, from which and also from *P. tamilana*, Moore, and *P. arjuna*, Horsfield, it may be instantly distinguished by the large blue-green discal patch on the upperside of the hindwing having its inner edge straighter, the patch more attenuated posteriorly, and especially by its being well separated from the outer end of the cell, in all those species it extends into it; the three submarginal green lunules are also much more prominent in *P. discoidia*; the red area of the subanal ocellus is again much larger, the central oval black portion half the size consequently. The forewing agrees best with

P. arjuna, of which species I possess specimens from Sumatra and Java, but it has absolutely no trace of a discal light green fascia, which fascia is barely traceable in *P. arjuna*, and is prominent in *P. paris* and *P. tamilana*. On the underside of the hindwing the red markings are also larger and more prominent. It is a much larger insect than *P. arjuna*, which occurs with it.

I am unable to follow Mr. A. R. Wallace's remarks on *P. arjuna*, in Trans. Linn. Soc., London, vol. xxv, p. 46, n. 42 (1865), as my Sumatra specimens agree absolutely with Javan ones, nor do these remarks at all apply to *P. discoidia*.

Described from a single example sent to me by Dr. L. Martin, of Deli, Sumatra.

18. PAPILIO (*Paranticopsis*) MACAREUS, Godart, Pl. I, Fig. 1, ♂.

P. macareus, Godart, Enc. Méth., vol. ix, p. 76, n. 144 (1819); id., Horsfield, Cat. Lep. Mus. E. I. C., pl. v, fig. 1 (1829); id., Elwes, Trans. Ent. Soc. Lond., 1888, p. 431, n. 421.

I have figured a very remarkable male aberration or "sport" of this species, which was obtained by Mr. F. A. Möller's native collectors in the spring of 1892 in Sikkim. On the upperside of both wings the normal marginal series of spots—nine rounded ones in the forewing; one small and rounded at the anal angle, then four lunulated spots, and lastly, one elongated spot, in the hindwing—are entirely wanting, the discal series of elongated streaks being so extended and prolonged as to include them; and in the forewing the greenish-white markings in the discoidal cell consist of a patch at the base, and a tripartite patch at the middle, instead of having a small spot at the base, then three very outwardly-obliquely placed lines across the middle, and two spots at the end of the cell (sometimes conjoined) as is found in *P. macareus*; the four rounded spots immediately beyond the end of the cell in normal *P. macareus* are in the specimen now figured joined to the short streaks beyond. On the underside the markings are very much the same as above, but are larger and more suffused.

Family HESPERIIDÆ.

19. ISMENE FERGUSONII, n. sp., Pl. J, Fig. 6, ♂.

HABITAT: South India.

EXPANSE: ♂, 2·2 to 2·5;, 2·5. ♀

DESCRIPTION: MALE. UPPERSIDE, *both wings* bronzy shining hair-brown. *Forewing* paler on the disc; with the usual costal vermilion streak, commencing at the base and reaching to about the middle of the wing. (This streak is composed of highly deciduous scales, and in many specimens otherwise perfect it is more or less abraded and wanting.) The usual "male-mark" placed before the middle of the first median interspace, and composed of a more or less rounded clump of deep black scales. *Cilia* cinereous. *Hindwing* has the base and abdominal margin clothed with long iridescent greenish hairs. *Cilia* vermilion, narrow at the apex of the wing, gradually widening to the anal angle where it is widest, extending narrowly a short distance up the abdominal margin. UNDERSIDE, *both wings* paler than above. *Forewing* with the inner margin broadly pale ochreous; some very obscure pale ochreous streaks between the veins beyond the end of the discoidal cell; the extreme base of the wing vermilion, bearing the usual round black spot. *Hindwing* with the usual round black spot at the costal base of the wing, the veins and narrow streaks between the veins on the disc vermilion, the abdominal margin widely streaked with vermilion. *Cilia* of both wings as on the upperside. *Antennæ* black, the club beneath ochreous. *Palpi* with the third joint black, the second and first ochreous, vermilion at the sides. *Thorax* above concolorous with the wings, but clothed with long iridescent greenish hairs, beneath vermilion. *Abdomen* above base of brown, beneath and anal tuft vermilion. *Legs* vermilion. pex, ex-differs only from the male in the absence of the "male-mark," angle in the vermilion cilia being paler, more ochreous.

Nearest to *I. jaina*, Moore, from Sikkim, Bhutan, the Hills, Cachar, the Shan States, and Borneo (*Druce*), with which agrees on the upperside, but differs beneath in the forewing in the absence of the "well-defined purplish-white spot within the cell, and a curved discal series of narrow less-defined spots," the inner margin also is pale ochreous, not "yellow." The "*Ismene*" *excellens*, Hopffer, from Celebes,* which I have not seen, is also apparently a closely allied species. It is also near to *Ismene etelka*, Hewitson (*itelka* on plate) † from Sarawak, Borneo, but appears to

* Stet. Ent. Zeit., vol. xxxv, p. 39, n. 119 (1874).

† *Ismene etelka*, Hewitson, Ex. Butt., vol. iv, *Ismene*, pl. ii, figs. 14,15, *female* (1867).

differ on the underside of the forewing in not having "the base, the cell, and some rays beyond it between the nervures, rufous-orange," nor has the hindwing "four central spots." *Ismene belesis*, Mabille,* from "India, or more probably Java" is also an allied species.

This butterfly has been recorded from the Nilgiri Hills, "3,000 to 6,000 ft., common at tea blossom; the two wet-season broods only, July and October," by Mr. G. F. Hampson,† as "*Ismene helirius*, Cramer," under which name it stands in the British Museum, but it does not agree with the original figure,‡ which shows the upperside only, and has a broad outer darker band to both wings, no costal vermilion streak to the forewing, and the cilia of the hindwing concolorous with that of the forewing instead of being rich vermilion, this being the most conspicuous feature of *I. fergusonii*. Moreover, Cramer gives Surinam as the habitat of his "*Papilio*" *helirius*. Mr. Harold S. Ferguson also records it ‖ from the High Range, Travancore, "where it appears to be common in April and May," under the name of *Ismene jaina*, Moore.

Described from numerous specimens from the Nilgiri Hills and Travancore kindly sent me by Lieut. E. Stokes Roberts, R. E., Mr. G. F. Hampson, and Mr. Harold S. Ferguson, after the latter of whom I have much pleasure in naming it, taken in April, May, August, and October. In Major C. T. Bingham's collection is a large female DERC[illegible]n taken at Kollido, Papun Hills, Tenasserim, Burma, in the sem[illegible]r, 1891, which probably belongs to this species, but differs ing les[illegible]outh Indian specimens in having the vermilion colour of the third [illegible]ing on the underside more extensive and diffused, almost hair[illegible]ring the posterior two-thirds of the wings. It is very large, being 2·9 inches in expanse.

Genus CAPILA, Moore.

Palpi large, porrect, projecting beyond the head, densely pilose; third joint conical, half the length of the second.

Genus PISOLA, Moore.

Palpi large, erect, projecting beyond the head, densely pilose; third joint minute, conical.

* Bull. Soc. Ent. France, fifth series, vol. vi, p. x, n. 12 (1876).

† Journ. A. S. B., vol. lvii, pt. 2, p. 365, n. 216 (1888).

‡ Pap. Ex., vol. i, p. 94, pl. lx, fig. D (1775).

‖ Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 446, n. 185 (1891).

Antennæ extending to half the length of the forewing.

Body moderately short.

Abdomen extending to near the anal angle of the hindwing.

Legs slender; femora slightly pilose beneath; hind tibiæ with a dense tuft of very long hairs at the side; mid tibiæ with a pair, and hind tibiæ with two pairs, of apical spurs.

Wings large, broad.

MALE. *Forewing*, costa nearly straight; apex acute; exterior margin very oblique; posterior margin abbreviated, half the length of the costa.

Hindwing with the apex angled; exterior margin convex, with a slight angle in the middle.

FEMALE. Larger than the male. *Forewing*, costa slightly arched; exterior margin oblique; posterior margin two-thirds the length of the costa.

Hindwing nearly quadrate, the exterior margin being produced to an abrupt angle in the middle.

Antennæ rather long, curved backwards at the apex.

Body very stout.

Abdomen extending to within one-third of the length of the hindwing.

Legs moderately slender; femora pilose beneath; mid tibiæ armed with a pair, and hind tibiæ with two pairs, of slender apical spurs.

Wings large, broad.

[MALE and FEMALE]. *Forewing*, costa slightly arched; exterior margin oblique; posterior margin straight; subcostal nervure six-branched; second and third branches arising at equal distances from the first; fourth to sixth contiguous at their base to the third.

Hindwing convex at the base of the anterior margin; apex, exterior margin, and anal angle convex.

Above are given, as written, Mr. Moore's original descriptions of the genera *Capila* and *Pisola*, described in the Proceedings of the Zoological Society of London for 1865, page 785, arranged opposite to one another for convenience of comparison. Of the

former he describes both sexes, but is evidently unaware that the dense tuft of very long hairs at the side of the tibia on the posterior leg is a male secondary sexual character. Of the latter he presumably means his description to apply to both sexes also, as in describing the type species he mentions them both. Both genera contain a single species each, and Mr. Moore has most unfortunately mixed them up in a terrible way. What he describes as the female of *Capila jayadeva* is the true male of *Pisola zennara;* and what he gives as the male of *Pisola zennara* is the true female of *Capila jayadeva*. He has figured both sexes of the true *Capila jayadeva*.

The specific descriptions of the two species should be rearranged thus :—

CAPILA JAYADEVA, Moore.

Male. Upperside, *both wings* brown, with the base clothed with orange-yellow hairs; a narrow longitudinal semi-transparent streak between the veins, the discoidal cell having two streaks, and a third but short streak arising from its extremity. Underside, *both wings* paler brown, the semi-transparent streaks being less prominent. *Palpi* (except third joint and a few surrounding hairs which are brown), *head* (except a spot on the forehead which is brown), and *thorax* above orange-yellow ; thorax below and *legs* brown ; *abdomen* brown, with narrow white segmental bands. Female. Upperside, *both wings* brown. *Forewing* with a broad yellowish-white semi-transparent irregular-margined discal band obliquely from the middle

PISOLA ZENNARA, Moore.

Male. Upperside, *both wings* similar [to the male of *Capila jayadeva*], but with the thorax and the base of the wings brown [instead of being clothed with orange-yellow hairs]. [Underside, *both wings* as above.] Female. Upperside, *both wings* [as in the female of *Capila jayadeva*], except that the two greyish longitudinal streaks between each pair of veins exteriorly in the hindwing are absent. [Underside, *both wings* as above.]

of the costa to the posterior angle. *Hindwing* exteriorly with two greyish longitudinal streaks between each pair of veins. UNDERSIDE, *both wings* uniform brown. *Forewing* with the oblique discal band as above. *Cilia* brown. Front of *head* and *palpi* dull orange-yellow; *body* and *legs* brown; *abdomen* with a pale greyish anal tuft.

Genus CROSSIURA, nov.

MALE. FOREWING, *costa* slightly arched; *apex* rather acute; *outer margin* slightly convex; *inner angle* rounded; *inner margin* straight: *costal nervure* ending on the costa considerably beyond the apex of the discoidal cell; *subcostal nervules* progressively from the base of the wing originating closer together, the fourth arising well before the apex of the cell and ending as usual at the apex of the wing; *subcostal nervure* ending well below the apex; *upper disco-cellular nervule* strongly outwardly oblique; *middle* disco-cellular short, upright, concave; *lower* disco-cellular twice as long as the middle one, in the same straight line, straight; *third median* nervule arising at the lower end of the cell; *second* median arising some [illegible] base of before the end; *first* median arising near the base of the [illegible] ex, ex- twice the distance from the second as the second arises from the [illegible] ing *submedian nervure* straight; *internal* nervure short. HIND[illegible]g, at elongated, narrow; *costa* regularly arched; *apex* rounded; *outer ma[illegible]*; quite straight from the apex to the termination of third median nervule, then well rounded to the anal angle, this rounded portion being at about right-angles to the rest of the outer margin; *anal angle* dilated, folded over beneath, the cilia being there developed into two or three strong and thick tufts of hair ·2 of an inch in length; *abdominal margin* nearly straight: *costal nervure* evenly curved, ending at the apex of the wing; *first subcostal nervule* arising well before the apex of the cell; *upper disco-cellular* nervule short, strongly concave, outwardly oblique: *lower* disco-cellular about three times as long as the

upper, in the same straight line, slightly concave; *discoidal* nervule well developed; *second median* nervule arising immediately before the lower end of the cell; *first* median arising about four times as far from the base of the second as the second does from the third; *submedian* and *internal nervures* sinuous. *Antennæ* exactly half the length of the costa of the forewing, with a well-formed curved club. *Palpi* with the third joint minute, pointed; second and first densely pilose, broad. *Thorax* rather robust. *Hind legs* with a dense bunch of hairs springing from the base of the tibia and lying along that joint, which they equal in length. *Abdomen* short, robust, not nearly reaching to the anal angle of the hindwing. FEMALE. Differs from the male only in the hindwing being considerably broader, and in lacking all the male secondary sexual characters.

In neuration *Crossiura* appears to agree very closely with *Capila* and *Pisola*,* Moore, but may be distinguished by the outline of the wings. In the forewing the male of *Crossiura* has the apex less sharply pointed than in *Capila*, more so than in *Pisola*; and the inner margin is longer than in *Capila*, shorter than in *Pisola*. The shape of the hindwing is quite different, being greatly lengthened, and the dilatation and folding-over of the wing-membrane of the anal angle, which is there furnished with long stout setæ, is an altogether unique feature in the family as far as I know, though, perhaps, Mr. Butler's genus *Spathiopoia*† which, according to Mr. Kirby's Catalogue of the Butterflies, contains seven species all inhabiting South America, may have a somewhat analagous structure, the anal angle of the hindwing being "clothed with long radiating spatulate scales in place of ordinary fringe."

20. CROSSIURA PENNICILLATUM, n. sp., Pl. J, Figs. 1, ♂; 2, ♀.

HABITAT: Khasi Hills.

EXPANSE: ♂, 2·5 to 2·7; ♀, 2·65 to 2·75 inches.

*The neuration of the genus *Pisola* is apparently very erratic. In one out of five specimens of the male from Sikkim in my collection the fourth subcostal nervule of the forewing is emitted *after* the apex of the discoidal cell—a quite abnormal feature in the *Hesperiidæ*; and in one out of three female specimens from Sikkim the neuration of the hindwing is so abnormal that I have given a sketch of it on Pl. J, Fig. 3.

† Ent. Month. Mag., vol. vii, p. 57 (1870).

DESCRIPTION: MALE. UPPERSIDE, *both wings* and *cilia* dark shining hair-brown. *Forewing* with an oblique silvery lustrous semi-transparent discal band, which, commencing at the subcostal nervure, crosses the discoidal cell towards the end and terminates in the submedian interspace opposite the anal angle in the middle of the space; this band is rather narrow at its commencement, but rapidly widens out till it reaches the median nervure, then gradually tapers to its extremity, below which also in the submedian interspace is a most minute dot; an oblique slightly curved series of four subapical equal-sized white dots, one in each interspace, with still a fifth most minute one in continuation of the series in the lower discoidal interspace. *Hindwing* outwardly a little paler than the rest of the wing, obscurely streaked with darker colour across this paler area between the veins. UNDERSIDE, *forewing* as above, except that the discal band is extended anteriorly up to the costal nervure, and the inner area of the wing is a little paler than the rest. *Hindwing* concolorous throughout. *Antennæ* dark brown, the club anteriorly pale. *Palpi* above with the third joint dark brown, second and first joints beneath chrome-yellow. *Thorax, abdomen*, and *legs* dark brown. FEMALE. UPPERSIDE, *forewing* differs from the male in the discal lustrous band being slightly wider, almost reaching the submedian nervure posteriorly, and extending anteriorly almost to the costa in an opaque creamy-white spot; the five subapical dots [illegible] of large. *Hindwing* with a discal series of five rather elonga[illegible]x, ex-placed one in each interspace from the subcostal nervure to th[illegible]ng median nervule. UNDERSIDE, *both wings* with the same diffe[illegible]tance as on the upperside. ♀, at

I am indebted to the Rev. Walter A. Hamilton for the gift of a single pair of this fine species in perfect condition, obtained by his native collectors in the Khasi Hills; he possesses five males and one female in his own collection, all of which I have examined, and find that the species is a very constant one. The figure of the male shews the dilatation of the anal angle of the hindwing forcibly distented with the setæ spread out; in nature the wing-membrane in this region is folded under and backwards, and the setæ lie across the wing beneath.

21. PADRAONA PROCLES, n. sp., Pl. J, Figs. 7, ♂; 8, ♀.

HABITAT: Ké Isles.

EXPANSE: ♂, 1·3 to 1·4; ♀, 1·4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* glossy fuscous with golden-coloured markings. *Forewing* with a broad increasing costal streak extending to more than half the length of the wing from the base, anteriorly bounded by the costa, posteriorly by the median nervure, its outer edge inwardly oblique, the veins crossing it black; three small conjugated subapical narrow streaks; a discal macular increasing oblique band placed parallel to the outer margin of the wing, consisting of five spots placed between the upper discoidal nervule and submedian nervure; each spot has its inner edge convex, its outer edge concave, the lowest spot in the interno-median interspace posteriorly lengthened and carried along the submedian nervure to the base of the wing; the band bearing a fine black sinuous line anteriorly in the two lowest interspaces, this conspicuous character being unique in the genus; a streak on the inner margin two-thirds the length of the wing from the base. *Cilia* of the anterior half of the wing fuscous, of the posterior golden-coloured. *Hindwing* with a broad median band, having its edges rather irregular, reaching from the internal nervure to the second subcostal nervule, anteriorly produced along the internal nervure towards the base of the wing; a patch of long golden-coloured setæ near the base of the wing. *Cilia* golden-coloured throughout, increasing in length from the apex to the anal angle. UNDERSIDE, *forewing* with the apical third of the wing golden-coloured; the markings much as on the upperside. *Hindwing* golden-coloured, more or less streaked with black between the veins; the discal band as above, but narrower and more macular. FEMALE. UPPERSIDE, *forewing* with the costal band less conspicuous and streaked with black, the discal band lacking the fine sinuous black line crossing the anterior portion of the two posterior spots seen in the male. *Hindwing* with the basal golden-coloured bunch of setæ and the discal band smaller and narrower respectively than in the male. UNDERSIDE, *both wings* exactly as in the male.

P. procles is, I believe, quite distinct from all the known species of the genus (*P. dara*, Kollar, =*P. mæsa*, Moore; *P. mæsoides*, Butler; *P. pseudomæsa*, Moore; *P. gola*, Moore; *P. goloides*, Moore;

DESCRIPTION: MALE. UPPERSIDE, *both wings* and *cilia* dark shining hair-brown. *Forewing* with an oblique silvery lustrous semi-transparent discal band, which, commencing at the subcostal nervure, crosses the discoidal cell towards the end and terminates in the submedian interspace opposite the anal angle in the middle of the space; this band is rather narrow at its commencement, but rapidly widens out till it reaches the median nervure, then gradually tapers to its extremity, below which also in the submedian interspace is a most minute dot; an oblique slightly curved series of four subapical equal-sized white dots, one in each interspace, with still a fifth most minute one in continuation of the series in the lower discoidal interspace. *Hindwing* outwardly a little paler than the rest of the wing, obscurely streaked with darker colour across this paler area between the veins. UNDERSIDE, *forewing* as above, except that the discal band is extended anteriorly up to the costal nervure, and the inner area of the wing is a little paler than the rest. *Hindwing* concolorous throughout. *Antennæ* dark brown, the club anteriorly pale. *Palpi* above with the third joint dark brown, second and first joints beneath chrome-yellow. *Thorax, abdomen,* and *legs* dark brown. FEMALE. UPPERSIDE, *forewing* differs from the male in the discal lustrous band being slightly wider, almost reaching the submedian nervure posteriorly, and extending anteriorly almost to the costa in an opaque creamy-white spot; the five subapical dots twice as large. *Hindwing* with a discal series of five rather elongated spots placed one in each interspace from the subcostal nervure to the first median nervule. UNDERSIDE, *both wings* with the same differences as on the upperside.

I am indebted to the Rev. Walter A. Hamilton for the gift of a single pair of this fine species in perfect condition, obtained by his native collectors in the Khasi Hills; he possesses five males and one female in his own collection, all of which I have examined, and find that the species is a very constant one. The figure of the male shews the dilatation of the anal angle of the hindwing forcibly distented with the setæ spread out; in nature the wing-membrane in this region is folded under and backwards, and the setæ lie across the wing beneath.

21. PADRAONA PROCLES, n. sp., Pl. J, Figs. 7, ♂; 8, ♀.

HABITAT: Ké Isles.

EXPANSE: ♂, 1·3 to 1·4; ♀, 1·4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* glossy fuscous with golden-coloured markings. *Forewing* with a broad increasing costal streak extending to more than half the length of the wing from the base, anteriorly bounded by the costa, posteriorly by the median nervure, its outer edge inwardly oblique, the veins crossing it black; three small conjugated subapical narrow streaks; a discal macular increasing oblique band placed parallel to the outer margin of the wing, consisting of five spots placed between the upper discoidal nervule and submedian nervure; each spot has its inner edge convex, its outer edge concave, the lowest spot in the interno-median interspace posteriorly lengthened and carried along the submedian nervure to the base of the wing; the band bearing a fine black sinuous line anteriorly in the two lowest interspaces, this conspicuous character being unique in the genus; a streak on the inner margin two-thirds the length of the wing from the base. *Cilia* of the anterior half of the wing fuscous, of the posterior golden-coloured. *Hindwing* with a broad median band, having its edges rather irregular, reaching from the internal nervure to the second subcostal nervule, anteriorly produced along the internal nervure towards the base of the wing; a patch of long golden-coloured setæ near the base of the wing. *Cilia* golden-coloured throughout, increasing in length from the apex to the anal angle. UNDERSIDE, *forewing* with the apical third of the wing golden-coloured; the markings much as on the upperside. *Hindwing* golden-coloured, more or less streaked with black between the veins; the discal band as above, but narrower and more macular. FEMALE. UPPERSIDE, *forewing* with the costal band less conspicuous and streaked with black, the discal band lacking the fine sinuous black line crossing the anterior portion of the two posterior spots seen in the male. *Hindwing* with the basal golden-coloured bunch of setæ and the discal band smaller and narrower respectively than in the male. UNDERSIDE, *both wings* exactly as in the male.

P. procles is, I believe, quite distinct from all the known species of the genus (*P. dara*, Kollar, =*P. mæsa*, Moore; *P. mæsoides*, Butler; *P. pseudomæsa*, Moore; *P. gola*, Moore; *P. goloides*, Moore;

P. augiades, Felder ; *P. olivescens*, Herrich-Schäffer ; and *P. palmarum*, Moore), differing therefrom on the upperside in the forewing in the presence in the male of the above-mentioned black streak, and in the markings of the hindwing being confined to a single median band, with an entire absence of the usual spots towards the costa and the base of the wings anterior to the band, except in *P. olivescens*, from Rockhampton, North Australia, which is also abnormal in this respect.

Described from two male and two female specimens presented to me by Heer M. C. Piepers, of Batavia, Java.

22. LOTONGUS PARTHENOPE, Weymer, Pl. J, Figs. 4, ♂ ; 5, ♀.

Hesperia parthenope, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 17, n. 15, pl. ii, fig. 8, *female* (1887) ; id., Plötz, l. c., vol. xlvii, p. 91, n. 75 *b* (1886).

HABITAT : Nias (*Weymer*, *Plötz*, and *de Nicéville*).

EXPANSE : ♂, 1·8 ; ♀, 1·9 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* dark shining brown. *Cilia* dark brown. *Forewing* with a lustrous semi-transparent stramineous dot in the discoidal cell about three-fourths of its length from the base, touching the subcostal nervure ; a similar but larger oblong spot placed transversely towards the base of the second median interspace ; a similar but still larger one at about the middle of the first median interspace ; a dot equal in size to that in the cell in the submedian interspace at its middle and touching the submedian nervure. *Hindwing* unmarked. UNDERSIDE, *forewing* with a second spot in the cell obliquely placed inwardly beneath the first spot ; the discal spots as above ; the dot in the submedian interspace developed into a large whitish patch which extends inwardly obliquely across the submedian interspace. *Hindwing* unmarked. FEMALE. UPPERSIDE, *forewing* with all the discal spots larger, the one in the cell developed into a figure-of-8 spot which extends completely across the cell, the spots—especially the lower one—in the median interspaces much larger and oval. *Hindwing* with the apex anterior to the subcostal nervure stramineous. UNDERSIDE, *forewing* with an additional spot on the costa anterior to the spot in the cell. *Hindwing* with the apex more widely stramineous than above. *Cilia* stramineous apically, followed apically by an anteciliary dark brown line.

As far as is known to me, the genus *Lotongus* now contains three species—*L. calathus*, Hewitson, *L. maculatus*, Distant, and *L. parthenope*, Weymer. Of these I have only seen the latter. All the species have hitherto been described from female examples only, at least that is my impression. Mr. W. F. Kirby has kindly examined the type specimen of *L. calathus* in the British Museum, and informs me that it is a female. I judge that *L. maculatus* is also a female, as it has the pale-coloured apical patch to the hindwing on the underside, which is apparently a female character. Unfortunately Mr. Kirby was unable to ascertain the whereabouts of the type specimen, and Mr. Distant does not say what sex he described. The shape of the wings, however, is masculine, but this may be due to bad drawing. I have here described a male of the genus for the first time. *L. parthenope* female differs from that sex of *L. calathus* in the forewing in having the three discal spots widely separated, in the latter they would touch but for the dividing veins, and the ochreous apex to the hindwing on both sides is much more extensive in *L. calathus*. It is much closer, however, to *L. maculatus*, from which, supposing the type specimen to be a male, it differs on the upperside of the forewing in having the upper spot only of the two in the cell, and in lacking on the underside of the hindwing the ochreous apex: supposing it to be a female, *L. parthenope* differs very greatly in the *Nalli-* of the wings, the discal spots on the upperside of the forewing in dry ger and more widely separated, these spots on the underside Africa, *maculatus* appearing to form a straight band "containing a Cattle- al fuliginous spot," which does not at all describe the position that the spots in *L. parthenope*.

Described from two male and one female specimen sent to me by Herr G. Hoppenstedt of Java.

23. PAMPHILA DIMILA, Moore, Pl. J, Fig. 9, ♀.

P. dimila, Moore, Proc. Zool. Soc. Lond., 1874, p. 576.

HABITAT: Runang Pass, south-east side, about 13,000 elevation, Busahir (*Moore*); Khibber Nala, about 16,000 feet elevation, Spiti (*Sage*).

I take this opportunity to figure a unique female of this species obtained by Major C. A. R. Sage. The drawing here reproduced

has been submitted to Mr. F. Moore, who pronounces the species represented to be his *P. dimila*. As far as is at present known, this species is the only true *Pamphila* occurring in Indian limits, and the specimen figured is the only one I have ever seen. It is in Major Sage's collection. The genus occur abundantly in Central and Northern Asia, and from Asia Minor to Japan.

EXPLANATION OF THE PLATES.

Plate H.

Fig. 1. *Ragadia critolaus*, n. sp., ♂, p. 322.
„ 2. *Dyctis esacoides*, n. sp., ♂, p. 323.
„ 3. *Discophora dis*, n. sp., ♂, p. 325.
„ 4. *Pithecops bassaris*, n. sp., ♂, p. 327.
„ 5. „ „ „ ♀, p. 327.
„ 6. *Cyaniris ceyx*, n. sp., ♂, p. 328.
„ 7. „ „ „ ♀, p. 328.
„ 8. *Suasa suessa*, n. sp., ♂, p. 337.
„ 9. „ „ „ ♀, p. 337.
„ 10. *Camena carmentalis*, n. sp., ♂, p. 335.
„ 11. *Tajuria thyia*, n. sp., ♂, p. 336.
„ 12. *Deudorix gætulia*, n. sp., ♂, p. 338.
„ 13. *Arhopala ace*, n. sp., ♂, p. 329.
„ 14. „ *acestes*, n. sp., ♂, p. 330.
„ 15. „ *arca*, n. sp., ♀, p. 331.
„ 16. „ *asia*, n. sp., ♂, p. 333.
„ 17. „ *æta*, n. sp., ♀, p. 333.

Plate I.

Fig. 1. *Papilio macareus*, Godart, ♂, p. 345.
„ 2. „ *discoidia*, n. sp., ♂, p. 343.
„ 3. *Metaporia harrietæ*, n. sp., ♂, p. 341.
„ 4. „ „ „ ♀, p. 341.

Plate J.

Fig. 1. *Crossiura pennicillatum*, n. sp., ♂, p. 351.
„ 2. „ „ „ ♀, p. 351.
„ 3. *Pisola zennara*, Moore, ♀, p. 351.

Fig. 4. *Lotongus parthenope*, Weymer, ♂, p. 354.
„ 5. „ „ „ ♀, p. 354.
„ 6. *Ismene fergusonii*, n. sp., ♂, p. 345.
„ 7. *Padraona procles*, n. sp., ♂, p. 353.
„ 8. „ „ „ ♀, p. 353.
„ 9. *Pamphila dimila*, Moore, ♀, p. 355.

BOMBAY GRASSES.

By Dr. J. C. Lisboa, F.L.S.

PART V.

(*Continued from Vol. VI., p.* 219.)

(*Read before the Bombay Natural History Society, on 29th September*, 1892.)

AGROSTIDEÆ.

Aristida, *Linn.*

A. depressa,* Retz., Obs., IV, 22; Dalz. and Gibs., *Bomb. Flora*, 295; *A. vulgaris*, Trin., *Rupr. Stipæ*, 131.

Ver.—*Mothi burri, Longi-kussal, Lani, Rampla*; (Telingi name) *Nalli-pootiki* (Roxb.). Common all over the Presidency, especially in dry places, widely spread over tropical and sub-tropical Asia and Africa, and the South Mediterranean region and in Australia. Cattle do not eat it. Some reports from Guzarat and Poona say that it is of little value as fodder grass, others state that it is eaten when young. Stewart describes it as a favourite fodder for cattle in the Punjab. Symond says that it is a troublesome grass, which cattle will not eat. Coldstream states that it is grazed (when young), but is too short and light to stack, that it covers the Hissar bir in vast sheets, is too fine to cut with a scythe, but is nutritious and particularly relished by cattle. This opinion is not borne out by reports from other parts of India.

A. hystrix, Linn., fil. Dalz. and Gibs., *Bomb. Fl.*, 295.

* This and the following grasses are minutely described at the suggestion of friends.

Ver.—*Pawn burri, Matari-kussal* (old woman's hair), *Kole kussal, Lamp, Lapri dhauli.* In the N.-W. P. it is named *Lappi*, and its Tellingi name is *Shilpurso-kalli* (Roxb.).

It is a more rigid grass than the preceding, and with a broader and more open panicle. It is common in dry and stony places, and not much used as a fodder grass. In this respect it may be ranked as the last, *i.e.*, it is eaten only when young.

A. setacea, Retz., Obs., IV, 22; Dalz. and Gibs., *Bomb. Fl.*, 295.

Ver.—*Mothi-kussal.* It is a taller grass than the last two species, found growing in various parts of the Bombay Presidency, in Ceylon, Africa, Brazil, in Southern Spain and Sicily. The culms are turned at the nodes. Leaves filiform, convolute, 3-6 inch long. Panicle rather dense, of a straw colour. Glumes unequal, and the awns very long and spreading.

Like the preceding, common on dry hilly ground. As fodder it is useless. Cattle do not eat it. Taties and brooms are said to be made of its long wiry culms. It is most troublesome to those who have to walk through it, the ripe spikelets fall off, acting as irritating substances.

Is this species a variety of *A. depressa* ?

A. royleana, Trin., *Rup. Stip.*, 160.

Ver.—*Pandari-kussal, Bushi-kussal, Pandri-kussal.* It is a small grass, 8-11 inch high, occasionally higher. Sheaths longer than the internodes. Leaves short, flat, glaucous. Glumes 6-7 lines long, acuminate, subulate, whitish, nearly equal. Awns very long, about 1½-2 inches long. Common all over India. In some parts of Poona, Satara, Sholapur, and Bhooj it is so common that the places where it grows in extensive patches appear to be of a dull grey or glaucous colour.

Not used as fodder.

STIPA, *Linn. Gen.*

S. aristoides, Staff., Nov. Sp. Culm slender, erect or slightly bent at the base, two feet high, glabrous, or hispid. Sheath shorter than the internodes, glabrous, rather striated. Sicula very short, truncated ? Nodes glabrous. Leaves 5-7 inches long, filiform, rigid, convoluted, glabrous. Panicle 6-12 inches long, diffuse, rachis

hispid or scabrous owing to minute murication turned upwards. Branches erect or nodding; capillary, plumose or flaccid, 2-3 inches long, generally two together, one a little longer than the other, often arising from a common very short (about $\frac{1}{2}$ line), rather thick peduncle, which is soon divided into two branches. Each of these is dichotomously subdivided into filiform branchlets, the latter bearing towards the upper part 2-3 spikelets, supported on pedicels 2-5 lines long. The internodes or spaces between the origin of branches are about $\frac{3}{4}$ to 1 inch. Spikelets 4-5 inches long. First glume pointed, 4 lines or $4\frac{1}{2}$ lines long, including the awn-like point; mid rib prominent, with muricated or stiff hairs turned upwards. Second glume nearly equal, two-toothed or jagged. Flowering glume folded over the flower, 3 lines long, ending in three awns; the central twisted and bent, 13 lines long, the bent portion about 9 lines long; the lateral awns straight, not twisted, about 5 lines, terminating a little above the bent portion of the middle awn. The rachis between the outer and flowering glumes is about half a line long, surrounded with numerous white hairs. Stamens 3, Styles 2. Palea minute, two-ribbed, pointed. Caryopsis small, almost rounded.

This grass appears to resemble a species of *Aristida*, but its natural place is in *Stipa*. This elegant grass is common in the Deccan; also in Burdwan. Used in ornamenting bouquets.

Sporobolus, *R. Br.*

S. commutatus, Bois. *Vilfa commutata*, Trin., *Sp. Gram.*, Plate X.

A small annual. Culms ramous, lower part leafy, upper naked. Leaves short, linear and flat; margins scabrous. Sheaths pilose. Ligula consists of short hairs. Panicle 1-3 inch long. Branches many in verticles, naked to the middle, short, spreading. Spikelets very small (about $\frac{1}{2}$ line), acute, glabrous. Inferior glume is shorter by about $\frac{1}{3}$th.

Grows everywhere in India in sandy or stony places, but is not common. Uses not known.

S. coromandelianus, Kunth., *Rev. Gram. Pl.*, 126; Dalz. and Gibbs., *Bomb. Fl.*, 296; *Vilfa coromandeliana*, Beauv., Agrost., 16; *Agrostis coromandeliana*, Retz. Obs., IV, 19.

Trin., *Sp. Gram.*, Pl. XI.

Ver.—Telingi name—*Yellika-tungoo-gadi*, Roxb. It is a small cespitose plant, 4-8 inches. Lower part of the culm surrounded with many leaves, which are somewhat rigid, acuminate, with finely serrate margins. Sheaths glabrous, as long as the internodes. Panicle 1½ inch long. Branches verticelled, secund.

Spikelets very small, glabrous. Glumes acute, nearly equal to the flowering glume. Seeds naked, ovate, rugose.

It is very common in some places in Poona. Uses not known.

S. indicus, R. Br. Prodr, 110. *S. tenacissimus*, Beauv.; Kunth. Enum., I, 211. *Vilfa tenacissima*, Trin., *Sp. Gram.*, Plate 60; *V. capensis*, Trin., *Spec. Gram.*, Plate 56.

Ver.—*Ghorla, Khir.*

An erect grass. Culm slender, 1-1½ feet, glabrous. Nodes glabrous. Sheaths glabrous, with a few hairs at the margins, or at the mouth only. Leaves also glabrous, mostly at the base of the stem, linear, ending in fine points. Panicle spike-like, contracted, 3-8 inches long, sometimes longer, often interrupted. Spikelets, numerous, crowded along the short, erect, almost intricate or distant branches. The outer glume obtuse, about ½ lin. long, 2nd glume ¾ lin. long. The 3rd or flowering glume about 1 lin. long. Seed obovoid.

It grows all over India, the Himalaya, North-West Provinces Ceylon, Australia, and is generally spread all over the tropics and subtropical parts of the world. Considered to be a good long, grass. At Balaghat it grows on clay soil, and is used as fodder about young. In the Gujranvalla district (Punjab) it is reckoned as a ona, fodder, especially for horses. In Australia it is valued as an excellent pasture grass. It stands drought well and is generally eaten by stock. (See Duthie.) In the United States this grass, which is known there under the name of *smuth* grass, is of considerable value for grazing purposes, if frequently cut or grazed down, but if allowed to remain untouched long, cattle and horses will not eat it, unless very hungry, as it becomes tough and unpalatable. Mr. J. N. Brashear, of Port Gibson, quoted by Dr. Vasey, remarks in reference to this species: "It is common all over our pasture lands, and is very hardy, standing any sort of weather. It grows well on almost any kind of land, but does best on rich moist bottoms. It is not used to

any considerable extent for hay, but it makes splendid feed, if cut while young. It will yield about 1½ tons per acre..... It makes a splendid pasture plant, and that is generally what we use it for. Stock are generally fond of it, until it goes to seed, and they sometimes use it when dry in winter." It is a common grass in the Kandian country, Ceylon.

S. rupestris. Trinius describes a grass under the name of *Vilfa rupestris*, and gives a figure in his *Species Gram.* This however appears to be a small variety of *S. indicus.*

S. diander, Beauv., Agrost., 26; Dalz. and Gibs., *Bomb. Fl.*, 296, *Agrostis diander*, Retz. Obs., V., 19; Roxb., *Fl. Ind.*, I, 317; *Vilfa diandra*, Trin., *Agrost.*, I, 38.

Ver.—*Chireya-ka-dana.* In Bengal it is called *Bena-goni*, Roxb.

An erect, glabrous grass, 1½-3 ft. high. Culm slender. Nodes glabrous. Sheath slightly bearded at the mouth, shorter than the internodes. Ligula very short, ciliated. Leaves chiefly at the base of the culm, very narrow and tapering to a fine point. Panicle contracted, 6 in. long, often longer, usually bending over a little. Inferior branches about 1 in. long. Spikelets 1 in. long, rather acute, glabrous. Outer empty glumes very obtuse, the outer very short.

Flowering glume longer, rather obtuse or somewhat acute. Palea [illegible], obtuse, not so readily splitting as in other species. Grain [illegible] not easily separable from the pericarp.

S. com[illegible]ommon; said to be common in the plains of North-West [illegible]es and at moderate elevations on the Himalaya; in fact it is A sm[illegible] spread in India. It grows also in Australia, and is said to be Leave[illegible] very common about Colombo and elsewhere in the Western Provinces.

Reported from Poona to be a good fodder grass fit for grazing. Said to be readily eaten by horses and cattle at Lahore, and is also favourably mentioned at Gujranvalla and Shapur. Mr. Fergusson says that cattle in Ceylon do not like this and the last described species.

S. orientalis, Kunt. Enum., I, 211; Dalz. and Gibs., *Bomb. Fl.* 295; *Vilfa orientalis*, Nees., *Agrost. Brazil*, 393. Under *Agrostis*; *Agrostis elongata*, Roth., Nov. Sp., 41.

Ver.—*Shapia, Kal, Usar-ki-ghas.*

The whole plant glabrous, culms extensively creeping, ramous, with 4-8 in. of the extremity erect, smooth, filiform and very firm. Ligula short, ciliated. Leaves chiefly at the base of the stem, very small and smooth, glabrous, tapering to a fine point. Panicle erect, linear or pyramidal. Branches verticillate, adpressed, 1-2 in. long. Spikelets many, 1 lin. long. Outer glume obtuse, almost hyaline, and very short. The second empty glume is nearly equal to the flowering glume.

Received specimens only from West Khandeish, where it is said to be reckoned as good fodder grass. I have reason to believe that it grows also in other districts of this Presidency, especially in dry, sandy, or saline soils.

"This grass is strictly confined to saline soils, and is found on all the usar tracts in Northern India, often constituting the entire vegetation. As such it is not only useful as an unmistakable indicator of reh-infected soils, but also by affording an abundant supply of fodder over large areas of land where other plants are unable to exist. The experiments now being undertaken at Aligarh and Cawnpore for the reclamation of reh-infected land are of great interest in regard to the changes affecting the growth of this grass. The immediate effect of excluding all cattle from usar land is the production of a more luxuriant growth of the usar grass, and rapid extension over what were formerly bare efflorescent [illegible] fodder At the same time other kinds of grasses quickly take advantage when the improved condition of the soil consequent on the more vigorous growth of the usar grass; for the thicker coating of usar herbage helps to moderate the scorching rays of the sun, and in this way diminishes the upward capillary movement of reh salts. On all usar tracts there are usually to be seen patches of various sizes scattered here and there, usually in the form of ridges or mounds. These raised portions are nearly always found to support an assortment of plants indicating a distinctly different condition of soil compared to that of their surroundings. *Dúb* and other valuable grasses form a large proportion of vegetation of these raised patches, and are ever ready to encroach wherever the ground in their immediate neighbourhood becomes fitted for their existence.

The usar grass does not appear to be able to hold its own on ground which is capable of supporting these other grasses; it will, therefore, gradually disappear as the reclamation of the reh-infected tracts proceeds."—*Duthie.*

POLYPOGON, *Desf.*

P. monspeliensis, Desf., Kunth. Enum., I., 232; Steud, Syn. *Pl. Glum.*, I., 184; *Beauv. Agrost.*, XVI., fig. 8.

Ver. *Chitra, Malhar.* Culm procumbent at the base, then erect or ascending, simple or sometimes branched, 1-2 feet high, glabrous. Sheath glabrous, striated. Ligula rather large, 2-3 lines, obtuse. Leaves flat, glabrous, or scabred, 5-8 inches long 2-3 lines broad. Panicle spike-like linear, cylindrical, dense, 1-5 inches long, of a yellowish-green, or whitish colour. Spikelets not longer than a line. Outer glumes nearly equal, scarcely one line long, pubescent or ciliate, with minute murication on the midrib, obtuse or notched, ending in a fine, straight awn, 3 or 4 times as long as the glume. Flowering glume broad, hyaline truncate, 4-toothed or jagged, the awn usually very short or wanting. Is common in Europe, Asia and Africa, also in Ceylon and Australia and in some parts of America, where it is supposed to be introduced. Mr. Duthie states that it is common in cultivated ground. It is an ornamental grass, but of little value for

Thr. I have received specimens from Sind.

spike

Band

ra-

AVENACEÆ, *Kunth.*

Cælachne, R. Br.

C. pulchella, R. Br.; Benth. *Fl. Austr.* VII. 625 Thiv. Enum. Pl. Zeyl. 373; *Panicum simpliciusculum*, Steud. Syn. *Pl. Gram.* I., 96.

A small glabrous grass, flowering almost from the base. Culm filiform (in the specimens seen), decumbent, 5 inches long. Sheath half-an-inch long, glabrous, striated. Leaves ovate, lanceolate, about one inch long, marked with strong lines, especially at the upper surface. Panicle 2-3 inches long, loose, narrow, the rachis and branches filiform. The latter short, erect or divergent, alternate. Spikelets numerous, almost imbricate, shortly pedicelled, often in

pairs, or sometimes clustered in fours, ovate, scarcely ¾ line long. Both flowers fertile, the pedicellate smaller. The two outer glumes slightly unequal, thin, membranous, broad, convex. Flowering glumes thinner, ovate, smooth, the third longer. Fruiting glumes not hardened.

This grass is probably rare. Specimens received from Kumberwada, in North Kanara, only. Seen from a distance, at first sight it resembles a depauperated species of *Setaria intermedia*, R. and S. Uses not known.

AVENA, *Linn.*

A. sativa, Linn., Gen. Kunth. Suppl., Pl. XX., fig. 1; Dalz. and Gibs., *Bomb. Flora.*, Suppl., 97.

Ver. *Wilaiti Jaw.* (Datr). The cultivators on this side treat it as barley and confound it with this grain. It is grown for its grain and fodder (straw) near some cantonments by cavalry officers and for race horses. It is largely grown for this purpose at the Saharanpur and Hapur Stud Depôts, and at the Hissar Cattle Farm, and is also stacked.

Dalz. and Gibs. state that the oat is often used for the feeding of horses, but as the paleaceous matter is much more predominant than is the case in the oat of Europe, it often gives rise to chronic cough and huskiness. Hence many prefer the *Cicer arietinum*, or gram, to the oat as a horse's food. (See *Bomb. Fl.*, Suppl., 97.)

It is extensively cultivated in some parts of Europe; its grain forms an important article of horse-food, and, when ground, which removes the husk, it becomes oatmeal. This is used in the preparation of porridge and cakes; and forms a nutritious food, greatly used by the people of Scotland. What is called *Emden Groats* of the shops in the entire grain deprived of its husk and dried.

It is stated that richer natives near the chief towns and military stations, are beginning to appreciate the value of the oatmeal as human food. The analysis of the Indian oat does not compare favourably with the oat grown in Europe. Whilst the later yields albuminoids 12, oil 6, fibre 11, and ash 3 per cent., the former gives albuminoids 10·1, oil 2·3, fibre 16, ash 2·3. It is to be remarked

here, that so far as the ratio of the nutrients are concerned, oatmeal is an almost perfectly adjusted food. (See food-grains of India by Church.)

TRISTACHIA, *Nees.*

T. Stocksii, Boiss. This is mentioned by Boissier as occurring in Sind and Baluchistan, not seen by me. Its spikelets are congested in threes at the ends of the panicle branchlets. Each spikelet is two-flowered, the lower male and the upper either hermaphrodite or female.

CHLORIDÆ.

SCHŒNEFELDIA, *Kunth., Rev. Gram.*

S. Gracilis, Kunth., Enum., Pl. I., 258; *S. ramosa*, Trin., Spec. Gram., t. 359; *S. pallida*, Edgew., *Asiatic Journal*, 1852, p. 183.

Annual, cespitose, and branched from the base, glabrous, 7-8 inches high. Sheath and leaves ciliolate at the margins. Leaves linear, ending in a rather long point. Spikes long, solitary, terminal, 2-3 together, secund, densely flowered, 2-3 inches long, spikelets subsessile, one-flowered, in two rows. Lower two glumes empty, persistent, unequal, the lower a little shorter, the 3rd emarginate, bifid, villous, shorter than the first, with a long, more or less bent, awn; the fourth or the flowering glume rather shorter than the [illegible] linear, lanceolate.

(Mr. J[illegible] whole plant is glaucous and looks very pretty with its slender "Th[illegible]s and their long awns. It is rare, scattered all over India, in plantat[illegible]a and dry sandy ground in North-Western India, also in the consi[illegible] vines bordering the Jumna and Chambal rivers. This grass, the No[illegible] only species of the genus *Schœnefeldia*, grows also in Senegambia, Nubia, and the Cape Verde Islands. My specimens are from Mahim, and Bodeli Guzerat. Nothing appears to be known regarding its uses.

CYNODON, *Pers.*

C. Dactylon, Pers; Kunth. Enum., I., 259; Dalz. and Gibs., *Bom. Flora.*, 297; *Panicum dactylon*, Linn., Sp.; *Digitaria Stolonifera*, Schrad., *Fl. Germ.*, t. 3, fig. 9; *Beauv. Agrost.*, t. IX., fig. I.; Sibth., *Fl. Gr.*, t. 60.

Ver. *Doorba* or *Duuva* of the Hindus, sacred to Ganesh, *Harala* or *Haryeli* of the Bombay people, *Gericha* of the Teling

(Roxb.), *Arugam-pilla*, Tamil (Roxb.). In some other parts of India it is known by the name of *Dubra dub; Nili dub, Ram ghas, Khabbar* (Duthie).

Stem perennial, prostrate, often creeping and rooting to a great extent, the flowering branches shortly ascending. Leaves short, rigid, distichous. Spikes 2—5, sometimes 6-8, digitate, at the end of a long peduncle, slender, often purplish, 1—1½ inches long. Spikelets, linear, smooth, sessile. Outer glumes narrow, acute, pointed, persistent, keeled, nearly equal, less than a line long. Flowering glume rather longer and broader, boat-shaped, the keel minutely ciliate, hardening when in fruit, and smooth on the sides.

It is abundant everywhere in this and other Provinces of India. It is said to be rare in very sandy parts of the Western Punjab and in the black soil of Central India. Grows also in Ceylon and over a greater part of the world. It is found in England, though rare, and other parts of Europe, abundant in the western slopes of the Andes, China, Thibet, South and Central America, and the Cape of Good Hope, and according to Birdwood is said to be introduced into Farz and Khuzistan by the British Expedition of 1856-57. It is considered to be the best and most nutritious fodder grass for cattle-especially for horses, in India, Ceylon, in the United States of America, and in Australia. In the settled parts of the latter country it is now generally spread. R. Brown suggests that it may have been introduced with cultivation. It varies considerably in habit as well as in its nutritious properties. It makes excellent hay, and will keep good in stock for many years. Mr. Fergusson says:—"Its flowers in their perfect state are among the loveliest objects in the vegetable world, and appear, through a lens, like minute rubies and emeralds in constant motion from the least breath of air. It is the sweetest and most nutritious pasture for cattle; and its usefulness added to its beauty, induced the Hindus, in their earliest ages, to believe that it was the mansion of a benevolent nymph. Even the Veda celebrates it as in the following text of the *A'th'hárvana*: "May Durva, which rose from the water of life, which has a hundred roots and a hundred stems, efface a hundred of my sins, and prolong my existence on earth for a hundred years." It is also sacred to Ganesha. Durva and Doorba must not be confounded with Darbha

a synonym of the celebrated *Cusha* grass. Sir W. Jones and others, ex. Birdwood, Bombay Products, p. 128.

The following extracts taken from Dr. Vasey's "Report on the Grasses of the South," pp. 26-28 (1887), show how highly valued is this grass in America. "In Louisiana, Texas, and the South generally, it is and has been the chief reliance for pasture for a long time, and immense herds of cattle on the southern prairies subsist principally on this food.....It has the capacity to withstand any amount of heat and drought, and months that are so dry as to check the growth of *Blue-grass* (*Poa arachnifera*) will only make the *Bermuda grass* green and more thrifty." (Professor Kilbrew.)

"Bermuda grass grows on any kind of soil in Texas, but will not stand the trampling of stock on loose sandy soil. It is hard to beat for a grazing grass, though long continued droughts cause it to dry up." (Mr. M. M. Martin, Central Texas.)

"While this is the most northern limit of Bermuda grass, it is also the most southern limit of the *Blue-grass*. The two growing together on the same land produce a most perfect pasture, as the *Blue-grass* is green, all the fall, winter, and spring months, while during the heat of summer, which prevents the growth of the *Blue-grass*, the Bermuda flourishes. The two together in good strong soil make a perfect pasture good all the year round." (Mr. J. B. Wade, N. Georgia).

"The time is not far distant when all the rough feed consumed on plantations will be made of this grass, and when the planter will consider his hay crop of more importance than his sugar and cotton. No other grass will yield such an amount of valuable hay, surpass it in nutritious qualities, or support on an acre of pasture such an amount of stock." (Mr. Affleck in Professor Kilbrew's "Grasses of Tennessee.")

Colonel Otley has written a long article on the cultivation of this grass as a fodder for Cavalry in the Madras Literary Journal. This article is copied in Johnson's 'Grasses of India' with a few useful observations.

CHLORIS, *Linn.*

C. Barbata, Swar., *Fl. Ind.*, Pl. 200; Dalz. and Gibs., *Bomb. Fl.*, 296, *C. decora*, Nees., in Royle's Herb.; *Andropogon barbatus*, Linn.

Ver.—*Gôshya, Aptia, Gondwal, Chanderyot, Phulkia* (Balaghât), *Chinkri* (Jeypur), *Gandi gavung* and *palriah* (North-West Provinces by Royle), *Ganni* (Punjab.)

Culm glabrous, compressed. Sheaths ciliate at the mouth. Leaves acute, bifarious at the base of the culm, shortly hairy on the upper surface. Spikes 6-12, digitate, secund, 1½-2 inches long. Spikelets two-flowered, imbricated, the lower sessile, hermaphrodite. Outer glumes two, empty, awnless; flowering glume membranous-keeled, ciliate at the end, with rather long hairs, and produced into a long straight awn. The upper floret consists usually of two empty glumes, often awned. The palea is hairy. This grass is very common all over India and also in Ceylon, and in Australia reckoned to be a good fodder. Cattle eat it till it flowers, after which they will not touch it.

C. Roxburghiana, Schult., Mant., II, 239; *C. polystachia*, Roxb., *Fl. Ind.*, I, 332.

Culm slender, erect, or decumbent at the base, and then ascending, about two feet high. Leaves smooth, sparingly hairy on the upper surface. Spikes numerous, usually about 20, terminal, digitate, or fasciculate, umbelled, 2-2½ inches long, secund. Spikelets alternate in two rows, sessile, imbricate, with one hermaphrodite flower. Glumes two, unequal, lanceolate, keeled, smooth, awnless. Flowering glume of the hermaphrodite flower produced into a fine straight awn, ciliate at the margins. The *rachis* bears at the top two pedunculated awned glumes.

The plant is rare. My specimens are from the compound of the Grant Medical College and from the neighbourhood of the Victoria Gardens. Is it a variety of *Chloris barbata* with numerous spikes?

C. tenella, Roxb., *Fl. Ind.*, I, 200.

Ver.—*Kagya, Morbhago* grass (Duthie).

Culm slender, smooth, glabrous, 1 foot high or higher. Leaves smooth, soft, glabrous, long in proportion to the plant, often longer than the stem. Spikes terminal, secund, solitary, or very seldom two, about two inches long. Spikelets 3-5 flowered, distichous or alternate, all hermaphrodite except the last which is often rudimentary. Glumes unequal, broad, lanceolate, acute. Flowering glume broad, cucculate, awned. The author's of the Bomb. Flora state: "This is

a rare grass according to Roxburgh, and we have not met with it in more than one place, *viz.*, in the city walls of Surat." I have received specimens from Surat, Dhulia, Poona, and the Loni Reserve on the banks of the Mutta Mulla river, where it is extremely local and by no means plentiful. Mr. Wroughton, Deputy Conservator of Forests, has found it in the Late, Murum and Reserves on the bank of the Nira river. "Here it grows in abundance and strongly. I had to wade through patches which were above my knees and covered considerable areas." (Wroughton.)

Duthie has discovered it in Rajputana, Bundelkhund, and the Central Provinces. The uses of this elegant grass are not known. At Ajmere it is reckoned to be a good fodder.

C. Digitata, Stend., *Synop.* Pl. Glum., I., 207; *Melica digitata*, Roxb., *Fl. Ind.* I., 328; *Chloris digitata*, Edgew, *Asiat. Journ.*, 1852, p. 183.

Ver.—*Kuncha, Bamna, Mathanya, Nika gadi*, and *Salakodam gadi* (Duthie).

Culms slender, decumbent at the base and then ascending; or erect when growing amongst bushes, 4-5 ft. long or longer. Sheaths hairy at the mouth. Leaves pilose, chiefly on the upper surface. Spikes 4-5, filiform, secund, terminal, digitate, expanding or divaricate, 6-9 inches long, hairy at the base, spikelets in two rows, sessile. The two outer glumes unequal, shortly awned, 3-4 times longer than the 3rd. Flowering glume with a long awn issuing just below the apex at the dorsal surface. The upper glume or neuter floret rudimentary, awned.

This is a large and beautiful species. When it grows amongst bushes it attains a considerable height. It resembles at first sight some of the large specimens of *Panicum sanguinale*. It is not uncommon in this Presidency, nor uncommon in Northern India. I have received specimens from Khandeish, Nassick, Thana, and from Southern India.

C. montana, Roxb., Fl. Ind., I., 329.

This is a variety of *Chloris barbata*, with four to six spikes only, the spikelets large, like those of *C. tenella*, often of a purplish colour.

There is another beautiful variety of *C. barbata* with long flexuose spikes, 4½-5 inches long; spikelets smaller than in *C. montana*,

white, awns short and straw coloured. The specimen was received from Nassick.

MELONOCENCHRIS, *Nees.*

M. royleana, Nees, Ann. Nat. Hist., vii, 221; *Eutriana abyssinica*. R. Br.; *Melanocenchris Jacquemontiana*, Jaub. and Spach; *M. rothiana*, Dalz. and Gibs., *Bomb. Fl.*, 297.

Ver. *Gooli*, *Bedari*, *Dongri*, *Landgeya-Kussal* or *Landga-Kussal* (Landga means wolf, the grass is supposed to resemble this animal).

Cæspitose. Culms filiform, 4-6 inches, high, branched. Leaves short, narrow, flat or convolute, pointed, edges ciliate. Spikes terminal, secund. Spikelets one flowered, sessile in two rows, often arranged in two rows, and falling away at the joints. Two outer glumes empty, linear, hairy below and produced into a straight awn. The flowering glume almost always glabrous, trifid, with three straight awns of a brownish colour, the two lateral smaller, the central longer.

This small elegant grass is very common in stony and barren places in the Konkan and Deccan; also in Northern India. Reports from Tulapur (Poona) state that it is not a good fodder. Mr. Duthie on the contrary states—"It is said to be a good grazing grass when young, though rather too small to be of much use."

TRIPOGON, *Roth. Nov. Pl. Spec.*

T. zeylanicus, Nees, Stend, *Syn. Pl. Glum.*, I., 301; Thw., Enum. Pl. Zeyl.

Cæspitose. Culm slender, about ½ feet high, pubescent. Sheath villous or pubescent. Leaves very narrow, linear, convolute, ending in a point, hairy. Spike terminal, solitary, narrow, lax, flexuose, 3-4 inches long. Spikelets alternate, sessile, oppressed, secund in two rows, not imbricate, 3-7 flowered. The two lower glumes empty, persistent, keeled, unequal, the lowest smaller. Flowering glumes shortly longer, 3-nerved, 3-awned. The lateral awns almost mucronulate, shorter than the central. Grows in Poona and North Khanara.

The description here given is from a grass kept in the Herbarium

of the Poona College of Science named *Septochloa tripogonoides* by Munro.

Tripogon, Nov. Sp. Glabrous. Culm straight, single, 2-2½ feet or higher. Sheath obsoletely striated. Ligula very minute. Leaves glabrous, rigid, very narrow, about one line broad, 4 inches to one foot and half long, ending in a long narrow point. Spike simple, straight, sometimes falcate, 6 inches to one foot long. Spikelets oppressed, sessile, compressed, alternate secund in two rows, ovate, lanceolate, 3-4 lines long, 4-8 flowered. First glume small, lanceolate, ¾ of a line long. Second glume 3-3½ lines, lanceolate, distinctly keeled. Flowering glume keeled, the keel running into a mucro or short awn (¼ line long) with two minute teeth on each side. Palea nearly equal to the flowering glume, two-ribbed. Styles free to the base.

There are two varieties of this grass, one with short spikelets and a few flowers, and the other with longer spikelets and with more flowers. Both varieties are from the Konkan. This elegant grass grows also in Khanan and Mysore. Uses not known.

T. jacquemontii, Staff., Nov. Sp. Grass greenish-glaucous, glabrous. Culm slender, erect or slightly bent at the base, 1½-2 feet high. Sheath rather loose, a little shorter than, or nearly as long as the internode. Ligula minute, truncate. Leaves chiefly at the base, linear, ¼-½ line broad, 3-5 inches long, rigid. Spike simple, straight, or more or less flexuose and nodding, 5-6 inches long, white, many flowered. Spikelets sessile, somewhat compressed, apparently cylindric, alternate, narrow, 5-9 lines long, many 13-19 flowered. First glume prominently keeled. Second glume similar but ¼ longer. Flowering glume 3-nerved, 3-awned, the central awn longer than the lateral. Pale 2-nerved, oblong, slightly shorter than the flowering glume. Lodicles a pair of scales.

This grass is found growing in Poona, Sholapur, Deccan, Konkan, in the same localities as the best species; it is said to grow also, in Bengal. It is named after Jacquemont, as he was the first to collect it in Poona.

T. capitatus, Jaub. and Spach. Under this name Jaubert and Spach describe minutely and give in their *Illustrationes Plant.*

Orient. a drawing of a species which they state grows in Poona "circa urbem *Poona* inter muscos supra arbores et saxa legit Jacquemont."

DINEBRA, *Jacq. Fragom.*

D. arabica, Beauv., XXVI., fig. 2. *Dinebra Ægyptiaca*, Jacq., Fragon X. 121; *Leptochloa arabica*, Kunth, Enum., I., 271., *Eleusine calycina*, Roxb., *Fl. Ind.*, i., 346.

Ver. *Baria, Kali-kauli, Bara sarpot; Waddata-toka, Jaddee* (Roxb.).

Culm decumbent or erect, 1-3 feet high, leafy at the base. Leaves flat, thinly sprinkled with hairs. Panicle erect, from 8-12 inches long, composed of numerous short, alternate, secund, sessile spikes, at first erect, and reddish when young, then reflexed. Spikelets 3-flowered in two rows; flowers hermaphrodite. The two outer glumes empty, nearly equal, persistent, narrow, keeled, accuminate and produced almost into a short awn. Flowering glume shorter, hyaline, obtuse, 1-nerved. No awn.

This elegant and ornamental grass is very common in Khandeish; also in the Punjab, Rajputana, and in the Central Provinces and in Bundelkund, also in Arabia, Egypt and Senegambia. It is said to be introduced in Ceylon. Reports from Kandeish and Poona say that it is good fodder for grazing and perhaps for stacking. Report from Nirgudi (Poona) "good fodder, especially for milk cows." This grass is annual, and during the rainy season is sold along with other fodder grasses. Mr. Duthie thinks that "it is probably nutritious, but being only an annual and not plentiful, it does not take a high place as a fodder grass." Dalz. and Gibs in *Bomb. Fl.*, p. 297, say "it is common in Sind, where it is called *Drub*, and it is a favourite food of buffaloes."

LEPTOCHLOA, *Beauv. Agrost.*

L. Chinensis, Nees, Agrost. Bras., 432; Steud., Syn. Pl. Glum., I., 209; *L. tenerrima*, Roen and Schult; *Poa decipiens*, Stend., Synop. Pl. Glum., I., 279.

Ver. *Chenhel, Jhira, Phulkia.*

Culm creeping and rooting from the flower nodes, then ascending 2-3 ft., ramous, usually slender, glabrous. Sheaths compressed.

Leaves linear, flat, scabrous, produced into a point. Panicle one foot long or longer, very ramous. Branches numerous, slender, simple, scattered or clustered along the rachis, 2-4 inches long. Spikelets alternate, sessile, shortly pedicelled, distant or approximated, narrow, 1-2 lines long, 4-6 flowered. The two outer glumes empty, somewhat unequal, lanceolate, acute or subulate. Flowering glumes broader and obtuse, hyaline at the apex.

Seen specimens collected in Parel (Island of Bombay) and Guzerat. Said to be common in the plains of Northern India, where it is used more or less for fodder. Also in Bengal, Ceylon, and Australia.

Leptochloa calycina (Roxb.), described in the *Bomb. Fl.*, is *Dinebra arabica*, Beauv., above described.

ELEUSINE, *Gaertn. Fruct.*

E. corocana, Gaert. Carp., 1; Roxb., *Flor. Ind.*, 1., 342; Dalz. and Gibs., *Bomb., Fl.*, Suppl., 97; *Cynosurus corocenus*, Linn., Sp. Pl.; *Tsjeth pullu*, Rheed., Hort. Mal., XII., t. 78.

Ver. Hind. and Mah. *Natchni, Nagli-Raggi, Mandha, Mandhua, Maruya*; Beng., *Marua, Modua*; Punjab, *Mandol, Cholodra*; Himalaya, *Hoda; Kurakan*.

Culm erect, 2-4 ft. high, compressed, simple, smooth. Sheath bearded at the mouth. Ligula short, fimbriate, pilose. Leaves bifarious, large, 1 ft. long or longer than the culm. Spikes 4-7, digitate, usually in-curved, sometimes straight, thick, secund, 1-3 in. long. Spikelets sessile, densely imbricate, in two rows, 3-6 flowered. The two outer glumes empty (the lowermost longer), keeled, obtuse. Flowering glume ovate, concave, obtuse, glabrous, minutely denticulate. Fruit globular, dark brown, rugose. Pericarp loose over the fruit or seed.

It is extensively cultivated over our ghâts and in the plains and lower districts more than 20 miles inland. It is transplanted and weeded like rice. It may be grown almost over stones and gravel, but when sown over a rich soil, the return is enormous in proportion to the area. It yields from 5-6 maunds of seed per acre upon the hills, 12-14 maunds in the plains. Dr. Roxburgh describes a luxuriant variety, *E. stricta*. For this variety Dr. Roxburgh gives "an increase equal to 120 fold, and for another 500, whilst on two tufts, the produce of one seed, 50 culms grew, and no less than 8100 fold

was carefully calculated to be the produce of this plant. Generally this grain is sold at the rate of 80 to 130 lbs. a rupee. It is considered by natives to be the most nourishing and invigorating of cheap food. On analysis nachni grain has been found to contain on an average 6·53 per cent. of nitrogenous matter, whereas rice contains 70·40 per cent., and wheat 13·42. In this respect natchni stands last amongst the cereals of India. Dr. Forbes Watson thinks that want of nitrogen is more than compensated by the mineral constituents of Raggi (nachni). It is rich in iron required for the blood corpuscles, and in potash, lime and phosphoric acid essential to various tissues of the body. On the whole natchni stands high in food value." The portion of phosphoric acid in the grain is about 0·4.

It is extensively used by the poorer classes of Patna, Bhagalpur, Dinajpur, Gorakpur, Behar and other districts of Northern India. In Mysore and other parts of Southern India it is the staple food, sometimes stored there in pits, and keeps without being deteriorated for years. Nachni is eaten in the form of cakes made of the flour, mixed with a sufficient quantity of water and sugar, and baked. The flour is also used by its being stirred with water, then boiled and formed into a sort of thick porridge, named *ambil* in Goa and in the South of India. Well-to-do people make a sort of pudding, which they call *tisana*. It is said that in Darjiling a fermented liquor is prepared from the natchni grain. The stocks are given to cattle as fodder or used as fuel.

Natchni has not been found in a wild state. Is it the result of the cultivation of the next species, which resembles it, and the grain of which is eaten by poor people during scarcity or famine times? Fergusson believes that the name *Eleusine corocana*, given by Gaertner and Linneus to this plant, is derived from "the Sinhalese *Kurakan* under which it has been known to and cultivated by the natives (of Ceylon) times out of mind."

E. Ægyptiaca, Pers. Syn., I., 82; Roxb., *Fl. Ind.*, I., 345; *Cynosurus ægypticus*, Linn., Sp. Pl., 106; *Dactyloctenium ægyptiacum*, Willd., Kunth. Enum Pl. I., 261; Dalz. and Gibs., *Bomb. Flor.*, 297.

Ver. *Makra, Madhana, Kark-medhana, Malicha, Mansa, Mathna, Chikara, Chota-Mandya, Makar Jali*; Duthie and Roxburgh.

Culm creeping and rooting at the lower nodes, then ascending to about a foot or more, slightly compressed. Sheath sparingly hairy. Ligula very short, ciliate. Leaves flat, flaccid, tapering to long points, hairy from minute tubercules. Spikes 3-5 digitate, secund, varying from ½-1 inch. Spikelets numerous, 3-5 flowered, closely imbricate on the underside of, and at right angles to, a prominent angular rachis. Outer glume acute, about 1 line long; the 2nd broader, obtuse or emarginate, its keel produced into a short awn. Flowering glume broad, acuminate or tapering into short points. Seed oval, somewhat 3-sided, rugose, enclosed in a thin loose pericarp.

It is common everywhere in Bombay and over India, in Ceylon, Australia, Africa, and even in Europe. In poor hard soils it assumes a creeping habit, and yields short spikes. It is reckoned to be a good nutritious fodder, especially when young cattle are fond of it. The seed is occasionally collected in some parts of India, and in times of scarcity eaten, but it is a poor unpalatable food.

This grass has a close affinity to the last described species of *Eleusine*. In fact *E. corocana* is supposed, as already stated, to be the result of the cultivation of *E. ægyptica*.

E. indica, Gœrtn. Carp., I., 8; Kunth, Enum. I., 272; Trin., Sp. Gram., X., 71; Roxb., *Fl. Ind.*, I., 345; Dalz. and Gibs. *Bomb. Flor.*

Ver. *Mendla* or *Medha, Guder, Khurd, Khurd-mendi, Mal-ankur, Kuror* (Roxb.); *Mandwa, Thingri* (Royle); *Makraila, Gadha-charwa, Gadha-mandwi, Gurchawa, Mandanya, Kakaria, Mandial Jari, Gurra-gadi* (Duthie).

A coarse tufted grass. Culm erect, compressed, smooth, 1-2 ft. high. Sheaths flattened, distichous, sparsely hairy, chiefly at the mouth. Ligula short, hairy; leaves glabrous, flat, linear rather obtuse; spikes 5-7, 2-3 inches long; secund, erect, digitate, often one, occasionally two, inserted at some distance below the others. Rachis prominent on the inner side. Spikelets 1½—2 lines long, loosely imbricate on the opposite side, 3—5 flowered. The two lower glumes obtuse, one-nerved, empty. Flowering glume usually 3-nerved. Seed oblong, obscurely three-sided. Pericarp rugose, loose. It is a common grass all over the Presidency and in Bengal, North-West Provinces, and in Ceylon. Grows all over tropical and subtropical countries, Australia, America, Africa,

Azores, Taiti, Guadaloupe, &c. It is a somewhat coarse grass, but the reports received are favourable to its being good fodder grass. It is eaten by cattle and horses. Is reckoned to be a good fodder in Australia, in the United States of America, where it is known as *yard grass, crow's foot, crab grass*, and *wire grass*. Professor Phares says:—"It grows in rich cultivated ground and produces immense quantity of seeds. It is very nutritious, and good for grazing, soiling, and hay. The succulent lower part of the stems covered with the sheaths of the leaves renders it difficult to cure well, for which several days are required. It may be cut two or three times, and yields a large quantity of hay." See Report on the Agricultural Grasses of the United States. See also Duthie.

Dr. Roxburgh says that the cattle are not fond of it; this remark may, however, apply, according to Duthie, to the Bengal form, which the nature of the climate would render more rank and unpalatable. Mr. W. Ferguson of Ceylon also writes:—"It is so coarse that cattle scarcely ever touch it. It is a most troublesome weed on road-sides, and will spring up from its roots after being cut down several times."

E. verticillata, Roxb., *Fl. Ind.*, I., 346; *Cynosurus verticillatus*, *Septochloa verticillata*, Kunth., Enum., I., 272.

Vern. *Chihkhe* or *Kuri-Chinke*, *Kanjsi*, *Jama*.

Culm erect, smooth, 1—4 feet high, terete glabrous. Sheaths loose, flattened. Leaves bifarious, flat. Panicle consists of 6—12 or more sessile secund spikes 1—3 in. long, the upper ones almost digitate, the lower ones distant or verticelled. Spikelets 2—3 lines long, numerous, impricate, in two rows, 8—12 flowered. Outer empty glumes small and narrow. Flowering glume broad, 3-nerved, and ending into a short mucro or point. Seed oblong, enclosed in a rugose pericarp.

It is a rare grass, though widely spread over India, and Africa, Australia, &c. It is considered to be a good fodder grass. I have before me specimens of this grass received from Bengal and North-West Provinces—none from this Presidency.

E. mucronata, Willd., Enum., 1029; Steud., *Syn. Pl. Glum.*, I., 112.

Vern. *Gondi-Natchni*, *Katali*, *Gondwal* (Poona names).

Culm erect, simple, not ramous, about ½ foot high. Sheath hairy. Ligula short, ciliate. Leaves flat, tapering to a fine point, ciliate. Spikes digitate, 3—5, often reduced to one, secund, about ¾ of an inch long or shorter. Rachis terminated in a distinct mucro. Spikelets numerous, densely imbricate, arising from the lower or outer part of the rachis, 5—3 flowered. Flowering glume tapering into a short mucroniform point; keel sparsely ciliate.

It is a short species, producing often one spike only. Specimens received from Khandeish, Nassik, and Poona. It is very common in some places of the latter district. It has close affinity to *E. Ægyptiaca*, if not the same species. I have described it because there is a specimen thus named by the late General Munro and kept in the Herbarium of the Poona College of Science.

E. flagellifera, Nees, in Royle's *Herb.*; *E. Arabica*, Hochst, Steud., *Syn. Pl. Glum.*, I., 211. *E. stolonifera*, R. *Br. Prod.*

Vern. *Veli, Daundi, Chimbar, Ganthia, Ganth dob, Gurdub* (Royle), *Chubrei, Bharu, Chembar, Gathil, Karimbor, Dubra* (Duthie)—Perennial. The whole plant is glaucous.

Culms many, creeping and arising from the bulb-like rooting nodes. The base covered with dry sheaths. These ciliate at the mouth. Leaves narrow, linear, lanceolate, acuminate, rigid, distant, upper very short. Spikes 2—5, 6—7 lin. long, digitate, loose, imbricate, 5—8 flowered. Glumes lanceolate, smooth, and obtuse, the flowering one acute. This grass lies prostrate over the ground and creeps over more than two feet. Not uncommon on hard and arid soil in Poona and West Khandeish, where it is considered to be a good fodder for cattle and horses. In Northern India it is also valued as a good fodder.

E. Scindica, Duthie, *Fodder Grass of India*, 58; *Dactyloctenium scindicum*, Boissier.

Vern. *Mandjiro, Bhobra, Bobriya, Ganthia, Ganti-grass, Jangli Malicha, Kakro-Makro.* Perennial. Culm creeping and rooting at the lower rather thickened nodes. Flowering stem long, slender, erect, naked at the upper part, 2—2½ ft. long. Leaves short, 1½—2½ inches long, very narrow, about 1—1¼ ins. large, acuminate, flat, edges ciliate at the mouth from bulbous base. Spikes 3—5 ins., digitate, 4—5 lin. long, slightly curvate, rather thick, secund. Rachis

mucronate. The two lower glumes empty, the lowermost acute, the upper larger and produced into a short oblique mucro. Flowering glume oblong, acute, its scabrid keel ending into a short mucro.

This slender grass grows in the plains of North-Western India and Aden.

It is reckoned to be a good fodder grass.

FESTUCACEÆ.

Arundo-donax, Linn. This tall and beautiful grass with its varieties are extensively cultivated in gardens all over India.

It is common in the South of Europe, in the region bordered by the Mediterranean Sea, and in East Asia. It may be said to be a classical plant, as its culm was first used in the manufacture of musical instruments, during the bucolic times, when man entirely or chiefly led a pastoral life. The pipes, or flute of Pan, of 7 tubes, the invention of which is lost in the mists of antiquity, was made of the culm of this plant. Virgil, in chanting the praises of Varus, speaks of this plant thus :—

Agrestem tenius meditabor arundine musam.

And in another place we read that this reed furnished the arrow—

Utque levi Tephyro gracilis vibrator arundo.

The plant is now used for the support of vines and other climbing plants, and also for many domestic purposes, walking sticks, fishing and measuring rods being made of it and also musical pipes. The reed often mentioned in the Bible is believed to be the culm of this plant or of the following species. Both are common in Palestine. The leaves are eaten by cattle.

PHRAGMITES, *Trin.*

This genus is closely allied to *Arundo*, the difference being that in *Phragmites* the lowest flower of the spikelet is male.

P. Roxburghi., Kunth., *P. Karka*, Roxb., *Fl. Ind.*, I., 347.

Vern. *Deonal*, or *Deondl*, *Nal* (Roxb.), *Karka* (Watt), *Naga-Sava*, *Patoo-ederoo* (Teling, Roxb.), *Nuda-nar*, *Narkut*, *Narkat*, *Narsal Nar*, *Naria*, *Nai* (Steward, Duthie).

Culm, erect, stout, perennial, piped, 6—12 feet high, covered with the leaf sheath up to the inflorescence. Leaves flat, lanceolate,

in luxuriant plants, 12—20 feet long, and about an inch broad, margins scabrous.

Panicle loose, 1-1½ feet long, erect, composed of numerous filiform, scabrous branches, generally of a purplish-brown colour. Spikelets numerous, crowded, flowers 3-5 in each. Glumes oblong, lanceolate, 4—5 lin. long. Inferior flower male, its flowering glume linear, subulate. Superior flowers hermaphrodite. Glumes glabrous, but they are covered with long silky hairs from the rachis.

P. angustifolia, *P. nejialensis*, Nees, and *Arundo bifaria*, Retz., appear to be varieties of *P. communis*. Trin. Kunth. Enum. I. 251. It grows all over India; in this Presidency, it is rare, occurs chiefly near the margins of rivers and lakes. I have before me at present specimens received from Dhund. The creeping root is very long, often measuring several feet. The large panicles, when dry, form an ornament for vases for the drawing room, &c. Pipes are made of the culms, particularly those used by the people who carry about dancing snakes. The common *Durma* mats of Bengal are made of the stalks split open. Vessels from the port of Calcutta are generally dunnaged with them. Roxb.

Phragmites communis has a very extensive range.

From the hollow reeds he fashioned,
Flutes so musical and mellow,
That the brook, the Sebowisha,
Ceased to murmur in the woodland,
That the woodbirds ceased from singing,
And the squirrel, Adjidaumo,
Ceased his clatter on the oak-tree,
And the rabbit, the Wabasso.
Sat upright to look and listen.

LONGFELLOW'S "Hiawatha."

ELYTROPHORAS, *Beauv.*

E. Articulatus, Beauv., *Agr.*, 14, fig. 2; Dalz. and Gibs., *Bomb.* Fl., 316; *Dactylis spicata*, Willd. in Nov. Act., iii, 415. *Echinalysium strictum*, Trin., Fund., 142.

Ver. *Kemshi*, *Jungli Rala* (small seed); *Chimansar*, *Poshe*, *Suria*, *Ket kapuri*, *Balha Kolhati*.

An erect glabrous annual 6 inches to 1 foot high including the inflorescence. Sheaths loose. Leaves flat, longer than the culm.

Inflorescence a green cylindrical spike 1-6 inches long, consisting of numerous small, flat, few-flowered (3-7 flowered) sessile spikelets, disposed in dense globular clusters, crowded so as to form one continuous spike or the lower clusters, distant. The inflorescence is often shortly branched at the base. The outer glumes two, membranous, narrow-keeled, shortly awned or pointed, subequal, about one line long, without the awn. Flowering glumes 3-nerved, tapering into awns, which are as long or longer than the glume. Palea folded, with two dorsal wings. Stamen one. Grain smooth.

It is common all over India, Australia and Africa. It grows near water-courses and in rice fields, looks something like *Setaria spicata*, at a little distance.

Uses not known.

ERAGROSTIS, *Beauv.*

E. ciliaris, Link.; *Poa ciliaris*, Linn.; *P. ciliata*, Roxb., Flor. Ind., I., 336.

Ver. *Undar--puncho, Tor Chandbol* (Campbell).

Annual, culms erect, rigid, procumbent below, three inches to one foot high, leaves narrow, linear, pubescent at the insertion into the sheath.

Panicle narrow, spike-like, occasionally branched from below. Spikelets 5—8, sometimes more, flowered. Glumes acute. Flowering glume distinctly 3-nerved, cuspidate-ciliate at the margins. Palea with long, white, stiff hairs. Seed obovate, globose, smooth, dark coloured.

Grows all over India and in Arabia in sandy soil. Common in Poona, Damaum, Domus, Guzerat, &c.,

E. brachystachya, *E. Arabica*, Jaub. and Spach. t. 322. This is a variety of the last and grows in the same localities. The inflorescence consists of a dense cylindrical spike, resembling that of *Æluropus lagopoicides*.

I have gathered specimens, some very small, not longer than one inch, on the polo ground, Poona.

It is eaten by cattle.

E. tenella, Beauv. Benth., *Fl. Honk.*, 431; *Poa tenella*, Linn., R. Br. *Prod.*, 181; Roxb. *Fl. Ind.*, I., 337.

Ver. *Dhooria, Bharbhuri, Mondiajori, Ichcoi* (Campbell).

Tufted annual. Culm erect, smooth, six inches to near two feet high. Leaves flat, narrow, pointed towards the end, smooth, glabrous, rather scabrous at the margins. Panicle very long and narrow, occupying the greater part of the plant. Branches numerous, filiform, usually much divided, ascending, or the lower ones verticillate or in clusters. Spikelets pedicillate, numerous, very small, ovate, 3-4 rarely 6-flowered, often tinged red. Glume thin, almost hyaline, obtuse, loosely imbricate, rachis articulate, palea glabrous. Seed oval, brown, smooth.

Grows all over India. Not common in this Presidency. Whilst writing these notes, I have before me specimens from the cultivated ground in Bassein. It is said to be good fodder, much appreciated in Australia. Mr. Duthie says "common in the plains of Northern India, specially in cultivated ground along with *sugar-cane, juar*, and *arhar*. It is eaten by cattle both fresh and dry.

E. nutans, Nees, Steud. Syn., *Pl. Glum.*, I., 264; Dalz. and Gibs., *Bomb. Fl.*, 297; *Poa nutans*, Retz., Obs., IV., 19; Roxb., *Fl. Ind.*, I., 337; *E. interrupta*, Beauv., Agrost., 71; *Poa interrupta*, Koenig, Roxb., *Fl. Ind.*

Ver. *Pohe, Poche, Dhooria* (Bassein name), *Ghodila, Ghorila* (Teling name *Nakurmaral* and *Urenke*, Roxb.), *Chiksi* (Khardi), *Madra* (Khardi, Thana), *Shetpatra* (Bheundi, Thana).

Culms single, erect, glabrous, 3—5 ft. high. Leaves narrow, long, scabrous. Panicle linear-contracted, 1-2 ft. high; branches filiform, solitary, two or more from nearly the same place, giving the panicle a verticillate appearance, lower branches are often distant. Spikelets pedicelled, smooth, glabrous, often tinged red, 8-14 flowered. Seed oblong.

It is a tall species with beautiful long drooping panicles, often of purple coloured spikelets, growing in large quantities in good, moist soil near the banks of rivers and streams, in water holes, and borders of rice-fields all over India and Ceylon.

It is not considered to be a good fodder grass. Cattle eat it, when other food is not available. Report from Khandeish says that it is a good fodder for buffaloes.

E. pilosa, Beauv. Agrost., 71; *Poa pilosa*, Linn.; *P. verticillata*,

Cav. Ic., t. 93. *E. parviflora*, Trin., *Mem. Acad. Petersb.*, 1831, 411.

Ver. *Burwai, Chiriaka-dana, Kutaki.*

Annual Culms slender, ascending, 1-2 ft. high. Leaves flat, narrow, linear, acuminate.

Sheaths shortly pilose at the mouth. Panicle 6 in. to 1 ft. long; branches numerous, capillary, at first appressed, afterwards (when in fruit) spreading. Pedicels longer than the spikelets. Spikelets minute, 2-4 lin. long, narrow, linear, the lower ones in verticels, 6-11 flowered, often tinged with purple. Glumes thin, keeled, the lateral nerves obscure. Flowering glume glabrous. Palea obscurely ciliate. Grain ovoid, oblong.

Grows in West Khandeish, Poona and Nassick, also "in the plains of Northern India, usually in damp and swampy ground, where it is relished by buffaloes." In Khandeish, Poona, Nassick, and Ajmere, and in Australia, it is considered to be a good fodder grass. This grass is also very common in Ceylon.

E. megastachya, Link., Hort., I., 185; *E. major*, Host. Gram., IV. t. 24. *Megastachya Eragrostis*, Beauv., Agrost., 14. *Poa megastachya*, Koel., Gram., 181.

Ver. *Ran Pohe, Phole* (Goa name), *Pohe, Kaodia, Chiriyake chaolay* (Royle).

Annual, culms ascending or erect. Sheaths glabrous, at the mouth pilose. Leaves narrow linear. Panicle large, ovate-oblong, inferior branches pilose at their origin. Pedicels shorter than the spikelets. Spikelets large, flat, linear oblong, solitary or in clusters, 15-20 flowered. Flowering glume shortly mucronate; lateral nerves prominent.

Common all over the Bombay Presidency and the plains of Northern India, up to 5,000 feet on the Himalaya. Mr. Duthie states that it is used more or less as fodder, but in this Presidency it is not used as such.

E. tremula, Hochst., Herb. *Poa tremula*, Lain, Ill., I., 185. *P. multiflora*, Roxb., *Fl. Ind.*, I., 139; *Eragrostis multiflora*, Dalz. and Gibs., *Bomb. Fl.*, 298.

Ver. *Chiraka, Chirika ket, Chirika chauvalia, Kalunji* (Royle). Annual, culm suberect, round, smooth, 6-18 inches high or higher. Sheaths sparsely pilose at the margins and the mouth. Ligula very

minute, ciliate. Leaves short, few, mostly from the base, narrow and tapering to a fine point. Panicle longer than the rest of the plant, oblong, bending, many branched, lax; branches thin, pilose at the axils. Pedicels capillary, equalling or longer than the spikelets. Spikelets linear, very long, obtuse, many flowered, nodding. Flowering glume ovate, obtuse, three-nerved, nerves distinct, the median prominent. Grain round, smooth."

Found near Gogo, on the Kattywar Coast, Lanowli on the left of the road leading to Poona, and on other dry elevated places.

Not used on this side. Its foliage is too scanty to be of much value. It is considered to be good fodder in Ajmere. "Its grain is said to have been extensively utilised by the starving population in certain parts of the Punjab during a famine which took place about 60 years ago, and which is even now remembered as the *lukkiwala sál*" (Duthie). The very slender pedicels, which support the long spikelets, give rise to the constant tremulous motion exhibited by this species, when in flower.

E. Brownei, Nees, Steud. Syn. Pl. Glum., I, 279. *Poa Brownei*, Kunth., *Enum.*, I, 333. *P. polymorpha*, R. Brown, Prod., 180.

Ver. *Fulia, Chikta, Chimanchara, Choti khidi, Jenkua, Khari.* Culm usually 6 inches to 1 foot high or higher, glabrous. Sheaths glabrous, except at the mouth, where sometimes a few cilia are noticed. Leaves glabrous, narrow, flat, or convolute. Panicle very variable, sometimes quite simple, and with dense spikelike branches, or with long distant spreading branches. Spikelets very shortly pedicelled, flat, very small, tapering to a point. 10-20 flowered (10-40 flowered Benth.). Flowering glumes closely distichous, glabrous, their lateral nerves distinct, nearly central on each side. Grain ovoid, oblong, smooth. Spikelets are darkish in colour or pale. Found all over Bombay, plains of North-West India and at lower elevations on the Himalaya. It is said to grow in Ceylon and also in Australia. In the latter country it is considered to be a good pasture grass, yielding an abundance of feed both in winter and summer.

E. unioloides, Nees, Steud. Syn. Pl. Glum., I, 264. *Poa unioloides*, Retz., Obs., V, 19; Roxb., *Fl. Ind.*, I, 339. *Uniola Indica*, Dalz., and Gibs., *Bomb. Fl.*, 298. *Eragrostis Amabilis*, W and A.

Ver. *Poi, Poke, Moti chava, Chota loniya* and *Loniya, Konee* (Bengal, Roxb.).

Culm slightly decumbent at the base, ascending 1-2 ft. high, ramous, round, smooth, glabrous. Mouth of the sheath bearded. Ligula very small. Leaves short, linear, lanceolate. Panicle ovate, oblong, half the length of the plant or longer, dense, erect, ramous; branches filiform, short, horizontal, fascicled below, solitary above. Pedicels long, very slender. Spikelets flat, ovate, 16-20 flowered, white or with a bluish-purple tinge. Flowering glume 3-nerved, nerves distinct. Grain oblong and smooth. Common in India, up to 5,000 feet on the Himalaya, usually on wet ground. Also in Ceylon. When growing on the banks of streams or on wet places, it is a very handsome grass. Graham in his Catalogue Bombay Plants, p. 236, calls it "the most elegant of all the grasses." Report from Shapur says that it is used there as good grass for horses and cattle.

E. elegantula, Nees, Steud. Syn. Pl. Glum., I, 266; *Poa elegantula*, Kunth., Enum., Pl., I, 346; *Poa elegans*, Roxb., *Fl. Ind.*, I, 339.

Ver. *Todha, Asara, Chota Asara, Kaluargi.*

Culm erect, simple, round, ascending, 1-4 feet high. Sheath glabrous, except at the mouth. Leaves few, short, glabrous. Panicle oblong, nodding; branches solitary, rather distant, adpressed. Spikelets pedicelled, 8-12 flowered, linear, of a purplish colour. Flowering glume 3-nerved, nerves distinct. Grain globular, smooth and brown.

A very elegant tall species, found in wet ground in Salsette, Khandeish and Poona. Also not uncommon in the plains of North-West India. It is eaten by cattle either fresh or dry. From Poona it is reported "to be good fodder but rare."

E. mucronata, Roth., Nov. Pl., Sp., 92, Sub. Poa; Steud., Syn. Pl. Glum., I. 267.

Culm in the specimens seen 1½-2 feet high, slender, smooth, striated, the middle stria or line is deeper, glabrous. Ligula minute, ciliated. Sheath glabrous, generally shorter than the internodes. Leaves narrow, ending in a fine point, glabrous, 6-8 inches long. Panicle 4-5 inches long, racemose. Pedicels filiform, equal to, shorter or longer than, the spikelets. Spikelets 2-3 lin. long, 9-13-

flowered. Flowering glume obtuse or slightly emarginate and shortly mucronate.

Specimens received from Halyal, North Kanara, where it is found on road sides and in open places.

Uses not mentioned.

E. plumosa, Trin., Var. *a*, In Act. Petrop., 6, I, 398; *Poa plumosa*, Retz. Obs., IV, 20; Roxb., *Fl. Ind.*, I, 338; Tsjama-pulu, XII, t. 41.

Ver. *Dhane, Chirika-khet, Chirika-bajro, Bharbhuri, Bharbusi, Bara Churbhura.*

Annual, culms many, filiform, ramous, smooth, round, glabrous, erect, from 1-2 feet high. Leaves linear-acute. Sheaths pilose at the mouth. Panicle ovate-oblong or somewhat pyramidal, diffuse. Branches many, ramous, alternate, horizontal, with a few short hairs at the axils. Spikelets minute, lax, pedicelled, dependent, from 4 to 7-flowered. Pedicels much longer than the spikelets. Outer glume smooth, glabrous. Flowering glume obliquely truncate, with hairs on the dorsum. Palea ciliate with spreading hairs, seed oblong, smooth, brown. Is common in Bombay, Konkan, and along the coast, in the plains of Northern India, especially on the sandy soils; it is also abundant on saline usar soil in company with the usar grass (*Sporobolus orientalis*). It is also said to be common in Ceylon, in the warmer parts of the island. The panicles of this grass present various forms; they are in some varieties so narrow and contracted as hardly to be distinguished from *E. ciliaris*, Link. In Allahabad it grows well along with *dub* and makes useful light hay for mixing with coarser hay eaten both by horses and cattle. In Ajmere it is also considered to be a good fodder grass. In Bombay it is eaten by cattle when young.

E. stenophylla, Hochst., Steud., Syn. Pl. Glum., I, 266.

Annual, culm erect, striated, glabrous, 1½ feet and more. Sheaths striated, pilose at the mouth. Ligula almost none. Leaves very narrow, linear, glabrous. Panicle erect, contracted, 4-5 inches long. Branches numerous, erect, fascicled. Spikelets linear, 12-20-flowered, ash-coloured. Flowering glume very narrow, minutely serrulate.

Specimens received from various parts of the Konkan and Kanara.

Uses not known.

E. minutiflora, Presl. in Rel. Haenk; *Poa biflora*, Retz. Obs., V, 19; Kunth., *Enum.*, I, 363. Culm erect or ascending, striated, glabrous, rather scabrous, 2 feet high or more. Sheaths lax. Ligula membranaceous. Leaves narrow, lanceolate, acute or acuminate. Panicle narrow, dense, spike-like, very small, 12 inches long. Lower branches alternate, upper verticillate. Spikelets very small, 3-flowered. Glumes ovate, glabrous, one-nerved, flowering glume 3-nerved.

Found growing in North Kanara.

Uses not known.

E. viscosa, Trin. in Act Petrop., I, 397; Steud., Syn. Pl. Glum., I, 265; Dalz. and Gibs., *Bomb. Fl.*, 298; *Poa viscosa*, Retz. Obs., IV, 20; Roxb., *Fl. Ind.*, I, 337.

Ver. *Bhurbur, Bhurbusi, Chikti, Bhulni, Chipal* (Duthie).

Culm ascending, cæspitose, 9-19 inches long, viscid. Sheaths glabrous, mouth clothed with long white hairs, as also the ligula. Leaves rather short, narrow, tapering to a point, usually glabrous. Panicle linear, oblong or thyrsiform, 2-5 inches long, branches short, verticillate, spreading. Spikelets oblong, very shortly pedicelled, 6-20-flowered. Upper glume most frequently ciliated.

The whole plant, especially the inflorescence, is covered with a viscid substance having a balsamic odour.

I have collected it in Chowpatty and Malabar Hill. Grows also in the plains of Northern India on sandy soils, often accompanying *E. plumosa*, and probably of equal value for fodder purposes. It is not found in Ceylon nor in Australia.

E. aspera, Nees, Fl. Afr. Austr., 408; *Poa aspera*, Jacq., *Host. Vind.*, III, 56; Lam. Ill., I, 185; *Poa paniculata*? Roxb., Fl. Ind., I, 340.

Culm erect, smooth, round, 3-5 feet high. Sheaths covered with long white hair at the mouth. Ligula ciliated. Leaves in the specimens before me are 2-3 lines broad at the base, soon becoming very narrow and pointed. Panicle very large, very ramous, branches numerous, spreading, filiform, generally alternate, their insertions covered with rather long white hairs. Spikelets linear, oblong, 1½ lin. long, on very long peduncles, 8-10-flowered (Roxb.'s *Poa paniculata*, 4-16-flowered). Peduncles scabrous. Glumes acute, nearly equal. Flowering glume distinctly 3-nerved.

Rare in India. Is distributed throughout tropical Africa and South Africa, Abyssinia, and the Isle de France. My specimens are from North Kanara.

Uses not known.

E. poaeoides, Beauv., t. XIV, fig. 11; Roem. and Schult., II, 574; *Poa eragrostis*, Linn., Sp. 100.

Ver. *Sul.*

Fibrous root. Stem erect or ascending, ramous, ½-2 feet high or higher. Sheaths glabrous or minutely pilose, lanceolate, acute. Panicle not large; branches expanding, solitary or two together, with or without hairs at their origin. Spikelets linear-lanceolate, 8-20-flowered. Glumes obtuse. Flowering glume with prominent lateral nerve.

My specimens are from Nassick, where it grows in *khar* lands and has to be weeded out or it destroys the rice plant.

Grows also in the plains of Northern India and up to 8,000 feet on the Himalaya.

Uses not known.

E. bifaria, W. and A.; Steud., Syn. Pl. Glum., I, 264; *E. secunda*, Nees, mpt; *Poa bifaria*, Vahl., Symb., II, 19; Roxb., Fl. Ind., I, 333.

Ver. *Chiraka, Punya-sufed,* and *Chota blankta, Moi, Woodatallum* (Roxb.)

Culms erect, simple, wiry, glabrous, 1-2 feet high. Sheaths keeled. Leaves narrow, carinate, complicate, rigid, glaucous, glabrous. Spike simple, terminal, straight, 4-8 inches long. Spikelets sessile, alternate, linear-lanceolate, compressed, secund, in two rows, upper many flowered, the lower ones 4-6-flowered. In Poona, Bhusawal, Pachora and in other dry places. Said to be used as a good fodder in Poona. In Bhusawal it is not known as fodder. This species grows also in sandy and rocky ground in North-West India, common in Rajputana. At Ajmere it is considered to be a good fodder grass, and is eaten by cattle on Mount Abu. It is not reported from Australia. In Ceylon is not uncommon up to an elevation of 5,000 feet.

It has a close affinity to *E. coromandeliana*, Trin., found growing in Coromandel.

E. cynosuroides, Roen. and Schult., Syst., II, 577; Dalz. and Gibs.,

Bomb. Fl., 298; *Poa cynosuroides*, Retz. Obs., IV, 20; Roxb., *Fl. Ind.*, I, 334.

Ver. *Darbha, Dab, Dhab,* or *Dib, Kussa, Koosha, Drab, Dabvi, Durper.*

Perennial, with a thick creeping root. Culm thick, reed-like, terete, covered at the base, with withered sheaths of leaves 1-3 inches high. Sheaths glabrous. Ligula ciliate. Leaves rigid, flat, the young root leaves convoluted, 4-8 inches to 1 foot long, acute, hispid, especially at the margins. Panicle spike-like or conical, elongated, ½-2 feet long, branches numerous, dense, racemose, horizontal, short, rigid. Spikelets sessile, secund in two rows, from the underside of each branch, distichous, 6-12-flowered. Flowering glume ovate, lanceolate, obsoletely nerved.

In Guzerat, West Khandeish, Nassick, also in the plains of Northern India in all kinds of soils, especially in places where water collects, its long vigorous rhizome-like roots serve to keep it fresh even in dry weather. It is said to be eaten by buffaloes; as a rule, cattle do not eat it. When in flower it is considered to be an indifferent kind of fodder. When other kinds of fodder are wanting, it is often given mixed with gram and wheat. It is stated that its strong fibres are used in Northern India for the ropes of the Persian wheel, where they will last for three months or more. The fibres are also used in some parts of Guzerat to make a sort of coarse paper. This grass is employed by the Brahmins in their religious ceremonies. Kussa, the Sanskrit name of this much-venerated grass, was given to it at a very early period by the Hindu Philosophers, and believed by Sir William Jones to have been consecrated to the memory of *Cush*, one of the sons of Ram (Roxb.). It is enjoined in the Shravan Puran that the Dharb should be collected or rather pulled out of the ground on *Pithori Anvashya*. Only plants thus collected are fit for use in religious ceremonies. They are also employed in various funeral ceremonies, such as *tarpan*. It is often spread beneath the dead bodies, the chief mourner wearing a ring of it on his finger.

An infusion of the root is used as a diuretic all over India.

CENTOTHECA, *Desv.*

C. lappacea, Desv., Kunth. Enum., I., 366; Beauv., Agrost., t. XIV., fig. 7.

Culm erect or geniculate below, glabrous, 1½ feet or more. Sheath loose, shorter than the internodes, striated. Ligula short, irregularly jagged. Leaves 7—8 lines, broad in the middle, flat with many prominent parallel nerves, joined by transverse veins, glabrous. Panicle terminal, 8—10 ins. long, branched; branches long, rather distant, at first erect, then patent or divergent. Spikelets 2 lin. long, loosely inserted, shortly pedicellate, two-flowered. Both flowers fertile, one (lower flower) sessile, and the other shortly pedicelled. First glume ovate, acuminate, 3-nerved, with a prominent keel very shortly prolonged at the upper end; margins smooth and almost hyaline; second glume similar to, but nearly twice as large as, the first. Flowering glume of the first or sessile flower similar, but nearly 1½ times as large as the second glume. Palea distinctly two-ribbed, lanceolate. Flowering glume of the second (pedicellate) flower 5-nerved, obtuse, keel runs at the upper end into a short point; margins marked with stiff reflexed bristles, rising from bulbous bases. Caryopsis fusiform, brown.

The specimens examined by me were received from North Kanara where "the grass grows in shady ever-green forests." All were two-flowered as described above. Mr. Bentham describes a variety called *C. biflora* from Rockingham Bay, Delachy, the spikelets of which are small, with only two flowering glumes like the Indian species.

ÆLUROPUS, *Trin., Fund. Agrost.*

Æ. lagopodioides, Trin. Fund.; *Æ. lævis*, Trin., Fundam; *Dactylis littoralis*, Linn., Sp. Pl.; Roxb., *Fl. Ind.*, I., 342; Dalz. and Gibs., *Bomb. Fl.*, 298; *Poa brevifolia*, Roxb., *Fl. Ind.*, I., 342.

Vern. *Luni, Mother Dhodar.*

Culms creeping, then ascending; the erect part 6—12 ins. high or higher, branched; branches single, short. Ligula small, pilose. Leaves short, lanceolate, from a broad base, rigid, convolute and pungent at the apex. Spike terminal, ovoid or sub-rotund, long, peduncled, white-flowered, dense. Spikelets 4—8 flowered. Outer glume 3-nerved; second glume nearly equal, 3-nerved, keeled, acute. Flowering glume ciliate at the back. Caryopsis compressed, smooth, bright. Common on salt ground, near the sea. "It is the first grass

to grow on land reclaimed from the sea." (Davidson, of the Revenue Survey.) "*Cryspis aculeata* takes the place of this grass in Sind."—Dalz. and Gibs., *Bomb. Fl.*, 299. It is described also from the Western parts of the Punjab, where it takes the place of *dub*, which it resembles somewhat in habit (Duthie). Is common in Ceylon or sandy ground near the sea (Fergusson).

Uses not known.

LIST OF BIRDS' EGGS.

Presented to the Society by Mr. E. C. S. Baker, of North Cachar, August, 1892.

Hume's Nos.	Scientific Name.	Popular Name.	No. of Eggs.
82	Hirundo rustica	Common Swallow	6
102 *bis.*	Cypsellus infumatus	Palm Roof Swift	6
109	Caprimulgus albonotatus	Large Bengal Night-Jar	2
116	Harpactes erythrocephalus	Red-headed Trogon	3
166	Chrysocolaptes sultaneus	Golden-backed Woodpecker	1
172	Gecinus occipitalis	Black-naped Green Woodpecker.	7
180	Brachypternus aurantius	Golden-backed Woodpecker	3
187	Sasia ochracea	Rufous Piculet	2
195	Megalæma asiatica	Blue-throated Barbet	2
196	Megalæma franklinia	Golden-throated Barbet	3
220	Taccocua sirkee	Bengal Sirkeer	2
286	Chibia hottentotta	Hair-crested Drongo	4
289	Muscipeta affinis	Burmese Paradise Flycatcher	5
290	Hypothymis azurea	Black-naped Blue Flycatcher	1
302	Siphia albicaudata	Neilgherry Blue Flycatcher	3
306	Cyornis tickelli	Tickell's Blue Redbreast	5
343	Myiophoneus temminckii	Yellow-billed Whistling Thrush	3
399	Pellorneum ruficeps	Spotted Babbler	4
399 *bis.*	Pellorneum mandellii	Mandelli's Spotted Babbler	1
444	Hypsipetes psaroides	Himalayan Black Bulbul	3
451	Criniger flaveolus	White-throated Bulbul	2
456	Rubigula flaviventris	Black-crested Yellow Bulbul	7
532	Prinia flaviventris	Yellow-bellied Wren Warbler	6
538 *bis.*	Prinia beavani	Beavan's Wren Warbler	3
586	Henicurus schistaceus	Slaty-backed Fork-tail	3
623	Ixulus flavicollis	Yellow-naped Flower-pecker	2
624 *bis.*	Staphidea castaneiceps	Chestnut-headed Staphidea	4
631 *B.*	Zosterops simplex	Swinhoe's White-eye	
645	Parus nipalensis	Indian Grey Tit	2
673	Cissa chinensis	Green Jay	3
694 *ter.*	Ploceus megarhynchus	Eastern Baya	5
702	Amadina acuticauda	Himalayan Munia	4
		Total number of Eggs.	108

REVIEW

ON

* *The Mammalia of India*—(continued from page 251).

The Black-buck is a more beautiful and interesting animal than *Tetraceros*, almost as widely distributed in India, and, like it, found nowhere else.

Being a beast of the open plain, it is a great deal better known and more popular. Mr. Blanford may be congratulated in this case, on the scientific name that he has adopted, *Antilope cervicapra*.

In his Indian names he is unhappy. Mirga is bad Sanskrit for Mriga, which is given just below (docked), as Hindustani "*Kalwit*" is not Hindustani (or anything else) for the female. But "Kalahint" is Maratha for the male, on account of his black (Kála) skin. "Bámaní Haran" is neither Uria nor Maratha, but bad Hindustani, fit for the mouth of a *Shikari*. The word "Phandáyat" *may* be Maratha; perhaps one of our Maratha-speaking members will tell us.

Mr. Blanford gives a good set of average dimensions, and puts the weight at "about 90 lbs." apparently for both sexes. At any rate, the present writer found that average obtain amongst many specimens weighed in Khandesh, the Deccan, and Gujarat. Some exceeded 90 lbs., none reached 100 lbs.; and the heaviest female was as heavy as any of the males, though the latter are commonly a little the larger. A good many females were amongst those weighed, because the writer often only shot, when meat was needed, in countries where the bucks were mercilessly shot down by head-hunters in cow-carts, and the herds could better spare those than the few surviving stud-bucks.

Mr. Blanford describes the family of a Black-buck as "from 10 to 30 in number, but sometimes as many as 50," and including two or three brown (young) bucks. But in the few places where the bucks are not especially persecuted, the right proportion seems to be about a dozen brown hides to one black one, and wherever they come near twenty to one, the head of the herd should be spared. Doe venison

* The Fauna of British India, including Ceylon and Burmah. Published under the authority of the Secretary of State for India in Council. Mammalia, by W. T. Blanford, F.R.S.

is moreover much better than that of the buck, and is good even up to a stage in pregnancy, easily recognizable through field-glasses. It is curious how little this fact is known to sportsmen. But any keeper of an English deer-park will tell you the same thing.

Mr. Blanford mentions one pair of horns twenty-eight inches and three-quarters long, from "Rajputana and Hariana," which is a little vague. The longest known to the reviewer were in the possession of the Civil Surgeon, Khandesh; in 1872, and had been shot somewhere on what is now the border of Nasik and Khandesh, between Dhulia and Malegaum.

Probably, the Civil Surgeon in question, who is a member of this Society, could give the right measurements. They cannot be much less than Mr. Blanford's maximum. In this Presidency, in 1892, an eighteen-inch pair is worth having, and 20 inches a good pair; 24 inches is an unusual length in most districts. Mr. Blanford's distribution of his black bucks is good; but he omits Sind, where the Antelope has been naturalized by the Amir of Khairpur. He is wrong, however, in saying that it "*never* enters forest or high grass, and is but rarely seen amongst bushes." In the early seventies, Antelopes were common in the low-lying forests of Western Khandesh, living in the forest like Chital. They were sometimes driven out of the Babul plantations of the Poona District by the beaters of the Poona Hunt (of which the undersigned was Secretary, and managed the beats).

And almost every quail-shooter in Gujarat must have seen them put up like hares from grass and crops, and sometimes knocked over with a charge of small shot in the neck. They constantly lie in millet crops, which are nothing, after all, but tall grasses cultivated, and they have been found in sugar-cane gardens.

He thinks it never drinks, and gives one case of its abundance, where there is no drinking water but from a well on the long sand-spit between the Salt Chilka Lake and the sea. But even there it must rain *sometimes*.

There is no doubt that, like most of the group of desert antelopes, it is very independent of water. But it has been known to come to a well at night and drink from the cattle-trough, and even from the puddles of waste water.

Pantholops Hodgsoni.—The Tibetan Antelope follows the Black-buck in Mr. Blanford's list. But it is not a beast of Bombay, where it is chiefly represented by the heads on our own walls. The next in order, however, the Indian gazelle, *was* a common antelope throughout our plains, and is still found in many of them, and still more in low foot-hills and broken ground. This is not, as Mr. Blanford seems to think, from preference, but because it has been driven into such places by persecution. Where it can get leave to live in a plain, as in some parts of Gujarat, it is quite at home there; and the present writer has shot it in pretty thick forest in Sind and elsewhere from thick lofty millet crops.

The natural home of the Gazelle, however, is barren ground with a certain amount of scanty cover, whether in the form of bushes or in that of rocks and ravines.

It is a shyer animal than the Black-buck, and knows better how to hide itself, and, accordingly, long survives it in places where they have been neighbours, and almost comrades. The native name, Chinkara (properly Chenkada), means "sneezer," and is given from its peculiar alarm note usually accompanied by an impatient stamp.

When not seriously scared, it will simply trot away from a passer-by with the action of a pony. Mr. Blanford thinks that it never drinks, but tame specimens do, and the present writer has seen Chinkaras go regularly to water, where there was no grass, and has seen their tracks at such places. A Bhil hunter in Khandesh, in 1873, said that he waited regularly for them at the water in the later forenoon.

Mr. Blanford's maximum for buck's horns is 14 inches. A pair in the possession of Captain Tinling, 17th Bombay Infantry, in 1872, were said to be 16 inches long, and looked it, high up on a wall.*

Mr. Blanford has rid us of a number of unnecessary synonyms. *Gazella Bennetti* is the only Indian species, even Trans-Indus. His Maratha name is wrongly spelt "Kalsipi" for Kalshipi or Kalshepat (Blacktail), but Chenkada is as good Maratha. The old term "Ravine deer" is as bad as it can be, for the gazelle is not a deer, and only lives in ravines when it is allowed no better quarters. It is often monogamous, and appears to breed at all seasons of the year.

* These came from some place near Kolhapur.

Some one got Mr. Hornaday to believe that it is not found south of the Godavari, but it is in all provinces of this presidency, except the Konkan and North Kanara.

A very ticklish weapon called "Maru" (=Death) was made, chiefly for the use of gosains and other ascetics, of a pair of black buck or gazelle horns steel tipped and set with the butts overlapping and linked, in the form of parallel rules opened to a right angle with their brass links.

This gazelle closes our list of Bombay antelopes. But the allied *G. subgutturosa* occurs in Afghanistan down to Pishin. Its females are hornless; ours have small horns.

After the gazelles come the *Cervidæ*, and Mr. Blanford begins his description of these with one of the smallest, *Cervulus Muntjak*.

As in other cases, he has cleared away a lot of useless Latin synonyms and pseudo species; and his Maratha name is here nearly right, "Bekar" for *Bekad*; shared with the four-horned antelope. The best English name is the Bengal one, "Barking deer."

With us this little beast, which belongs rather to the Malayan fauna, is generally confined to the densest jungles of the Western ghâts and Satpura; outside of these, "Bekad" usually means *Tetraceros*. They are continually mixed up together by both native and English sportsmen; although resembling each other only in size. Bombay horns are short, compared to those from further East and South; and, indeed, the little deer is here on the very frontier of its region.

Passing over several deer, not known within our province, we come to an animal almost extinct in it, *Cervus Duvaucelli*, the Swamp deer.* Our author gives no Panjabi name, though he knows that the animal exists in the Panjab. He gives the Sindi name as "Goin" not "Knowin" that the terminal "d" is only dropped as the g in that participle. The present writer has seen, like Mr. Blanford, the only reliable evidence of the Swamp deer's existence in Sind, *viz.*, General Marston's heads, and those in the mosque at Ghotki in Shikarpur.

* Mr. Blandford has corrected the supposition that he, at any rate, misconstrued a passage probably referring to this deer as concerning a Rhinoceros. His letter on the subject will appear in next number.

One or two herds were supposed to exist in the Rohri Division of the Shikarpur District in the early eighties, but it is not likely that any survive there now, unless the foresters have managed to save them. They are like the Tanna bison, and it will take our best shikari to complete their extinction.

The term "Bara singa" is ill-applied to this deer, though it often has 12 tines; because it was earlier known to Englishmen in connection with the Kashmir stag. In native mouths it is so vague that the present writer has heard it used (in the Hatti Hills) as a distinctive term for the female Sambar, which has no horns at all.

Skipping a deer foreign to us, we come to this very Sambar, one of our noblest local beasts of chase. Mr. Blanford's Latin title for him, *Cervus unicolor*, has undeniable priority and propriety, and it is a pleasure to be rid of "*hippelaphus*" "*equinus*," and *aristotelis*," which can scarcely have originated otherwise than in confusion of the Sambar and the Blue Bull. His native names are better than usual, but he omits the curious names, *Kakada* ♂ and *Barsing* ♀, current in the Hatti Hills; once if not now, the Sambar's great metropolis, where the lamented Forsyth, and after him the present reviewer, saw the ground marked with Sambar tracks as if by flocks of sheep.

In one evening this writer, having occasion to feed over 100 hungry men, shot three hinds for meat there, and might have shot a dozen.

The slaughter of the stags would have been useless, as they were all at that season hornless and much inferior as food. One, which had horns, was stalked by a comrade, but he lost one horn in the furlong or so that he ran after receiving his death wound. In such circumstances, the sparing of the best meat is a silly conventionality. The thing to shoot is what man wants, till the land can afford no more. And if any Gymkhàna Shikari calls that pot-hunting, the answer of the old hunter is that no man knows what shooting is until he has shot for dear life; for his dinner; or as sometimes happens to the naturalist, for a rare, perhaps unique, specimen.

A good deal of the mercy bestowed by ignorant sportsmen on the females of polygamous fauna would be far better spent upon the wearers of "second rate heads;" that might have become first rate; and are no great credit to a wall, still less to a lumber-room—if anything could grace that—their usual ultimate destination. One

of the most famous sportsmen of modern days told the present writer that he had shot seventeen Black-buck in a week, and that the heads were hardly worth keeping. He had better have used his field glass more, and his rifle less. The meat was not wasted; but the region could well have spared as many does; whose meat would have been better. In this matter, as in some others, we need, as Dr. Johnson said,—"to clear our minds of cant;" that is, of the use of mere stock phrases as if they embodied principles.

To return to our Sambar; he is now almost extinct in the Konkan and Deccan proper, and the qveer Akadi or "frog" for suspending the universal bill-hook of the forest tribes is now, if made of Sambar horn, treasured as an heirloom; and hard to come by to the curio hunter. Along the crest of the central Sahyádris; and still more in Khandesh, Kanara, and a part of Woodland Gujarat the race is stronger and more numerous. Its development in the Central provinces has been dealt with by another member in these pages.

If the Sambar is of our noblest, the Chital is perhaps our most beautiful beast; for in grace he equals the Black-buck, and though his colours are scarcely so brilliant as those of several *Felidæ*, he has a charm of expression unattainable by a cat. The horns too are more regular and elegant than those of the Sambar; or of any many-tined stag. He is also a beast of taste; and always frames himself, if allowed, in our best forest scenery; green-wood with a water foreground and mountain back-ground. It is pleasant to find that Mr. Blanford simplifies his title to plain "*Cervus axis*." He gives no Maratha name, but "Chital" is good Maratha as well as Hindustani. There is a place in this presidency where the present writer has seen (he believes) and spared over a hundred and fifty spotted deer of a morning; preserving the beautiful herds as much as he could. But in the Konkan and in most of our districts, it is almost an extinct animal; being, indeed, a very easy one to approach or drive, and so soft that it has been killed with a charge of No. 6 shot about the neck. The hours of feeding and drinking vary with the amount of human or bovine interference rather more than Mr. Blanford seems to think; but his account is not only generally accurate but very readable; the interest attaching to this lovely creature having lured him out of his dogmatic compression.

The next deer on his list, the Hog-deer, is less interesting, being indeed little better than something to empty a gun-barrel into, and a fit subject for its chief use in this presidency are the battues of the Amirs of Sind, which deserve description on their own account.

The first step is to enclose a sanctuary as large as the sportsman can afford, it may be 5 acres, it may be five hundred, with a Muhari, that is a wattle fence some eight feet high. The ground within it must contain thick cover, it matters little what; the usual thing is scrub tamarisk from 10 to 30 feet high. There may be the Euphrates poplar (bhan) reaching even to 50 feet.

In the ring fence there is one opening or more, according to the size of the enclosure, and the number of guns meant to shoot, about 20 feet wide, rather less than more. On the right of this, as you face inwards, is the "Kunda," a thatched shed with a floor raised on piles some two feet above ground, and its front open, but for a brushwood balustrade rising some 18 inches or less above the corduroy floor. Above, the eaves project far, usually at least three feet beyond the balustrade. In such a building the gunner is almost imperceptible, and shoots *to his left*, the easiest shot.

When the enclosure and gun-shed are once built, the ingress of man or domestic beast into the sanctuary is forbidden, and all wild brutes, in the course of a few months, learn to look on it as a safe refuge.

To make things surer, for two or three days before a "big shoot," the whole neighbourhood is tormented with beaters, rockets, and shots, even of camel-swivels and falconets. Naturally the game crowd into what they have learnt to look on as a sanctuary, and care naught for the "kundas," familiar to them, in their empty state, as the surrounding trees. It is sometimes found that the space beneath the floors of these has been a lair.

But on the day of the battue, the unhappy game wake up at ungodly hours in the damp Sind mornings, to find one end of the enclosure full of beaters with the fierce Sindi dogs. In every pass out a cord is stretched across; in the "kundas," the guns peer over the balustrade. The wretched hog-deer, driven to the gaps, come to a full halt before the cord, and are shot down without regard to age or sex, standing before the gun. It has happened to the present

writer to raise his rifle see that the buck was in velvet, and then lower it. On the remonstrance of the young heir, acting as host, that his grandfather would be angry with him if one beast escaped the guest's rifle, it was raised again, and the buck died without knowing what killed him, having stood, while his life was in argument, much quieter than if he had been a man in the dock.

It was sickening, but the next shot was better. A huge boar, with a dozen dogs behind him, came tearing through the tamarisks. He knew the dangers of the gap well; and hurled himself at the fence to the *right* of the guns, trusting to his weight to carry him through it—which it did—dead. In such a place there is hardly any limit to the slaughter possible. One of the writer's assistants, then young, killed eight bucks in one morning without counting does, fawns, or pigs. Sometimes trapped hog-deer are put into the enclosure over night. The only real shooting given is by the pigs, which seldom start until the dogs are on their sty, and then go past at full speed, caring naught about the string in the gap, or, like our wise old boar, passing to the right of the "Kunda" and forcing their way through the half-rotten fence, instead of giving the shot to the left through the gap.

The whole procedure is intensely uncomfortable. You must rise at ungodly hours; ride through cold jungles dripping with dew, do exactly what you are bid; and curl your legs into Asiatic positions for hours; in a hut of damp rotten brushwood and thatch. If you smoke, drink, swear, stretch your legs, or do anything Christian, every failure in the whole business must be laid upon your back. It is therefore best, in these circumstances, to do all these things; and to be a Political Agent.

Even so, you don't get off easily. This writer had to shoot from "Kundas" two days running to please an imperative invalid Amir who thought his bag not such as "befat" eleven guns; after shamefully evading a first day and sending out the young fellows to whom the thing was new.

On the third morning the "Gros Veneur" and the prince of the blood acting as Mihmandar intimated that if the butcher's bill was not satisfactory, there were stripes before them, and all mercy to the brute creation had to be cast to the winds.

The thing is amusing for once, afterwards, unless one gets leave to spare something, merely disgusting. Mr. Blanford's account of the Hog-deer is good; he gives no weights, but the average of a full grown buck is just one hundredweight. The reviewer has weighed several large bucks of 120 lbs., none over, out of about 100 weighed. Our author, though justly suspicious of the Western India records of Hog-deer, all due to confusion with *Tragulus memimna*, need not have doubted the assertions of such authorities as Forsyth and Ball, as to the animal's distribution, and the reviewer does not. The skin makes a tolerable fur in the cold weather, and an excellent soft and strong "chamois" leather, much used in the plain of the Indus for leather stockings, camel's housings, and other purposes.

The Barking Deer, in Mr. Blanford's Catalogue, is followed by the Musk-Deer, not a Bombay beast. The next, however, the Mouse-deer, is a common animal in the Ghât and Konkan forests. Mr. Blanford unnecessarily confines it to the Western Ghâts, North of Bombay. The truth is that its small size, shy habits, and extremely protective coloration (olive brown with dull white markings), make it very hard to see in the forests. European sportsmen seldom use dogs here, and without dogs it is seldom brought to bag. It closes the list of deer, and the next chapter is for the Grey Boar. At the end of the deer, and before the swine, Mr. Blanford gives the camels a couple of paragraphs, but does not describe the Indian species; following his own precedent, the case of *Bos indicus*. As both animals undoubtedly form part of the Mammalian Fauna of India; the merit of this procedure seems doubtful. He believes Prejevalisky's wild camels to be the descendants of tame specimens of *C. Bactrianus*; which is possible enough, but if it be true that the Chinese annals record ancient camel hunts in Prejevalisky's region; the original ancestor must have strayed a long while ago. Camels do stray and make themselves at home in the jungle in India, but usually singly. There was, not long ago, a feral herd of camels in southern Spain, where somebody had imported them for a special purpose not followed up. There were wild camels in India once, for our author says, "Fossil remains of two extinct species have been found in the Pliocene Siwaliks."

The Grey Boar, it seems, is in future to be known as *Sus cristatus*, and distinguished from the Wild Boar of Europe by its longer mane and the proportionally greater size and complexity of the last molar in each jaw. The geographical distribution of these two species is not settled. Mr. Blanford does not believe in the 40-inch boar, and is sceptical about the 12-inch tusk.

He allows only two other Indian species, *S. Andamanensis*, which grows to twenty inches high, and *Sus Salvanius*, the pigmy, not of Nepal, which barely attains a foot in height.

The *Hippopotamidæ*, so lately reported from Bannu, were, our author says, "probably contemporaries of man, a worked flint having been found in the Nerbudda gravels that contain bones of Hippopotamus."

Hugh Falconer thought that the Sanskrit "Water Elephant" was an Hippopotamus. Mr. Blanford thinks that he was a river porpoise. It seems probable enough that he was neither, nor anything else in life, but of the nature of the Gaelic "Water-horse," still reported from Irish and Highland lakes.

We come now to the Indian *Cetacea*, of which very little is known. Something had been said about them in these pages, by the present writer, before the publication of the work under review. No "Right whale" without the dorsal fin cruises in Indian waters, but it seems probable that our Fin-backed whales (*Balænoptera*) are identical with Atlantic species, and that, in fact, the Fin-backs are cosmopolitan. They are not common in the neighbourhood of Bombay. The present writer has twice seen them within 30 miles of the Prongs, and is aware of about a dozen cases of their being stranded on the coasts of Tanna and Kolaba.

To the North-west, South, and West of Bombay, they are much more common, but do not seem to enter the Gulf of Cambay.

The Sperm Whales or Cachalots are not recorded from these seas at all, though at least two species have been seen in the Bay of Bengal. One of these, *Cogia breviceps*, is little more than a porpoise, and is followed by the porpoises.

The first of these is of some interest to us here, as a good deal of the matter collected by Mr. Blanford in respect of it is ours, and

the plate is from Mr. Sterndale's drawing of a specimen of ours published in these pages.

This is *Phocæna phocænoides* according to Mr. Blanford. It used to be *Neomeris phocænoides* at the British Museum, but Mr. Blanford sees no reason for separating it generically from *Phocæna communis*. The difference is that the European *Phocænæ* have a well-marked back fin, and *Neomeris* has only a carunculated scar on the back (not well described by our author), looking as if the back fin had been cut off, and ending backward in a little angle. It is, indeed, an obsolete back fin. The abolition of a needless genus is a good thing, and Mr. Blanford's aid in this direction is here (as very often) valuable. Unluckily, his contempt for Greek has led him into what, if not a barbarism, is at least an absurdity, for *Phocæna phocænoides* means "the porpoise that is very like a porpoise," whereas the essence of this porpoise is that he is not like other porpoises in a rather important feature. An almost identical porpoise has been found in the great Chinese rivers, *since* such a discovery was predicted in these pages.

Passing over several Dolphins of no immediate interest, we come to another in which we have some property, the common spotted Dolphin of Bombay harbour, which our author calls *Steno lentiginosus* (it had been *Delphinus* and *Sotalia*). Mr. Blanford gives dimensions of an adult female from Vizagapatam, and those of a specimen once in our Museum, a large male. He doubts whether the Vizagapatam measurements are from the fresh specimen, but on comparing them with the Alibag measurements (made with steel tape and standard on a Dolphin scarcely dead), there appears a general ratio of about seven to nine. This, between female and male *Cetacea* is not at all unreasonable, and the Vizagapatam measurements must therefore be accepted as correct. Having come from Sir Walter Elliot through Sir R. Owen, they might have claimed this presumption from the first. The plate, however (from Elliot's figure drawn by a native artist), is a hideous caricature of a very graceful animal. The plate of *Delphinus delphis*, at 587, gives a much better idea of *Steno* than its own.

The last of the Indian Cetaceans, perhaps the most curious, and the only one exclusively Indian (until lately, when we annexed the

whole habitat of *Orcella fluminalis,* the Irrawaddy porpoise) is *Platanista,* the "Bullan" of the Indus. Mr. Blanford refuses (rightly) to separate this from the Gangetic species, and the specific name *Gangetica* has precedence. It is also found in the Brahmaputra. It was sufficiently noticed in these pages in the "Waters of Western India," but it is only fair here to say that the suggestion then put forward of its probable method of entry into the Indus had been anticipated by an unknown contributor to the Imperial Gazetteer.

The *Sirenia* were formerly classed as "*Herbivorous Cetacea,*" but are now considered a distinct order, and have one representative in our seas. This is *Halicore Dugong,* which is recorded from Ceylon, Malabar, the Andamans, and the Mergui Isles. Mr. Blanford gives it 15° range on each side of the equator, but this is probably an under estimate. For (as he himself remarks) the Dugong is probably identical with *H. Australis* of Australian Waters, and *H. Tabernaculi* from the Red Sea.

The godfather of the latter (Ruppell) considered it to be the beast whose skin was used in the Hebrew tabernacle (Exodus xxv. 6) and is there called "Seal skin." Our revised version hazards "porpoise skin" in the margin, which is more probable, but not as good a guess as Ruppell's. For seals are none in the Red Sea, and porpoises not easy to catch. But *Halicore Tabernaculi* does inhabit the Gulf of Suez, and gives its name to the Isle of Shadwan, at the mouth of the same, which many of us have seen. The Red Sea Pilot also, like most sailors, and translators, calls him a "seal" in that connection.

There is a doubtful but not an improbable record of a *Halicore* from the Coast of Kattywar, and a few years ago a Bombay paper mentioned a strange carcass as stranded on our own island which (if correctly described) was of nothing else. But our basaltic coasts are too poor in *Algæ* to maintain so large a marine herbivore.

Of the *Edentata* Mr. Blanford allows India three species of one genus, *Manis,* of which one is found over most of this presidency, the Scaly Ant-eater or Pangolin. We have specimens, and the beast is not so rare as its shy and subterraneous habits might make us think. But the present writer has no record of it from the Konkan, and believes it to prefer drier regions more suited to its

habits. Our old friend Mr. Hornaday has a delightful Singalese yarn of its curling round the elephant's trunk, and so choking him. He gives also a good plate. Mr. Blanford's (of another species) is inferior in execution, perhaps not in fidelity. With this plate ends our author's list of the Mammals of India. Probably the most noticeable addition to their roll, since he wrote, has been made in this Journal, in the record of *Paradoxurus nictitatans* (a name that might well be cropped of a syllable).

On the whole, this work is much the best of the series, and it is to be hoped that Mr. Blanford will do no worse in the Third Volume of the Birds, which will describe all those of most interest to the sportsman. If it is to be as dry as the first and second, its popularity and value will be little above those of Mr. Murray's "Edible and Game Birds."

MISCELLANEOUS NOTES.

No. I.—NEST AND EGGS OF THE CRESTED BLACK KITE.

(*Baza lophotes*).

On the 30th April, 1892, while out on a stroll, collecting birds in the Mepale forests, which form part of the Thoungyin Valley, on the south-east frontier of Tenasserim, I came upon a Crested Black Kite sitting on the top of a dry tree at the edge of a small opening in bamboo and tree forest. I fired at the bird but missed, and at the sound of the shot a second bird of the same species swooped out of a tall leafy tree some 30 yards off. As I have found the crested Black Kite a somewhat rare bird, I sat down and waited to see if the birds would not return. In a little while one did return to the dry tree, while the other commenced circling round and round. I again fired at the seated bird, but, to my disgust, missed, and both birds flew off. However, I still thought if I hid myself, the birds might chance to come back, and in a few minutes, to my delight, I saw one come back and alight on the leafy tree. Watching it for a bit I noticed that it moved along the branch into a thick leafy part of the tree and remained there. I was then sure there must be a nest somewhere, for the second bird also returned to its original perch on the dry tree. Previous observations of *Baza lophotes* had shewed me that it was a very shy bird, so the return of these two birds again and again to the same spot could only be accounted for by their being nesting there at the time. Determined to secure a specimen I again fired at the last-mentioned bird but missed again; the tree was evidently too high for the shot to take effect, and, as I afterwards found out, the local manufacturer had kindly loaded my cartridges with 2¾ drams of powder, and then

filled the cartridge case up to the brim with No. 5, altogether about 2 oz., of shot. At this shot the bird that had disappeared into the leafy tree came into view and sat on a branch close to where I concluded the nest must be. I then fired at this bird with my usual luck, and both birds, after flying round for a short time, returned, and sat side by side on the very top of the dry tree, erecting their crests and looking for all the world like a pair of black and white cockatoos. I watched them for some time, and made absolutely certain that they were crested Black Kites. The sight being too tempting, I ventured again to fire, and I need not say missed, the birds flying clear away, one, I am sorry to say, apparently wounded. I sat there for some time, but as they did not return I strolled back to camp, for I could not climb the tree myself, as its stem was about 8 feet in circumference at the base, and devoid of branches for about 10 feet. Next morning I returned with a Karen who could climb. His proceeding was peculiar:—Cutting a notch on the left hand side at about his own height, he struggled up and got the big toe of his left foot into this standing, and clinging there he cut another notch on the right side about waist high, and there placed his right foot, and thus worked his way gradually up, cutting notches alternately right and left and clinging tooth and nail. It took him a good half hour to reach the branches, where he sat himself down and panted freely. In a few minutes he was able to make his way to the leafy spot where I had seen the Kite disappear the day before, and to my delight reported that there was a nest containing 3 eggs, which he suggested bringing down in his head-cloth, whereupon I threatened to shoot him unless he came down and went up again with an egg box. This he was finally persuaded to do, and after carefully packing the eggs he took the nest, which he brought down complete. This latter was a regular hawk's nest, about one foot in diameter, formed of twigs and small sticks with a *very slight* depression in the centre, lined with a few fresh Padouk leaves; it was placed on the horizontal fork of a branch some 6 inches in diameter.

The eggs, which were very hard set, were of a chalky white colour, one rather stained with the yellow droppings of the birds. They are broad ovals in shape, and measured 1·55 × 1·25, 1·5 × 1·22, and 1·4 × 1·3, respectively.

The nest and eggs are now in the possession of Major C. T. Bingham at Moulmein. While the above-mentioned nest was being taken, from a Padouk tree, some 50 yards away, a female Hunis Goshawk *Astur poliopsis* flew off, which I shot, and seeing the nest I sent my Karen climber up, when in the fork formed by a branch striking out from the trunk about 50 feet from the ground he found a nest containing two young birds and an addled egg, which he brought down; the egg, which is not unlike the egg of the above mentioned Kite in colour, but is more pointed at the small end and dreadfully dirtied by the droppings of the birds, measured 1·6 × 1·1.

T. A. HANXWELL,
Deputy Conservator of Forests.

Moulmein, 30th May 1892.

No. II.—CURIOUS TUMOUR ON A BLACK BUCK.

The following anecdote may be worthy of a corner in the Society's Journal:—

Yesterday morning, shortly after my arrival here, my servants came and told me that a very fine black buck was heading towards the tank, close to where my tents were pitched. I went out taking my rifle with me to have a shot, and sure enough the buck was heading straight on towards the tank. As he came nearer, I noticed something very strange about him. In the first place he had only one horn, and further he had a huge protuberance under his chest. I had a shot at him, but missed as usual. Later on in the day he came again to the tank to drink, and this time I had a good look at him at closer quarters, and decided that with such an impediment as above mentioned I might perhaps be able to ride him down, so this morning I went out to look for him, taking a Sowar with me; we both carried spears.

After going about two miles from Camp, we came across him, not alone this time but in a *tolah* of some 15 or 20 deer of both sexes. We gave chase, and this buck at once separated from the rest of the herd, and after giving us a run of between 3 and 4 miles we speared and got him. Sure enough one horn was wanting; it had apparently been shot or broken off *close* to the head, and the protuberance I had noticed was a huge goitre, or what the natives called "Russoli." When the buck was brought into Camp, I measured this swelling and found it to be 11 inches long, 7 inches across, and 5½ inches deep; it began just between the forelegs and extended over the whole chest. On pricking the swelling about 2 quarts of yellowish water poured out, and after skinning the buck the goitre or "Russoli" was removed and opened; it was composed of a yellow sponge-like substance, apparently rotten, with large clots of blood here and there. It appeared to be a thing of long standing, but had not been in the way of the buck's enjoyment of life, for he was in splendid condition, and evidently an old buck, judging from his teeth. I measured the one horn and found it only 19½ inches. I should think this swelling must have caused the beast great pain when he lay down, and I noticed the hair all rubbed off on one side, which seemed to show that he had been able to lie down only on one side, and that with difficulty.

H. BULKLEY.

Camp Nal Baoli, 7th May, 1892.

No. III.—DOES A TIGER KILL SNAKES?

On opening the stomach of an old tigress I shot last month, I found in it the tail-end of a snake that the tigress had bitten off and swallowed whole; the portion swallowed measured 2 feet 3 inches in length. Though quite fresh, the pattern of the skin was rather spoiled by digestion, and I am not sure what kind of snake it was, but it appeared to me to be a rock-snake. There where no teeth-

marks on it, nor was there any breakage of the bones. It seems somewhat remarkable that a piece of this length should be bolted whole.

The natives thought that the tigress had caught it in the water when she went to drink. I should estimate the piece bitten off at about one-third of the snake's length.

The tigress had also made a heavy meal off a bullock.

J. D. INVERARITY.

Byculla Club, June 28th, 1892.

No. IV.—A BEAR WITH THREE CUBS.

BEARS usually bring forth two cubs at a birth, and I was not aware of any instance of their having more, until last month, when shooting in the Central Provinces, I shot an old she bear with three cubs. The cubs were about half-grown or more, and in gender were two males and one female.

One of the male cubs was slightly smaller than the other two, but I have no doubt they all belonged to the same litter (if that is a proper word to use in reference to bears). It is not usual in other animals, *e.g.*, the dog and pig, for one or more of the young ones to be smaller than their brothers and sisters. The old one was closely accompanied by all three cubs during the whole beat.

J. D. INVERARITY.

Byculla Club, June 28th, 1892.

No. V.—A RARE SNAKE.

(*Psammophis longifrons.*)

AT the end of last month I received a specimen of *Psammophis longifrons*, (Blgr.), ♀, from Kalyan. According to the *Fauna of British India* (*Reptilia and Batrachia, page* 367) "only the head and neck of a specimen, which must have been about four feet long, have been preserved by Col. Beddome, who obtained this snake in the Cuddapah hills." From this it appears that the present specimen is the first which has been preserved entire. It was shot in Kalyan from the top of a big Babool tree by Mr. D'Aguiar. As Mr. Boulenger could only give a description of the anterior half of the snake, I may add a few notes on the other half. The total length is 123 ctm. (nearly exactly four feet, the estimated length of Col. Beddome's specimen), tail 37·5 ctm., circumference round the middle of the body 7·5 ctm., ventrals 173, anal and sub-caudals bifid, sub-caudals 93. The coloration slightly differs from that of the type. The head

is uniformly olive without any symmetrical undulating black lines, except a rather faint oval mark on each of the parietals. From the occiput two narrow vertebral black lines run a short distance down the neck. The anterior portion of the neck is, like the head, uniform olive, but all the scales of the back and sides (not only on the vertebral line), and those of the upper side of the tail down to the tip, have broad black margins; beneath, as in the type, uniform white throughout. For a *Psammophis* the snake is rather a thick-set animal, in appearance very much like a *Tropidonotus*, and as it was shot from the top of a tree, its habits seem to be more arboreal than those of its congeners.

F. DRECKMANN.

9th July, 1892.

No. VI.—A PANTHER EATING A PANTHER.

With reference to Mr. Barton's note on the above subject in Journal No. 2, Vol. VI., the following may be of interest to some of our members:—

In 1884 I was staying with D., a forest officer, in the Panch Mahals, near to Sodhra. Whilst we were sitting out one evening on the side of a hill where we had been for a walk, a panther came along and stood within 10 yards of us. D. had a rifle with him, but on my whispering to him that there was a panther close by him, he turned round so quickly that the panther saw him and disappeared. We decided to tie up a couple of goats, but nothing came that night except a hyæna, which D. shot. The next evening, however, D. wounded a panther, but it was too late to follow it up. During the night we heard one calling for its mate all over the hill, and next morning, whilst searching for tracks, our attention was called by one of the men to something in the fork of a large tree close by, and on nearer inspection this turned out to be the body of the wounded panther, whose hind-quarters were half eaten, and the skin, of course, worried. The 'gallant husband' who had performed this act of cannibalism had left the marks of his claws on the tree, where some five feet above the ground he had sprung up on to the trunk.

Most sportsmen will remember having in the course of their shooting expeditions come across trees, which, from the marks of blood, &c., on some large fork were evidently regular resorts to which the resident panther of the neighbourhood was in the habit of taking its prey for consumption, and this tree was a case in point.

H. D. OLIVIER, Major.

Ahmedabad Districts, April, 1892.

PROCEEDINGS

OF THE MEETING IN JULY, 1892.

The usual monthly meeting of the members took place at the Society's Rooms on Monday, July the 4th, Dr. G. A. Maconachie presiding.

The following gentlemen were duly elected members of the Society:—

Captain T. G. R. Finny (R.I.M.S. "Mayo"), Mr. Nanabhoy Muncherjee N. Banajee (Bombay), Mr. James Lidgett (Victoria, Australia), Captain G. H. H. Couchman (Rangoon), Veterinary-Lieutenant G. H. Evens, A.V.D. (Rangoon), Mr. H. U. Baker (Tasmania), Mr. A. W. Forbes (Secunderabad), Mr. B. Ehlers (Bombay), Mr. T. A. Hanxwell (Moulmein), Mr. J. D. Forbes (Jubbulpore), Colonel Fagan (Jubbulpore), and Mr. J. S. Ommanney (Lower Burma).

The Honorary Secretary then acknowledged the following contributions to the Society's collection:—

CONTRIBUTIONS DURING MAY AND JUNE.

Contribution.	Description.	Contributor.
20 Scorpions (alive)	Scorpio swammerdami	Rev. Fr. Dreckmann, S.J.
1 Skin of Wild Cat	Felis chaus	Mr. M. D. Mackenzie.
4 Lizards	Salea anamallayana	Mr. H. S. Ferguson.
1 Snake	Simotes arnensis	Mr. W. Gay.
1 Chaplain Crow (alive)	Corvus capellanus	Mr. W. Cummins.
1 Lesser White Pelican	Pelecanus javanicus	Do.
3 Sea Horses	Hippocampus comes	Miss E. Dickinson.
1 Sea Horse (alive)	Hippocampus trimaculatus	Do.
1 Cobra (alive)	Naia tripudians	Mr. N. J. Stabb.
1 Snake	Callaphis sp.	Col. W. S. Hore.
2 Chamæleons (alive)	Chameleon calcaratus	Mr. J. Bapty.
1 Snake (alive)	Cligodon fasciatus	Do.
1 Monkey's skull	Macacus sinicus	Do.
1 Snake	Nendrophis pictus	Mr. H. Ommanney, C.S.
32 Eggs of the King Cobra	Naia bungarus	Mr. G. K. Wasey.
1 Snake skin	Do.	Do.
1 Nest of Sunbird	Arachnechthra zeylonica	Capt. Tighe.
A quantity of Scorpions (alive)	Scorpio swammerdami	Mr. J. MacPherson.
1 Indian Bittern	Botaurus stellarus	Major-General Anderson.
1 Snake	Lycodon aulicus	Captain Shopland.
1 Lynx (alive)	Felis lynx	Colonel Gunthorpe.
2 Cobras	Naia tripudians	Dr. Kirtiker.
1 Ground Snake (alive)	Ichthyophis glutinosus	Captain Thorburn.
1 Bird-eating Spider	Mygale sp.	Mr. F. A. Naylor.
A pair of Wild Boar Tushes	9¾ inches in length	Professor H. Littledale.
2 Skins of Wild Dogs	Cyon dukhunensis	Do.
1 Skin of Wild Cat	Felis chaus	Do.
1 Snake (alive)	Silybura macrolepis	Mr. C. E. Kane.

MINOR CONTRIBUTIONS

Were also acknowledged from Mr. E. S. Luard, Miss Baird, Mr. N. J. Burrows, Mr. H. Bicknell, Mr. W. Webb, and Mr. B. Aitken :—

CONTRIBUTIONS TO THE SOCIETY'S LIBRARY.

	Presented by
"Himalayan Journals," by Sir Joseph Hooker	Mr. W. F. Sinclair.
"The Sportsman's Handbook to practical Collecting and Preserving Specimens and Trophies", by Rowland Ward, F. Z.	The Author.
Illustrations of North American Grasses, Vol. I., by Dr. G. Vasey	The U. S. Dept. of Agriculture, Washington.
Annual Report of the Fruit Growers' Association, and Entomological Society of Ontario, 1891	The Ontario Dept. of Agriculture, Toronto.
"The Indian Forester," May and June	In Exchange.
Le Monde des Plantes, Nos. 8 and 9, by Mons. H. Leveille ...	The Author.
The Transactions of the Entomological Society of London, 1889, 1890, and 1891	In Exchange.
The Victorian Naturalist, Vol. IX, No. 1	In Exchange.
The Canadian Entomologist, Vol. XXIV	In Exchange.
The Minutes of the N.-W. Provinces and Oudh, Provincial Museum, Lucknow	In Exchange.
"Sporting Sketches in South America," by Admiral Kennedy ...	The Author.
The Proceedings of the Linnæan Society of N. S. Wales	In Exchange.
The Proceedings of the Chemical Society	Do.

NOTES ON WILD DOGS, WILD BOARS, TIGERS, FOUR-HORNED DEER, AND COBRAS.

Mr. J. C. Anderson then read an interesting paper on the above subject by Professor H. Littledale, B. A., of Baroda, and mentioned that one of the Wild Dogs referred to had lately been presented by Mr. Littledale to the Victoria Gardens, where she would be happy to show her teeth to anyone.

The paper will be published in full in the Society's *Journal*.

The usual meeting of the members of this Society took place on Thursday last, the 29th September, Mr. Andrew Murray presiding. The following seventeen new members were duly elected :—Miss Agnes E. Boorke (Bhownugger), Veterinary Captain J. W. Morgan (Ahmednugger), Mr. E. T. Ansell (Bulsar), Lieutenant H. R. Mead (Aden), Lieutenant R. M. Edwards (N. Lushai Hills), M. R. H. Heath (Mhow), Mrs. J. R. Maconachie (Mooltan), Dr. H. L. Batliwalla (Bombay), Mr. R. Bignell (Cooch-Behar), Mr. R. B. McCabe, C. S. (N. Lushai Hills), Mr. R. St. J. Hickman (Cachar), the Administrator of the Rajpipla State, Mr. James Kenyon (Bombay), Mr. C. W. Chitty (Bombay), Mr. A. W. H. Lee (Secunderabad), Mr. W. G. Windham (Bombay), and Mr. J. G. Buchanan (Bombay).

The Honorary Secretary then acknowledged the following contributions to the Society's collection :—

CONTRIBUTIONS DURING JULY AND AUGUST.

Contribution.	Description.	Contributor.
1 Snake	Dendrophis pictus	Mr. H. Ommanney, C. S.
1 Lizard	Varanus bengalensis	Mr. A. L. Rhenius.
14 Bird Skins	From Burma	Major G. B. Radcliffe.
1 Civet Cat (alive)	Viverricula malaccensis	Mr. F. D'Aguiar.
1 Pair of Takin Horns	Budorcas taxicolor	Major J. H. Yule.
1 Baboon (alive)	Cynocephalus babuin	Mr. W. Maidment.
1 Egg of the Monaul Pheasant	Lophophorous impeyanens	Mr. C. Douglas Pennant.
1 Fœtus of Domestic Cat	Felis domestica	Lieut. Carter.
1 White-throated Ground Thrush	Geocichla cyanonotus	Mr. H. Bulkley.
1 Tiger's Head (stuffed)	Felis tigris	Raja Murli Manohur Bahadoor.
1 Viper (alive)	Vipera russellii	Mr. E. J. Farquharson.
1 Snake (alive)	Tropidonotus stolatus	Mr. G. V. Evans.
1 Myna (alive)	Acridotheres tristis	Mr. F. E. Otto.
1 Skin of Purple Sunbird	Arachnechthra asiatica	Mr. R. A. Heath.
1 Skin of Pied-crested Cuckoo	Coccystes jacobinus	Mr. R. A. Heath.
1 Bear (alive)	Melursus ursinus	Col. W. Scott.
1 Panther Cub (alive)	Felis pardus	Mr. E. L. Barton.
A quantity of small Insects.	From S. India	Mr. P. Henry K. Lee.
1 Cobra	Naia tripudians	Mr. C. E. Kane.
108 Birds' Eggs (32 species).	From North Cachar	Mr. E. C. S. Baker.
1 Snake	Tropidonotus stolatus	Mr. H. Ommanney, C. S.
1 Snake (alive)	Gongylophis conicus	Mr. T. Moore.
1 Skull of Musk Deer	Moschus moschiferus	Mr. Naorojee H. Katrak.
1 Snake	Gongylophis conicus	Lieut. J. R. Carter.
Some Water Beetles	From Burma	Mr. C. F. Gilbert.
1 Porcupine Fish	Diodon hystrix	Dr. Munday.
1 Bear Cub (alive)	Melursus ursinus	Mr. H. F. Silcock, C. S.
1 Monkey (alive)	Macacus sinicus	Mr. W. T. Lidbetter.
1 Large Snake Skin	Python molurus	Mr. C. G. Rogers.
1 King Cobra	Naia bungarus	Mr. H. Wapshare.
1 Albino Musk Shrew	Crocidura cærulea	Mr. H. D. Mehta.
1 Snake (alive)	Dipsas trigonata	Mr. B. W. Blood.
A quantity of Butterflies	From Cooch-Behar	Dr. H. E. Brown.
1 Krait (alive)	Bungarus cæruleus	Purchased.

MINOR CONTRIBUTIONS FROM

Mr. D. Knight, Mr. H. E. M. James, C.S., Captain Thorburn, Mr. W. Andrews Godfrey, Lieutenant J. R. Carter, Mr. Dwarkanath Trimbuck, Mr. F. Gleadow, Mrs. Birdwood, Mr. E. H. Elsworthy, Mr. R. F. Goode, Mr. D. Morris, Mr. W. G. Windham, and Mr. H. O. Campbell.

CONTRIBUTIONS TO THE SOCIETY'S LIBRARY.

"The Victorian Naturalist," Vol. IX., Nos. 2, 3, and 4, in exchange.

"The Proceedings of the Linnæan Society of New South Wales," in exchange.

"Reports of the Geological Explorations during 1890-91, New Zealand," by the Colonial Museum of Geological Survey of New Zealand.

"The Transactions of the Entomological Society of London, 1892," Part I., by G. A. J. Rothney, Esq., F.E.S.

"Records of the Geological Survey of India," Vol. XXV., Part II., in exchange.

"Contents and Index of the first twenty volumes of Memoirs of the Geological Survey of India," in exchange.

"Index to Memoirs of the Geological Survey of India, *Palæontologia Indica*," in exchange.

"Mémoires de la Société Zoologique de France, 1892," in exchange.

"The Indian Forester"—July, August, and September, in exchange.

"The Canadian Entomologist," Vol. XXIV., in exchange.

"Bulletin of the American Museum of Natural History," Vol. III., No. 2, in exchange.

"Proceedings of the Academy of Natural Sciences," Part III., September-December, in exchange.

"Bulletin of the United States National Museum," No. 41, in exchange.

"Smithsonian Report, 1889,—U. S. National Museum," in exchange.

"Journal of the Asiatic Society of Bengal," Vol. LXI., Part II., No. 1, in exchange.

"List of the Batrachia in the Indian Museum;" by W. L. Sclater, F. Z. S.; by the Author.

"Annual Report of the Society of Mines, Victoria," in exchange.

"A Monograph of Oriental Cicadidæ," Parts V. and VI.; by W. L. Distant, from the Trustees of the Indian Museum.

"Proceedings of the Zoological Society of London, for 1891," Parts, 1—4 1892, Part 1; from W. F. Sinclair, C. S.

"Index to Proceedings of the Zoological Society of London, 1881-1890"; from W. F. Sinclair, C. S.

"Transactions of the Zoological Society of London," Vol. XIII., Parts 1—4; from W. F. Sinclair, C. S.

"Transactions and Proceedings of the New Zealand Institute," Vol. XXIV., in exchange.

"Journal of the Asiatic Society of Bengal," Vol. LXI., Part II., No. II., in exchange.

"Records of the Geological Survey of India," Vol. XXV., Part III., in exchange.

"Administration Report of Government Central Museum, Madras, for the year 1891-92," in exchange.

A VALUABLE CONTRIBUTION.

The Honorary Secretary said, amongst the contributions recently received, it would be noticed was a pair of *Takin* horns (*Budorcas taxicolor*), presented to the Society by Major J. H. Yule.

These horns were quite new to the collection, and belonged to an animal about which very little is known. The *Takin* is a curious-looking beast, standing about

3½ feet at the shoulders, and is closely allied to both the goats and the antelopes. It is found on the Mishmi Hills and Eastern Tibet, and this probably accounts for the fact that it has so far escaped the attention of the Anglo-Indian sportsman.

Major Yule writes that the horns were found in a village in the Katchin country, two hundred miles north of Bhamo, and he was informed that the animal was not found in their country, but that the horns had been brought from a long way north, and were worth about Rs. 20 a pair—a large sum for a Katchin to give.

NOTES.

The following interesting notes were read:—"A Rare Snake (*Psammophis longifrons*), by the Rev. F. Dreckmann, S. J.; Notes on the Nest and Eggs of *Bazalophotes*, by Mr. T. A. Hanxwell, and it was resolved that they should be published in the *Journal*.

RESOLUTION.

Mr. J. C. Anderson proposed that the following resolution be passed and recorded in the Society's *Journal*:—"The members of the Bombay Natural History Society desire to record their sense of the great loss which they have sustained in consequence of the recent death of the late Mr. G. Carstensen, Superintendent, Victoria Gardens, Bombay," Mr. Anderson said Mr. Carstensen, as a member of the Executive Committee, had given the Society much valuable help and advice, and had also contributed a number of interesting papers to the Society's *Journal*, amongst which he might mention:—"The Conditions for the Distribution of Plants and the means by which it is performed, with special regard to Indian Species"; "How to facilitate the Study of Botany;" "Bombay Gardens;" "Landscape Gardening in Native States;" "Bombay Ferneries"; besides showing his interest in the Society in many other ways. Mr. Carstensen was one of our few scientific botanists, and a man of very considerable attainments, although his modest and retiring disposition always concealed that fact. The wonderful improvements which had taken place in the Victoria Gardens during his *régime* are, and will be, a standing testimony to his great ability.

Mr. Andrew Murray seconded the resolution, and after a few remarks it was put to the meeting and carried unanimously.

NOTES ON A VISIT TO THE ISLANDS OF RODRIQUEZ, MAURITIUS, AND RÉUNION.

Mr. Anderson then read a paper on the above subject, by Rear-Admiral W. R. Kennedy, in which, after giving a graphic description of the formation, produce, and sport in these islands, Admiral Kennedy mentions that bones of the "Dodo" are still to be found in some caverns on Rodriquez, and that he is bringing some of them for the Society's Museum. The paper will be published in full in the Society's Journal.

A vote of thanks was passed to Rear-Admiral Kennedy for his interesting paper and the meeting then terminated.

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F. C. S. Baker del. Mintern Bros. Chromo lith. London.

1. SPIZIXUS CANIFRONS, The Finch-billed Bulbul.
2. ALCURUS STRIATUS, The Striated Green Bulbul.
3. MOLPASTES BENGALENSIS, The Bengal Red-vented Bulbul.
4. MOLPASTES BURMANICUS, The Burmese Red-vented Bulbul.

JOURNAL

OF THE

BOMBAY

Natural History Society.

No. 4.] BOMBAY, 1892. [Vol. VII.

THE BULBULS OF NORTH CACHAR.

By E. C. Stuart-Baker.

Part IV.

(With 1 Plate.)

(Read before the Bombay Natural History Society on 21st December, 1892.)

Molpastes burmanicus.

The Burmese Red-vented Bulbul.

Oates' "Fauna of B. I.," Vol. I., p. 269; *id.*, Hume's "Nests and Eggs," Vol. I., p. 173.

Description.—Forehead to back of crown, chin and throat extending to the top of the breast, lores, cheeks and round the eye black; ear-coverts hair-brown. Nape, neck, back, wing-coverts and breast brown; each feather margined with pale grey; rump light brown; upper tail-coverts white; tail dark brown, deepening to black towards the tip, the central feathers tipped obsoletely, the others distinctly, with white; quill feathers of wing brown, margined grey; flanks and sides of abdomen greyish-brown; centre of abdomen almost white; under tail-coverts crimson-scarlet; thighs dark brown. Bill and legs black, irides brown, reddish-brown, or light brown.

Length 7·9″ to 8·3″ ; wing 3·6″ to ·4″ ; tail 3·6″ to 3·9″ ; tarsus ·8″ ; bill at front ·6″ and from gape ·92″.

The above description is taken from a bird in fresh plumage ; when this becomes worn and abraded the brown seems to fade in colour and the grey margins to the feathers almost disappear, whilst the abdomen becomes more grey from the bases of the feathers showing through more.

NIDIFICATION.—It is quite unnecessary to describe the nest of this species, as it in no way differs from that of its near relations, *M. bengalensis* and *M. hæmorrhoas*, &c. Like the other members of the genus, it seems to have a great partiality for breeding in compounds, orchards, &c. about houses and villages. At the time of writing this article there are three nests within my own compound, each containing three eggs. One of these is situated in a pomegranate tree in which the foliage is so thin that the nest can be seen from a great distance ; another nest is built in an orange tree about ten yards away from the last, and the third is placed in a clump of Boganvilla in company with a Spotted Dove's nest. As with all very common birds whose nests are found in great numbers, some of these birds' nests have been taken in very queer places. I once found a nest being built inside a Government rest-house, but I was obliged to occupy the house, and the birds refused to go on with their work whilst I was there, though it is probable that they did so after I left, for during the week I occupied the house, the owners of the nest used to daily come to sit on the roof and expostulate with me for interfering with them. Another nest was once shown to me built on the top of a dead stump, in full view of every passer-by, though it was shielded from rain and sun by a heavy branch of a tree some 4 or 5 feet above it. Perhaps the most peculiar place, though, in which to find a Bulbul's nest, would be a patch of sungrass, yet I have twice taken nests from such places, once built in a thick tuft at about 2 feet from the ground, and the other time placed amongst the roots almost on the ground itself. These birds undoubtedly sometimes return to their nest of the previous year or else make use of an old nest of some other bird. This year, 1892, a pair of birds have taken possession of an old nest which was built in 1891 in an orange tree in my orchard, but was not noticed until January this

year. They seem to have done nothing to the nest beyond putting a little fresh grass in as a lining, and the nest is now a most shockingly dilapidated looking habitation for a respectable bird. The eggs vary quite as much as do those of the other species of *Molpastes*, and the following are only a few of the many types that may be found:—

(1) The ground-colour varies from white to pale pink or cream with numerous speckles and small blotches of reddish, purplish-brown and very pale lavender and grey, fairly numerous everywhere and often tending to form a ring or cap at the larger end. (2) Pink with large blotches of deep blood-red and purple-brown with underlying ones of grey and pale neutral tint, all confined to the larger half where they nearly always form a ring. (3) Pale livid ground-colour, with minute stipplings of purple-grey almost absent over the smaller end and becoming confluent at the other, where they form a dull-coloured cap. I have only seen one clutch of this remarkable type, and no one would ever think this, or indeed the one next mentioned, could possibly be a Bulbul's egg. (4) White with tiny specks of very light red and *very* pale grey, few at the small end and becoming more numerous towards the large, but forming neither ring nor cap. This type is almost as rare as the last; in appearance it is just like a small Broadbill's (*S. lunatus*) egg. (5) White or very pale cream, boldly blotched with dark brown and reddish. (6) Pale cream mottled all over with dark cream and lavender. (7) Pale pinkish with the ground-colour almost obliterated with innumerable speckles of dark reddish. (8) The same only marked with bright pinkish-red. These will be enough to show how widely one egg may differ from another: to give all the known forms of this egg would fill pages and serve no purpose.

I once took an abnormal clutch of this bird's eggs. They were four in number, and were in shape almost perfect little spheres, measuring no more than ·50″ × ·48″. In coloration they were equally abnormal, for the ground-colour, which was a deep pink, was almost obliterated by deep purple blotches.

Two hundred eggs, which I have measured, varied in length between ·76″ and 1·01″, whilst the difference in the greatest and least breadth was even greater, the respective limits being ·79″ and ·54″. The average of the whole two hundred was ·93″ × ·68″.

This bird and the Bengal form are equally common in North Cachar and often keep one another company when they assemble in their immense flocks during the cold weather. Both species are semi-migratory in their habits and move from one part of the district to another, but the reason why they do so is not easy to give, for beyond the fact that they, like most other birds, are to be found higher in the hot weather than in the cold season, they seem to move about independently of food-supply or time of the year. Thus in the year 1892, about Gunjong itself, that is to say, about the centre of the district, both types were equally common. In 1891, during April, May and June, I did not come across a single Bengal bird, whereas in the previous year it was just the other way, and no Burmese birds were to be met with. Generally speaking, as regards distribution, the Burmese bird is the common form to the east, and, to the extreme south-east, may be said to be the only type obtainable, *M. bengalensis* only appearing there as a rare straggler. In the plains it is uncommon; some years a fair number may be seen, in other years none. To the north, towards the Assam Valley, I believe it never wanders, and to the west only very rarely. In the centre, as I have already said, it seems to wander backwards and forwards.

Strange to say, in spite of these birds being so much intermixed, I have never yet come across a distinct hybrid, nor have I ever found the two species pairing together, though I have on several occasions shot both male and female from a nest on purpose to find out whether such inter-breeding ever does occur.

They are I think the boldest birds I know. I have already mentioned a nest built in a pomegranate tree in my garden. This nest is visited by me every morning and evening, and my hand is inserted to find out if the eggs are hatched or not: whilst I am doing this the birds, if they are present—often they are both absent—sit close by and watch, and as soon as I go fly to the nest to see their eggs, and then go off without further fuss. Now, after having seen me so regularly, they show no excitement when I visit the nest, and appear to consider it a matter of course that I should do so. The third nest I mentioned was first found by a Naga *mali*, who took it out of the tree and brought it to me, but by my orders it was at once replaced, upon

which the birds, which had seen it taken, at once went back to it, and have since shown no desire to desert their eggs, which I expect to hatch out in a day or two. From what I have been able to observe, Bulbuls seldom lay an egg each day until they have completed their clutch; one day I think *generally* intervenes between each laying, and sometimes two days elapse between the depositing of the first and second egg, but not, I believe, between the succeeding eggs.

Like other Bulbuls of this genus, the Burmese Bulbul is a very quarrelsome bird, and the males often have most determined fights, though they seldom seem to injure one another as the birds of the genus *Chloropsis* so frequently do.

I have often observed this bird pursuing white ants on the wing, not merely taking short flights into the air, but hawking about very much in the same manner as the Drongo-shrikes. On one occasion I was witness of a most curious scene.

Just outside the rest-house I was stopping in at the time, an immense flight of white ants were rising into the air. On the ground, busily feeding, were frogs, lizards, *doves*, and squirrels; above them several Racket-tailed Drongos of both species were flying backwards and forwards to and from the trees on either side of the road, taking the ants as they flew; above them again these Bulbuls, together with other species, were hawking high into the air, in company with a pair of Red-billed Rollers, a few crows, and a solitary kite, whilst of course the common Drongos were present in swarms.

Molpastes bengalensis.

The Bengal Red-vented Bulbul.

Oates' "Fauna of B. I.," Vol. I., p. 271; *id.*, Hume's "Nests and Eggs," Vol. I., p. 174; Hume's Catalogue No. 461; Murray's "Avifauna," Vol. II., p. 37; Jerdon's "B. of I.," Vol. II., p. 93.

Description.—Differs from *M. burmanicus* in having the black of the head continued over the nape and sides of the neck as far as the upper back, and in having the lower breast much deeper, in colour a blackish-brown. The ear-coverts are of a decidedly darker brown.

Length about 9"; wing 4" to 4·3"; tail 3·9" to 4·3"; tarsus ·85", bill at front ·61"; from gape ·92".

These birds vary much in plumage, according to whether it is new or not. Birds just before moulting are much browner and the breast and back right up to the nape seem far more brown than black. If a bird in a moulting state is obtained it will be found that the new feathers, which are already fully developed, are much darker, besides having better defined grey edges, than the old feathers.

There is practically nothing to add to what I have already noted under the heading of the last species. I may, however, mention that I saw a nest this April (1892) in the garden of a friend in Silchar, which was evidently an old one just sufficiently repaired to make it serviceable. It was built in some trellis work, covered with creepers, and not more than two yards from the front door of the bungalow. Naturally, the nest was very frequently visited, shown to visitors, &c., and more than once I myself took the eggs from the nest to show people. The birds, however, did not at all object, and the young were hatched and reared in safety.

Neither this nor the last Bulbul are common above 4,000 feet, and this bird may be said hardly ever to ascend above that elevation, though *M. burmanicus* is found in small numbers up to nearly 6,000 feet.

Iole virescens.

The Olive Bulbul.

Oates' "Fauna of B. I.," Vol. I., p. 284; *id.*, "B. of B. B.," Vol. I., p. 177; Hume's Catalogue No. 452, *dee*; Murray's "Avifauna," Vol. II., p. 23.

Description.—Lores and short eyebrow olive-yellow; ear-coverts dark olive; remainder of head and upper plumage to the rump olive green; upper tail-coverts and the tail rather bright rufous-brown; sides of the neck olive-brown; whole under surface from chin to vent yellow, more or less suffused with olive-brown; under tail-coverts pale tan-colour; wings dark brown; the coverts and inner secondaries broadly, and the remaining feathers narrowly, edged with rufescent olive-brown.

Length 7·4″; tail 3·3″; wing 3·3″; tarsus ·7″; bill at front ·6″; from gape ·88″.

NIDIFICATION.—In 1891 I took four nests of this bird, and this year (1892) I have had one brought to me. All these nests are of the same type exactly, and a description of any one would answer equally well for any other of the five. In shape they are very nearly hemispherical, and they are far stouter, compacter, and, proportionately, bulkier nests than those of *Molpastes* or *Otocompsa*. Externally they average about 4·5″ in diameter, by about 2·2″ in depth, and internally they are about 2·5″ by 1·1″. The external materials consist principally of long, tough strips of the inner bark of some tree and a few scraps also of the outer bark, with these are to be found a few fine elastic twigs, and in four of the five nests a number of small dead leaves are also attached to the outside by means of coarse cobwebs and by a few of the longer materials being passed over and round them. The lining is of black fern roots and a quantity of long reddish fibres which look like the straight red tendrils of a common kind of convolvulus.

Three of the nests were placed between horizontal twigs, and another in a vertical fork formed by a whole cluster of twigs meeting, the fifth looks as if it had been built in a rather stout horizontal fork. They are semi-pendent in position, the supporting twigs being at about the centre of the nest; covered partly by the materials and also further strengthened with cobwebs. All my nests were found well in the interior of biggish forests, but there was no attempt made by the birds to conceal them. My first nest was taken near Diyungmukh, quite at the north of the district and practically in the plains. I was going along an elephant path through a forest with thin scrub undergrowth, when my attention was attracted by seeing a bird fly from a nest, which was on a branch crossing the track just in front of me. As the bird flew off I noticed its olive back and rufous tail, and when I saw the eggs I thought that they must belong to this species, so, as I could not get the bird, I took the nest and went on my way. The next day, in just the same sort of place, I came across another nest, also with three eggs in it; and this time having brought some black thread with me for the purpose, I set some nooses and retired behind a tree to await events. I had not been seated five minutes before the male returned and was at once caught, and before I could get up to take him the female was

also trapped. Two other nests were taken close by this place during the same month (May), and two other nests were brought to me, which could not, however, be identified with certainty.

Three clutches are all much alike, the ground-colour is a creamy-white, and the markings consist of small irregular blotches of rather light reddish and other underlying ones of pale lavender and pale brown. The primary markings are fairly numerous everywhere, and very numerous at the larger end where they form a broad ring, the spots here running into one another; the secondary spots are few in number and are scattered here and there over the whole surface.

A fourth clutch is the same in ground-colour, perhaps a rather deeper pink, and is thickly marked everywhere with purple, ranging from a dark reddish-purple to a colour so deep as to appear almost black; the underlying marks are of rather dark inky grey. The character of the marks range from specks and freckles to big blotches over ·2″ long by ·1″ broad. The general tint of all four of these clutches is rather bright.

The fifth clutch is the most boldly and brightly marked of all, resembling closely the last mentioned, but not having the smaller specks and freckles. All these eggs *can* be matched with eggs of *Molpastes*, but they are much brighter, handsomer eggs than 99 in 100 of that genus, and have a certain character of their own, though it is hard to express what it is in words.

They are I think stouter than most Bulbul's eggs (not *Criniger*) and they have a slight gloss. In shape they are rather broad ovals, somewhat compressed towards the smaller end, but not pointed. The fourteen eggs average ·87″ × ·58″ and vary in length between ·84″ and ·91″ and in breadth between ·56″ and ·60.″

This bird is very rare here, with the exception of in the low-lying forests to the extreme north, where it appears to be fairly common. It keeps entirely to the interior of the forest, preferring such as is rather thin as regards the tree-growth, but which has plenty of scrub undergrowth. I have noticed that its flight is quicker and far more level than most Bulbuls, but this is almost the only thing about it that I have observed: I have not heard its note even beyond the jarring cries made by such as had been caught in nooses; indeed, it appears

to be a most silent bird. I have never met with it over about 1,600 feet elevation, and only once as high as that.

Alucurus striatus.

The Striated Green Bulbul.

Oates' "Fauna of B. I.," Vol. I., p. 266; *id.*, "B. of B. B.," Vol. I., p. 187; *id.*, Hume's "Nests and Eggs," Vol. I., p. 169; Jerdon's "B. I.," Vol. II., p. 81; Hume's Catalogue No. 449; Murray's "Avifauna," Vol. II., p. 32.

Description.—Whole upper plumage and visible portion of the wings and tail olive-green, brownest on the crest, in some birds being here almost a dark hair-brown. The feathers of the crown have white striæ, which are broadest, and often yellowish, on the forehead, and narrowest on the longest crest feathers, where they become little more than a shaft stripe. Nape, upper back and scapulars broadly striated white, the striations becoming narrower towards the rump, and ceasing altogether on the upper tail-coverts; lores and chin yellow or orange-yellow; throat duller and lighter yellow; the feathers tipped dusky brown. Ear-coverts dark brown narrowly striated yellowish-white. Breast, sides of neck and flanks dark grey-brown, very broadly striated with yellowish towards the centre of the abdomen, the brown margins to the feathers become fainter and narrower and are absent in the centre, which is plain yellow; under tail-coverts yellow. Under surface of the tail yellowish-green. In many birds in abraded plumage the breast looks as if it was a merely yellowish-white with brownish black edges to the feathers from the dark part of the feathers becoming worn away and the lighter portion showing up in consequence more distinctly.

Bill dark horny, almost black; iridis Indian-red or reddish-brown; legs dark clear plumbeous.

Length 8·7″; wing 4·2″; tail 3·95″; tarsus ·65″; bill at front ·75″; from gape 1·05″.

The birds of this part seem to range in size between those of the East and West, but personally I have only seen one specimen of this bird taken elsewhere than in North Cachar. This, which was kindly sent me from the Indian Museum by Mr. Wood-Mason, is a bird (unsexed) from Darjeeling, and has a wing measurement

of 4·35". It is also a browner bird than most of those I have seen here.

I have been able to discover no difference whatsoever between the sexes.

NIDIFICATION.—Personally, I have taken two nests only of this species and have seen but two others, all of which were much alike in shape, materials, &c. Outwardly, all four nests were composed of fine elastic twigs and coarse fern roots, these materials being very strongly and closely interlaced with one another. Inside this are more twigs and roots, a few dead stems of weeds, and, in one case, a few scraps of a long fern moss; none of these are at all intertwisted, being merely wound round and round in the same manner as is the lining, which is composed entirely of very fine shreds of grass. The nests are fairly compact and rather stout, and measure externally from 3·8" to 4·2" in diameter by about 1·5" to 1·75" in depth, internally they measure about 3" by 1" or a little more.

In none of these nests was the light colouring of the materials, remarked on by Hume in the nest found by Mandelli, at all conspicuous. The first nest I took was found in a thick bush growing by the side of a path zig-zagging up a steep hill. The parent birds flew out of the bush on my approach and kept hovering about, calling very loudly, much in the way the common Bengal Bulbul does, but, in spite of my having noticed whence they flew, I was unable to find out the nest, and at last came to the conclusion that they had not begun to build. I therefore left the place and went on my way, but as I got to the turn of the path, just above the bush, one of the birds flew into it again, so I returned to have another search, and this time, noticing very carefully whence it flew, I succeeded in finding the prize. It was placed quite close to the ground, and, besides being hidden by numerous thick twigs and branches, was half buried in dead leaves and also concealed by a thick creeper which grew upon the bush. This nest was built in fairly thick forest with dense undergrowth, and the two nests which were brought to me were said to have been found in much the same kind of place. The fourth nest was taken from a clump of small bamboos growing in mixed scrub and bamboo jungle.

All the four nests were found in June 1888 and 1889, and were taken at a place between 5,000 and 6,000 ft. high.

One nest contained two young birds, the other three, each three eggs. One of these clutches was given away, I regret to say, before I took any measurements or noted their coloration.

The other two clutches were in ground-colour a very pale pinkish-white decidedly suffused with brown towards the larger end. The primary markings consist of rather bold spots and small blotches, ranging in colour from a dark reddish-brown to a very deep purple, and are scattered rather sparsely over the whole surface forming an indistinct ring towards the larger end. The secondary marks consist of spots, specks and irregular blotches of pale grey and neutral tint, and in addition to these are a good many indistinct smears and blotches of pale vandyke-brown. About the larger end, in four eggs, there are one or two very long but extremely fine hair-like lines, in colour a purple black or clotted blood-colour.

The three eggs I gave away were, if I remember rightly, less brown in their general appearance, and they were also different in shape, being somewhat lengthened ovals, whereas my other eggs are all rather broad ovals, but little compressed towards the smaller end.

The texture is fine and close, but exhibits no gloss. It is very fragile. The largest of the six eggs measured is ·86″×·65″; the smallest ·82″×·60,″ and they average ·84″×·63.″

This bird is here found in but few localities, and is rare even in those few. I have but once seen it in the cold season, when I observed about a dozen birds together in a clump of small saplings and bushes; they kept close to one another and moved about very continuously and rapidly from one sapling to another, not visiting at all the few big trees that were close by. During the rains and hot weather, all the birds I have seen, whether in pairs only or in small flocks, were scuttling and dodging about in the thick scrub jungle and appeared to have deserted the higher trees altogether. When disturbed in scrub jungle they do not fly for any distance, but take short flights from one bush to another until they consider themselves safe, very much in the manner of many Babblers. They are, however, capable of long flights, and are, I think, stronger on the wing than most members of this sub-family, and their flight also is very fairly steady. Their principal note is the "loud mellow warble" mentioned by Jerdon, but my experience does not prove that it is often

used, for I have found them to be very silent birds, probably because I have not observed them in the cold weather. Their other cries are not unlike the less harsh sounds made by *Hypsipetes*, and, when angry or frightened, they utter, as already mentioned, a cry almost exactly like that of *Molpastes pygæus*.

I have never observed this bird below 4,500 feet, and seldom as low as that.

THE BUTTERFLIES OF THE CENTRAL PROVINCES.

By J. A. Betham.

Part VI.

(Concluded from Vol. VI., page 331.)

FAMILY V., HESPERIIDÆ.

We now come to the family known scientifically as the *Hesperiidæ*. They are commonly called "Skippers," the name being given them evidently because of their jerky method of flight. They are generally rather small butterflies of dingy colours, and are sometimes crepuscular in their habits; many of them are found resting in dark, secluded spots during the day. These are more active towards the evening and in the early morning when they issue forth to sip the nectar of flowers. During the day, if disturbed, they do not, as a rule, fly far; but after a few turns in the air settle again; most of the species, however, fly about in the bright sunshine. Their flight is extremely rapid and it is very difficult to follow their movements. Some of them rest with their wings outspread; but most of them fold their wings upright over their backs when resting, while a few rest with the forewings raised and the hindwings flat or nearly so. Some rest on the ground and on stones, others on the upper surface, and others again on the under surface of leaves; these latter nearly always with wide outspread wings. The number which will be found after the specific name of each butterfly is that given in *Hesperiidæ Indicæ* by Lieut. E. Y. Watson, M.S.C., in which book they are fully described.

Badamia exclamationis, Fabricius (1). This is a plain brown butterfly with long narrow wings, which are paler on the underside. It has three transparent yellowish spots on the forewing. The body is dark brown with pale bands to the abdomen. This butterfly flies very fast and settles with wings upright on the undersides of leaves, and is often crepuscular in its habits.

Bibasis sena, Moore (17). I have only one specimen of this handsome "Skipper" taken some years ago at Pachmarhi. It is chiefly remarkable from the wings being bordered with red. The underside of the hindwing has a conspicuous white band crossing it transversely.

Parata chromus, Cramer (18). This is a very dark brown "Skipper" looking almost black. The underside in the male has a purple gloss, and is crossed by a whitish band. The female is paler than the male, and has three semi-transparent spots on the forewing. It flies very rapidly, is often crepuscular in its habits, though frequently seen in the day-time feeding on strongly scented flowers like the pomelo, orange and lime blossom. When at rest it folds its wings upright over its back and settles sometimes on the underside of leaves.

Parata alexis, Fabricius (19). This closely resembles the last, but is smaller and has a broader white band on the underside of the hindwing. Its habits are very similar.

Matapa aria, Moore (23). This is a pale brown "Skipper" remarkable for its red eyes. I took it at Pachmarhi, chiefly near streams and close to waterfalls. These seemed to be its favourite haunts, and it delighted to flit about where the spray of the water fell, apparently revelling in the soft moist atmosphere of the Khuds caused by the falling water.

Baoris oceia, Hewitson (33). A dark brown "Skipper" with a few pale yellow semi-transparent spots on the forewing. The male has a tuft of long, dark brown hairs, like a miniature paint brush, on the upperside of the hindwing.

Chapra mathias, Fabricius (35). This is the very common little pale brown "Skipper" with pale yellow semi-transparent spots on the forewing, met with nearly all over India. It affects the brightest sunshine as well as the deepest shade. It generally rests with the forewing raised and the hindwing flat.

Parnara guttata, Bremer and Grey (41). This has been known generally as *P. bada*, but Mr. Elwes considers these two are one and the same species. It resembles the last mentioned "Skipper" very much; but the males have not the glandular streak on the forewing which is present in the genus *Chapra*.

Parnara bevani, Moore (44). Extremely like the last and difficult to distinguish from it; but in this the hindwing is devoid of spots, while in *P. guttata* there is a row of four small semi-transparent spots.

Parnara plebeia, de Nicéville (50). This very much resembles the last in shape, but is larger and of a darker brown.

Suastus gremius, Fabricius (66). This looks very much like *C. mathias*, but the underside is grey instead of pale brown, and the spots on the underside of the hindwing are black instead of being pale yellow and semi-transparent. It is very common and has the same habits as *C. mathias*. The larva feeds on the date-palm.

Sarangesa purendra, Moore (71). A dark glossy-brown looking "Skipper" with numerous semi-transparent spots and marks on the wings. The border of the wings is alternately brown and grey. It rests with its wings extended, chiefly on rocks and stones; but frequently on the upperside of leaves. If disturbed it goes off with a rapid flight; but invariably returns to the same spot, or one close by, so that it is easily captured.

Sarangesa sati, de Nicéville. This is not described in Mr. Watson's book. It is smaller than its relatives, and the spots on the upperside are very minute or scarcely discernible.

Telicota augias, Linnæus (74). A yellow and black "Skipper," fairly common in most places. It rests with the forewing raised and the hindwing flat.

Telicota bambusæ, Moore (75). Very similar in appearance and habits to the above; but with the yellow markings deeper and darker and not carried out to the outer margin along the veins, as in the last species, on the upperside of the forewing.

Padraona dara, Kollar (78). Very like the two preceding, but with the yellow markings broader. It is also a very much smaller insect.

Padraona palmarum, Moore (83). The yellow markings in this "Skipper" are paler than the above and it is altogether larger.

Ampittia maro, Fabricius (84). Similar to the above, the yellow markings being paler and much broader, so that it looks quite yellow while flying. It is also a much smaller insect than *P. dara* or *P. palmarum*.

Taractrocera mævius, Fabricius (86). A paler edition altogether of the above lot of "Skippers."

Isoteinon vindhiana, Moore (122). Perhaps the same as *I. nilgiriana*, Moore (123). A tiny dark brown "Skipper" with a few white spots on the forewing on the upperside. It is very fond of dark, shady spots.

Satarupa bhagava, Moore (129). The ground-colour of the wings of this "Skipper" is a dark brown, and the hindwing has a broad white band across it which extends into the forewing, at the apex of which there is a band of white spots. The white band on the hindwing is bordered with black spots, and there are two or three black spots on the band itself towards the upper portion. Its face, as one might say, is yellow. I found it at Pachmarhi and nowhere else.

Tagiades ravi, Moore (135). A large dark brown "Skipper" with some white spots on the forewing. The underside of the hindwing is greyish-white. This "Skipper" rests on the underside of leaves with its wings extended flat. It has a remarkable way of disappearing, for in its flight it is very conspicuous on account of the contrast between the colouring of the upper and undersides; but as soon as it settles down it is out of sight, and to secure it requires good eyesight and patient search.

Abaratha ransonettii, Felder (148). The wings of this "Skipper" have a tessellated appearance from the presence of numerous white and pale brownish-yellow spots. The hindwing is prettily curved and angled. It rests on the underside of leaves.

Abaratha syrichthus, Felder (150). Altogether a paler insect than the above with wings having a more regularly tessellated appearance. It rests on the ground or on rocks with wings extended flat. It also delights in sipping the moisture from muddy and damp spots so often found on the roadside.

Coladenia tissa, Moore (168). A handsome "Skipper" with brown wings marked with white, black and orange spots. It rests with wings extended flat, and is common in Jabalpur after the rains. It delights in rather shady spots.

Udaspes folus, Cramer (176). A rather large dark brown "Skipper" with conspicuous white spots on both wings. The hindwing on the underside has a rich brown patch as well as a white one. It rests on the ground usually with forewing raised upright and the hindwing flat. In common with many other "Skippers" it gives a circular sort of motion to its hindwing while resting.

Notocrypta restricta, Moore (180). This butterfly resembles the last very much in habits. The white spots on the forewing are, however, differently arranged, the inner ones are replaced by a pure

white band, while those between the band and the apex of the wing are much smaller, the one nearest to the front margin being at right angles to it, and the two below this being smaller and following the direction of the outer margin of the wing; there is also another small spot, rather like a streak, between these two spots and the white band. The hindwing is spotless and of the general ground-colour, which is a rich brown. On the underside the spots on the forewing are reproduced, and there is a greyish band between them and the outer margin, the hindwing has two similar greyish bands running across it. The cilia or fringe of the wings is grey in the hind, and brown in the forewing. The antennæ, just below the clubbed tip, have a white band around them.

Celænorrhinus leucocera, Kollar (192). A large dark "Skipper" with a number of white transparent spots forming a band on the forewing, and some yellow ones on the hindwing. The shaft of the antennæ, in the male only, is snow-white above, hence its name. This and the next are very similar in appearance, but this species rests with its wings flat, while *Notocrypta* rests with them closed over the back. They are fond of dark and shady places, and frequently settle on the walls of verandahs, stables and outhouses in the localities where they are found. They are distinctly crepuscular in their habits.

Celænorrhinus ambareesa, Moore (195). The spots on the forewing of this "Skipper" are pale yellow instead of white, and there are besides some yellow spots which are not transparent on the forewing. It is very similar in appearance and habits to the foregoing.

Astictopterus salsala, Moore (208). A small dark brown "Skipper" with a very few minute spots. The underside is of a rich chestnut-brown.

Hesperia galba, Fabricius (220). A very small black and white "Skipper" common almost everywhere. It skips and flits about the grass like a little moth, and affects the bright sunshine.

I have now finished with all the species of butterflies that are found in these parts except one. This is *Melanitis zitenius* which looks like an enlarged edition of *Melanitis ismene*. It was sent to me by a man collecting for me in Bastar. Should I come across any species not hitherto mentioned in this series of papers, I will record the fact in the pages of this Journal.

LES FORMICIDES DE L'EMPIRE DES INDES ET DE CEYLAN.

Par Auguste Forel,
Professeur à l'Université de Zürich.

Part II.

SUITE AU GENRE CAMPONOTUS, MAYR.

1. Sous-genre Camponotus sens. strict., Mayr.

22. *C. Wroughtonii*, nov.-sp.

☿ *minor*:—L. 5·5 à 6·5 mill. Mandibules armées de 5 dents, luisantes, abondamment ponctuées. Du reste très-semblable à la race *æthiops* (Latr.) du *C. maculatus*. Epistome subcaréné, n'ayant devant qu'un lobe assez peu développé, arrondi, entier au milieu de son bord antérieur. Arêtes frontales plus divergentes que chez le *C. æthiops*. Tête nullement rétrécie derrière les yeux, même un peu plus large derrière que devant. Face basale du métanotum fort convexe, ce qui le distingue aussi du *C. æthiops*; mais elle est moins séparée de la face déclive que chez le *C. marginatus*. Ecaille biconvexe, basse, assez tranchante à son bord supérieur. Tibias tout-à-fait cylindriques, sans petits piquants à leur bord interne.

Très luisant et très faiblement chagriné partout, même sur le devant de la tête. Ponctuation éparse, superposée, presque nulle, sauf une petite fossette peu apparente de chaque côté des bords antérieur et postérieur de l'épistome.

Quelques poils d'un jaune brunâtre sur l'abdomen et sur la tête. Pilosité presque nulle ailleurs, nulle sur les tibias, les scapes et les joues. Pubescence adjacente très courte et extrêmement diluée, même sur les tibias et les scapes où elle est fort peu apparente.

D'un noir brunâtre luisant; thorax, scapes et hanches d'un brun foncé ou noirâtre. Mandibules, devant de la tête, funicules et pattes d'un rouge brunâtre. Segments de l'abdomen largement bordés de jaune.

♂ :—L. 5·3 à 5·8. Mill. Tête élargie derrière. Un sillon médian antérieur et deux sillons latéraux postérieurs sur le mésonotum. Subopaque, densément reticulé; abdomen assez luisant. Ailes grandes, teintées de brun-noirâtre. Nervures et tache marginale

brunes. Pilosité et pubescence comme chez l'ouvrière. Entièrement noir.

Himalayas, à 9000′ de hauteur. Récolté par M. Smythies.

Dans le tableau analytique (Part I) sous le chiffre 7, à côté du *C. reticulatus*, mais :—" Luisant. L. 5·5 à 6·5. mill. Faiblement " chagriné. Epistome lobé, entier. Tibias sans piquants."

23. *C. marginatus* (Latr.)

Var. *himalayanus*, n. var.

☿ :—L. 7 à 10 mill. Noir avec les funicules, les tibias et les tarses brunâtres ; les hanches et les cuisses d'un jaune roussâtre vif.

Cette variété diffère de la forme typique d'Europe par sa grande taille et sa couleur. Certains exemplaires de Japon sont presque identiques.

Dans le tableau analytique on la placera à côté du *C. Wroughtonii* (Chiffre 7) mais on mettra :—" Epistome fortement échancré au " milieu de son bord antérieur, sans lobe ; tibias armés de quelques " piquants à leur bord interne."

7. *C. reticulatus* (Roger.)

Var. *latitans*, n. var.

☿ :—D'un brun jaunâtre ou d'un jaune brunâtre assez homogène partout ; bord des segments abdominaux jaunâtre. Pilosité blanchâtre, assez abondante sur la tête, les scapes et le thorax. Métanotum assez distinctement concave dans le sens longitudinal (impression transversale). Tête de la ☿ major seulement un peu plus longue que large, épaisse, faiblement subtronquée devant, tendant à la forme du soldat des *Golobopsis*. Epistome seulement un peu plus large devant que derrière, échancré au milieu de son bord antérieur. Les angles inférieurs—postérieurs du pronotum sont prolongés en lobe arrondi, un peu translucide. Les antennes de la ☿ minor sont beaucoup plus longues que celles de la ☿ major.

Ceylan (Major Yerbury) ; nid dans une tige creuse.

race : *Yerburyi*, n. st.

☿ *Major* :—Tête rectangulaire, bien plus longue que large, subtronquée devant, à côtés non, ou à peine, convexes (distinctement convexes chez la variété *latitans*) et avec le bord antérieur aussi

large que le bord postérieur qui est excavé. Epistome aussi large derrière que devant. Sur la tête de grosses fossettes superposées plus distinctes et bien plus abondantes que chez le *reticulatus*, var. *latitans*. Derrière de la tête, thorax et abdomen assez luisants, avec une sculpture bien plus faible que chez le *reticulatus*, var. *latitans*, réticulée sur les premiers, ridée transversalement sur l'abdomen. Métanotum et pilosité comme chez la variété *latitans*, mais les tibias ont quelques poils dressés.

Noir, pattes et scapes brunâtres; mandibules, bord antérieur de la tête et funicules rougeâtres. Extrémité des hanches, anneaux fémoraux, extrémité des tarses et bord des segments abdominaux, jaunâtres. L. 3·3 à 5·3 mill. comme la variété *latitans* du *reticulatus* à laquelle il est du reste identique.

Ceylan (Major Yerbury).

Le *C. reticulatus* appartient au groupe *novogranadensis*, *fastigatus*, etc. Il est court et robuste. La ♀ minor de la race *Yerburyi* a les mêmes particularités que la ♀ major, avec les attributs de la ♀ minor.

21. *C. maculatus* (Fab.)

race : *dichrous* (Forel.)

Forme typique, distincte de la variété *Kattensis*. M. Smythies l'a trouvé dans le Bas Himalaya où jusqu'ici la variété *Kattensis* seule avait été trouvée.

race : *thraso*, n. st.

♀ *Minor* et *submedia*. L. 4·5 à 6·5 mill. Ressemble beaucoup à la ♀ *minima* [illegible] *compressus*, dont il a exactement la pilosité, la pubescence, et presque la sculpture et la couleur. Ressemble aussi à la ♀ *minor* du *C. mitis*, var. *fuscithorax* dont il a la forme. Mat, densément réticulé; abdomen subopaque, densément ridé; fond de la sculpture granulé. Dents des mandibules courtes, souvent usées. Ecaille comme chez le *mitis*. Tibias nullement prismatiques, à peine comprimés, sans aucun piquant à leur bord interne. Tête non rétrécie derrière les yeux, à bord postérieur distinct. D'un noir brun; funicules, mandibules et devant de la tête rougeâtres.

Pattes brunes. Epistome comme chez le *C. mitis*. La ♀ *major* est probablement plus petite que celles du *mitis*.

Ceylan (Major Yerbury).

race : *Taylori* (Forel).

var. *infuscoïdes*, n. var.

♀ *Minor* et *submedia* :—L. 4·7 à 5·5 mill. Pattes plus longues que chez le *Taylori* typique. Noir luisant, avec les pattes et les scapes brunâtres, les tarses et les funicules jaunâtres. La forme plus svelte que chez le *Taylori*, le rapproche de l'*infuscus*. C'est une forme intermédiaire.

24. *C. nirvanæ*, n. sp.

♀ *Major* :—L. 6·2 mill. Mandibules courtes, obtuses, armées de 5 à 6 dents, mates ou subopaques extrêmement, finement et densément réticulées-ridées, presque sans ponctuation. Tête rectangulaire, bien plus longue que large, subtronquée devant, comme chez le *C. reticulatus*, race *Yerburyi*, mais un peu plus large derrière que devant, assez fortement échancrée derrière. Yeux situés au deux cinquièmes postérieurs des côtés de la tête. Epistome rectangulaire-arrondi, plutôt plus étroit devant que derrière, presque sans portions latérales, aplati, sans carène, ni lobe, ni échancrure devant. Arêtes frontales longues, distinctes et très divergentes. Les scapes n'atteignent pas les angles postérieurs de la tête. Thorax large, subdéprimé en dessus, sans échancrure, mais avec les sutures fortement imprimées. Face basale du métanotum subbordée, rectangulaire, un peu plus longue que large ; face déclive obliquement tronquée, un peu concave, subbordée comme chez le *C. reticulatus*. Ecaille très basse, très large, deux fois aussi large que haute à bord supérieur obtus, transversal ; épaisseur mediocre. Pattes courtes.

Assez densément réticulé et subopaque ; occiput et vertex plus faiblement réticulés, assez luisants. Abdomen luisant, chagriné. Devant de la tête un peu plus fortement réticulé-ponctué. Quelques grosses fossettes, irrégulières sur l'épistome et très peu sur les joues.

Pilosité dressée jaunâtre très éparse, très courte et un peu obtuse ; une rangée de poils entre les deux faces du métanotum. Tibias et scapes sans poils dressés, sans piquants, avec une pubescence adjacente diluée, très fine, qui est encore plus éparse ailleurs.

Rougeâtre, abdomen noir. Mandibules et bord antérieur de la tête d'un brun foncé. Ecaille, hanches et cuisses brunâtres.

☿ *Minor*:—L. 4·8 mill. Epistome convexe, assez distinctement caréné, légèrement échancré devant, au milieu, sans lobe, beaucoup plus large devant que derrière. Tête plus large derrière que devant où elle est très obtuse. Scapes longs, dépassant les angles postérieurs de la tête de plus d'un quart de leur longueur. Pronotum subépaulé, avec une impression longitudinale médiane. Dos du thorax plus déprimé que chez la ☿ *major*. Mésonotum et face basale du métanotum très distinctement subbordés. Cette dernière plus allongée que chez la ☿ *major*.

Du reste comme la ☿ *major*, mais la pilosité est plus longue et pointue et la couleur plus foncée. Tête et thorax d'un brun foncé; scapes, base des funicules et pattes d'un brun jaunâtre. Sculpture de la tête plus faible que chez la ☿ *major*. Epistome presque sans gros points enfoncés. Mandibules comme chez la ☿ *major*, mais plus étroites.

♀ :—L. 7·8 à 8 mill. Comme la ☿ *major*, mais les mandibules ont en outre une ponctuation espacée assez distincte et les joues par fois des fossettes plus distinctes. Mésonotum densément réticulé-ponctué et mat. Métanotum fort convexe. Couleur assez semblable à celle de la ☿ *major*, mais le devant de la tête et le scutellum rougeâtres et l'abdomen d'un brun roussâtre plus clair que chez les ouvrières. Ailes subhyalines, un peu jaunâtres. Nervures et tache marginale d'un jaune pâle. Du reste comme l'ouvrière.

Les ♀ proviennent de Kanara (M. Wroughton), une ☿ *minor* de Poona (M. Wroughton) et une ☿ *major* de l'Inde, sans localité particulière indiquée. Malgré ces différentes provenances, je crois être certain qu'elles appartiennent à la même espèce. Le *C. nirvanæ* est voisin du *C. varians* (Roger), mais plus grand, avec une sculpture différente, sans échancrure thoracique. L'écaille est toute autre. Dans le tableau il doit être placé sous le chiffre 3, à côté du *C. varians* avec les différences indiquées.

C. Lamarckii (Forel).

Une ☿ major à pubescence un peu plus courte

Kanara (M. Bell).

2. SOUS-GENRE COLOBOPSIS (MAYR).

Tableau des espèces de la faune de l'Empire des Indes et de Ceylan (☌, ☿, ☿).

1. La partie de l'épistome située dans la surface tronquée chez la ☿ et le ☌ est fortement rétrécie d'arrière en avant et s'élève au dessus des côtés de l'épistome; pas de carène médiane. Thorax des ☿ et des ☌ avec une profonde échancrure méso-métathoracique. Troncature de l'épistome faible, à peine subbordée ..... *C. angustata* (Mayr).

   La partie de l'épistome située dans la surface tronquée chez la ☿ et le ☌ est faiblement ou pas rétrécie d'arrière en avant, pas plus élevée que les côtés de l'épistome. L'épistome a en général une carène médiane. Thorax des ☿ et des ☌ sans échancrure distincte, seulement avec des sutures marquées. Troncature de l'épistome forte, bordée d'une arête aiguë 2

2. Taille petite. Le devant de la tête du ☌ et de la ☿, derrière la troncature, et densément est assez finement ridé-réticulé; ☌ distinct de la ☿ ..... *C. Rothneyi*, n. sp.

   Taille assez grande. Le devant de la tête du ☌ et de la ☿, derrière la troncature, est très grossièrement strié-ridé; les rides sont distantes et longitudinales. Des individus formant le passage de la ☿ au ☌ 3

3. Noir. Une épaisse pubescence jaunâtre formant duvet ..... *C. pubescens* (Mayr).

   Rougeâtre. Pubescence beaucoup plus courte et plus diluée, ne formant pas duvet ..... *C. Saundersi* (Emery).

Liste des *Colobopsis* de l'Inde avec description des espèces nouvelles, synonymie et géographie.

1. *C. Rothneyi*, n. sp.

☌ :—L. 4 mill. Plus petite que la *C. truncata* (Spinola) d'Europe à laquelle elle ressemble beaucoup, et dont elle diffère par les caractères suivants :

Mandibules subopaques, finement et densément ridées-réticulées, sans points enfoncés épars. Epistome fortement caréné au milieu et plus fortement rétréci devant, sur la troncature; sa portion postérieure à la troncature est moins de deux fois aussi large que longue et

divisée en deux par un sillon médian. Yeux situés un peu plus en avant et un peu plus grands. Scapes un peu plus courts, n'atteignant pas les angles postérieurs de la tête (les dépassant un peu chez la *C. truncata*). Thorax plus large, plus court, mais rétréci derrière. Mésonotum beaucoup plus large que long (aussi large que long chez la *C. truncata*). Troncature de la tête assez grossièrement réticulée à peu près comme chez la *C. truncata*. Devant de la tête, derrière la troncature, assez mat, finement et densément réticulé-ponctué, avec des rides longitudinales assez fines, assez serrées et irrégulières, un peu plus grossières sur les côtés. Chez la *C. truncata* cette partie de la tête est simplement grossièrement réticulée. Le reste du corps est finement chagriné ; derrière de la tête et thorax un peu plus réticulés et moins luisants que chez la *C. truncata*.

Pilosité presque nulle ; les poils courts et obtus de la tête de la *C. truncata* font entièrement défaut.

Abdomen d'un noir brunâtre sans tache, avec le bord des segments jaunâtre. Le reste du corps d'un jaune rougeâtre un peu plus clair que chez la *C. truncata*.

♀ :—L. 7 mill. Plus grande relativement au ♃ que chez la *C. truncata*. Tête plus allongée. Métanotum un peu plus convex. Ailes subhyalines, à peine un peu jaunâtres. Nervures et tache marginale pâles. Du reste comme le ♃, c.a.d. comme la *C. truncata* ♀, avec les mêmes différences que chez le ♃

Barrackpore (M. Rothney) un ♃

Orissa (M. Taylor) une ♀.

2. *C. angustata* (Mayr).

♀ :—L. 9·2 mill. : correspond du reste à la description de Mayr.

Barrackpore (M. Rothney).

Var. *Siggii*, n. var.

♃ :—L. 5·3 à 5·8 mill. Mandibules armées de 6 dents. Tête à côtés convexes, un peu plus large derrière que devant, un peu plus longue que large, à troncature assez faible et seulement subbordée tout-à-fait comme chez la ♀. Pronotum et mésonotum formant ensemble une forte convexité. Une profonde échancrure entre le mésonotum et le métanotum. Face basale du métanotum plutôt

étroite, convexe longitudinalement et transversalement, s'élevant en arrière où elle est abruptement tronquée et presque bordée. Face déclive concave, bordée latéralement et presque bordée en haut, subverticale. Ecaille fort mince, assez tranchante, assez élevée, largement et faiblement échancrée à son bord supérieur. Pattes et antennes plutôt courtes. Yeux situés au quart postérieur des côtés de la tête.

Lisse, très luisante, faiblement chagrinée. Ponctuation très éparse, un peu plus forte et plus abondante derrière la troncature, sur les côtés.

Une pilosité dressée assez courte, fine, pointue, d'un jaune roussâtre, abondante sur les pattes, sur les scapes et sur le corps. Pubescence presque nulle.

Noire. Mandibules, devant de la tête et front rougeâtres. Scapes, hanches et cuisses brunâtres. Funicules, tibias et tarses d'un brun rougeâtre ou roussâtre. Segments abdominaux faiblement bordés de jaunâtre.

♀ :—L. 3·8 à 4·2 mill. Mandibules armées de 5 dents. Tête obtuse, mais sans troncature. Epistome grand, fort convexe, bien plus large devant que derrière, subcaréné, à bord antérieur légèrement convexe et un peu avancé au milieu. Tête bien plus large derrière que devant. Métanotum comme chez le ♀, mais plus étroit et avec la face déclive à peine subbordée. Ecaille un peu plus convexe devant et moins échancrée en haut que chez le ♀. Noire; scapes et pattes bruns; mandibules, funicules et tarses d'un brun roussâtre. Du reste comme le ♀, mais la pubescence un peu plus accentuée.

Bangkok (M. H. Sigg, de Zürich.)

Cette ♀ et ce ♀ sont-ils bien la *C. angustata* ? La conformation de la tête du ♀ me le fait croire avec une probabilité voisine de la certitude. Cependant la pilosité plus courte et plus abondante ainsi que la couleur plus foncée me font admettre qu'il s'agit d'une variété particulière.

3. *C. pubescens* (Mayr).

Camponotus Leonardi (Emery).

Birmanie (Major Bingham).

Tenasserim et Birmanie (Feu, d'après Emery).

4. *C. Saundersi* (Emery).

Tenasserim (Fea, d'après Emery).

Se trouve aussi à Sumatra. Le ♃ a la tête très élargie devant, fortement tronquée et avec un bord très aigu, ce qui est aussi le cas chez la ♀, ainsi que chez le ♃ et la ♀ de la *C. pubescens*; mais chez cette dernière espèce le bord de la troncature est moins élevé et plus obtus.

5. * *C. stricta* (Jerdon).

Malabar (d'après Jerdon).

D'après Mayr (Syn: Brit: Museum, 1886), la *Formica stricta* (Jerdon) est une *Colobopsis*. D'après Jerdon cette espèce aurait le métanotum bidenté. Mais comme il est impossible de savoir, ni par Jerdon, ni par Mayr, les caractères de la tête, ni même s'il s'agit d'un ♃ ou d'une ♂, je n'ai pu placer cette espèce dans le tableau synonymique.

6. *C. Cotesii*, n. sp.

♂:—L. 4·3 mill. Mandibules avec le bord externe fortement convexe près de sa base, plus étroites que chez la *C. truncata*. Tête presque aussi large que longue, subtronquée devant, avec le bord antérieur droit. Epistome grand, large, faiblement caréné, convexe vers le haut. Une impression longitudinale sur le front, jusqu'au vertex. Tête un peu plus large derrière que devant. Suture pro-mésonotale fortement imprimée. La partie antérieure du mésonotum forme, vue de profil, avec la partie postérieure du pronotum une surface bien plus faiblement convexe que le devant du pronotum et le derrière du mésonotum. Une forte échancrure entre le mésonotum et le métanotum. Métanotum étroit; sa face basale très étroite, fortement convexe transversalement, faiblement convexe longitudinalement, aussi longue que le pronotum et assez horizontale, passe par une courbe forte et rapide à la face déclive qui est bien plus courte qu'elle et très abrupte, à peu près subverticale, mais nullement bordée. Ecaille épaisse, fortement convexe devant, plane derrière, à bord obtus et large, échancrée au sommet comme chez la *C. truncata*, mais plus épaisse au sommet.

Finement réticulée ou réticulée-ridée et subopaque ou [illegible] luisante. Abdomen faiblement chagriné et luisant. [illegible] de la tête finement réticulé-ponctué. Mandibules densément et finement

ridées. Presque glabre. Quelques poils épars assez longs sur la tête et l'abdomen. Pubescence presque nulle, très espacée sur les tibias et les scapes, qui n'ont pas de poils dressés.

D'un brun foncé, un peu rougeâtre. Abdomen noir, avec deux taches allongées d'un jaune roussâtre à sa base. Mandibules d'un jaune roussâtre. Devant de la tête et scapes d'un rougeâtre foncé. Base des funicules, tarses, et tibias d'un brun jaunâtre.

Mussoori Hills (M. Rothney).

Ne connaissant ni le ♃ ni la ♀, je ne l'ai pas intercalée dans le tableau. Le ♃ a probablement la tête fortement tronquée. Cette ♀ est suffisamment distincte de toute les autres espèces par sa tête courte et subtronquée, l'échancrure du thorax, la forme du métanotum, les mandibules, etc. Elle ressemble à la *C. impressa* (Roger), mais le métanotum est plus long, l'écaille plus haute, et la taille plus grande.

NOTES ON A VISIT TO THE ISLANDS OF RODRIGUEZ, MAURITIUS AND RÉUNION.

By Rear-Admiral W. R. Kennedy.

(*With a Plate.*)

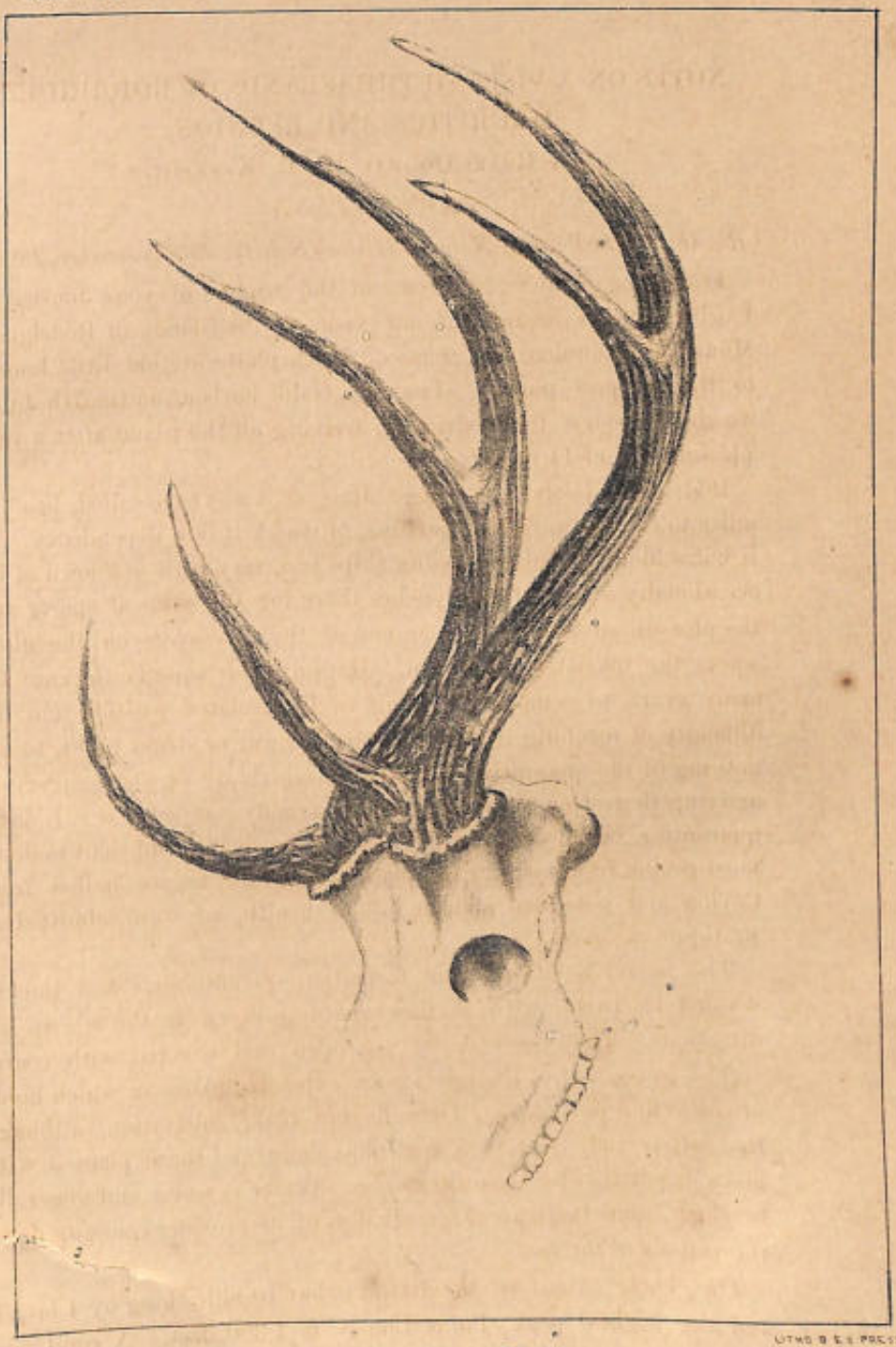
(*Read before the Bombay Natural History Society, 29th November, 1892.*)

It may be of interest to some of the readers of your Journal if I give you an account of our visit to the islands of Rodriguez, Mauritius, Réunion, etc., some of which places are but little known to the general public. Leaving Galle harbour on the 7th June, we shaped course for Rodriguez, arriving off the island after a very pleasant sail of 11 days.

Rodriguez Island, or Diego Rais, as it was once called, lies 320 miles to the eastward of Mauritius, of which it is a dependency. It is but seldom visited by passing ships and very little is known of it; occasionally a man-of-war touches there for the sake of sport, and the pleasure of a run ashore on one of the few spots on the globe where the tourist is unknown. Happily this must be the case for many years to come, on account of its isolated position and the difficulty of reaching it, except by man-of-war or steam yacht, to say nothing of the quarantine regulations which are very strict; vessels arriving there from Mauritius are invariably subjected to 21 days' quarantine, be they ever so healthy. This alone is sufficient to deter most people from visiting the place. However, as we hailed from Ceylon and possessed a clean bill of health, we were admitted to pratique at once.

The island is of volcanic formation, mountainous and thickly wooded in parts, with ravines running down to the sea in all directions. The lower slopes are open and covered with coarse yellow grass, and in the interior are extensive plains in which herds of cattle find pasturage. There is but little cultivation, although the soil is rich, merely a few plots here and there planted with maize or potatoes for the owner's use. Water is scarce and generally brackish, but there are a few rivulets of sweet water coursing down the valleys to the sea.

The whole extent of the island is but 10 miles long by 4 broad, and the highest peak, Point Limon, is 1,300 feet. A coral reef



HEAD OF RODRIGUEZ STAG.

Killed by Rear-Admiral W. R. Kennedy.

Extreme length of horn ...	... 34"
Brow antler...	... 14"
Upper tine	... 14"
Span	... 24½"

Weight of body when cleaned 16 [illegible]lb.

surrounds the island, but an opening in the reef on the north side allows a vessel to find a secure anchorage in Port Maturin. This is the lee side, as the S.-E. trade blows regularly all the year round. An inner reef fringes the shore on all sides, leaving a shallow passage for "piroques," but the navigation is at all times difficult and often dangerous.

To the sportsman, the naturalist and geologist, Rodriguez offers unusual attractions. In the old forests herds of deer roam unmolested, save from naval officers in their rare visits to the island. These deer were originally introduced some thirty years ago, when a pair were landed from Borneo and subsequently another pair from Mauritius. These have done well, and at the present day probably from 1,500 to 2,000 deer exist on the island, some of the stags being as much as 20 stone in weight, and carrying fine heads. Guinea fowl are numerous, but difficult to bag, owing to the rocky nature of the soil making sport a severe toil. Partridges abound, also wild pigs, cats, goats, and rabbits on the small islets round the coast.

The climate is similar to Mauritius, and very pleasant during the winter months, May till September. It is also very healthy. The population is about 1,500, mostly creoles of Mauritius, speaking a French *patois*.

Fruits of many kinds peculiar to the tropics are abundant. Mangos, guavas, oranges, limes, citrons, bananas, etc., and in the woods may be found wild raspberries, and of vegetables, quantities of chillies, sweet potatoes, pumpkins, yams, sugar-cane, maize, etc. The waters are teeming with fish of excellent quality, and turtle visit the island in the breeding season.

In Oyster Bay are some basaltic columns, nearly 200 feet high, and on the south side are numerous caverns, similar to those in Bermuda and other coral islands. In fact, the island is largely composed of coral, bearing evidence of having been up-heaved from the ocean by volcanic agency at a remote period. No active volcano exists at the present time.

During our stay of 8 days we organized several "châsses" with very satisfactory results, our sportsmen bagging 30 deer, amongst them some fine stags, also guinea fowls, partridges and rabbits.

One splendid stag, which I had the good fortune to kill, weighed 19 stone 3 lbs. (clean) and carried a splendid head, another was bagged by one of our officers, with a very remarkable malformed head. I enclose a sketch of the former. Others were in the velvet, showing, what I have often observed in hot climates, that animals and birds breed at all times of the year.

Before concluding these remarks on Rodriguez, I will quote from a letter I lately received from Mr. Colin, Magistrate, on the island, in which he gives me the following interesting information:—

"One buck and one doe (*i.e.*, stag and hind) were introduced here "in 1862 by Captain Worth of the barque "Gazelle." They came "from Borneo. In 1863 a pair were sent from Mauritius by the "Schooner "Espoir," and the species of deer we have here take their "origin from the two above breeds. Partridges were brought here "by Captain Guinol, of the barque "Teemayma" from Tranquebar. "The ship was in distress, and a cage full was exchanged for fowls, "by the magistrate, Mr. Jenner. Thirty-six partridges, and twelve "quails were let loose at Oyster Bay, but the latter were destroyed "by wild cats. Guinea fowls are indigenous to Rodriguez, and were "found when the island was first inhabited.—In former times there "were a great number of large green parrots, but they died away "after the large fire which destroyed the forests on the western side "of the island."

"Bones of the 'Dodo' are still to be found in some caverns. "Pilot Bandorous has the bones of a whole Dodo."

I may tell you here, that I am bringing you some Dodo bones, also the large stone, always found with the bones, which the bird carried in its stomach (probably for the purpose of digestion). From the above notes it will be seen that the deer, peculiar to Rodriguez, are not the true Sambur (*Rusa aristotelis*), but a cross between these animals and the Borneo deer or, as some say, the Javanese animal. The Mauritius deer is, I believe, identical with the Sambur, having been originally introduced there from Ceylon.

MAURITIUS.

Thirty-two years had elapsed since I last saw this beautiful island, when as Lieut. in H. M. S. "*Wasp*," I planted the Union Jack upon

the summit of the Peter Botte Mountain. And now alas how it is changed, for the hurricane of April 29th devastated the island. The town of Port Louis in ruins, country houses unroofed, sugar-mills destroyed, churches levelled, trees broken down, or stripped of every leaf, and sugarcanes flattened to the earth; ships aground or dismasted, and the lovely gardens at Pamplemousse not recognizable. All this damage was done in 3 hours, and much of it in 5 minutes. For an hour the wind was registered at the rate of 112 miles an hour, and for the space of five minutes at 123 miles. Before this awful blast nothing could stand, and houses of wood and stone went down like packs of cards.

The centre of the storm appears to have passed directly over the ill-fated town, so that its force may have been even greater than that registered at the observatory 8 miles away. The whole face of the country was altered, the mountains alone remaining unchanged, and the familiar old Peter-Botte reared its head above the sky-line, as we steamed into the harbour on the 29th June. A good idea of the force of the wind may be obtained by comparing it with the speed of an express train travelling at the rate of 60 miles an hour. Anyone putting his head out of the carriage on such an occasion can fully appreciate the pressure of the wind at nearly double that speed.

A curious feature about this hurricane seems to have been that its force was greatest near the earth, and the higher one went the less was the destruction. Thus at Curepipe, in the centre of the island, some 1,500 feet above the sea level, the damage done was comparatively slight, and it is probable that on the tops of the highest mountains the wind might have been no more than a strong gale.

As to the cause of these hurricanes, so disastrous in their effects, and which may be said to be almost peculiar to Mauritius, it is not easy to determine. In the present case, neither Réunion or Rodriguez felt anything of the storm, although situated but 100 and 340 miles respectively from Mauritius.

Professor Meldrum, of the Royal Observatory, Mauritius, has made the question his especial study, and his plans showing the paths of these cyclones, during the last 50 years, are of great interest.

From a glance at Dr. Meldrum's chart it appears that these hurricanes have their rise in a spot, roughly speaking, between the

parallel of 10° South and the Equator, and 90° to 100° East Longitude, from whence they shape a course direct towards Mauritius and Réunion, and passing either over those islands, or between them and Madagascar, are deflected suddenly to the S. E. and lose themselves in the South Indian Ocean. Cyclones are most numerous during the months of November, December, January, February, and March, and occasionally in April, but are almost unknown during the rest of the year. They would seem to be begotten, so to speak, in the calm region, existing between the limits of the S.-E. trade wind, and the region of the N.-E. monsoon, which probably produce a vortex, or rotary motion in the air. Whether this is the correct solution of the problem I know not, and leave it to experts to determine. Dr. Meldrum has a theory in which he traces a distinct connection between the periods during which the spots in the sun are most numerous and these cyclones. But while admitting the high authority of so learned a professor as Dr. Meldrum, I confess I am not scientific enough to grasp the fact as to why the sun's influence should be directed against unfortunate Mauritius in particular, to the exclusion of other portions of the globe.

The disaster which lately happened to this once-favoured isle brought forth some of the most heroic qualities of mankind, and the noble exertions of the Governor, Mr. Hubert Jerningham, the Doctors, the Military, and many others, not forgetting many ladies, who devoted themselves to the sick, the wounded and the dying,—will never be forgotten. Nor, on the other hand, will be the cowardly and scandalous behaviour of the black Creole population who refused to exert themselves to rescue the dying or remove the dead from under the ruins, unless well paid beforehand for so doing.

In the meanwhile money has poured into the Colony from public and private sources, and it is confidently hoped that the dear little island will ere long regain its former prosperity, although it will be years before its beauty can be restored.

The failure of the New Oriental Bank added much to the distress of all classes, but, I am happy to say, that before our departure commercial confidence was being restored; people were becoming more hopeful for the future, and encouraged by the wide-spread

sympathy everywhere manifested, especially from the mother country, were facing the disaster bravely and cheerfully.

To turn to sport. During our stay several of the wealthy proprietors organized *châsses* in our honour, on which occasions many deer were killed, but the system that obtains of killing small stags is disastrous and unsportsmanlike and must lead to the deterioration of the species at no distant period, if not to its extinction. The hospitality of the land-owners induces them to invite so many of their friends, that sport is apt to degenerate into slaughter. The performance always winds up with a sumptuous banquet. Of other kinds of game there are wild pigs—"Cochon Marron," partridges of two kinds, Guinea-fowls, &c., &c.

It was a beautiful evening on August 3rd, when the "Boadicea" and her two little satellites, the "Redbreast" and "Lapwing," slipped their moorings in Port Louis, and spreading their canvas to the breeze, glided out of the harbour *en route* to Madagascar.

RÉUNION.

Owing to the very strict quarantine regulations which enforce 21 days upon any ships leaving Mauritius, we were unable to land at this fine island, so we merely anchored off the town, saluted the French flag, and exchanged complimentary letters with the Governor. At the time of the disaster at Mauritius the people of Réunion were prompt and generous in coming to their assistance, and this is the more creditable from the fact that Réunion is not a rich island, and is not self-supporting as Mauritius is, the French Government devoting annually large sums for its maintenance. The island has no harbour, the usual anchorage off the town of St. Denis being merely an open roadstead, but a wet dock has been constructed about a mile to the westward of Shingle Point (Point de Galets). This dock is nearly 40 acres in extent, and can accommodate ships 300 feet long, and has a depth of 26 feet inside and 29 at the entrance. Like Mauritius, Réunion is of volcanic formation, one mountain, the Grande Brûlé, being an active volcano. Being in the track of hurricanes it is also liable to those visitations, causing great damage to the crops. Heavy rollers, locally called "Ras de Marée," occasionally appear on the coast without previous

warning, inflicting heavy damage to the harbour works, and stopping all communication with the shore. Viewed from the sea, Réunion presents a magnificent appearance, the mountains rising to more than 10,000 feet. The tops are generally enveloped in clouds, and that of the "Piton des Niege" is capped with snow in the winter months. A railway runs round the island, and I understand from those who have visited the interior that the scenery is magnificent, but of this we had no means of judging, and as it was of no use remaining, we sailed the same evening of our arrival, shaping our course for Tamatave, the principal seaport of Madagascar.

NOTES ON THE FLORA AND FAUNA

OF THE

KACHIN HILLS.

By Captain G. H. H. Couchman.

Flora.—Owing to the practice which prevails amongst the Kachins of clearing new ground annually for their hill cultivation, large trees are but seldom seen in the hills. But in the belt of forest below the hills very fine forests are to be found. In these forests the teak is common, though never attaining to any great size. The best forest seen was that between Ayaindama and Manmeugh. In this the teak was larger than in other parts of the country, though not so large as I have seen in India. The teak is also plentiful along the Molé chaung, though here it is of small size. That there are large trees to be got in some parts is evident from the size of the teak posts of some Sawbwas' houses, notably at Pumpien, where some of the posts were over 3 feet in diameter. Bamboo is very plentiful, and in the higher ranges near Sadôn, and the frontier near Waror, the hills are covered with a small species of male bamboo. The India-rubber tree was frequently seen, but never in any quantity, solitary trees, some of great size and beauty, being the rule. They are generally easily distinguishable from the numerous slashes they have on their trunks made by dah cuts. I saw trees at all elevations between 400 feet and 6,000 feet. Banyans are fairly common. Lemon bushes are very common, and near Manmeugh I saw a large kind of lemon with a very acid flavour. Round nearly every Kachin village are to be seen some magnificent clumps of giant bamboo, which have probably been planted there; some of these bamboos have a diameter of 8 to 9 inches. I saw one in flower at Letsao near Pumpien. The Kachins say the seeds, if planted, will not grow, so I conclude the clumps are formed by planting cuttings. The prickly cane is common everywhere except close by the Taping. Several "Wangi" canes were obtained by digging up the roots of a peculiar kind of bamboo. These are made into walking-sticks and pipe-stems. The bir tree is very common, but the fruit is very sour. It is round, and not like the elongated cultivated fruit one gets in India. The "*seit*" tree was occasionally met with. It appears to be a kind of palm, having long

pendulous clusters of fruit which are about the size of a racquet ball, and look like enormous chains of large beads. I was informed that the leaves of this tree are edible when young, and that a kind of cloth is manufactured from the bark. The Kachins call it "lai-si." The crab-apple was also occasionally met with, and at Nawku near Alawpum we discovered a large apple with good smell, but did not discover the tree from which it came. Wild plantain trees are very numerous along the streams in the plains. One meets occasional patches of them in the jungle. Only one fir-tree was seen, and that was at Nawkhum near the Namsang kha, at an elevation of under 5,000 feet. A few cinnamon trees were seen at Kazu and Ningrong, and three or four stunted mango trees. Horse-chestnuts were seen near Palap, and also some wild brinjals. The jack-fruit tree was occasionally seen in the lower hills near the plains. Near Nachang a fine acid scarlet plum was obtained. This was of elongated shape, and is called by the Burmese "hmanguthi." One of the most common fruits to be got is the yellow raspberry. This has a flavour similar to the blackberry at home. It is found everywhere. Wild peach and greengage trees were very common about Sadôn and Wabong. There was also a tree similiar to a cherry at Wabong. These trees were all in full blossom in March. Their fruit is said to never ripen properly, as it is attacked by a small worm, which destroys the fruit before it has time to ripen. The prickly-pear was seen in the hills near Kantaoyang. The only place I saw toddy-palms in the hills was at Shingop, a small Chinese village near Sadôn. A very common tree near Wabong was one with a large purple and white blossom which had a very sweet smell. I could not find out its name. In the Sansi gorge towards the summits we saw *primulas*, purple primroses, rhododendrons, stunted oaks, and a tree very like a larch. This latter was also common about Waror and Upra. Indigo, both cultivated and wild, is very numerous. The wild tea plant was also observed in large quantities near Palap and Sima. The Kachins do not drink tea, with the exception of the Yawyins, but the Chinese do. This tea is very bitter, and has not much market value, and is used only for the purpose of adulteration. I saw a single guava tree at Karwun, but nowhere else. Pumpkins appear to grow wild everywhere, and attain large sizes. Orchids and tree

ferns are to be found everywhere. There must be very many new species in these hills. A species of small wild strawberry is very common, but it is absolutely tasteless; other plants were dog and white violets and cowslips. The latter only near the Paknoi kha, where also was a kind of wild sweet-briar. There is a very fine fodder grass all over these hills. It has a long bamboo-like stem, from which at intervals of 6 to 9 inches springs a long narrow leaf. This is very fattening for all animals. Bamboo leaves form a good fodder, but only for a time, as they are apt to affect the kidneys.

Fauna, &c.—For the sportsman the Kachin hills themselves do not afford any great attractions. These hills are so densely populated that the game has been frightened away into the plains and valleys below. The Kachins themselves all shoot, as numberless sambur, bison, and other skulls, hung at the entrance of their houses, attest. The tiger is common, as is also the leopard, both in hills and plains. Their pugs and dung were seen daily, so that they must be very numerous. I saw the skins of several freshly-killed hill bear. These are similar in colour and markings to the ordinary black bear of the plains of India. The hair, however, is short and much finer, and they have more white about them. In the plains, in the neighbourhood of Manmeugh, Ayaindama, and Talawgyi, elephants and bison are numerous, whilst at the latter place I saw numerous wild buffalo tracks. On the right bank of the Irrawaddy, between Hokat and Mogaung, I saw tracks of rhinoceros buffalo, and bison, and also tsine. This was in 1886, but I hear they are still there, no one ever having been shooting there. Sambur with very good heads are very plentiful. In the plains round about Talawgyi and Myitkyina the "dyair," a Burmese deer, is very numerous. Near the latter place, in 1886, I shot four in a morning on the line of march. I did not observe any traces at all of either chital or brow-antlered deer. Nor did I see the "jee." But the barking deer is very common both in hills and plains. Others are common in all the streams. I saw some in the Nantabet choung and one in the Mali kha. Their traces are very commonly seen. The Gibbon monkey is found everywhere, and the wild boar is common. Major Yule got a curious head at Sadankong. This was called the "takin," and is evidently a rare animal of the cow tribe. The horns appear to meet

over the forehead in a similar manner to those of the African buffalo. They are of a curious spiral shape. Of birds the Imperial pigeon is very common. These birds appear to be very fond of a large sour kind of plum about the size in circumference of a quarter-anna piece. They swallow these whole, and I have taken as many as five out of a bird's crop. In the marshes near Myothit a large kind of crane was observed. This is similar to the Indian coolen in colour, shape and call. Their flight is also similar, but they have a scarlet hood or crest. I was unfortunately unable to procure a specimen. Feathers of the silver pheasant were picked up, and one blue kalige was shot. This is a fine large bird with scarlet cheeks, a black crest, and inky blue plumage, with a few white feathers in the tail. These birds are to be found in the jungles below the hills near Bhamo, Manmeugh, &c. Several coveys of francolen partridge were seen. Major Yule informs me he shot the bamboo partridge near Sadôn. Painted quail and francolen partridge abound in the plains near Talawgyi, pea-fowl and jungle-fowl on the banks of the larger streams. Duck, teal, geese, and snipe near the Irrawaddy. I have also shot a few woodcock near Bhamo. There is a peculiar kind of small green pigeon in these hills. They fly exactly like parrots, having a long pintail. I never observed these before. Other common green pigeons were numerous. A curious plover I shot had a peculiar small spur at the elbow of the wing about half-an-inch long. This spur pointed to the front and inwards when the wing was extended. The bird was mouse-coloured on the back, wings white, with black feathers on the outside edge, head black on top with black crest, and white on the throat. I saw several of these birds on the sandbanks of the Irrawaddy river. The cuckoo was occasionally heard in March. The mahsir is common in all streams. Some up to 12 lbs. were caught with the rod. A peculiar kind of double-mouthed fish was caught at Kazu. The best season for sport is from April 1st, as the jungles are then open, the grass having been burnt. But although shooting on foot could be carried out, elephants would certainly help to increase the bag. For elephants and such like the early rains would be the best time. But it is risky on account of fever, and just now the country is in a very disturbed state.

A woodcock was shot within a mile of the Eastern wall of Mandalay fort early in December.

I myself saw a woodcock about 15 miles north of Mandalay. Another officer saw three in the same place.

Hume and Marshall say the Shoveller duck is not to be found in Burma. This is incorrect. I shot several near Bhamo.

The painted quail is to be found near Pegu. I have seen wild goats on Byingyi hill, which is between Pyinmana and Yameltren, about 30 miles to the east of the railway. This hill is over 6,000 feet high. Bison and elephant tracks were very numerous there, but the hills are very steep and the jungle thick. The top of the range itself is bare.

UP A HILL.

By W. F. Sinclair, I.C.S.

(*Read before the Bombay Natural History Society*, 21*st December*, 1892.)

On former occasions I have asked you to suppose yourselves "personally conducted" through scenes not far from Bombay, but yet beyond the range of a mere weekly holiday; and so, to-night, I propose to describe the ascent of a hill not more remote than Mahableshwar, and, indeed, in sight of Arthur's Seat. I think that no one here to-night has ascended the old mountain metropolis of Raigarh, but several of us have gone to Mahableshwar *viâ* Dasgaum.

About five miles east of Dasgaum, just before reaching the town of Mhad, the gorge of the Savitri suddenly opens out into a wide valley, and we ford its little estuary, the Gándhári, close to their junction. Halfway through the town, our present route turns to the left or north by a cross street, and presently brings us out upon the plain, with the Pali Caves visible on the left, and a low range of hills, the remnant of a huge trap-dyke, right ahead. Through a notch in these, we come upon one of those formerly lacustrine valleys so common in the Konkan, now drained by the Gándhári through another notch close by. The range, which we may name after the Pali Caves, runs from 800 to 1,300 feet above the western bank of the Gándhári, and, as the sun sinks, its shadow gives a sort of twilight to the valley. To the right front, a great hill called Guhiri terminates and masks another range. After passing the pretty village of Nate, perched over the river amongst thick set trees, the valley narrows, and the made-road ceases, while, from behind Guhiri, there comes into sight a hill of equal size, but distinguished by its more massive form, somewhat like that of the well-known Prabhal, south of Matheran, but a trifle loftier and more pudding-headed.

Nate is a usual camping place. A mile or two below it we have left the estuarine region, which, indeed, has begun to pall upon the traveller by the Bankot route. Sedge and tamarisk abound in the river bed. These, and some rice-fields north-east of the camp, usually hold a few snipe and teal, and the fields, especially near the river, a handful of quail,—in the cold season be it understood. At Nate itself, I once saw the small grey Hornbill. This is not a

common bird hereabouts, but the great Black and White Hornbill is more abundant in the valley of the Savitri than anywhere to the northwards in our province, and is a very noticeable bird to a visitor from the plains.

Like many forest birds and beasts, it makes foraging excursions to some distance from its natural cover, especially to pipal or pipri figs where and when ripe. And on such occasions, when flying across the open, it irresistibly suggests the Prussian eagle broken loose from one of his thousand shields and flags, to take the air on his own account, without soldiers in company for once. This Hornbill, though not an appetizing bird to look at, is as good as bustard for the table. I once furnished this information, as a "thing not generally known" to a Bombay regiment bound for the Burman War, and asked, on its return in peace with honour, whether the same had been verified. The answer was "Yes, and more than once it was worth a meal to us."

On the next day's march the valley gradually narrows, until at Konjan, the river runs in a ravine, with steep rock-walls on one side, and towering, but climbable hills, on the other, the eastern. Up this a foot-path winds through the woods to a wide ledge on the side of the Raigarh range, where lies the little village of Pachad, once a sort of suburb and market to the metropolis far above it. During the whole of this march, one is struck by the very unoriental appearance of the country. At Nate we parted with palm and bamboo, and all the valley suggests recollections of those sub-Alpine glens in which the chestnut takes the place here filled by the mango.

At Pachad, however, a few remnants of old buildings, a temple, and a dome, bring us back to the east, and the black cliffs, now near neighbours on all sides, have a colouring and character which is their own even in the Sahyadri region. A man, long familiar with this range, if set down at night in a glen new to him, like a Prince in the Arabian Nights, would yet tell you in the morning where the water of its burn would seek the sea; and a view from Mahableshwar is very different from one near Khandala or Igatpuri. Here at Pachad, we seem to be on part of a great level plain, looking down upon another to the north-west, (the valley of Mangaum), and dominated by the Mahabaleshwar Ghâts to the south-east, while here

and there on its surface rise isolated hills, such as Raigarh, close above us, and Guhiri a few miles away. The truth is that we are upon a remnant of such a plain. But wind and water have furrowed it with glens that are really a thousand feet deep, and though we can only see the single one close to our feet, we could not walk a mile without crossing one such, nor ten miles, across the apparent plain, without crossing half-a-dozen. This seemingly continuous plateau is itself exceedingly bare looking. The flat ground on it is the most cultivable, and where there is any soil over the basalt, is under crop in the rains. The woods are pushed down into the glens, or lie in long dark lines along the foot of the cliffs, where the *débris* of ages has formed a "talus," particularly favorable to tree growth. Throughout the North Konkan such a line on the mountain side is a mark for the botanist who seeks the evergreen giants, here at the edge of their province, and the rarer forest fruits and flowers, and here our friend the Hornbill, and the fruit-eating pigeons and doves, delight in shade and safety.

In the Raigarh region the forests have few other inhabitants for the sportsman. In several weeks of continuous forest work, I never heard the jungle cock or peacock, and only once the spur-fowl, and was, indeed, very glad to supplement the wretched supplies of the hill hamlets with doves and "Did-ye-do-its." These despised fowls, indeed, make capital soup. The mammalia are equally scarce. The reason seems to be that this region has, ever since Raja Sivaji's time, (nearly two centuries and-a-half ago), contained a population exceeding the production of the soil, and hungry accordingly. For long, it was largely fed by plunder, and it still subsists largely on the more honourable pay and pensions of the Bombay Army. But times have pressed hard upon everything eatable that could be trapped or shot, and the forests, which were probably never much to boast of on this thin and scanty soil, were evidently greatly cut into when Raigarh was a market for fuel and timber, and for the coarse grains that replaced the trees. They have, of late years, regained some ground and some condition, but it will be long before (if ever) they regain an animal population of any importance. Fishes there are, on the Pachad Plateau, some hundreds of little creatures crowded together in a spring. I brought away specimens for our Museum from this

and from many similar places in the Savitri basin, all over 1,000 feet above the sea, and cut off by cascades and dry beds from the ingress of lowland species. Amongst some 500 specimens, I could only find three distinguishable species, two loaches and a *Discognathus* or mountain carp, which seems to be that originally described by Dr. Day as *Mayoa modesta*. The villagers say that these climb up the hill sides when streaming with moisture during the monsoon. The tale is strange; but many of us have seen the Bhor Ghât in the rains, and the walking fishes of our mud-flats and rock beaches, to say nothing of the murrell and climbing perch. I, for one, have seen young eels climbing over a wall at the Cutts of Coleraine, in Ireland, with the help of a wet straw rope hung over it *ad hoc*. And I saw *Discognathus modestus* walk up the sides of my bath tub, and out of it, not quite as easily as a gecko lizard goes up a wall, but without doubt or hesitation.

At Páchád, as may be gathered from the length of my remarks on it; one usually makes a day's or night's halt, using a light "Kabul Pal" or a shelter ("Mandwa") built on notice by the hill villagers.

The upward path leads through a notch in the Raigarh ridge; between the fort on one side and a lower and narrower hill on the other, which is, at its further or northern end, separated from the fine line of Ghâts by one of those tremendous notches so characteristic of the Northern Sahyádrí Range, which cut off from it almost every so-called spur, north of our present point. But I am not aware of any such notch to the Southward. The next great spur in that direction, forming the Southern watershed of the Savitri basin, is crossed by the great Konkan Road at a height (speaking from memory) of about 1,300 feet, at the Kashedi Pass, where it is already many miles from the parent range.

At the end next our pass the hill now in question possesses a "Hole in the Wall," or rather two, being embrasures for two guns opening westwards out of what was probably once a natural cavern with its mouth east of the ridge, now called "Little Gibraltar."

It is extremely exasperating, on reaching this point, to see that one must descend almost as far as one has climbed from Páchád;

and then begin the real ascent of some 1,800 feet, through the heavy band of evergreen forest already mentioned as growing on the "talus" at the foot of the great scarp.

This point is called the "Raja's Garden," very much, I fancy, as a similar spot as Matheran is "Ram's garden." There is not water enough for any real gardening; and no hardy imported plant has naturalized itself, and survived, as commonly happens in hill forts wherever there has been, anything of the sort. Nor is there any tree on the hill which can be supposed to have been even planted by the founder. From the top, however, one can see in a pass, east of the hill, a huge Kinjal tree (*Terminalia paniculata*) under which he may have ridden. I have here no note of its girth; nor is there any legend about it, but looked full 300 years old, and the Raja is only dead 212 years. In various spots round the foot of Raigarh there are remains of gardens, with ruins in them which tradition and reasonable probability connect with the fort. It was natural that such places should grow up near the residence of a king and nobles, with money to pay for fruit and flowers, and a natural desire to come down out of the clouds at times.

On the top of the hill itself there can have been little of the sort. Water is abundant now, in huge cisterns cut in the rock, some of them undoubtedly the quarries whence came the building stone. But the surface is mostly a sheet of basalt, thinly covered with an inch or so of mould, and in very few places softening into a rock capable of forming "muram." Only one wild flower abounds there in the fine weather; and this, curiously enough, is that of a bush as hardy a foot above high water mark as here at nearly 3,000 feet, (*Vitex Negundo*), the "Nirgude." One tree has rooted itself in the heaps of rubbish within the walls, and another in the cracks of the walls themselves. The former, as with the flower, is a tree of the Plains; and indeed of the neighbourhood of water, (*Ficus Glomerata*), the "Umbar" or Guler. It is according to some shastras the right wood of which to make a throne; but here it has turned the tables, and occupies the actual ancient place of the throne. The other tree is the Ashte or mountain Pipal. I do not know whether it has a specific name, but I think it a good species, for it is exclusively of parasitic habit, *at all ages*, (the common pipal outgrows its hosts, or

kills them, and stands alone), its dwarfish and shrubby habit, and the brilliant red colour of its leaf buds.

Of living creatures there are few on the actual top of Raigarh. The cisterns are said to hold centenarian fish of enormous size. They certainly hold many small fry; loaches and highland carp such as described above, preyed upon by two king fishers; *Alcedo Bengalensis* and *Halcyon Smyrnensis*. The latter could have done without the fish, for there were some spot-winged locusts here and there, probably strays. No mammal was seen, nor the trace of any, but in the rains a few cattle come up and nibble the scanty grass. Lizards of course were in their proper place on the walls of departed glory, but then, lizards don't wait for the glory to depart before taking possession, in the East at least; and I daresay Jamshid saw a good many more lizards on the walls "where Jamshid gloried and drank deep" than ever 'Umar Khayyam did.

But if one descends from the pudding-shaped centre of the hill to its scarped edge, one comes suddenly on a world of life in a rather new aspect. The scarps of Raigarh furnish quarters to an immense number of birds; chiefly of course *Raptores*; and it is a strange sight to a man from the plains to find himself suddenly looking down upon the backs of vultures and eagles and falcons, and see them flying in and out as it were under his feet. They don't look at all the same birds. Some, as *Aquila Imperialis*, are much more easily distinguished from above than from below, because you can see the markings of the back and tail better; and when they do rise and pass over your head to see what you are doing on the roof of their house they will give you a much better view of the breast and under plumage than is often granted by living wild birds in the plains—they feel at home and expect the intruder to be on his good behaviour.

Of course few people ever do shoot from such a place, where the odds would be incalculable against ever recovering a hit bird. Many a shot has been fired at men from here; but the birds have presumably never been molested. Even amongst themselves there seems to be a sort of "truce of God" at breeding places. The pigeons go in and out amongst the great and little *Raptores*; and I have seen the same in trees. Yet the birds are without the very

obvious reasons which induce the wise Fox to abstain from plunder near his own earth, and even the tiger, (according to his neighbours), to forage far abroad, on pain of denunciation to the "Sahe bôlk," which I have known to follow a breach of this tacit *entente cordiale*.

I have seen no region so rich in Eagles as that visible from the heights of Raigarh. The wide plain of Mangaum to the North-West, is a chosen haunt of the larger Serpent Eagle, *Circacus Gallicus*; and the Imperial Eagle hunts the low hills, covered with scanty jungle and brushwood, which abound on its skirts. Where there are large evergreen trees such as Mangos along the numerous streams, you find the Crested Serpent Eagle, *Spilornis cheela*, the most beautifully marked of our birds of prey when in full feather. The first two prefer to perch on bare trees, *Spilornis* likes a thick tree, and sits on a big limb, in good shade, but not amongst the boughs and twigs, until startled; when he goes straight off, perhaps from over your head, a startling object if you have not seen him, nor he you. I have shot one of these eagles in such a position with a pistol, and wore his ocellated game-like feathers for many a day, in "jactance" over the feat.

This happened in thick forest, in the Sukeli pass, where he was, I think, a little off his beat and out of his reckoning, though not exclusively a bird of the open. The next, and the characteristic eagle of the immediate neighbourhood of Raigarh, is the Crested Hawk Eagle of Jerdon (*Limnætus Cristatellus*). The Latin name is bad, as he does not frequent "Zimnai"; and I think Mr. Murray calls him *Cirrhætus*, which is better. We must await Mr. Blanford's long-promised volume. I myself like to call this bird the Wood-Eagle, as the forest is his especial domain. He can break through the branches after prey with the rush of a charging beast, and when he sees you walk up to one side of his tree, long before you have distinguished his grey form from the surrounding boughs, he has shifted his perch to the far side as easily as a green pigeon or parrot would.

The Grey-backed Sea-Eagle comes up the estuaries to Mhád but I don't think he often rises high enough above them to see the Hill itself. The Osprey forages over the Kal to its very foot; and everywhere in the open are the Laggar (our particular falcon here), the

harriers, and the red-headed merlin, the bantam of our birds of prey. I have not identified any of the hawks except these and the blue harrier, because one must shoot them to do so, and I don't like shooting them. But it was near Raigarh that a guest of mine shot a Brahmani kite (*Haliastur*) with a living garfish in its claws, which he and I both saw it catch from the water, with the action of its big brother, the Sea-Eagle. I think this to be the natural action of *Haliastur*, and that it only takes to carrion and garbage when corrupted by the neighbourhood of man. I think I have mentioned before, in these pages, having seen one attack and severely injure a hare, which it would have killed, but for my own interference.

BOTANY OF THE LACCADIVES, being NATURAL HISTORY NOTES FROM H. M. I. M. SURVEY STEAMER "*INVESTIGATOR*," Commander R. F. HOSKYN, R.N., COMMANDING.

Series II., No. 5. By D. Prain.

(*Continued from page* 295).

PHANEROGAMIA.

Thalamifloræ.

Anonaceæ.

1. Anona muricata Linn., Sp. Pl. 536; Watt, Dict., i., 258. The *Sour Sop*.

Minikoi; only one tree, *Fleming*.

Native of America, cultivated in most tropical countries, though rarely in India, except in the Madras Presidency, and even there sparingly.

Capparideæ.

2. **Cleome viscosa** Linn., Sp. Pl. 672; Roxb., Fl. Ind., iii., 128; Hook. f., Flor. Brit. Ind., i., 170.

Améni; *Hume!* Anderut; *Alcock!* Akati; *Fleming!* Kiltán *Fleming!*

A weed of cultivation almost cosmopolitan in the tropics.

Bixineæ.

3. Bixa Orellana Linn., Sp. Pl. 512; Roxb., Fl. Ind., ii., 581; Hook. f., Flor. Brit. Ind., i., 190; Watt, Dict., i., 454. The *Anatto*; vernac. "*Potang*."

Améni; cultivated for its dye, "several hundredweights of the fruit are exported yearly to Malabar," *Robinson*.

Native of America, generally cultivated throughout the tropics.

4. **Flacourtia sepiaria** Roxb., Corom. Pl. i., 48, t. 68; Fl. Ind., iii., 835; Hook. f., Flor. Brit. Ind., i., 194.

Kadamum; very common, *Fleming!*

Throughout Bengal, Peninsular India and Ceylon, in dry jungles; also in Java.

POLYGALEÆ.

5. **Polygala erioptera** DC., Prodr., i., 326; Hook. f., Flor. Brit. Ind., i., 203.

Kadamum; *Fleming!* The narrow-leaved form (*P. Vahliana* DC.) is alone reported.

India, Burma, Beluchistan, Arabia, Africa.

PORTULACEÆ.

6. **Portulaca oleracea** Linn., Sp. Pl. 445; Roxb., Fl. Ind., ii., 463; Hook. f., Flor. Brit. Ind., i., 246.

Minikoi; *Fleming!* Two very distinct forms are communicated: one, the ordinary annual condition; the other, a perennial state with very large tuberous roots exactly like those of *P. tuberosa*, Roxb., from which, however, it is at once distinguished by its opposite flat leaves, and by the denser beard of white hairs on its nodal appendages.

A weed of cultivated ground and waste places, cosmopolitan in the tropics.

GUTTIFERÆ.

7. **Calophyllum inophyllum** Linn., Sp. Pl. 513; Roxb., Flor. Ind., ii., 606; Hook. f., Flor. Brit. Ind., i., 273; Watt, Dict., ii., 29. The *Poon-Spar* or *Alexandrian Laurel*.

Améni; planted, *Hume!* Kalpéni; apparently indigenous, *Alcock!* Akati; planted, one tree only, *Fleming!* Minikoi; planted, but also occurring as an indigenous tree in the coast-zone, *Fleming!*

Cultivated throughout India. Wild on the sea-coasts of the Mascarene Islands; India, Ceylon, Andamans; Malaya, N. Australia and Polynesia.

MALVACEÆ.

8. **Sida humilis** Willd., Sp. Pl., iii., 744; Roxb., Flor. Ind., iii., 171; Hook. f., Flor. Brit. Ind., i., 322.

Kadamum; *Hume! Fleming!* Akati; *Fleming!* Minikoi; *Fleming!*

A field and road-side weed in tropical Asia, Africa and America.

9. **Abutilon indicum** G. Don: Mast. *in* Hook. f., Flor. Brit. Ind., i., 326.

VAR. *typica*. *A. indicum* G. Don, Gen. Syst. i., 504. *Sida indica* Linn., Sp. Pl. (ed. ii.) 964; Roxb., Flor. Ind., iii., 179.

Minikoi; *Fleming!*

VAR. *populifolia* W. & A., Prodr. i., 56. *A. populifolium* G. Don, Gen. Syst., i., 503. *Sida populifolia* Lamk., Encycl. Meth., i., 7; Roxb., Flor. Ind., iii., 179.

Kadamum; *Hume! Fleming!* Akati; *Fleming!* Minikoi; *Fleming!*

Both varieties are widely dispersed in India, the second being the more common in Western India. A weed of cultivation, cosmopolitan in the tropics.

10. **Urena sinuata** Linn., Sp. Pl. 692; Roxb., Flor. Ind., iii., 182; Hook. f., Flor. Brit. Ind., i., 329.

Kalpéni; *Alcock!*

A weed of fields and roadsides, cosmopolitan in the tropics.

11. **Hibiscus Solandra** L'Herit., Stirp., i., 103, t. 49; Roxb., Flor. Ind., iii., 197; Hook. f., Flor. Brit. Ind, i., 336.

Minikoi; common, *Fleming!*

A weed of fields and roadsides, confined to India, Ceylon and tropical East Africa.

12. **Hibiscus tiliaceus** Linn., Sp. Pl. 694; Roxb., Flor. Ind., iii., 192; Hook. f., Flor. Brit. Ind., i., 343.

Akati; *Fleming!* Minikoi; *Fleming!*

A littoral species, cosmopolitan on tropical sea-shores.

13. HIBISCUS ROSA-SINENSIS Linn., Sp. Pl. 694; Roxb., Flor. Ind., iii., 194; Hook. f., Flor. Brit. Ind. i., 344. The *Shoe-Flower*.

Minikoi; cultivated, *Fleming!*

Cultivated in gardens throughout India; native of China.

14. **Thespesia populnea** Corr., Ann. Mus. Par. ix., 290; Hook. f., Flor. Brit. Ind., i., 345. *Hibiscus populneus* Linn., Sp. Pl. 694; Roxb., Flor. Ind., iii., 190. The *Portia Tree*.

Anderut; planted, *Alcock!* Kiltán; indigenous, *Fleming!* Akati; both indigenous and planted, *Fleming!* Kadamum; indigenous, *Fleming!*

A littoral species, common on all tropical sea-shores in the Old World and Polynesia; naturalised in the West Indies.

15. Gossypium herbaceum Linn., Sp. Pl. 693; Roxb., Fl. Ind., iii., 184; Hook. f., Flor. Brit. Ind., i., 346; Watt, Dict., iv., 26. *Indian Cotton.*

Anderut; cultivated, *Wood.* Minikoi; cultivated, *Fleming.*

Cultivated throughout India, yielding the Indian cottons; native of Old World.

16. Gossypium barbadense Linn., Sp. Pl. 693; Roxb., Flor. Ind., iii., 187; Hook., f., Flor. Brit. Ind., i., 347; Watt, Dict., iv., 15. *Barbadoes Cotton.*

Anderut; cultivated, *Wood.* Minikoi; occurs pretty frequently and grows well, *Fleming!*

Cultivated throughout India, yielding the American cottons; native of New World.

Tiliaceæ.

17. **Corchorus acutangulus** Lamk., Encycl. Meth., ii., 104; Hook. f., Flor. Brit. Ind., i., 398. *C. fuscus*, Roxb., Fl. Ind., ii., 582.

Kadamum; *Fleming!* Akati; *Fleming!* Minikoi; *Fleming!*

A weed of cultivation, cosmopolitan in the tropics.

Disciflorae.

Rutaceæ.

18. **Triphasia trifoliata** DC., Prodr., i., 536; Hook. f., Flor. Brit. Ind., i., 507.

Minikoi; *Fleming!* Not found in gardens, but perhaps originally introduced.

Common in gardens, and as an escape, in many tropical countries; the native country doubtful. The writer has collected this, with all the appearance of being indigenous, in Car Nicobar. It has not, however, been obtained in any locality where the evidence that it is indigenous is unequivocal.

19. Murraya Koenigii Spreng., Syst. Veg., ii., 315; Hook. f., Flor. Brit. Ind., i., 503; Watt, Dict., v., 288. *Bergera Koenigii* Linn., Mantiss., ii., App. 563; Roxb., Flor. Ind., ii., 375.

Minikoi; carefully cultivated, *Fleming!*

20. Citrus medica Linn.: Brandis, For. Flora, 52.

var. *acida* Brandis: Hook. f., Flor. Brit. Ind., i., 515; Watt, Dict., ii., 355. *C. acida*, Roxb., Flor. Ind., iii., 390. The *Sour Lime* of India.

Améni; cultivated, "trees numerous, quality good," *Robinson; Hume.* Anderut; cultivated, *Wood.* Kiltán; cultivated, but does not thrive, *Robinson.* Minikoi; cultivated pretty frequently, *Fleming!*

Probably a native of India; generally cultivated in the tropics.

21. Citrus Aurantium Linn., Sp. Pl. 782; Roxb., Flor. Ind., iii., 392; Hook. f., Flor. Brit. Ind., i., 515; Watt, Dict., ii., 335. The *Sweet Orange.*

Anderut; cultivated, *Wood.*

Probably a native of India; cultivated in tropical and sub-tropical countries.

22. Citrus decumana Linn., Syst. Nat. (ed. xii.), ii., 580; Roxb., Flor. Ind. iii., 393; Hook. f., Flor. Brit. Ind., i., 516; Watt, Dict., ii., 348. The *Shaddock* or *Pomelo.*

Minikoi; cultivated, only one tree on the island, *Fleming.*

Native of Malaya and Polynesia, generally cultivated in S.-E. Asia.

23. Ægle Marmelos Corr., Trans. Linn. Soc., v., 222; Roxb., Flor. Ind., ii., 579; Hook. f., Flor. Brit. Ind., i., 516; Watt, Dict., i., 117. The *Bael.*

Minikoi; *Fleming!*

Cultivated and wild throughout India.

Simarubeæ.

24. **Suriana maritima** Linn., Sp. Pl. 284; Hook. f., Flor. Brit. Ind., i., 522.

Bitrapar; *Hume! Fleming!* Bangáro; *Hume!* Kadamum; *Fleming!* Minikoi; *Fleming!*

Cosmopolitan on tropical sea-shores.

Celastrineæ.

25. **Pleurostylia Wightii** W. & A., Prodr. 157; Hook. f., Flor. Brit. Ind., i., 617. *Celastrus opposita* Wall. *in* Roxb., Flor. Ind. (ed. Carey), ii., 398.

Kadamum; very common throughout the island, *Fleming!*

Mascarene Islands; Malabar, Ceylon.

Rhamneæ.

26. **Colubrina asiatica** Brogn., Ann. Sc. Nat., sér. i., x., 369; Hook. f., Flor. Brit. Ind., i., 642. *Ceanothus asiaticus* Linn., Sp. Pl. 196; Roxb., Flor. Ind., i., 615.

Akati; *Fleming!* Kíltán; *Fleming!*

Littoral species common on sea-coasts of S. Africa, the Mascarene Islands; India, Ceylon; the Malay Archipelago and Australia.

AMPELIDEÆ.

27. **Vitis quadrangularis** Wall., Cat. n. 5992; Hook. f., Flor. Brit. Ind., i., 645. *Cissus quadrangularis*, Roxb., Flor. Ind., i., 407.

Kalpéni; *Alcock!*

East Africa; India, Malaya; common on the sea-shores of the Andaman group, where it is unequivocally indigenous. Lawson (*Flor. Brit. Ind.* l. c.) states that the stems are eaten in curries in Ceylon. He does not quote any authority, the statement is certainly not derived from Thwaites, who says (*Enm Pl. Zeylan.*, 62) that the stems are used medicinally. The species is not cultivated in Kalpéni; it is most probably a bird-introduced species.

28. **Vitis carnosa** Wall., Cat. n. 6018; Hook. f., Flor. Brit. Ind., i., 654. *Cissus carnosa*, Roxb., Flor. Ind., i., 409.

Kiltán; *Alcock! Fleming!*

India and Malay Peninsula; probably a bird-introduced species. Though both Dr. Alcock and Mr. Fleming found it growing profusely, Mr. Hume did not meet with it; perhaps, therefore, it is a recent introduction, possibly during the interval between 1875 and 1889.

SAPINDACEÆ.

29. **Cardiospermum Halicacabum** Linn., Sp. Pl. 366; Roxb., Flor. Ind., ii., 292; Hook. f., Flor. Brit. Ind., i., 670.

Améni; *Hume!* Kalpéni; *Alcock!*

A weed of road-sides and waste places, cosmopolitan in the tropics.

30. **Allophylus Cobbe** Blume, Rumphia, iii., 131; Hook. f., Flor. Brit. Ind., i., 673. *Ornithotrope Cobbe* Willd., Sp. Pl., ii., 322; Roxb., Fl. Ind. ii., 268. *Rhus Cobbe* Linn., Sp. Pl. 267.

Minikoi; *Fleming!*

A littoral or sub-littoral species distributed throughout S.-E. Asia and N. Australia, but almost certainly a bird-introduced, not a sea-introduced, species.

ANACARDIACEÆ.

31. MANGIFERA INDICA Linn., Sp. Pl. 200; Roxb., Fl. Ind. i., 641; Hook. f., Flor. Brit. Ind. ii., 13; Watt, Dict., v., 146. The *Mango*.

Minikoi; cultivated, only one tree, *Fleming*.

Cultivated throughout the tropics; native of S.-E. Asia.

MORINGEÆ.

32. MORINGA PTERYGOSPERMA Gaertn., Fruct., ii., 314, t. 147, f. 2; Hook. f., Flor. Brit. Ind., ii., 45; Watt, Dict., v., 276. *Hyperanthera Moringa* Vahl., Symb., i., 30; Roxb., Flor. Ind., ii., 368. *Guilandina Moringa* Linn., Sp. Pl. 381. The *Horse-Radish Tree*.

Améni; commonly cultivated: Kiltán; occasionally cultivated, *Hume*.

Cultivated generally throughout the tropics; native of the lower slopes of the North-Western Himalaya.

Calycifloræ.

LEGUMINOSÆ.

33. **Crotalaria retusa** Linn., Sp. Pl. 715; Roxb., Flor. Ind., iii., 272; Hook. f., Flor. Brit. Ind., ii., 75.

Akati; *Fleming!*

A common weed or escape from cultivation in the tropics, only doubtfully wild in Africa or America.

34. **Crotalaria verrucosa** Linn., Sp. Pl. 75; Roxb., Flor. Ind., iii., 273; Hook. f., Flor. Brit. Ind., ii., 77.

Améni; *Hume!* Kadamum; *Fleming!*

A cosmopolitan tropical weed.

35. **Indigofera cordifolia** Heyne *in* Roth., Nov. Sp., 357; Hook. f., Flor. Brit. Ind. ii., 93.

Kiltán; *Fleming!* Kadamum; *Fleming!*

India, Afghanistan, N.-E. Africa, Malaya, N. Australia. A weed of waste places and fields.

36. **Indigofera tinctoria** Linn., Sp. Pl. 751; Roxb., Flor. Ind., iii., 379; Hook. f., Flor. Brit. Ind., ii., 99; Watt, Dict., iv., 387. The *Indigo Plant*.

Kadamum; whole fields of this species growing in a wild state, *Hume! Fleming!* Akati; *Fleming!*

Cultivated universally throughout India. Here *not* cultivated, though perhaps originally intentionally introduced. Native of India, but not known truly wild, except in this and similar localities, where it cannot possibly be "indigenous."

37. **Tephrosia tenuis** Wall., Cat. n. 5970; Hook. f., Flor. Brit. Ind., ii., 111.

Kadamum; *Fleming!* Akati; *Fleming!*

A weed of cultivation hitherto known only from Scinde, Panjab, and Concan.

38. **Tephrosia purpurea** Pers.: Baker *in* Hook. f., Flor. Brit. Ind., ii., 113.

VAR. *pumila* Baker. *T. pumila* Pers., Synops., ii., 330. *T. diffusa* W. & A., Prodr. 213. *Galega diffusa* Roxb., Flor. Ind., iii., 387.

Kadamum; *Fleming!* Kiltán; *Fleming!*

A cosmopolitan tropical weed; very distinct from typical *T. purpurea*, and never exhibiting any intermediate states; probably quite deserving specific rank.

39. **Sesbania aculeata** Pers., Synops., ii., 316; Hook. f., Flor. Brit. Ind., ii., 114. *Coronilla aculeata* Willd., Sp. Pl., iii., 1147. *Æschynomene spinulosa* Roxb., Flor. Ind., iii., 333.

Kalpéni; *Alcock!*

A weed of wet places and rice-fields throughout the tropics of the Eastern Hemisphere.

40. SESBANIA GRANDIFLORA Pers., Synops., ii., 316; Hook. f., Flor. Brit. Ind., ii., 115. *Sesban grandiflorus*, Poir., Encycl. Meth., vii., 127. *Æschynomene grandiflora* Linn., Sp. Pl. (ed. ii.), 1050; Roxb., Flor. Ind., iii., 331. *Agati grandiflora* Desv., Jour. Bot., iii., 120. The *Agati Tree*.

Kiltán; Kadamum; Akati; Minikoi; in all four islands planted as a support for the Pepper-vines which the people cultivate carefully, *Fleming*.

Mauritius; India and Ceylon; Malaya, N. Australia; generally, if not always, planted in India, and usually (especially in South India) grown for the purpose for which the tree is used in these islands (*Roxb., Fl. Ind.*, iii., 332). Native apparently of Malaya.

41. ARACHIS HYPOGÆA Linn., Sp. Pl. 741; Roxb., Flor. Ind., iii., 280; Hook. f., Flor. Brit. Ind., ii., 161; Watt, Dict., i., 282. The *Ground-Nut.*

Minikoi; cultivated, *Fleming!*

A native of America, cultivated largely in Southern India, more rarely in other parts.

42. **Desmodium triflorum** DC., Prodr., ii., 334; Hook. f., Flor. Brit. Ind., ii., 173. *Hedysarum triflorum* Linn., Sp. Pl. 749; Roxb., Flor. Ind., iii., 353.

Akati; *Fleming!* Kadamum; *Fleming!* Kiltán; *Fleming!* Minikoi; *Fleming!*

A cosmopolitan tropical weed.

43. CLITORIA TERNATEA Linn., Sp. Pl. 753; Roxb., Flor. Ind., iii., 321; Hook. f., Flor. Brit. Ind., ii., 208; Watt, Dict., ii., 375.

Améni; cultivated, *Hume.*

In gardens, or as an escape, throughout the tropics; not in Australia.

44. MUCUNA CAPITATA W. & A., Prodr., 255; Hook. f., Flor. Brit. Ind., ii., 187. *Carpopogon capitatum* Roxb., Flor. Ind., iii., 284.

Améni; in gardens, "many plants * * * with bunches of deep blackish purple flowers, looking like Hamburg grapes," *Hume!*

India and Java; perhaps only a cultivated form of the common Cowhage (*Mucuna pruriens* DC.)

45. **Canavalia turgida** Grah. *in* Wall., Cat. n. 5534 A.; Miq., Flor. Ind. Bat., i., 215. *C. ensiformis* VAR. *turgida* Baker *in* Hook. f., Flor. Brit. Ind., ii., 196. *Dolichos rotundifolius* Roxb., Flor. Ind., iii., 302. Rheede, Hort. Malabar., viii., t. 43. Probably=*C. obtusifolia* DC., Prodr., ii., 404.

Minikoi; very common, a climber on the *Pandanus* sea-fence, *Fleming!*

Littoral species; coasts of Bengal, Burma, Andamans and Nicobars, Malay Peninsula and Java (*Miquel*). Also Coromandel Coast, "on islands at mouth of Godaveri river," (*Roxburgh*); and Malabar Coast, "locis arenosis" Cochin (*Rheede*).

Roxburgh's and Rheede's plant is, without doubt, from the former writer's account and the latter's figure of the "semi-elliptic" (*Roxburgh*), turgid pod, the same as Graham's Wallichian

plant from Penang, yet Mr. Baker places the Indian plant in *C. obtusifolia* and regards the Penang one as a variety of *C. ensiformis*.

It is therefore better in the meantime to consider *C. turgida* Grah. to be a plant specifically distinct from *C. virosa* (the wild form of *C. ensiformis*), as well as from *C. obtusifolia*.

46. **Canavalia obtusifolia** DC.: Baker *in* Hook. f., Flor. Brit. Ind., ii., 196 (syn. *Dolichos rotundifolius* Roxb. excl.); Clegh., Madr. Journ. (n. s.), i., t. 4. *Dolichos obcordatus* Roxb., Flor. Ind., iii., 303. Probably = *C. lineata* DC., Prodr., ii., 404.

Minikoi; on sandy beach, *Fleming!*

A littoral species cosmopolitan on tropical shores.

It is interesting to find on the same island examples of both these sea-coast *Canavalias*. The specimens of *C. turgida* are both in flower and with fruit, those of *C. obtusifolia* are in flower only, but are exactly like the Madras ones (in Herb. Calcutta) of Wallich (*Cat.* n. 5532), of Wight and of Gamble. They are well distinguished, as Mr. Baker indicates, by the racemes in *C. obtusifolia* being much the fewer-flowered of the two. But the accuracy of the *nomenclature* is extremely doubtful, for *Canavalia obtusifolia* DC. (*Prodr.*, ii., 404) is the exact equivalent of *Dolichos obtusifolius* Lamk., (*Dict.*, ii., 295), which in turn is, according to Lamarck himself, the plant figured by Rheede (*Hort. Malabar.*, viii., t. 43). It is moreover the equivalent of *Dolichos rotundifolius*, Vahl (Symb. ii., 81), of which plant De Candolle himself saw a fruiting specimen. Roxburgh identified the plant described by Vahl with that figured by Rheede. It seems therefore clear that Rheede's *Katu-Tsjandi*, Lamarck's *Dolichos obtusifolius*, Vahl's and Roxburgh's *Dolichos rotundifolius*, De Candolle's *Canavalia obtusifolia* and Graham's *Canavalia turgida* are *one and the same sea-coast species*, which species is entitled to the name *Canavalia obtusifolia*. On the other hand, it seems clear from the specimens in Calcutta Herbarium that the plant common on the Madras coast figured by Cleghorn, and the Chinese plant cultivated in the Calcutta Botanic Garden described and figured (*Icon. Ined.*, xx., 136) by Roxburgh as *Dolichos obcordatus*, are specifically identical; their pods, as figured by Roxburgh and Cleghorn, agree well with the pods of *Canavalia lineata*

DC. (*Dolichos lineatus* Thunb.) from the sea-coast of Japan as described by De Candolle (*DC., Prodr.*, ii., 404) and Thunberg (*Flor. Japon.*, 280) and as figured by Iinuma Yokusai (*Sōmoko-Dusets*, ed. ii., vol. xiii., t. 20); the species might therefore be best known as *Canavalia lineata*. The name "*obtusifolia*" is more appropriate to *C. lineata* as here understood than to the true *C. obtusifolia* of Rheede's figure. In this respect, however, both species are variable, for the leaves of the Japanese plant (*Doliches lineatus* Thbg.) are quite like those of the Penang one (*Canavalia turgida* Grah.) and of that figured by Rheede, though its pods are quite like those of the emarginate-leaved Chinese plant (*Dolichos obcordatus* Roxb.) and of the rounded or emarginate-leaved Madras plant (*Canavalia obtusifolia* Baker, not DC.)

47. **Phaseolus calcaratus** Roxb., Hort. Beng. 54; Flor. Ind., iii., 289; Hook. f., Flor. Brit. Ind., ii., 203.

Minikoi; an escape, *Fleming!*

India and Malaya, wild and commonly cultivated.

48. **Vigna lutea** A. Gray *in* Bot. Wilkes' Exped., i., 452; Hook. f., Flor. Brit. Ind., ii., 205. *Dolichos luteus* Swartz, Flor. Ind. Occ., iii., 1246.

Minikoi; very common on the beach; *Fleming!*

A littoral species, cosmopolitan in the tropics; not reported from any of the Indian coasts; very abundant in the Andamans.

49. Vigna Catjang Endl. *ex.* Miq., Flor. Ind. Bat., i., 188; Hook. f., Flor. Brit. Ind., ii., 205. *Dolichos Catjang* Linn., Mantiss. 259; Roxb., Flor. Ind., iii., 303. Vernac. "*Loba.*"

Améni; cultivated, *Robinson.* Kadamum; cultivated, *Robinson.*

Generally cultivated throughout the tropics of the old world; a native of India. It is interesting to observe that it is under the Arabic name of *loba* (*lubia*, Forsk.), and not under an Indian name that it is known to the inhabitants.

50. **Cæsalpinia Bonducella** Flem., Asiat. Res., xi., 159; Roxb., Flor. Ind., ii., 357; Hook. f., Flor. Brit. Ind., ii., 254. *Guilandina Bonducella* Linn., Sp. Pl. (ed. ii.,) 545. *G. Bonduc* Linn., Sp. Pl. 381 (*pro parte*).

Bangáro; forming a dense low jungle, *Hume!* Akati; only one plant met with, *Fleming!* Kadamum; only one specimen seen, *Fleming!*

A littoral species, cosmopolitan in the tropics.

51. **Cassia occidentalis** Linn., Sp. Pl. 377; Hook. f., Flor. Brit. Ind., ii., 262. *Senna occidentalis* Roxb., Flor. Ind., ii., 343.

Akati; *Fleming!*

A cosmopolitan tropical weed.

52. **Cassia Tora** Linn., Sp. Pl. 376; Hook. f., Flor. Brit. Ind., ii., 263. *Senna Tora* Roxb., Flor. Ind., ii., 340.

Kalpéni; *Alcock!* Kadamum; *Fleming!* Akati; *Fleming!* Kiltán; *Fleming!*

A tropical road-side weed, almost cosmopolitan (absent from Polynesia).

53. TAMARINDUS INDICA Linn., Sp. Pl. 34; Roxb., Flor. Ind., iii., 215; Hook. f., Flor. Brit. Ind., ii., 273. The *Tamarind.*

Ameni; cultivated, *Hume.* Akati; cultivated, *Fleming.*

COMBRETACEÆ.

54. **Terminalia Catappa** Linn., Mantiss., i., 128; Roxb., Flor. Ind., ii., 430; Hook. f., Flor. Brit. Ind., ii., 444. The *Country Almond.*

Minikoi; both planted and indigenous; "the island abounds with this tree, its wood being put to various uses," *Fleming.*

A littoral species, extremely abundant in the Andamans and Nicobars as well as on all Malayan shores. Though now growing wild in Minikoi, this species has probably been originally introduced intentionally. It is not known wild in India.

MYRTACEÆ.

55. PSIDIUM GUAJAVA Linn., Sp. Pl. 470; Hook. f., Flor. Brit. Ind., ii., 468. *Psidium pyriferum* Linn., Sp. Pl. (ed. ii.,) 672; Roxb., Flor. Ind., ii., 480. *Psidium pomiferum* Linn., Sp. Pl. (ed. ii.,) 672; Roxb., Flor. Ind., ii., 480. The *Guava.*

Minikoi; cultivated, *Fleming.*

Native of Mexico, cultivated and often "wild" and quite naturalized in India and other tropical countries.

56. EUGENIA JAMBOS Linn., Sp. Pl. 470; Roxb., Flor. Ind., ii., 494; Hook. f., Flor. Brit. Ind., ii., 474; Watt, Dict., iii., 287. The *Rose-Apple.*

Minikoi; cultivated, *Fleming!*

Cultivated throughout India, Malaya and North Australia; native of the warmer Eastern Himalaya.

57. EUGENIA JAMBOLANA Lamk., Encyc. Meth., iii., 198; Roxb., Flor. Ind., ii., 484; Hook. f., Flor. Brit. Ind., ii., 499; Watt, Dict., iii., 284. The *Black Plum*.

Minikoi; cultivated, *Fleming!*

Cultivated or wild throughout India and Malaya.

LYTHRACEÆ.

58. **Ammania baccifera** Linn., Sp. Pl. 120; Hook. f., Flor. Brit. Ind., ii., 569. *A vesicatoria* Roxb., Flor. Ind., i., 426.

Kalpéni; *Alcock!*

A marsh weed, common throughout the tropics of Asia and Australia. The leaves are used as a vesicant in native medicine.

59. LAWSONIA ALBA Lamk., Ill., t., 296, f. 2; Hook. f., Flor. Brit. Ind., ii., 573; Watt, Dict., iv., 597. *L. inermis* Linn., Sp. Pl. 349; Roxb., Flor. Ind., ii., 258. *L. spinosa* Linn., Sp. Pl. 349. The *Mendi* or *Indian Privet; Henna Plant.*

Minikoi; *Fleming!*

A favourite hedge-plant in Indian gardens; wild in Western India, Afghanistan and Persia.

60. PUNICA GRANATUM Linn., Sp. Pl. 472; Roxb., Flor. Ind., ii., 409; Hook. f., Flor. Brit. Ind., ii., 581. The *Pomegranate*.

Ameni; cultivated, *Hume*. Akati; about half a dozen plants bearing good fruit, *Fleming*. Minikoi; generally cultivated, *Fleming*.

Native of Afghanistan, Scinde and Persia; generally cultivated throughout the tropics.

PASSIFLOREÆ.

61. CARICA PAPAYA Linn., Sp. Pl. 1036; Roxb., Flor. Ind., iii., 824; Hook. f., Flor. Brit. Ind., ii., 599. The *Papaw*.

Kiltán; cultivated, *Hume; Fleming*. Anderut; cultivated, *Wood; Alcock*. Akati; cultivated, *Fleming*. Kadamum; cultivated, *Fleming*. Minikoi; cultivated, *Fleming*.

Native of America, generally cultivated throughout the tropics; now perfectly naturalised in various parts of India.

CUCURBITACEÆ.

62. LUFFA ÆGYPTIACA Mill. *ex* Hook. f. *in* Oliv., Fl. Trop. Afr., ii., 530; Hook. f., Flor. Brit. Ind., ii., 614; Watt, Dict., v. 96. *L.*

pentandra Roxb., Flor. Ind., iii., 712. *L. racemosa* Roxb., Fl. Ind., iii, 715. *L. clavata* Roxb., Flor. Ind., iii., 714. *Momordica Luffa* Linn., Sp. Pl. 1009.

Minikoi; cultivated, *Fleming!*

Generally cultivated throughout the tropics.

63. MOMORDICA CHARANTIA Linn., Sp. Pl. 1009; Roxb., Flor. Ind., iii., 707; Hook. f., Flor. Brit. Ind., ii., 616; Watt, Dict., v., 256.

Minikoi; cultivated, *Fleming!*

Cultivated in tropical Africa and throughout S. E. Asia.

64. CUCUMIS MELO Linn., Sp. Pl. 1011; Roxb., Flor. Ind., iii., 720; Hook. f., Flor. Brit. Ind., ii., 620; Watt, Dict., ii., 627. *C. utilissimus* Roxb., Flor. Ind., iii., 721. The *Sweet Melon*.

Kadamum; growing "wild" round the village, *Fleming!* Kiltán; cultivated only, *Fleming!* Akati; cultivated, *Fleming!* Minikoi, frequent, *Fleming!*

Cultivated throughout the tropics.

65. CUCUMIS SATIVUS Linn., Sp. Pl. 1012; Roxb., Flor. Ind., iii., 20; Hook. f., Flor. Brit. Ind., ii., 620; Watt, Dict., ii., 632. The *Cucumber*.

Kiltán; "found growing wild, only one creeper seen," *Fleming!*

Cultivated throughout India, as it is in all tropical and temperate countries; here palpably an escape from cultivation.

66. **Cephalandra indica** Naud. *in* Ann. Sc. Nat., ser. v., v., 16; Hook. f., Flor. Brit. Ind., ii., 621. *Momordica monadelpha* Roxb., Flor. Ind., iii., 708.

Akati; *Fleming!*

A very common creeper in hedges throughout Africa, India and Malaya; here most probably a species introduced by birds.

67. CUCURBITA MAXIMA Duchesne *in* Lamk., Encyc. Meth., ii., 151; Hook. f., Flor. Brit. Ind., ii., 622; Watt, Dict., ii., 638. The *Common Gourd*.

Minikoi; cultivated and also growing "wild," *Fleming!*

Cultivated in all warm countries.

FICOIDEÆ.

68. **Sesuvium Portulacastrum** Linn., Sp. Pl. (ed. ii.,) 684 Roxb., Flor. Ind., ii., 509; Hook. f., Flor. Brit. Ind., ii., 659. *Portulaca Portulacastrum* Linn., Sp. Pl. 446.

Minikoi; *Fleming!*

A littoral species, cosmopolitan on tropical and sub-tropical shores.

Corolliflorae.

RUBIACEÆ.

69. **Dentella repens** Forst., Charact. Gen. 26, t. 13; Roxb., Flor. Ind., i., 532; Hook. f., Flor. Brit. Ind., iii., 42. *Oldenlandia repens* Linn., Mantiss. 40.

Anderut; *Alcock!*

A weed of moist places throughout tropical Asia, Australia and Polynesia.

70. **Oldenlandia corymbosa**, Linn. *ex* Hiern *in* Oliv., Flor. Trop. Afric., iii., 62; Hook. f., Flor. Brit. Ind., iii., 64. *O. biflora* Lamk., Encyc. Meth., iv., 553, *nec* Linn.; Roxb., Flor. Ind., i., 423. *O. ramosa* Roxb., Flor. Ind., i., 424.

Kalpéni; *Alcock!* Kadamum; *Fleming!* Kiltan; *Fleming!*

A weed of waste places and fields throughout tropical Asia, Africa and America.

71. **Oldenlandia diffusa** Roxb., Hort. Beng. 11; Flor. Ind., i., 423; Hook. f., Flor. Brit. Ind., iii., 65.

Anderut; *Alcock!* Minikoi; *Fleming!*

A tropical and sub-tropical weed of cultivation in Eastern and South-Eastern Asia.

72. **Oldenlandia biflora** Linn., Sp. Pl. 119; Hook. f., Flor. Brit. Ind., iii., 70.

Kalpéni; *Alcock!* Kadamum; *Fleming!*

A weed of cultivation confined to Southern India and Ceylon. The Laccadive specimens agree exactly with those of Wight (Herb. Wight n. 1376, Kew Distrib.).

73. **Guettarda speciosa** Linn., Sp. Pl. 991; Roxb., Flor. Ind., i., 686; Hook. f., Flor. Brit. Ind., iii., 126. *Nyctanthes hirsuta* Linn., Sp. Pl. 6.

Kadamum; *Hume! Fleming!*

A littoral species; found on all tropical shores.

74. IXORA COCCINEA Linn., Hook. f., Flor. Brit. Ind., iii., 145.
VAR. *Bandhuca* Roxb. (sp.). *I. Bandhuca* Roxb., Flor. Ind., i., 376.

Kadamum ; interspersed with the patches of wild indigo, *Hume !* Anderut, perhaps cultivated, *Alcock.* Kalpéni; at edges of patches of cultivation and probably planted, *Alcock !* Minikoi ; *Fleming !*

This form of *I. coccinea* is apparently a native of Southern India. It is common in native gardens throughout India and Ceylon : the bark of the root possesses valuable antidysenteric properties.

75. **Pavetta indica** Linn., Sp. Pl. 110; Hook. f., Flor. Brit. Ind., iii., 150. *Ixora paniculata* Lamk., Encyc. Meth., iii., 344. *Ixora Pavetta* Roxb., Flor. Ind., i., 385.

Kadamum; plentiful inshore, *Fleming !*

South-Eastern Asia; throughout India and Indo-China, and extending from S. China to N. Australia.

76. **Morinda citrifolia** Linn., Hook. f., Flor. Brit. Ind., iii., 155. VAR. *bracteata* Hook. f., Flor. Brit. Ind., iii., 156. *M. bracteata* Roxb., Hort. Beng. 15; Flor. Ind., i., 544.

Bangáro; *Hume !* Kalpéni; certainly wild, *Alcock !* Kiltán; *Fleming !* Akati; *Fleming !* Kadamum; *Fleming !* Minikoi; extremely plentiful throughout the island, *Fleming !*

A purely littoral plant, plentiful on all the Indian, Indo-Chinese, Andamans and Nicobars coasts visited by the writer. Here, as elsewhere, in the region where the plant occurs, it is truly wild, and has doubtless been introduced by the sea; it appears to be equally common also on the coasts of the Seychelle islands. This form, which it may be perhaps more convenient to consider, with Roxburgh, a species apart from *M. citrifolia*, is never cultivated in India except (*e.g.*, in the Calcutta Botanic Garden) as a curiosity; in Ceylon, according to Thwaites, it is both wild and cultivated, and from Mr. Fleming's note this would seem to be the case in Minikoi. In Bangáro it must of necessity be just as wild as it is in the Andamans and Nicobars where, even in uninhabited islands, it is not merely, as Kurz has said, "not infrequent," but is in reality one of the chief components of the beach-forest undergrowth behind the sea-fence of *Pandanus* bushes; sometimes it is common farther inshore.

This variety—or species—is confined to India, Indo-China and Malaya, not reaching Polynesia or Australia.

COMPOSITÆ.

77. **Vernonia cinerea** Less. *in* Linnæa, iv., 291, *et* vi., 673; Hook. f., Flor. Brit. Ind., iii., 233. *Serratula cinerea* Roxb., Hort. Beng. 60; Flor. Ind., iii., 406. *Conyza cinerea* Linn., Sp. Pl. 862.

Améni; *Hume!* Anderut; *Alcock!* Kiltán; *Fleming!* Kadamun; *Fleming!* Akati; *Fleming!* Minikoi; *Fleming!*

A cosmopolitan weed of waste places and fields.

78. **Adenostemma viscosum** Forst., Nov. Gen. n. 15.; Clarke, Comp. Ind. 28; Hook f., Flor. Brit. Ind, iii., 242. *Ageratum aquaticum* Roxb., Hort. Beng. 61; Flor. Ind., iii., 416.

Kalpéni; *Alcock!* Minikoi; *Fleming!*

A cosmopolitan tropical weed of fields and waysides which also not infrequently occurs on sea-shores growing among the ocean drift at high tide-mark, thus suggesting the possibility of introduction by the sea. The specimens from Kalpéni are probably referable to Clarke's variety *reticulata* (*Adenostemma reticulatum* DC. *in* Wight, Contrib. 8); they have ovate leaves (the largest being 9-11 in. long and 3½-4 in. across), reticulate; the achenes are elongate and sparsely warted. This variety is characteristic of South India and Ceylon. The Minikoi specimen has no leaves, but the achenes are precisely like those in the Kalpéni specimens.

79. **Ageratum conyzoides** Linn., Sp. Pl. 839; Hook. f., Flor. Brit. Ind., iii., 243. *A. cordifolium* Roxb., Flor. Ind., iii., 415.

Améni; *Hume!* Anderut; *Alcock!* Kalpéni; *Alcock!* Kiltán; *Fleming!* Minikoi; very plentiful, *Fleming!*

A weed of cultivation, originally American, but now cosmopolitan in the tropics. Though so common in the Archipelago, it is not recorded from any of the uninhabited islands which would indicate that its wide and rapid dispersal is due altogether to unintentional human action.

80. **Blumea laciniata** DC., Prodr., v., 436; Hook. f., Flor. Brit. Ind., iii., 264. *Conyza laciniata* Roxb., Flor. Ind., iii., 427.

Kiltán; *Fleming!* Akati; *Fleming!*

A weed of waste places distributed throughout S. E. Asia.

81. **Eclipta alba** Hassk. *in* Miq., Flor. Ind. Bat., ii., 65; Clarke, Comp. Ind. 134; Hook. f., Flor. Brit. Ind., iii., 304. *E. prostrata*

Linn., Mantiss. 266; Roxb., Flor. Ind., iii., 438. *Verbesina Lavenia-alba* Linn., Sp. Pl. 902.

Kadamum; *Fleming!* Kiltán; *Fleming!*

A cosmopolitan tropical weed.

82. **Wedelia calendulacea** Less., Syn. 222; Hook. f., Flor. Brit. Ind., iii., 306. *Verbesina calendulacea* Linn., Sp. Pl. 902; Roxb., Flor. Ind., iii., 440.

Anderut: in the excavated cultivation areas, *Alcock!*

A weed of wet places, widely distributed throughout S.-E. Asia.

83. **Wedelia scandens** C. B. Clarke, Comp. Ind., 136. *W. biflora* Hook. f., Flor. Brit. Ind., iii., 306; Prain, Laccadive List, 5. *Verbesina scandens* Roxb., Flor. Ind., iii., 441. *Wollastonia insularis* DC., Prodr., v., 548. *W. Horsfieldiana* Miq., Flor. Ind. Bat., ii., 72.

Kadamum; *Hume!* "the island abounds with this creeper," *Fleming!* Anderut; *Alcock!* Kiltán; *Fleming!* Minikoi; very common, *Fleming!*

A purely littoral species, distributed throughout all the coasts of S.-E. Asia. For the correction of the error in his former list, the writer is indebted to the kindness of Mr. C. B. Clarke, F.R.S.

84. **Bidens pilosa** Linn., Hook. f., Flor. Brit. Ind., iii., 309.

VAR. *bipinnata* Hook. f., Flor. Brit. Ind., iii., 309. *B. bipinnata* Linn., Sp. Pl. 832; Roxb., Flor. Ind., iii., 411.

Kadamum; *Fleming!*

A cosmopolitan tropical and sub-tropical weed.

85. **Crepis acaulis** Hook. f., Flor. Brit. Ind., iii., 396. *Prenanthes acaulis* Roxb., Flor. Ind., iii., 403.

Kiltán; *Alcock!*

A tropical weed, common throughout India and Burma; not reported hitherto from Ceylon.

86. **Launea pinnatifida** Cass. in Ann. Sc. Nat., xxiii., 85; Hook. f., Flor. Brit. Ind., iii., 416. *Prenanthes asplenifolia* Roxb., Flor. Ind., iii., 404 *in parte*, *vix* Willd.

Bitrapar; *Hume! Fleming!* Kadamum; *Fleming!* Minikoi; very plentiful, *Fleming!*

A littoral species, common on the shores of India, the Mascarene Islands and East Africa.

GOODENOVIEÆ.

87. **Scaevola Koenigii** Vahl, Symb., iii., 36; Hook. f., Flor. Brit. Ind., iii., 421. *S. Taccada* Roxb., Hort. Beng. 15; Flor. Ind., i., 527. *Lobelia Taccada* Gaertn., Fruct., i., 119, t. 25. *Lobelia frutescens* Linn., Fl. Zeyl. 148.

Bitrapar; very abundant, *Hume! Fleming!* Kadamum; abundant on the shore, *Fleming!* Kiltán; in a dense hedge along the entire lagoon face of the island, *Hume, Alcock! Fleming!* Akati; *Fleming!* Minikoi; *Fleming!*

A littoral species common on the shores of S.-E. Asia, N. Australia and Polynesia; also in the Mascarene Islands and Africa.

PLUMBAGINEÆ.

88. **Plumbago zeylanica** Linn., Sp. Pl. 151; Roxb., Flor. Ind., i., 462; Hook. f., Flor. Brit. Ind., iii., 480.

Améni; perhaps an escape from cultivation, *Hume!*

Cultivated throughout the tropics of the old world, readily escaping and spreading: wild in Southern Asia.

APOCYNEÆ.

89. **Ochrosia borbonica** Gmel., Syst. Veg. 439; Hook. f., Flor. Brit. Ind., iii., 638.

Minikoi; *Fleming!*

A littoral species distributed from the Mascarene Islands to Ceylon, the Andamans, Nicobars and Malaya; not reported from Indian coasts.

ASCLEPIADEÆ.

90. **Calotropis gigantea** R. Br. *in* Ait., Hort. Kew. (ed. ii.), ii., 78; Hook. f., Flor. Brit. Ind., iv., 17; Watt, Dict., ii., 34. *Asclepias gigantea* Willd., Sp. Pl., i., 1264; Roxb., Flor. Ind., ii., 30. The *Mudar*.

Kadamum; *Hume!* very common in the centre of the island near the huts, *Fleming!*

A weedy shrub of waysides and waste places throughout South-Eastern Asia. It is remarkable that it should be present only in one of the islands, and that it should occur only in the neighbourhood of the people's dwellings; these facts appear to indicate that the introduction of the plant has been here due to human agency, and has,

moreover, been deliberate. The milky juice of this plant is employed in native medicine, and it yields a fibre largely used in making fishing-lines.

91. **Tylophora asthmatica** W. & A., Contrib. 51; Hook. f., Flor. Brit. Ind., iv., 44. *Asclepias asthmatica* Willd., Sp. Pl., i., 1270; Roxb., Flor. Ind., ii., 33.

Kadamum; *Hume! Fleming!* Anderut; *Alcock!* Kiltán; plentiful along the shore, *Fleming!* Akati; *Fleming!*

A common weed throughout South-Eastern Asia. Its juice, like that of the preceding species, is used in medicine; its presence in so many of the islands, however, as well as its habitat indicate that introduction has not here been deliberate; though found on the shore, it is probably to the wind and not to the sea that its introduction is due.

92. **Leptadenia reticulata** W. & A., Contrib. 47; Hook. f., Flor. Brit. Ind., iv., 63. *Cynanchum reticulatum* Willd., Sp. Pl., i., 1258. *C. alatum* Prain, Laccad. List 5, *nec* W. & A. *Asclepias suberosa* Roxb., Flor. Ind., ii., 38.

Kiltán; *Alcock!* Kadamum; *Fleming!*

A roadside weed and climber in dry jungles throughout India, Burma, Malaya and Ceylon. The Kiltán specimens were erroneously referred to *Cynanchun* in the former Laccadive List.

BORAGINEÆ.

93. **Tournefortia argentea** Linn. f., Suppl. 133; Roxb., Flor. Ind. (ed. Carey & Wall.), ii., 4; Hook. f., Flor. Brit. Ind., iv., 145.

Bitrapar; very abundant, *Hume! Fleming!* Kiltán; *Alcock!* Akati; only seedlings found germinating on the shore, *Fleming!* Kadamum; *Fleming!* Minikoi; *Fleming!*

A littoral species extending from Africa and the Mascarene Islands to Ceylon, the Andamans, Malaya and Australia.

CONVOLVULACEÆ.

94. **Ipomœa grandiflora** Lamk., Ill., i., t. 467; Hook. f., Flor. Brit. Ind., iv., 198. *Convolvulus grandiflorus* Linn. f., Suppl. 136. The *Coast Moon-flower*.

Bitrapar; densely draped over the clumps of *Scaevola* and *Tournefortia*, *Hume! Fleming!* Kadamum; plentiful, *Fleming!*

A littoral species extending from Eastern Africa and the Mascarene Islands throughout South-Eastern Asia, and thence to North Australia and Polynesia. This species occurs in America as a cultivated plant only. *Ipomæa grandiflora* Roxb., Flor. Ind., i., 497, is not this species, but a form of *Ipomæa Bona-nox*, the true "Moon-flower," originally introduced from America.

95. Ipomœa Batatas Lamk., Encyc. Meth., vi., 14; Hook. f., Flor. Brit. Ind., iv., 202; Watt, Dict., iv., 478. *Convolvulus Batatas* Linn., Sp. Pl. 154; Roxb., Flor. Ind., i., 483. The *Sweet-potato*.

Amóni; cultivated, *Robinson; Hume*. Anderut; cultivated, *Alcock*; "of very inferior quality," *Wood*. Akati; cultivated, "only one small plot," *Fleming!*

96. **Ipomœa denticulata** Choisy *in* DC., Prodr., ix., 379; Hook. f., Flor. Brit. Ind., iv., 208.

Minikoi; *Fleming!*

A littoral species extending from the Mascarene Islands to Ceylon, the Andamans, Nicobars, Malaya and Burma (extending as far north as Akyab on the coast of Arracan), thence to North Australia and Polynesia, but, like *Ochrosia borbonica* and *Tournefortia argentea*, not as yet reported from the coasts of the Indian mainland.

97. **Ipomœa biloba** Forsk., Flor. Aeg. Arab. 44; Hook. f., Flor. Brit. Ind., iv., 212. *I. Pes-Capræ* Roth., Nov. Sp. 109. *Convolvulus Pes-Capræ* Linn., Sp. Pl. 159; Roxb., Flor. Ind., i., 486.

Bitrapar; plentiful, *Hume! Fleming!* Kalpéni; *Alcock!* Akati; on shore and also solitary plants in interior, *Fleming!* Kadamum; only on shore and not very common, *Fleming!* Minikoi; *Fleming!*

A littoral species, cosmopolitan on tropical sea-shores.

98. **Ipomœa sinuata** Ortega, Dec. 84; Hook. f., Flor. Brit. Ind., iv., 214. *Convolvulus dissectus* Linn., Mantiss. 204.

Minikoi; *Fleming!*

Native of America, now widely spread in the Old World: here growing quite wild.

99. **Convolvulus parviflorus** Vahl, Symb., iii., 29; Roxb., Flor. Ind. (ed. Carey & Wall.), ii., 51; Hook. f., Flor. Brit. Ind., iv., 220.

Minikoi; common on the coast, *Fleming!*

Tropical Africa; S.-E. Asia; Australia. Here, as on the shores of the Andamans and Nicobars, a purely littoral species; it occurs, however, far inland (as in Assam, &c.) as well.

100. **Evolvulus alsinoides** Linn., Sp. Pl. (ed. ii.) 392; Roxb., Flor. Ind., ii., 105; Hook. f., Flor. Brit. Ind., iv., 200. *E. linifolius* Linn., Sp. Pl. (ed. ii.) 392. *E. angustifolius* Roxb., Flor. Ind. (ed. Carey & Wall.), ii., 107. *Convolvulus alsinoides* Linn., Sp. Pl. 157

Kadamum; *Fleming!*

A weed of dry places in all tropical and sub-tropical countries.

SOLANACÆ.

101. **Solanum torvum** Swartz, Prodr. 47; Hook. f., Flor. Brit. Ind., iv., 234. *S. stramonifolium* Roxb., Flor. Ind., i., 572, *nec* Jacq.

Minikoi; *Fleming!*

A shrubby weed of waste places in South-Eastern Asia and tropical America.

102. **Physalis minima** Linn., Sp. Pl. 183; Roxb., Flor. Ind., i., 563; Hook. f., Flor. Brit. Ind., iv., 238.

VAR. *indica* Lamk., Encyc. Meth., ii., 102; Clarke *in* Hook. f., Flor. Brit. Ind., iv., 238. *Nicandra indica* Roem. & Schult., Syst., iv., 682.

Bangáro; *Hume!* Anderut; *Alcock!* Kadamum; *Fleming!* Kiltan; *Fleming!* Minikoi; *Fleming!*

A cosmopolitan weed of waste places and fields; also in Bangáro and Kadamum in this group, as on the Andaman coasts, a distinctly littoral species: the probabilities of introduction by fruit-eating birds or by the sea are almost evenly balanced.

103. PHYSALIS PERUVIANA Linn., Sp. Pl. (ed. ii.), app. 1670; Roxb., Flor. Ind., i., 562; Hook. f., Flor. Brit. Ind., iv., 238. The *Winter-cherry* or *Cape Gooseberry*.

Améni; cultivated, *Hume*.

Native of America, much cultivated in the Eastern Hemisphere. The specimens from Bangáro attributed to this species in the former list [illegible] in reality *P. minima* VAR. *indica*; Mr. Hume may, however, be right in saying that the Winter-cherry is cultivated in Améni.

104. CAPSICUM FRUTESCENS Linn., Sp. Pl. 189; Roxb., Flor. Ind., i., 574; Hook. f., Flor. Brit. Ind., iv., 239; Watt, Dict., ii., 157. The *Chillie*.

Minikoi; cultivated, *Fleming*.

Cultivated in all warm countries, native place unknown.

105. **Capsicum minimum** Roxb., Hort. Beng. 17; Flor. Ind., i., 574; Hook. f., Flor. Brit. Ind., iv., 239. The *Bird's-eye Chillie*.

Akati; as a weed, *Fleming!*

Cultivated throughout India and Malaya, probably originally Malayan.

This species is extremely apt, in the warmer valleys of the Himalaya and in hot moist localities like the Andamans and Nicobars, to escape and become, as it has become here, a weed of waste places. It is nevertheless doubtless a plant originally intentionally introduced into the Laccadives.

106. **Datura fastuosa** Linn., Syst. Nat. (ed. x.), ii., 932; Roxb., Flor. Ind., i., 561; Hook. f., Flor. Brit. Ind., iv., 242; Watt, Dict., iii., 32. The *Black Dhatoora*.

Améni; frequent, *Hume*. Anderut; *Alcock*. Akati; occurs pretty frequently and is not cultivated, *Fleming!* Kiltan; "only met with one plant about 100 yards from the shore," *Fleming!* Minikoi; "only one plant seen, grown in a garden," *Fleming!*

A weed of waste places in tropical Africa and South-East Asia; occurs in America also, but perhaps not there indigenous. The Minikoi specimen, which is from a garden, is the common Black Dhatoora (*D. fastuosa*), and though in most of the islands it is clearly only a weed, it is not improbable that it has been originally intentionally introduced. It should not be forgotten that the species may be, and at times is, a bird-introduced one.

SCROPHULARINEÆ.

107. **Linaria ramosissima** Wall., Pl. As. Rar., ii., 43, t. 153; Hook. f., Flor. Brit. Ind., iv., 251.

Kiltán; *Fleming!*

A weed of dry places throughout Afghanistan, [1]Here it is quite probably has been

[1] Ceylon.

108. **Herpestis Monnieria** H. B. & K., Syn., ii., 125; Hook. f., Flor. Brit. Ind., iv., 272. *Gratiola Monnieria* Linn., Sp. Pl. (ed. ii.) 24; Roxb., Flor. Ind., i., 141.

Anderut; *Alcock!*

A marsh-weed, cosmopolitan in the tropics.

109. **Striga lutea** Lour., Flor. Cochin. 22; Hook. f., Flor. Brit. Ind., iv., 299. *Buchnera asiatica* Linn., Sp. Pl. 630, *in part*; Roxb., Flor. Ind., iii., 31.

Akati; *Fleming!* Kadamum; *Fleming!* Kiltán; *Fleming!*

A parasitic weed distributed throughout tropical Africa, the Mascarene Islands, Arabia, India, Indo-China and China. It occurs in the Andamans (as an introduced species); apparently absent from Malaya.

ACANTHACEÆ.

110. **Ruellia prostrata** Poiret, Encyc. Meth., vi., 349; Hook. f., Flor. Brit. Ind., iv., 411. *R. ringens* Roxb., Flor. Ind., iii., 44.

Minikoi; very common, *Fleming!*

Common throughout India and Ceylon and extending to East Africa; absent from Malaya and Indo-China. Roxburgh's description applies to a form with larger leaves and longer internodes than typical *R. prostrata*; in Mr. Fleming's gatherings (five or six in number) both forms occur, as well as intermediate conditions.

111. BARLERIA PRIONITIS Linn., Sp. Pl. 636; Roxb., Flor. Ind., iii., 36; Hook. f., Flor. Brit. Ind., iv., 482; Watt, Dict., i., 400. *B. ciliata* Hume, Stray Feathers, iv., 446, *nec* Roxb. *B. cristata* Prain, Laccad. List 6, *nec* Linn.

Améni; *Hume!* Minikoi; planted as a hedge, *Fleming!*

Tropical Africa and Asia, perhaps usually only an introduced plant in India.

This is mentioned by Mr. Hume in conjunction with a number of apparently introduced species, and in Minikoi it is also an introduced plant. The specimen on which the presence of *B. cristata* in the group depends, proves on re-examination to be only an example of *B. prionitis* without any trace of spines. Mr. Hume indeed 304; hat, like the spiny Acanthad, the unarmed one is "yellow- Pl. 571. *Bat*h alone makes its identification with *B. ciliata* Roxb., Flor. Ind. ssible. And Mr. Fleming's Minikoi specimens Kadamum; *Flemin*.

shew the same peculiarity of some being spiny, while others are quite unarmed.

112. **Rungia linifolia** Nees *in* Wall., Pl. As. Rar., iii., 110; Hook. f., Flor. Brit. Ind., iv., 548.

Kadamum; very common, *Fleming!* Akati; common, *Fleming!*

A weed of dry places confined to Western India.

113. **Rungia parviflora** Nees: C. B. Clarke *in* Hook. f., Flor. Brit. Ind., iv., 550.

VAR. *pectinata* Clarke: Hook. f., Flor. Brit. Ind., iv., 550. *R. pectinata* Nees *in* DC., Prodr., xi., 470. *Justicia pectinata* Linn., Amoen. Acad., iv., 299; Roxb., Flor. Ind., i., 33.

Améni; *Hume!* Kadamum; *Hume!* Akati; *Fleming!*

A universal weed throughout India, Indo-China and Ceylon.

114. **Peristrophe bicalyculata** Nees *in* Wall., Pl. As. Rar., iii., 113; Hook. f., Flor. Brit. Ind., iv., 554. *Justicia bicalyculata* Vahl, Symb., ii., 13; Roxb., Flor. Ind., i., 126.

Améni; *Hume!* Kadamum; *Fleming!* Kiltán; *Fleming!*

Tropical Africa, India and Indo-China; not from Malaya or Ceylon. A common weed in South India, less common elsewhere.

VERBENACEÆ.

115. **Lippia nodiflora** Rich. *in* Michx, Flor. Bor. Amer., ii., 15; Hook. f., Flor. Brit. Ind., iv., 563. *Verbena nodiflora* Linn., Sp. Pl. 20; Roxb., Hort. Beng. 4.

Akati; *Fleming!* Minikoi; *Fleming!*

A weed of wet places in all tropical and sub-tropical regions, also often met with near tropical sea-shores; not impossibly a bird-introduced species. Though enumerated in Roxburgh's *Hortus Bengalensis*, this species is not described by him in the *Flora Indica*.

116. **Stachytarpheta indica** Vahl, Enum., i., 206; Hook. f., Flor. Brit. Ind., iv., 564. *Verbena indica* Linn., Syst. Veg. (ed. x.), ii., 851; Roxb., Hort. Beng. 4.

Anderut; *Alcock!*

A common garden-plant, readily escaping and becoming wild, throughout tropical America where it is indigenous, and tropical Asia where it is probably "naturalized" only. Here it is quite wild; it may have come as a weed, but more probably has been

intentionally introduced. As with *Lippia nodiflora*, Roxburgh includes this in the *Hortus Bengalensis*, but excludes it from the *Flora Indica*.

117. **Premna integrifolia** Linn., Mantiss. 252; Hook. f., Flor. Brit. Ind., iv. 574. *P. serratifolia* Linn., Mantiss. 253. *P. spinosa* Roxb., Flor. Ind., iii., 77.

Kadamum; "forming thickets," *Hume!* "very common; a little way inshore," *Fleming!* Kalpeni; on the shore, *Alcock!* Minikoi; coast zone, *Fleming!*

A littoral and sub-littoral species, very abundant on Indian, Indo-Chinese, Andamans, Nicobars and Malay Coasts.

118. **Clerodendron inerme** Gaertn., Fruct., i., 271, t. 57, f. 1; Roxb., Flor. Ind., iii., 58; Hook. f., Flor. Brit. Ind., iv., 589.

Kalpéni; plentiful on the coast, *Alcock!*

A littoral species abundant on Indian, Ceylon, Andamans and Indo-Chinese coasts.

LABIATÆ.

119. **Ocimum gratissimum** Linn., Sp. Pl. 1197; Roxb., Flor. Ind., iii., 17; Hook. f., Flor. Brit. Ind., iv., 608.

Bitrapar; growing near the Pir's tomb, *Alcock.* Kadamum; *Fleming!* Kalpéni; *Alcock!* Minikoi; *Fleming!*

One of the *Tulsi* plants, occasionally cultivated, but generally occurring as a weed of waste places throughout tropical Africa, the Mascarene Islands, India, Ceylon and Malaya. It also occurs as a weed in America, but there it is probably only an escape from cultivation and not an indigenous plant. Here, where the people are Mohammedans, the true or sacred *Tulsi* (*Ocimum sanctum*) is not found at all, this—the *Ram Tulsi*—taking its place. In Car Nicobar and in Burma, where also one *Tulsi* is as good as an other, the people not being Hindus, it is the *Gulal Tulsi*—the Basil (*O. Basilicum*)—that is usually found as a weed near native dwellings.

120. **Anisomeles ovata** R. Br. *in* Ait., Hort. Kew. (ed. ii.), ii., 364; Hook. f., Flor. Brit. Ind., iv., 672. *Nepeta indica* Linn., Sp. Pl. 571. *Ballota disticha* Linn., Mantiss. 83. *Ajuga disticha* Roxb., Flor. Ind., iii., 2.

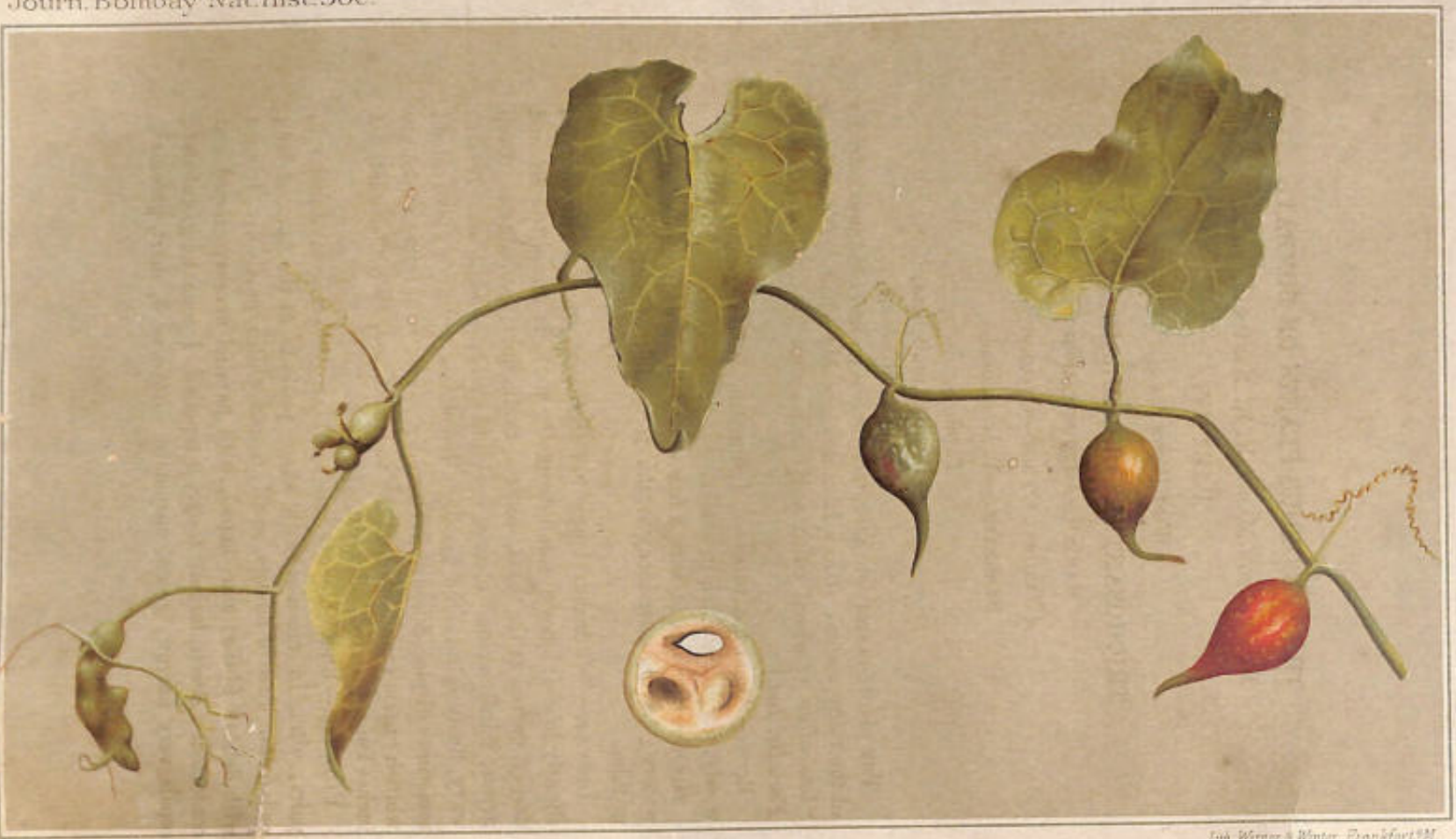
Kadamum; *Fleming!* Akati; *Fleming!* Miṅikoi; *Fleming!*

A weed of roadsides and waste places throughout tropical and sub-tropical South-Eastern Asia.

121. **Leucas aspera** Spreng., Syst., ii., 743; Hook. f., Flor. Brit. Ind., iv., 690. *Phlomis esculenta* Roxb., Flor. Ind., iii., 10.

Améni; *Hume!* Anderut; *Alcock!* Akati; *Fleming!* Kadamum; *Fleming!* Kiltán; *Fleming!*

A weed of cultivation throughout South-Eastern Asia and in the Mascarene Islands.



Isaac Benjamin del.

Lith. Werner & Winter, Frankfurt a/M.

The Poisonou[illegible] Plants of Bombay

Trichosanthes [illegible] Linn.

THE POISONOUS PLANTS OF BOMBAY.

By Surgeon-Major K. R. Kirtikar, F.L.S.,

PART IV.

(With Plates E and F.)

TRICHOSANTHES CUCUMERINA (*Linn.*).

Marâthi—कडुपडवळ; रानपडवळ.

(Natural Order—Cucurbitaceæ.)

Synonyms:—T. lancinosa.

T. pilosa.

Bryonia umbellata.

Cucumis Missionis.

The plant is a scandent herb, more or less pubescent; annual, strictly of the rainy season. Has a faint disagreeable odour. Diœcious; or "less often (? when cultivated) monœcious":—Clarke (*Hooker's Flor. Br. Ind.*)

Root.—Somewhat tuberous, lying deep in the ground; slightly woody, fibrous; whitish in colour.

Stem.—Herbaceous, with a few woody fibres, pentangular, striate, watery; having a tendency to the formation of twisted irregular nodules.

Leaves.—3-6 inches long; 2-4 inches at base; ovate-cordate; slightly lobate; lobes five, not distinctly marked; margin broad and deeply curved at the base, serrate throughout; acuminate. Deep green; faintly cream-coloured here and there; puberulous. *Tendrils* wavy, finely spiral, bifid usually; sometimes trifid or undivided; sometimes displaced by irregular nodes. *Venation* of leaves strikingly whitish; nerves prominent on the under surface. *Petiole*, slender, 2-4 inches long; grooved, often deeply; wavy.

Flowers.—Buds oblong-rotund. Male flowers.—Peduncles in pairs; often in racemes with short pedicels at the apex of long peduncles. Size of flowers, small; colour white; petals five, fringed with delicate fibrils; star-shaped, with parallel nerves; crisped and contorted. *Bracts*, large. *Calyx*, 5-sepalled, 1 inch long, tubular; sepals very narrow, green, cuspidate. *Stamens*, 3, short, greenish,

almost included; connate; long-linear; 1 one-celled, 2 two-celled; cells conduplicate, yellowish.

FEMALE FLOWERS.—Solitary, often opposite a leaf; calyx and corolla as in male. *Style*, greenish; *stigma*, trifid and whitish.

FRUIT.—A pepo; 2-4 inches long; ovate, pointed at both ends; with short peduncles which are incurved, dark green and shining; shape oblong-rotund; carpels imperfect; externally marked greenish-white in the younger stage with broken longitudinal lines from apex to base. The colour of the fruit is greenish when first formed, gradually changing into yellow, orange, and deep scarlet as the fruit matures: pulp cream-coloured when the fruit is young.

SEEDS.—$\frac{3}{4}$-$\frac{1}{2}$ inch, compressed or corrugate; arranged in rows of three, transversely or horizontally; large; varying in number from 20—30 or more, surrounded by a thin fœtid bitter watery pulp which assumes a deep red colour when the fruit matures. Shape of seed oblong-plane; angulated at its attachment to the funicle. The fruit matures in September and October. Abundant in the neighbourhood of Bombay.

POISONOUS PROPERTIES.

The plant has a distinctly emetic effect. Rheede (in *Hort. Malab.*, Vol. VII., pp. 107-108) mentions that the juice of the plant produces vomiting. The juice of two ounces of the root acts as a violent drastic purgative, not unlike *Elaterium* which is a product of the squirting cucumber of the same Natural Order. The plant is said to cure quotidian and quartan fevers chiefly by inducing vomiting. The drug, therefore, has to be used with caution. The leaves, root and fruit are all bitter, and act equally powerfully.

Description of Plate E.

A branch of the plant with fruit. The leaf in the centre is typical. The red fruit to the right is mature. Irregular nodes shewn in two places to the left: the one below has swollen the stem; the one above in 3 globular masses has displaced a small branch. Below the branch is a transverse section of the fruit through the middle shewing the 3 seeds, and the creamy pulp of the three indistinct carpels.

The Poisonous Plants of Bombay

Gloriosa superba - Linn.

(½ Natural size)

GLORIOSA SUPERBA (*Linn.*).

MARÂTHI—खड्यानाग.

(NATURAL ORDER—LILIACEÆ.)

The plant is an annual climber, wild in hedges and jungles; often cultivated in gardens for its beautiful flowers.

ROOT—Tuberous, fleshy, budding from the convexity above; tubers cylindrical or flattened, in some parts sometimes slightly twisted. 4 to 9 inches long; about an inch thick. Substance internally white, mealy, juicy, with a slight acrid odour. The external appearance of the tuber is brown. This is due to the thin paper-like epidermis which encloses it at all parts of the bulb, except the growing point, which latter looks like the eye of a potato. The epidermis is easily removed by the mere handling of the bulb, and is fragile. The old bulb, as the plant matures, shrivels up, and gradually throws out a new bulb at right angles which terminates in a growing point. It is from this growing point that the future plant sprouts out. The rootlets are chiefly confined to the part of the bulb directly opposite to where the stem is situated.

STEM—Usually a single stem arises from the bulb. It may branch off almost immediately after it leaves the tuber. The stem is put down as 10—20 ft. by Hooker (*Flora Br. Ind.*), but is often much longer than that in the jungles, where it is seen in its natural condition. When the stem branches off immediately on leaving the tuber underground, three or four slender cylindrical green sprouts shoot up above the ground, thus making it appear that they are separate plants from one and the same bulb; but it is not so. One bulb, one plant is the rule invariably in a number of bulbs I have carefully examined. The stem is nearly cylindrical, and though herbaceous, is tough and interspersed with woody fibres in close-packed bundles. The medulla of the stem is slightly pithy and full of watery juice when fresh; hollow when the plant dries up and the pith shrivels up. At each insertion of the leaf, which is arranged in pairs in an opposite manner, the stem deviates from the median line, thus giving the whole plant an angular or regular wavy appearance.

LEAVES—Sessile or short petioled; the inferior ones opposite and oblong; the superior ones single, ovate-lanceolate; the other leaf replaced by the flower-stalk, when the plant is in flower. The length of the leaves varies from six to eight inches; the greatest breadth is often as much as two inches. *Venation*, parallel-nerved. Mid-rib prominent, terminating into a stiff spiral coil, which resembles a tendril. This is a marked characteristic of the plant, which, so far as I know, has no parallel in the Vegetable Kingdom.

FLOWERS—Solitary, on long slender variously curved peduncles, 4-6 inches long; deflexed, often giving the flowers with their reflex petals the appearance of a slender-winged butterfly poised in the air. It is this that gives the gorgeous flowers their unique appearance, and shows off their rich, varied, and ever-varying hues.

PERIANTH—Of six petals, persistent. *Flower-buds* conical or pyramidal, bright green.

PETALS—3-4 inches long; linear-lanceolate, narrow, undulate or crisped; bright green with a pale yellow margin when fresh opened; bright yellow up to a third from their insertion, and scarlet up to tip when full-blown; gradually converting into rich scarlet, with golden-yellow margin and mid-rib when the ovary is maturing into fruit and growing in size. The flower retains its beauty for several days. The petals are persistent, and don't fall off even after the plant has dried. They fall off long after the fruit and seeds are mature. It is this that makes it so appreciable as a forest and garden beauty. The petals, which are reflexed when fresh-open, assume a spreading aspect as they grow older.

STAMENS—Six hypogynous; radiating from the ovary.

Filaments—Filiform, sometimes stout; bright green when the flower first opens; gradually changing into bright golden yellow as the flower matures.

Connective—Greenish; changing into golden-yellow.

Anthers—Large, semilunar, versatile, golden-yellow, extrorse; often dorsifixed.

PISTIL:—

OVARY—3-celled, superior, as is characteristic of the natural order *Liliaceæ*; the carpels deeply grooved in the centre, thus giving the fruit the appearance of a six-lobed

body, though actually three-lobed, as is clearly shown in figures 4 and 5 in the accompanying plate drawn from nature.

STYLE—Filiform, deflexed almost at right angles from the very apex of the ovary, tapering into a trifid stigma from a broadish base, greenish just as the flowers open, gradually changing into yellow. Sometimes the style remains long after the petals have fallen.

FRUIT—A capsule 2 inches long; an inch broad when full developed; coriaceous; septicidal.

SEEDS—Numerous, subglobose, in dense double rows in each of the three carpels of the capsule. *Testa* spongy white when young, covered with a brilliant rich scarlet mucilaginous coat when the fruit matures.

EMBRYO—Cylindrical.

REMARKS.—*Gloriosa superba* is essentially a monsoon plant; it begins to sprout out in the early part of the rainy season, and dies soon after the rains. The bulb remains dormant throughout the cold weather. It flowers and bears fruit from July to September. Should the plant be cultivated as a garden beauty or ornamental trellis-plant, it is best to repot or replant it in February or March, or at the latest in April, when the terminal bud of the tuber begins to sprout out. Dalzell and Gibson call it "Buchnâg." This is a mistake. Buchnâg is the root of *Aconitum ferox*, which is different in form and appearance. There is no doubt, however, that the tubers of this plant are adulterated with the tubers of the real Buchnâg. Dalzell and Gibson also call the plant "*Kalawee.*" This is evidently a misprint, and meant for the Marâthi synonym "Kaḷa-lâwee" (कळलावी). Surgeon-General Edward Balfour, of Madras, states that the petals of the flower of *Gloriosa superba* are fringed (*Cyclopædia of India*, Vol. I.). It is not so. There is no fringe of any kind on any part of the plant. The colour of the flowers depends a great deal on the amount of the sun or the intensity of it, to which the flowers are exposed as they are maturing and expanding. The specimen from which our drawing is made was obtained from a plant which flowered under a persistent cloudy sky; the scarlet colour is therefore not quite so deep or bright as it might be, and very often is. Firminger speaks of a

caterpillar infesting it. He says that if not looked to, the plant is entirely consumed by the caterpillars. I am not aware of the plant ever being similarly attacked or even approached by devouring insects, on this side of India. It would be useful to have more information on this point.

THE POISONOUS PROPERTIES.

This plant is one of the nine secondary poisons mentioned by Hindu writers. They are given as follows in *Nighanta Ratnâkar* (Vol. III., p. 255):—

1. Euphorbia neriifolia.
2. Calotropis gigantea.
3. Gloriosa superba.
4. Abrus precatorius, red and white.
5. Nereum odorum.
6. Strychnos Nux-Vomica.
7. Datura alba and fastuosa.
8. Jatropha Curcas.
9. Papaver somniferum (its product opium).

Very few cases of poisoning are on record, but the plant is well known all over the country as a virulent poison, although it is said to be useful in fevers as an antiperiodic. Dr. Norman Chevers mentions two cases (*Medical Jurisprudence*, p. 284), in one of which the effects are stated to have been those of a Narcotico-irritant poison; it is not stated what poisonous symptoms were observed in the other. In the one ½ tola and in the other 2 tolas of the root caused death. Brigade-Surgeon Lyon mentions (*Medical Jurisprudence*, p. 454) a case reported in the *Indian Medical Gazette*, 1872, p. 153, in which the powdered root (quantity not mentioned) produced the following effects:—"Symptoms of poisoning appeared in half an hour, and were:—retching, violent vomiting, spasms and contortions of the body, with fearful racking pain; from time to time there were short intervals of relief, followed by recurrence of the same symptoms. Death took place in four hours. The *post-mortem* appearances were congestion of the brain and its membranes with extravasations of blood. The lungs, liver, and kidneys were all deeply congested. The gastric mucous membrane showed signs of inflammation. The peritoneal covering of the fundus of uterus (unimpregnated) was also found inflamed."

...ient Hindu writers agree in attributing violent emetic properties to the root; it is also said to cause abortion, and as such prescribed by Hindu physicians for expelling retained after-births. Dr. Dymock, in citing the researches of Warden, says that there are two resins and a bitter principle in the root. Warden names this bitter principle *superbine*, and considers it identical with that of *Urginea Scilla*, the ordinary Squill. The bitter active principle of Squill, says Dr. Lauder-Brunton, is a glucoside Scillitoxin or Scillain. The Scillitin of some authors is probably slightly impure Scillitoxin (*Pharmacology*, p. 962). Squill is classed by Lauder-Brunton among stimulants of the Cardiac muscle, when moderate doses are given. When, on the other hand, larger doses are given, it acts as a "Cardiac poison" (p. 276, *Op. cit.*). In such cases, that is to say, where the dose is large, "the stage of stimulation is followed by one of peristaltic action and final arrest in Systole." It is a pity the case quoted by Dr. Lyon gives no information regarding the *post-mortem* condition of the heart, although the condition of every other organ is noted. It will be useful to note this condition in all future observations with a view to verify the opinion of Warden. In excessive doses, "the operation of Squills," says Dr. Waring (*Therapeutics*, p. 489), "is that of an acro-narcotic poison, 24 grains having proved fatal." Squill is known to cause nausea; a small dose may act with extreme violence. I have already said that the plant is well known among the Hindus as possessing emetic properties. The conjecture of Warden is in my opinion based on a striking similarity of the physiological effects of the two plants on the human body.

Description of Plate F.

1. Flowering branch of the plant.

2. Root, bilobed; vertical portion being half the shrivelled tuber of the current year; the horizontal portion being the new tuber, from the terminal eye of which, at the tip of the part marked 3, the future plant will sprout out: from the convexity of the angle rises the green stem of the plant dividing into four branches immediately on escaping from the bulb; from the under surface of the angle are shown numerous rootlets.

4. Half-mature fruit cut across, about the middle.

5. Half-mature capsular fruit *in situ*.

NOTES ON WILD DOGS, &c.,

By Prof. H. Littledale, b.a., Baroda College.

(*Read before the Bombay Natural History Society, July 4th*, 1892.)

Having lately been looking into the accounts of wild dogs given by several writers on sport and natural history, I have been impressed by the comparative scantiness of the information that seems to have accumulated on the subject.

The fullest and most scientific account of wild dogs in India is to be found in Mr. Blanford's recent book on the *Mammalia of India*, and I have compared with his remarks the various references to these animals in Darwin's *Animals and Plants under Domestication*, Jerdon's *Mammals of India*, Sterndale's *Natural History*, Cassell's *Natural History*, Stonehenge's *Book of the Dog*, Ward's *Sportsman's Guide to Kashmir*, Forsyth's *Highlands of Central India*, Saunderson's *Thirteen Years among the Wild Beasts of India*, Baldwin's *Game of Bengal*, Kinloch's *Large Game Shooting*, and Nicholson's *Zoology*.

Mr. Blanford divides the living Indian *Canidæ* into three genera, *Canis*, *Cyon*, and *Vulpes*. He mentions some fossil remains of extinct species of *Canis* and *Vulpes*, and also an extinct genus called *Amphicyon*, intermediate between dogs and bears, of which a fossil species has been found in the Siwaliks; and he points out that the Indian wild dog, although belonging to the *Canidæ*, is less truly canine than are other members of the family, such as the wolf and jackal.

The genus *Cyon* (κυων a dog) has two Indian representatives, *Cyon deccanensis*, the wild dog of the Himalayas and Peninsular India, and *Cyon rutilans*, the wild dog of the Malayan region ('rutilans color' in Pliny means of a 'red or glowing colour,' from *rutilo*, to make or colour red). The specific differences of these two forms are slight, and have not been very fully examined.

The essential points of unlikeness between the genus *Cyon* and the true dog-genus *Canis* are that *Cyon* has only two true molars on each side of the lower jaw, instead of three, as in *Canis*.

The dental formulæ of the two are as follows :—

	Cyon.	Canis.
incisors	$\frac{3-3}{3-3}$	$\frac{3-3}{3-3}$
canines	$\frac{1-1}{1-1}$	$\frac{1-1}{1-1}$
premolars.....	$\frac{4-4}{4-4}$	$\frac{4-4}{4-4}$
molars	$\frac{2-2}{2-2}$	$\frac{3-3}{2-2}$
Total.....	40	42

In the next place, the female *Canis* has ten mammæ, or more rarely eight, while *Cyon* has twelve or fourteen.*

Finally, says Mr. Blanford, the muzzle in *Cyon* is proportionately shorter, and the line of the face, when viewed from the side, is slightly convex, instead of being straight or concave as in other *Canidæ*.

I will return to Mr. Blanford's account of the wild dog later on; I may now give an outline of what other writers have left on record, adding a few comments here and there.

* Darwin (*Animals and Plants*, i. p. 36) points out that the mammæ in *Canis* "vary from seven to ten in number; Daubenton having examined twenty-one dogs, found eight with five mammæ on each side; eight with four on each side, and the others with an unequal number on the two sides." But if I understand him rightly, he does not consider "the additional molar teeth" or "the number of mammæ" as essential characteristics of distinct breeds. He says:—"Some of the difference above enumerated are in one respect of little value, for they are not characteristic of distinct breeds; no one pretends that such is the case with the additional molar teeth or with the number of mammæ," &c. (page 38, Vol. i.). Does *such* refer to 'being of little value' or to 'being characteristic'? The sentence is rather obscure, but I think it is elucidated by what follows:—"Those who have attended to the subject of selection will admit that, nature having given variability, man, if he chose, could fix five toes to the hinder feet of certain breeds of dogs, as certainly as to the feet of his Dorking fowls; he could probably fix, but with much more difficulty, an additional pair of molar teeth on either jaw, in the same way as he has given additions horns to certain breeds of sheep," &c.

Mr. Sterndale (p. 241) gives a spirited illustration of the wild dog hunting, but his dog has pointed instead of rounded hyæna-like ears, and is too full-bodied and wolf-like; its tail too is not long enough, for the wild dog's tail is one-half the length of the head and body, and the tail of the dog in his woodcut does not look more than one-third, if so much, of the head and body. This would suit a jackal's picture better. In fact the portrait gives one rather an incorrect idea of the wild dog as it appears alive in the jungle. Mr. Sterndale (following Jerdon and Blyth) considers that there is only one species of wild dog, *Cyon rutilans*, varying locally, and there is probably a good deal to be said for this view of the matter. Certainly Mr. Blanford's attribution of "woolly under-fur" to *deccanensis*, would be applicable to the Himalayan form than to the wild-dog of the plains, as this latter has only a slight ruff of under-fur round the throat, where a mane might have been placed, and not covering the body generally. The existence of under-fur suggests that the animal of the plains may be derived from ancestors that inhabited colder regions. Mr. Sterndale quotes from Hodgson and McMaster, but as his book is so well known in Bombay, I need not make any long extracts from it, and will only note that according to Hodgson (on native authority, Mr. Blanford surmises) "wild dogs bark like hounds in hunting"; while McMaster quotes "Hawk-eye" (Col. Hamilton) to the effect that "the wild dog does not throw his tongue when in chase; he has heard them make a kind of tremulous whimper." This latter opinion is confirmed by Stonehenge and other writers.

Mr. Sterndale also quotes from his own "Seonee" as follows:—"The natives in all parts of India declare that even tigers are attacked by them; and we once heard a very circumstantial account of a fight which took place near the station of Seonee, between a tiger and a pack of these dogs, in which the latter were victors. They followed him about, cautiously avoiding too close a contact, and worried him for three successive days,—a statement which should be received with caution. We have however heard of them annoying a tiger to such an extent as to make him surrender to them the prey which he had killed for himself."

There is a general tendency, I may remark, among English

naturalists, to disbelieve the native stories about tigers and wild dogs, and some of the stories are certainly incredible,* but these legends come down from old times when tigers were far more plentiful than they are now, and when the natives had very full opportunities of observing the ways of wild beasts. Besides, though wild dogs are extremely shy and timid in the presence of man, they are terribly fierce by nature also, and we know that individually timid species of the lower animals will often display great daring when mutually encouraged and acting in a flock or pack. And is it not an error to suppose (as is often done) that among the four-footed, as among the human denizens of the jungles, there is that overpowering awe of the tiger that civilised man—more imaginative than they—is sometimes disposed to feel? For my own part, I can well believe that a pack of these agile dogs could give even a full-grown tiger, when either recently gorged or else weakened by hunger, an exceedingly bad time of it, especially if they worried him day after day for several days under the hot sun, as they are said to do. Nor are all tigers alike in strength. There may be the mangy old toothless tiger on his last legs, growing weaker and dimmer-eyed as the days pass by; in fact dying

as slow
As the morning mists down the hill that go;

such a tiger as he would have a bad chance against a dozen of these red demons snatching at his flanks! And, again, there may be the perky and inquisitive cub (whose mother does not know that he is out), when the wild pack meet with him in a lonely place, is he not likely to pay for his desire of "seeing life" by losing it?

Certainly with regard to the tiger in his full vigour, "burning bright in the forests of the night,"—I confess to a liberal disbelief of the native legends myself. The oriental imagination is undoubtedly too luxuriant at times, and we must allow a discount accordingly. But on a view of the whole matter, I incline to think that there is or was a very large substratum of fact to the native stories, wonderfully circumstantial and widespread as they are, of the prowess of the wild red dogs against the tiger. "Why should I shoot the wild dog?" said the *patel* of a jungle-village to me once; "he is my god: he kills the tigers that take my cows!" And this represents the universal belief among the wilder tribes of India,

* For example, the extraordinary belief stated further on in a quotation from Molesworth's *Marathi Dictionary*.

from north to south. In this connection, finally, I would ask you to recollect the instinctive antipathy between the *Canidæ* and *Felidæ*, and the well-known fear that the *Felidæ* show for packs of dogs, panthers especially taking to trees when chased even by three or four village pariah dogs, although they turn the tables on the pariah when they meet him by moonlight alone.

Mr. Saunderson (p. 275) says: "From what I have seen of their style of hunting, and of their power of tearing and lacerating, I think there can be no doubt of their ability to kill a tiger;" and he mentions some facts in corroboration of this. Captain Baldwin (p. 126, compare pp. 19 and 108) says that he only twice met with the wild dog, once near Mussoorie and once in the Lullutpore jungles. He too relates "well-authenticated anecdotes of a tiger and a bear having been attacked by wild dogs, and both coming off second best in the battle; the result being that the former was torn to pieces, and the latter so cruelly mauled that he could only have held out a short time longer, had the fight continued to the end."

Once a pack of nine of these dogs hunted some pig that his beaters had turned out; they went by him with their noses to the ground.

This coincides with what I have observed in my young *Cyon* wild dog—she seeks her food not more by sight than by scent; often when she does not see clearly where a bit of meat has fallen she noses it out with great quickness and then snap! and it is gone. Her sight is improving in this respect—at first it was very bad. Baldwin quotes a Bombay sportsman who shot a couple of *junglee kútás* that were "very thin and long in the leg," but other observers notice the shortness of leg of these animals as compared with true *Canis*. I have not been struck by any very marked difference in this respect between *Cyon* and *Canis*, but the forelegs of *Cyon* do seem shorter than those of the ordinary red pariah; and *Cyon* has a habit of stooping in an inquiring way, with his back somewhat rounded, when facing you. His body is very greyhound-like and muscular.

Colonel Kinloch gives a good picture of a stuffed head of the wild dog, a Tibetan specimen from near Leh in Ladakh, where these dogs are not uncommon, and are known as Hāzi. He says that the

wild dog "stands considerably higher than the common jackal; he is also much longer in the body and more wolfish-looking. The colour is a reddish-yellow; the hair is soft and woolly, and about two inches in length. The tail is long and bushy, and carried like a fox's, but it is not so full as the brush of the latter animal."

Colonel Kinloch is speaking of the wild dog as it is modified to suit the rigorous climate of the Tibetan table-land, and you will see that the same animal puts on a much shorter and thinner and darker coat in the hot jungles of the Vindhyan region. Kinloch says that he has often been in their vicinity but has very seldom seen them.

Captain Forsyth (p. 357) relates that he fell in with a tribe of Gond wood-cutters who had a breed of "fine large red-coloured dogs, with the aid of which they were able to run down and spear many deer and wild pigs. This red breed of pariahs is certainly" (he continues) "the indigenous one of these parts [Pachmarh country] whether or not," as he suspects, "descended from the wild species that frequent these jungles."

Darwin (*Animals and Plants under Domestication*, Vol. I., p. 23 states that "the natives of Guiana have partially domesticated two aboriginal species, and still cross their dogs with them; these two species belong to a quite different type from the North American and European wolves." This suggests that we should make an examination of the Gond dogs, to see whether they possess the dental and other characteristics of *Cyon*. Professor Duncan, quoting Captain Williamson from Youatt, also states (Cassell's *Natural History*) that the wild dogs in some parts of India are "half-domesticated, and used in the noble sport of pig-sticking." Darwin (*op. cit.* II., p. 144) says that Indian wild dogs breed in captivity. Thi might lead to partial domestication in the second or third generation, perhaps sufficient to admit of crossing for purposes of sport. But the whole subject of the semi-domesticated dogs of the wild tribes of India requires looking into. Perhaps some member of our Society residing in the Central Provinces will kindly favour us with notes on these Gond dogs. It does not seem impossible that the pariah dog and the wild dog should inter-breed occasionally, as jackals and pariahs do; and the uniformity of colour in those red dogs mentioned by Forsyth is indicative of a feral origin, as variation of colour on the

contrary is characteristic of domestication. "The wild dogs," Forsyth continues, "live in packs of fifteen or twenty, and prey exclusively on game, running down all sorts of deer like a pack of hounds. Where a pack has been hunting for any time, most of the game naturally disappears. This applies to the tiger even, which they are said to attack whenever they meet him. Tigers would naturally follow the herds of deer on which they prey, if they were moved by the wild dogs; but there is such a consensus of native opinion as to the pack actually hunting, and even sometimes killing, tigers, that it is difficult altogether to discredit it. I do not believe [Forsyth continues] that any number of the dogs could overcome a tiger in fair fight; but I think it quite possible that they might stick to him, and wear him out by keeping him from his natural food. Many stories are related of tigers climbing into trees (which, of course, is quite against their nature) to escape from them; and I once saw the bones of a tiger lying on a ledge of rock, where more than one person assured me that they had seen him lying surrounded by a large pack of the wild dogs."

"Fair fight," as Forsyth calls it, is not the system of attack pursued by these dogs; they keep out of reach and make snatches at the tiger, lacerating the hinder parts in a terribly effective manner.

Major Ward, in his *Sportsman's Guide to Kashmir* (p. 88), says that the *Ram hun* or wild dog is tolerably common in Tilail, north-east of the vale of Kashmir. He shot two out of a pack, and notes that one was five feet long from the nose to end of tail. He also notes that game leave a district infested by these dogs, but he does not credit the stories of their killing tigers, though he believes that the tigers leave the jungles as the game has been driven away by the dogs. He mentions that a pair of these dogs took up their quarters near a Kashmiri village, and often worried the sheep in the open country. Jerdon (*Mammals*, p. 145) says that there is "a prevalent belief among sportsmen in India of the existence of two races of wild dogs in India," and he quotes Hamilton Smith, who goes further in stating that "besides the *Jangli Kútá* of the plains, there are two hill kinds, one larger, the other smaller," &c. According to Major Ward, the Kashmiri shikaris also say that there are two species of these wild dogs, the small breed destroying sheep and goats and

keeping low down in the ravines, the larger breed hunting on the higher mountains; but he doubts the truth of this statement.

I would suggest that the "small breed" is really a pack of females and cubs; the mothers are teaching the young ones to hunt, and they naturally blood them on easily-killed animals as sheep and goats which are found low down in the valleys. The full-grown and larger animals would seek their natural food, wild goats, musk deer, barasing, oorin, etc., in the haunts of such creatures on the higher ground.

"Stonehenge" has some remarks on the *dhole*, as, following Captain Williamson, he calls the wild dog; he quotes from the older writers, Buffon, Pennant, and Bell, on the origin, and Williamson on the habits, of the animal. He states that the *dholes*, unlike most dogs which hunt in packs, "run nearly mute, uttering only occasionally a slight whimper, which may serve to guide their companions equally well with the more sonorous tongues of other hounds." On the whole, I may say that his account of the wild animal is not very authoritative, as his special knowledge of the subject begins with the domesticated varieties of the dog.

Ogilvy's Dictionary states that *dhole* is the Cingalese name for the wild dog, and quaintly adds that it "runs down almost every animal except the elephant and rhinoceros." Mr. Blanford does not give the name *dhole*, and says that the wild dog is not found in Ceylon. To what, then, do the Cingalese refer as the *dhole*? What is *Chrysaeus ceylanicus*? and is Jerdon (p. 148) wrong in saying: "The wild dog is common in Ceylon?"

There is an excellently compiled account of the wild dog by Professor Duncan in Cassell's *Natural History*, Vol. II., giving the facts as I have quoted them from other writers.

Dr. Nicholson, in his *Manual of Zoology* (p. 747), figures the dentition of the wolf as a typical *Canis*, but omits all mention of the genus *Cyon*, unless he means to include it when he says: "Such wild dogs as there are, are probably merely derived from the domestic dog;" this, however, is so clearly not true of *Cyon* that I conclude he does not mean to indicate it among these tame dogs run wild, but is rather thinking of the Australian *dingo*.

My interest in the subject of Indian wild dogs has been increased

of late by my having come across them several times last May in the jungles of the lower Tapti Valley, when I procured a couple of dead full-grown specimens, and a couple of live pups, one of which still survives. I met with three packs of five, nine, and fifteen individuals, and these numbers represent the average size of one, two, or three families, if packs are aggregates of families, as seems likely. Mr. Blanford gives twenty as the size of large packs, but a friend well acquainted with packs of hounds informs me that he saw a pack of nearly forty of these wild dogs, many years ago, in the Chandni jungles near Asseerghur. Probably small packs or family parties combine at times, and then separate again according as business is brisk or the opposite.

On the 5th of May my shikaris captured two pups of the wild dog, *Cyon deccanensis*. The men said that there were three in the litter, but that one escaped. They found them in the Baroda jungles to the south of the Tapti, opposite Vajpur. The pair brought were male and female; but the male, the smaller and weaker of the two, was very sick and died on the 7th, having refused all food. They seemed to be about three weeks old, which would fix their birth about the middle of April. Mr. Blanford says the young are produced from January to March; so this period must now be extended a little. He also says that they are of a sooty-brown colour, but I should rather describe their colour as a sooty-yellowish dun. They were as snappish and wild at first as this one is on a larger scale still. After their capture the pups were taken to a village five miles or so distant, but the mother tracked them and was heard calling to them at night. Next day at noon they were carried in a bag to my camp, five miles away on the other side of the Tapti, which thereabouts is 100 yards broad but only two or three feet deep. They were tied up inside a hut of branches with my other dogs, amid a concourse of grooms and other servants, horses, goats, bullocks, camel, &c. But the mother soon found them again. The pups whimpered occasionally, and the men said that she had called to them during the night. She had crossed the river and tracked them five miles, and at 9-30 on the morning of the 7th, she was about 100 yards from the camp amid the bamboos on a hill side, calling to them in a loud piercing wail, quite unlike a dog's cry. As I would not restore

her lost pups to her, and as I thought how the *sambur*, once numerous, had all been killed off or driven from the hills by these same red dogs, I checked all sentimental emotions in a transport of scientific zeal, and five minutes later had ascertained her weight to be 30 lbs., her length 34 inches from nose to root of tail; her tail with hair 17 inches, and 15 inches to end of vertebræ; her height 20 inches at the shoulder; her irides brown, and pupils large and round. The terminal portion of the brush was black, with a few white hairs at the very tip. Mr. Blanford quotes Hodgson as saying that the tail of a specimen he had was 14½ inches, including the hair, and 8 inches without the hair. These figures seem doubtful. The general colour was rufous, paler underneath. The hair was considerably redder and coarser and somewhat longer than is that of the ordinary village pariah-dog; the muzzle blackish; ears, large, thick, and rounded like those of a hyæna. I had been feeding this pup on milk and water, which she seemed to think poorly of as an article of diet; and as the mother-dog (if she was the mother and not merely a sympathetic passer-by) did not seem to have such a supply of the milk of canine kindness as would suffice for three hungry puppies, I concluded that they had begun to be weaned, and accordingly changed the diet to soup and meat. One was too far gone to feed, but the other snatched at the bits of meat with a ravenous fury that reminded me of the way in which a pike or a young crocodile dashes blindly at a bait as it passes him. The irides of this pup were not brown, but blue-gray at first, as one notices is the case with the irides of brown-eyed pups generally. In about a fortnight they had become brown. This dog seemed to be guided to her food by smell rather than by sight at first, and even now she does not always seem to see near objects clearly, but noses about on the ground for small bits of meat thrown to her. She dashes at a plate full of scraps of meat, and tries to bolt bit after bit as fast as she can snatch them, nearly choking herself at times, and she often seizes the plate and drags it away to the end of her chain, upsetting the contents. She does this oftenest with milk. She rarely touches water, but laps, rather gobbles up, milk eagerly. My little spaniel Paddy often tried to play and frisk with her, and she used to put her head up to his nose and seemed to be

inclined to be friendly with him, but she never wagged her tail as canine puppies would have done in such a case; sometimes, when alone, she jumps up and frisks on her hind legs, but her playfulness comes to an end quickly, and she whimpers in a sad way as if yearning for freedom. Latterly, she has ceased to be friendly with the spaniels, and flies at them if they come near her, and seizes them by the ears or snaps at their flanks. I always feed her myself, and she is less shy with me than with anyone else, but if I come near her suddenly she gives a short snappy *grrr*, and dashes round to the end of her chain—soon returning to see if the usual bit of meat or drink of milk has been brought her. I had to give up holding the meat while she seized it from my hand, for as often as not she caught my fingers as well as the meat in her pike-like snatches. Her teeth are sharp and her jaws powerful—she cracks small bones easily. She screams (I might almost say) with excitement if my spaniels get their food before she gets hers. She is as fierce as she is shy, and if certain of my servants come near her she bristles up and goes for them at once. She struggles and bites like a demon when anyone tries to touch her, but once she is lifted up by a hand being placed under her, she remains quite quiet and does not snap even if one touches her head. Although Hodgson partially tamed some young wild dogs, I do not think that any amount of training would make this animal learn to be gentle. Shyness and distrust of man, fierceness and currishness combined, swiftness in snatching, tenacity in hanging on,—these are her strong points. When she lays her ears back, she looks a regular tyke, a truculent little skunk, meaner than the meanest village cur; but when she erects her ears or turns them forward, she looks more as a wild animal should. Her favourite position of watchfulness is lying down, with her head resting on or between her forepaws, her large bat-like ears bent forward, and her bright eyes keenly observing every movement. This position would enable her to catch sound-vibrations well also. She sometimes climbs about on her large basket, and shews almost cat-like agility in balancing herself on the ledge. In short, she is essentially a *wild* creature. In the adult animal, the senses of hearing, sight and smell must be developed to an extraordinary degree of perfection, judging from this immature specimen alone.

Mr. Blanford, following Jerdon, gives the Marathi names of the wild dog as *kolsun*, *kolusna*, *kolsa*, and *kolasrá*, as variously pronounced by the Marathas in different localities,* but neither Jerdon nor he includes in the list of vernacular names of these dogs the names by which they are known in Guzerat, viz., *kól*, or *kól-kúttá*. The Vasáwas of the Tapti Valley call them *kól*. The Guzerathi language, of which a very corrupt form is spoken among the Bhils, Kolis, Naikḍas, Vasáwas, Dúblas, and other wild tribes of the jungles of South-Eastern Guzerat, shades gradually into Marathi along the frontiers of Khandeish, and possibly the word *kól* is the same as the Marathi *kolá* (कोला), a jackal (Guzerathi both શિયાળ and કોલું *kholun*), in which case *kól-kutta* would mean the jackal-dog. This would be rather a good descriptive name, as the *kól*, like the *kólá*, is shortish-legged, and of a reddish hue, and has a dark tip to its brush. I would also compare with the name the word *kól-bhálu*, given in Hindustan to the so-called tiger-provider, the supposed jackal with the weird wild-dog-like cry (see Blanford, p. 142). Indeed, it may perhaps be a question whether this *kól-bhálu* be always a jackal and not at times a solitary *kól-kuttá*, which utters this unearthly wail, just as domestic dogs sometimes moan so strangely as to have given rise to certain notions of *bánshees* and ghostly visitants. *Bhálu* in Hindustani means 'a bear.' What is its special sense in *kól-bhálu*? Elliot (quoted by Jerdon, p. 143) says that in the South of India *bhálu* is the name of an old jackal "in constant attendance on the tiger"; and the evidence that the "tiger-provider" is a jackal, seems rather strong; but as the tiger is nocturnal, I do not see how the *kól-bhálu* could have been identified beyond all doubt as a jackal. On this point a friend writes as follows:—

"Rice mentions the *kól-bhálu* as accompanying the tiger. I think he saw one more than once. He certainly believed it to be a jackal. It has always seemed to me that the term 'provider' was inverted, and that the jackal followed the tiger to pick up the

* In Molesworth's Marathi Dictionary (ed. 1831, p. 221) I find:—"कोळिंगा *sm.* A small wild animal, said to kill tigers by making water upon its tail, and spirting it into the tiger's eyes. This word is variously written: कोळिसरा, कोळिस्रा, कोळिसें, कोळिस्ना, कोळसुंगा, &c." Compare this with Jerdon's and Blanford's remarks.

crumbs, &c., &c. It would not be unnatural for the smaller carnivora to follow the larger, in hopes of feeding on the remains of the prey."

"The idea we have is that, like pilot fish to the shark, the *kólbhálu* acts as a kind of 'pointer' and guide."

On the 10th of May I obtained another wild dog. It was also a female, one of a pack of eight or nine that I had come upon in the morning when out for a stroll near my camp with a friend. I suppose they were hanging about to find out what had become of the dog I had shot. We had our terriers with us, and they gave chase to something amid the bamboos. Thinking they were after monkeys, we whistled them back. They returned with unusual promptitude, and a minute or two afterwards an extraordinary sound arose—a weird bewildering noise—such as I had never before heard in the jungles. I could not at first tell where it came from — it seemed aërial, from the trees overhead as much as from the thickets around. It lasted for nearly half-a-minute, and my companion described it afterwards as "a kind of fiendish hysterical yapping, in a shrill chorus, decidedly uncanny and all-pervading." I asked the young Vasáwa, who was carrying my camera, what the noise was. He answered: "*kol!*" At first I thought that they might be attacking one of our dogs, and ran forward to the edge of a nullah, where I caught sight of four of them near some pools of water. A bullet made one spring into the air and fall over, but it picked itself up almost at once and was off. They retreated slowly, keeping well behind the bamboo clumps and peering back at us, but I did not get another shot. My shikari said there were eight or nine altogether; I must have seen six or seven at intervals. I sent a sporting sepoy on their track, and he returned later in the day with another specimen, a female, but larger and heavier than the first. As we were changing camp I could not get my spring-balance, but judged her to be at least 5 lbs. heavier than the first one, which would make her 35 lbs. She measured 23 inches at the shoulder, but her legs had been rather stretched by her having been carried slung on a pole by the feet; body from nose to root of tail 35½ inches; tail with hair 17, and without 15 inches; girth behind shoulder 19 inches. No white hairs at end of brush.

These wild dogs are now very abundant along that range of hilly jungle east of Baroda, from Pawagarh through Chhota Udepur, Rajpipla, Ságbára, and the Surat and Baroda districts along the Tapti. I remember seeing a pair of pups in captivity at Chhota Udepur, about seven years ago; there was a pack said to number fifteen about Champanir in March last, and they had cleared out the game too; and I or my men saw or heard of at least half a dozen packs in the Baroda jungles of the Tapti Valley last month. They are exterminating the *sambur*; we came on the remains of two hinds that had been recently killed by them, and over mountains where three years ago I had seen twenty-five or thirty *sambur*, I only saw three this time, and round pools where in former years the tracks of *sambur* were innumerable we scarcely saw a footprint. The wild pig are still plentiful, but seem to have packed into big sounders for safety. I saw one sounder that had more than forty pig in it—they made a tremendous clatter as they scampered into the jungle from the fields in the grey dawn. The boars thereabouts seem to grow fine tushes: here is a pair that measure fully 9¾ inches. My men said they had taken them from the remains of a boar that had been recently killed by a tiger. The recent killing I admit: the village shikari's matchlock was, I suspect, the cause of death. Besides I examined the skins of both the tigers that resided in that neighbourhood, and could find no traces of any recent conflict with the scythe-tusked boar. It is permitted sometimes here for us to mingle tales of the chase with more serious matters of natural history, and I ask to be allowed to spin out this paper with a few extracts from my diary for May, 1892.

On the third of May, at 1-30 o'clock, *khubber* of a tiger came in from a village about five miles from my camp. I set off at once, with four followers, carrying the usual paraphernalia of guns, camera, chagul, a rope for climbing into trees, &c. About a mile beyond the village I met three of the chief trackers—sportsmen all of them—with rusty matchlocks, and bamboo props for resting those antiquated bits of gas-pipe on while taking aim. The leader said that three other men were on the look-out, and that the tiger was asleep in a *chimpi* (clump of bamboos) on a hillside, and was quite unconscious of the attentions that were being lavished

on it. The jungle was too thick for a direct attack, so it was decided that I should take post above it, over the ridge of the hill, so as to command the approach to a ravine on the other side, towards which the tiger would certainly make when disturbed by the yells of men from the trees below and on each side. We made a detour and had a very hot climb up the off side of the ridge. The heat was terrific, and I referred several times to my canvas chagul, which contained what I have found to be an excellent jungle drink, *viz.*, Montserrat limejuice and water, in the proportion of one ounce of limejuice to at least twenty of water. Some people would add a little sugar. Well, we got to the top of the long narrow ridge, which was covered with rubbly stones and bamboo clumps, with a few large trees at intervals—nice ground to shoot across. There was a very slight breeze, and the intense heat seemed good for business, as the tiger would not be keen on travelling in such weather, and would make for the nearest cool place, which would be the ravine that I had to supervise. There was a crooked old teak tree with branches that seemed to offer a good stand, at about fifteen feet from the ground, and into this I climbed, followed by my gun-bearer with a spare rifle. I was able to stand firmly on one branch and rest my arms on another—it is very seldom that one gets a good stand or seat in a tree, and generally one is in torture on such perches. The jungle-wallah, who had assisted in the selection of the stand on the *náka* or pass by which the tiger would come, went off when he saw me treed, and then ensued that wearisome and anxious pause when one thinks of all the chances of failure: missing the shot, the tiger breaking back or wide, and so forth. A very long pause it seemed, but the wily men of the woods were all stealthily taking up well-chosen posts in trees, encircling the sleeping tiger from below. At last the shout arose, and from a wizened old man in a tree on my left front, on the tiger's side of the ridge, such frightful yells came that I concluded the tiger was breaking towards his side. This was so, but he turned it up hill, and it came over the ridge about 80 yards from me, and down at a good trot straight towards me. I let it come, and when 18 yards off I fired. To my surprise, the tiger fell over at once—never rose again, but rolled forward into a little

channel in the ground, and was brought up against a charred old trunk of teak-wood. It seized the nearest branch and bit furiously at it, and clawed it and bit it again and again, roaring and growling horribly. My shot had caught it below the wither, grazed the spine and gone down between the shoulders towards the heart, paralysing it from the shoulders back. I shouted to the men that it was killed, and when it heard my voice it turned its head over and glared at me and snarled and struggled to rise—perhaps it was just as well that it was not able. It still seemed lively enough so I gave it another shot, which smashed up the spine still more, and then I got down, and with rifle in one hand and camera in the other, walked up to fifteen feet of it, and took its picture while it was still alive and snarling at me, shewing its teeth in impotent fury.

It was an unusually large tigress, 107½ inches from nose to tail, tail being 36 inches. The skin measured 123 inches when pegged out. The hard bit of teak-wood had a number of holes in it nearly an inch deep from her bites.

On the 8th of May I met another tigress, and had quite a lively time before I held an inquest on her remains. She gave rather a hard shot at about fifty yards, cantering through scattered bamboo jungle. My first shot hit her hard on the foreleg, about six inches too low, and my second smashed on a bamboo, only a splash of lead cutting her off foreleg. She roared two or three times when hit, which tigresses very rarely do, and went on, up and down hill, and up again, nearly three miles in a circle. We followed the trail, which was very plain as she bled freely; four men tracking and I holding my rifle at the ready through thick low jungle—very exciting it was, as she might have pulled up anywhere, and we could at times barely see twenty yards ahead. The trail gradually became thinner, but led towards a cave on a spur, and we made a detour so as to come on the rocks from above. She was not there, and we had lost the trail, but a tiny speck of blood on a stone near where we were standing shewed that she had come up the rocks. For nearly half an hour we could find no trail. The ground was very hard. At last after several casts round on a plateau near the hill top we recovered it. It led towards the highest ridge of the hill, and the men said there was another cave there. More blood stains on

bamboo leaves and an occasional footprint guided us up to the rocks. We got above the cave and threw down stones. There was an aperture in the rocks above where the cave was said to be, and I threw down a cracker which fell right into the cave and popped and sputtered splendidly, finally setting fire to a lot of dried leaves, which blazed up with a roaring sound and sent clouds of smoke through the cave. Still no sign of the tigress. The men all agreed that she had gone on, and went down the rocks to where the trail had last been seen. I climbed down in front to have a look at the cave. The rocky cave was certainly empty, but lower down was an earthen burrow beneath the rocks. I got on my hands and knees and peeped into it. There she was, barely three yards in front of me, glaring out of the gloom, and crouching as if to spring! Her face was resting on her paws: a horrible devilish face it looked. The next few seconds were critical. I thought "steady does it," and quickly steadied the rifle on her. As I aimed she gave a growl, and firing into her opening mouth I executed a strategic movement outwards and to the right. This evolution was not skilfully performed, as in attempting to beat the record I fell just outside the cave, and thought for a moment that I was going to verify the opinion that one feels "just as usual while being chawed up." However, I picked myself up double quick and reloaded, but could not see her in the cave through the smoke. When it cleared off, my shikari, who had joined me with the second rifle, said: "I see one eye." After a little while I made it out and fired again, hitting her exactly in the centre of the eye—scoring a tiger's eye in fact—and smashing one side of the face. I thought she had had enough, but when after a few minutes we again looked in, the other eye still glared bright and green out of the darkness. She had retreated a few feet further into the cave—and I had to give her a finisher in the forehead before I felt it safe to let a man go in. We soon had a rope round her neck and hauled her out. She measured 8 feet 1 inch from nose to tail (tail measured 32 inches). She was in very fine condition, and the *post mortem* disclosed four little tiger cubs about 8 inches long each. We found that my first shot in the cave had blown away her right upper canine; the fragments of the bullet had smashed some incisors and

premolars, cut the tongue badly, raked the palate, and gone down the throat somewhere. It was a case of "first come first served," and fortunately my little express was too quick for her; but I hope never to have to seek the bubble reputation quite so literally in the tiger's mouth again. It was too close a thing to be altogether pleasant.

While tracking this wounded tigress we came on a female four-horned deer that she had killed and nearly devoured that morning; and this leads me to say that Mr. Blanford has united the two varieties of four-horned-deer—those with long anterior horns and those with short—into one species. I have shot about thirty of these little deer at various times (I got four last month), and I have never succeeded in getting a head in which the anterior horns reached half an inch in length. I have shot them in the Gir Forest and in the jungles of Guzerat and the Panch Mahals generally from the Tapti nearly up to Edur. In this part of India, so far as I know, the anterior horns are invariably very small, mere wart-like excrescences in fact, and I mention this point to invite members of the Society to record the measurements of horns of four-horned deer shot by them, with localities, so as to ascertain, if possible, the distribution of the two varieties. A friend at Baroda has now a young male four-horned deer alive. Its posterior horns have grown three-quarters of an inch long, but no trace of the anterior horns can yet be felt. This deer came from near Godra. I have taken up so much of your time that I will now conclude after briefly mentioning a curious bit of snake-lore that I heard last May. When descending a hill one evening, a large black cobra sprang up about two feet from me, spread his hood in a threatening way, and then glided off, stopping twice and rising with hood outspread. I cut him nearly in half with a rifle bullet. When the men came up and I told them to stretch him out to measure him—he was five feet eight inches exactly—one of them pointed to his tail, which was blunt and whitish, as if the end scales had come off, and another said to me: "That cobra has bitten some man. The end of the tail always drops off when he bites any one." All the men seemed to be quite familiar with this curious belief. It may be new to some of the members present, as it was to me.

In the *Asian* for June 17th, Mr. H. B. Riddell mentions a similar superstition about a supposed poisonous lizard.

INDIAN FLOWERS.

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(Extracts from a Lecture delivered at the Sassoon's Mechanics' Institute, Bombay, on 28th March, 1892.)

To us (Hindus) the uses of flowers are manifold. Their existence is wedded with our own. Though no idolator myself now for the past quarter of a century, there was a time in my early life when following the custom of my forefathers I worshipped the gods and goddesses, the Lares and Penates of my paternal home, with a profusion of flowers that the surrounding garden or nearest flower-market could afford, before I began my daily duties. To the Ganpati, the god of Wisdom, I offered the scarlet Jâswan (*Hibiscus Rosa-Sinensis*); to Shiva I offered the cream-white Kânchan (*Bauhinia Variegata*) and the purple Dhatura (*Dhatura fastuosa*); to Vishnu I offered the Pârijâtak (*Nyctanthes Arbor-tristis*) and racemes of Tulsi (*Ocymum Sanctum*); to Mâruti, garlands of Rûi (*Calotropis gigantea*); and you my Hindu hearers who still choose to follow the faith and rituals of our fathers are to this day doing the same. You are not wrong in thus following your faith and offering these pure unsullied gifts of Nature to your and to Nature's God, if you only remember that they ought to stir in you your noblest passions and lead you on to appreciate what is absolutely pure and unsullied in Nature. To follow up these floral offerings to the Hindu gods and goddesses, I may mention that in the Navrâtra holidays the shrines of Lakshmi, Ambâ, or Durgâ are adorned with lotuses of all colours and the flowers of Guljâfri (*Tagetes erecta*). When small-pox is raging in a Hindu house, we entwine the cradle of the baby stricken with this foul disease with wreathes of Jasmin and leaves of Nim (*Azardirachta Indica*), and propitiate the goddess Shitalâ, who is supposed to restore the baby to health, with all the choicest flowers of the season. On all joyful occasions and on occasions of special thankfulness to our gods, we distribute flowers and sugar to our near and dear lady friends and relations. When our dear ones depart this life, the Jasmin interspersed with the leaves and racemes of Tulsi deck their mortal remains as they are borne to the funeral pyre, their last dissolving place. No Hindu lady that dies during the life-time of her husband leaves her home in death without having her hair decked with the choicest flowers of the season as though they were symbolical of that purity in which she leaves this world in prospect of joining the regions above where what constitutes the impure is utterly unknown. Our virgin bride too comes in for a full share of these serene emblems of purity. The very agreeable custom of our ladies wearing fresh flowers in their hair is well known to those who know our domestic habits. Every married lady considers it her privilege and her prerogative to wear the flowers that the varying seasons of the year produce. In the days of her widowhood she discards this pleasure, among the many things she denies herself or has to deny herself in obedience to the national custom or on the assumption of the austerities of her altered life and solitary existence. The husband gone, there is nobody to wear the flowers for,

and she does not wear them. She considers that her privilege is gone for ever, however much she may regret it. Thus, you will see how through the varied walks of life and in the daily duties and pleasures of a Hindu home, flowers come in for their share of attention and usefulness.

Let us now turn to the consideration of the structural peculiarities of the flowers we commonly see in our fields and forests, gardens and green alleys. The size, the form, the colour and the perfume of flowers at once mark them out, morphologically speaking, as some of the most striking products of the vegetable world. To consider the interesting subject of the development of a flower—in the light of its being a mere modification of the leaf, would be foreign to the scope of my discourse this evening, but it may be stated briefly that the subject is one of vast usefulness to a practical gardener in appreciating the formation of what are called double-flowers where often we see nothing but petals where the stamens and even the pistil are transformed into petals, as, for instance, in the Bât mogra (double variety of *Jasminum Sambac*), the Tagar (*Tabernæmontana Coronaria*), or the Dalimba Gondâ (the tufted male flower of *Punica Granatum*).

Of the flowers noted for their large size and conspicuous form, we have beautiful illustrations in our *Dillenia speciosa* (Mothâ Karmal) and *Nelumbium speciosum* (Kamal or Padma). Belonging to the class of water-plants producing bold flowers we have also the white and crimson lotuses known as the *Nymphæa Alba* (Swetotpal), and *Nymphæa Rubra* (Raktotpal), and the pale blue *Nymphæa Cyanea* (Nilotpal) which is probably the Nilophar of Arabian and Persian writers. *Thespasia populnea* (our common Bhend) with its rich yellow flowers tinged inside with deep crimson and *Thespasia Lampas* (Rânbhendi) with its rich orange flowers, are conspicuous in our forests and hedges. The former flowers throughout the year. It knows no seasonal change. Our common Sâori (*Bombax Malabarica*) is in flower now and conspicuous in our forests. The rich crimson of its bold succulent flowers on leafless branches is striking in the extreme even to a distant gazer on this our forest beauty. In a few days more the Boab tree (*Adansonia digitata*), a naturalized exotic from the South African coast, will throw out its equally striking bold scarlet or white flowers. The large purple racemes of *Mucuna pruriens* (cowhage); the rich copious panicles of *Cassia fistula* (Bâhawâ); the bright dazzling scarlet and white spikes of *Erythrina Indica* (Pâringâ or Pângârâ); and the dense orange fascicles of *Butea frondosa* may be grouped together as our consummate forest beauties. Nor must we forget to include in this class the more homely climber *Clitorea ternatea* (Gokarna) which adorns our hedges and garden trellis-work with delicate blue and white flowers seated solitary or at the most in pairs on their delicately formed parent, trailing over hundreds of yards at a stretch. The well-known Ashoka of pristine and Puranic fame—*Saraca Indica* (otherwise known as *Jonesia Asoka*) bears a small flower, but its gorgeous terminal corymbose panicles of rich orange turning into bright red, peeping through the densely-set drooping leaves varying from the deep green of its older foliage to the sparkling delicate purple of its tender tops—mark ou this

handsome and hardy tree as a remarkable garden and forest beauty. Then, again our Tarwad (*Cassia auriculata*), *Cassia Sumatrana* so common in Bombay as a road-side tree, and *Cassia ferruginea* growing beautifully in the Grant Medical College gardens are remarkable for the large yellow or orange tinted panicles they throw out when in full bloom. The *Cassias* as a class may be said to be the prevailing and persistent beauties of our Indian floral world. The naturalized exotics *Poinciana pulcherrima* (Shankâsur) throwing out delicate bright yellow or orange flowers on long green pedicels, and *Poinciana regia* (Gulmohor) throwing out copious axillary and terminal racemes of bright scarlet flowers mottled with white and orange in profusion, are well known in our gardens. They need but be mentioned and you will be at once reminded of their exquisite beauty.

The *Mimosas* are a distinct class by themselves, bearing flowers in globular masses of various colours and fragrance, well worthy of a detailed description here, but I must again think of the limited time at my disposal. The *Bauhinias* are worthy of special mention, as being noted for the beauty and variety of their delicate flowers. *Bauhinea tomentosa* (Roxburgh) has a cream-coloured flower pale sulphur-marked on the ventral aspect "with an oblong deep purple spot" at the base or insertion of the petals. The flower is as delicate as it is pleasing to the eye for the harmonious blending of its colours. This I believe is the real Kânchan of the Hindus. "The vernacular names of *B. purpurea* and *B. variegata* demand further inquiry" says Brandis in a note to this genus in the Forest Flora of the North-West and Central Provinces. I hope to furnish the results of this inquiry some day before our Natural History Society. The larger-flowered *Bauhinea Variegata* with its rich show of purple tinged with cream and red entitles it in my opinion to the name of Vana-rajah—the "king of forests"—in preference to any of the known and described species of the genus *Bauhinia*. The Rev. Mr. Nairne, late of the Bombay Civil Service, who strikes me as one of the most scientific and quietly working Botanists this Presidency has ever seen, has been lately making special enquiries with regard to the correct native names of the *Bauhinias*. "I find," says he in a printed circular sent round to the members of our Natural History Society, "some doubt as to which of the species of *Bauhinia* the names Kânchan, Dev-kânchan, and Wan-rajah belong to." I have already specified the first and the last, the second I believe to be the *B. purpurea* described by Roxburgh, the Deva-kânchan of Bengal, a name I may say almost unknown in this Presidency, so far as my information goes. Though as a tree *B. variegata* is nothing to look at, and looks a half-starved irregular uncouth tree, ill-clad with foliage, when not in flowers, it is a forester of marked beauty when its bold purple parti-coloured flowers appear and conspicuously show it out in all its dazzling beauty as the "king of forests"—a name, I think, barring its miserable foliage, it richly deserves.

The flower of the pretty looking *Careya arborea* (kumbhâ)—if you but watch it as the sun rises, for it drops its numerous white pinkish stamens *en masse* soon after the flower opens—is a conspicuous forest beauty on account of the congregation of its succulent flower cups on its bald bold terminal buds. *Ixora coccinea* is another of our forest shrubs, perpetually in flower and of marked beauty. They grow in

persistent cymes and retain their bright scarlet hue long after the fruit has formed. There are white, pink and yellow garden varieties of them. The two former are small flowered and throw out numerous close-packed umbellate cymes.

Among the denizens of our fields we have yellow-flowered *Argemone Mexicana* (Feringhee dhaturâ), which, though of American origin, grows almost as wild as any native weed. It is particularly found on the banks of tanks and ditches. It is abundantly in flower now, and will continue to be so till the end of the hot weather. *Cleome viscosa* (Kânphuti), a pubescent sticky weed as the name indicates, bears beautiful yellow flowers. It infests our gardens, fields and way-side retreats during the rains. *Gynandropsis pentaphylla* (Mâbli) with its delicate terminal racemes changing from white to pink, from pink to purple from day to day, marks this garden plant as one of intense beauty. It flowers throughout the rains. The *Capparis horrida* (Wagheti), which furnishes the people of the Konkan with an edible fruit, throws out flowers which, from the arrangement of their numerous filiform stamens and their delicate shades of white and pink colour, may be classed among the beautiful products of our bushes. The flowers are so numerous that often the whole creeper is one mass of pink and white hair in spring. The pink terminal panicles of *Bixa orellana* (kesri) shaded off by the rusty petals is another of our exotic garden beauties. The dense white and pink racemes of the *Tamarix Indica* (Zâo) are exceedingly pretty, though the flowers are small. They are common in our river beds and in marshy places along watercourses. Our Sida shrubs generally bear solitary flowers of large and small size, but are conspicuous by the delicacy and beauty of their yellow tints.

The common Jâswan (*Hibiscus Rosa-Sinensis*) with its single and double flowers is a standing beauty of our gardens. It is never weary of flowering from day to day, regardless of seasonal changes. The colours which some of the varieties of *Hibiscus* display are well worthy of special consideration, but I must rest content with only mentioning their beautiful tints, *viz.*, pale yellow, pale pink, buff, deep yellow, pale purple and rich scarlet, with or without ventral markings of deep crimson. Mr. Framji Nanabhoy Davar of Tardeo has in his garden twelve well-marked varieties which are distinct from the ordinary tinted varieties I have alluded to. They are as beautiful for their substantial petals as for their gorgeous colours.

The flowers of *Zizyphus rugosa* (Toran) are very tiny—without petals, and perhaps do not deserve a special mention here as flowers, but they are worthy of passing notice on account of the exceptional length of their flower-stalk, which rises in the air three or four yards high above the surface of the top foliage of the plant and droops in an ample compound axillary or terminal thyrsus. *Pongamia glabra* (Karanj) is just now throwing out its fresh tender foliage. In a few days more copious drooping racemes of its white purple-tinted flowers will be thrown out to add beauty to the ending days of our Indian Spring. The semi-globose male flowers of *Punica granatum*, the favourite of our Hindu ladies, is another common beauty of our gardens. It is worthy of mention as it is one mass of densely-

packed bright scarlet petals without stamens or pistil. It appears to me to be an example where the numerous stamens have been arrested in their growth and converted into petals. Later on in May and June the Jâmbul (*Syzygium jambolanum*) will blossom with its characteristic greenish flowers arranged in broad panicled cymes and bearing innumerable small filamentous stamens. Let me not forget the two garden beauties—the *Lagerstræmia regina* with its bold crimpled lilac flowers blooming in copious panicles, and the *Lagerstræmia Indica* with its smaller white purple or pink crimpled flowers—which are so much cultivated for ornamental purposes. The male plant of *Carica papaya* bears abundance of cream-coloured tubular flowers in long compound racemes. One point is worthy of notice with regard to this plant. On the male flowering pedicels occasionally there are hermaphrodite or small female flowers, which bear fruit on long pedicels. The female plant on the other hand never deviates from its feminine duty, and harbours a female flower in its axils, which seldom fails to develop into luscious fruit. The fruit grown on the male pedicel is very much smaller than that on the female plant. The flowers of Guljâfri (*Tagetes erecta*) of various forms and colours are strongly scented but never used for scent-making. Often the lower classes, *i. e.*, villagers and kunbi women, wear wreaths of them in their hair. For other purposes also they are much used by all classes of Hindus. They are used for various ceremonials. Thus, for instance, wreaths ten or twelve inches long are worn on either side of the forehead and around by the Hindu bride and bridegroom when they go through certain religious and domestic ceremonies prior to the actual marriage ceremonial. Long garlands are also made—eight to ten feet long, ending in a mango-sprig and hung on new year's day in front of the entrance door of all Hindu houses—from the Goodi or silken streamers raised to greet the dawning year on that auspicious day, or to mark the sense of joy on any other happy occasion.

To-morrow being the Hindu New Year's day, you will see this in front of Hindu houses in the town. Why this agreeable function has fallen to the lot of this exotic—for the plant is merely the French Marygold,—and why not to any other equally or even more attractive flower, I cannot tell. It may be, perhaps, because the flower is handy—perennially flowering, but being at its best in the rainy season. The Asclepiads furnish a few good examples of showy flowers. The curiously crown-shaped purplish flowers of *Calotropis gigantea*, I have already referred to as being sacred to Hanumân, the monkey-god. Every Saturday the devout follower of this deity will present to the image a garland of Rooi flowers with a spoonful or two of teel oil and shindur (red lead). The rich scarlet flowers of *Asclepias Curassavica* capped with a bright yellow crown are to be seen in our gardens almost as wild as any natural weed, though the plant is an exotic from the West Indies. *Holostemma Rheedii* (Shirdodi) with its pink fragrant flowers, and *Hoya viridiflora* (Hirandodi) throwing out its pale green flowers in drooping umbels, form the prevailing creepers of our forests and hedges. Let me not omit to mention the showy orange-yellow petalled richly filamentous flowers of our common hedge-cactus known as Phadyâ Nivdung (*Opuntia Dillenii*). Originally introduced from America, it has become so naturalized in this country as almost to be a rank weed.

Among the gentians, the flowers of *Exacum bicolor* possess much beauty. Graham declares it to be "worthy of the garden of Paradise." The purple tips of its petals shine in marked contrast with its large white body arranged on the terminal branches of its square herbaceous stem bearing showy leaves. The flowers of the *Bignoniaceæ* as a class are striking for richness of their colour. Here is a specimen of Waras (*Heterophragma Roxburghii*). Notice the tints marking the throat of the white bi-labiate corolla varying from pink to crimson. The forest tree known as Tetu (*Oroxylon Indicum*), bearing the large two-feet pod-like capsules so singularly attractive, has a very large showy flower. It is dark crimson outside, cream-coloured, thick velvetty inside, seated on a firm persistent calyx and mostly blooming before the outburst of the monsoons. The *Pedalineæ* are well represented in our country. The Teel plant (*Sesamum Indicum*), so commonly cultivated for its rich oily seed, which form one of the staple articles of our commerce, has a delicately tinted bi-labiate flower only surpassed in beauty and depth of colour by its congener *Martynia diandra*—the common Vichvi, which is noted for bearing large black rugose seeds with sharp double-curved persistent hooks, not unlike the black-beetle in appearance. The *Convolvulaceæ*—an order everywhere bearing delicate campanulate or tubular flowers, and noted for their exquisite tints—are well represented in this country. What more beautiful can you see in the floral world than the purple-throated *Argyreia speciosa* (Samudra-shoka) peeping through its glaucous leaves? What is more pretty than *Ipomœa pes-caprœ* (Maryâdâ Vel) which trails in profusion along our sandy shore, throwing out its crimson flowers only to be lashed by the tidal waves? The *Ipomœa Quamoclit* (Kâmalatâ), though an exotic from America, is as delicate and charming a flower as one could set eyes on, whether it be deep crimson or white, seated on a delicate climbing stem by the side of the still more delicately-formed pectiniform leaves. Trace again the Nâl plant, *Ipomœa vitifolia*, creeping profusely over the surface of our ponds and way-side ditches with its bright rosy or purplish flowers standing erect over their watery bed. You will wonder at this solitary instance of a convolvulus preferring to live and thrive in a watery home. I must not here omit to mention how well the *Thunbergias*, *viz.*, *T. fragans*, *T. alata*, and *T. grandiflora*, thrive under our Konkan sky. A tiny representative of this order—the *Cuscuta reflexa* known as Akâshvel—is worthy of special mention on account of its extremely small white flowers borne in tufts, and more especially on account of the epiphytal nature of the plant. Originally a seed-grower from the ground, it trails along our bushes and hedges, and directly it finds another plant to support it, it winds round its host, and by degrees abandons its subterranean connections. Finally it becomes an absolute aërial grower without in any way damaging the host, as far as I have been able to observe in our jungles. Among the Acanthads, the flowers of *Andrographis paniculata* (Kreat) are insignificant, but prettily marked on the throat with crimson lines. The *Eranthemums* also are equally pretty in colour and delicate in structure. Let me not here fail to mention the bluish-purple flowers of our common jungle weed *Hygrophilla spinosa* (Kolsundâ) glowing amidst whorls of dark dingy leaves and stiff long spines which disfigure

this plant. *Acanthus ilicifolius* (Mârândi), one of our pre-eminently pretty salt-marsh plants, not unlike the English Holly in its leaf, bears an exceedingly pretty purplish-blue flower. Here is an illustration of it. The flowers of *Strobilanthes callosus* are equally lovely in the richness of their purple hue and strobiliform arrangement of their showy pink bracts. *Barleria prionitis* is another of our jungle beauties. It is also to be seen in abundance along our hedges and bushes. Popularly known as korânti, the flowers are of varied hue from pale blue to buff, and are of extremely delicate texture. The common Aboli (*Justicia infundibuliformis*) is a favourite with our villagers and Bombay Hindu ladies who weave the flowers into *venis* (garlands) for their hair though absolutely devoid of any kind of smell. Their pink and light blue colour is, however, pleasing to the eye, for I may add that pink goes very well with the dark glossy hair. *Beaumontia grandiflora*, a gigantic creeper from Nepal, thrives well in our gardens, throwing out large showy white flowers, 8-9 inches long, which are noted for their delicacy and softness. Among the Verbenas the Teak tree (*Tectona grandis*) claims our attention. The wood of the sâg is popularly said to be worth its weight in gold, and it is said very truly, for the teak tree is universally acknowledged to be the unrivalled king of our timber trees. But it is its bold inflorescence that claims our attention here. Its huge terminal compound panicles rise high in air and often remain standing even after the seed has matured. The flower has no particular beauty, but the inflorescence is striking on account of its dry persistent spongy woolly calyces which cover the hard nutty fruit like inflated bladders. The light purple tiny flowered compound terminal panicles of *Vitex Negundo* and *Vitex trifolia* (which both go under the name of Nirgundi) are pretty when examined closely, though from a distance they are not attractive. The scarlet flowers of Lâl Chitrak (*Plumbago coccinea*) and the pale lavender-coloured panicles of *Plumbago Zeylanica* are also striking for their beauty and delicacy. Among the Solanaceous plants, the largest flower is borne by an exotic from Peru, *Brugmansia candida*. It is a grand garden beauty throwing out large white drooping tubular flowers as much as even a foot in length. The white and deep purple flowers, often double, of *Datura fastuosa* and *Datura alba* are also noted for their large size. Let me not omit to mention the prickly straggling weed of our jungles and marshy places, *Solanum Jacquini* (Kâte-Ringni), which is perpetually covered with beautiful purple flowers set off by the bright yellow double-barrelled anthers characteristic of their order. Among the flowers of the *Nyctaginaceæ* stand pre-eminent the flowers of *Mirabilis Jalapa* (Gul-bâs). I do not know if in the whole range of the flowering plants there is a single plant or species which is capable of producing so many tints in the flowers of one and the same individual, nay on one and the same branch. Indeed there are no two flowers that can be called alike in their tints or petal-markings. Their colours are bright and range from white to yellow and deep crimson, with all the delicate shades between. They begin to open at 4 o'clock (and hence the plant is called the "*4 o'clock plant*") and fade the following morning. The plant is also known as the "Marvel of Peru" in our gardens, but we may well call it the "Marvel of the World," with

equal felicity and propriety. The *Euphorbias* are very irregular in the formation of their flowers. The floral envelopes are generally incomplete or inconspicuous, very erratic in their formation and very ungainly in their appearance. There are, however, exceptions to this. *Poinsettia pulcherrima* is well known for its bright red bold bracts; there is also a yellow-bract variety of it. The bright scarlet dichotomous cymes of *Euphorbia splendens* are also to be seen thriving in our gardens. The long pendulous tufted racemes of the forest tree Petari (*Trewia nudiflora*) are very effective. They flower in February when the tree is leafless. Perhaps the *Ricinus communis* is the most showy in its floral display, especially the deep crimson variety of it seen in some of the Bombay gardens. Mr. Justice Birdwood has introduced it into our University gardens. The flowers of the fig order are shut up in a fleshy curved thalamus which forms our figs. We shall not disturb their tiny flowers from their natural seclusion. It will only serve to expose their utterly destitute condition, so far as floral envelopes are concerned. The five varieties of *Loranthus* (Bânda) I have come across have all very showy flowers of a mouth-formation which is peculiarly their own. Two of them are white, two bright crimson or scarlet, and a small one very prettily orange outside. The petal-tips curl backwards thickly marked with green and yellow. Among the *Apocynaceæ*, *Vinca rosea* and *alba* deserve mention, as they flower throughout the year, and are used by Mahomedans over their graves in Bombay. They are known as Sadâphul, perpetual flowers. Among the Amaryllids the *Crinum Asiaticum* (var. *toxicaria*—Nâgdowni) has conspicous white flowers. *Crinum insigne* is a pretty variety of it in the Thana jungles, richly marked with purple on the outside of the petals. Among the Lily order there is nothing more showy in the forests and along hedges than the gigantic trailer *Gloriosa superba* (Khadyâ-nâg) which throws out the parti-coloured creanulate petals of its bold flowers changing their hue from green to yellow, yellow to orange, and thence to bright scarlet. This creeper forms the monsoon beauty of our jungles.

We next come to a class of Plants which are not only noted for the beauty of their flowers, but are also remarkable for their fragrance. It is not to be supposed they will be equally agreeable to all, nor indeed is it expected that what I call 'delicately fragrant" will not be "very strong" to others. What I do say, however, is this: that to any practical scent manufacturer our Indian flowers present vast field of research and usefulness. Some of the flowers I have already mentioned possess more or less smell, but those I am going to include under the distinct head of "scented flowers" have a marked odour more or less agreeable. Among the *Magnoliâs* we have the golden yellow and orange varieties of Champak (*Michelia Champak*) which are strongly scented, and from a distance remind one of the Mignonette. Among the *Anonaceæ* we have the *Artabotrys odoratissima* (Kâlâ champâ) smelling strongly of ripe apples and plantains. The scented representatives of the *Guttiferæ* may now be seen in our forests in blossoms. Here I pass round a garland of the yellow globular male flowers of Surangi (*Ochrocarpus longifolius*, also known as *Calysaccion longifolius*). They are highly scented and much worn by our ladies in their hair. The smell of its congener *Calophyllum*

inophyllum (Undi) is not so marked, yet its flower is handsome. Here is a fragrant flower of *Pterospermum suberifolium*, which, with the flower of its congener *Pterospermum acerifolium*, goes under the name of Muchkund. The flower proper is white, but its fragrance is chiefly confined to its succulent calyx deep brown outside, golden inside, which is longer than the petals, and covers the whole corolla incompletely, splitting into five parts as the flower matures. Its fragrance is lasting, even when the sepals dry; the sepals are much worn by Hindu ladies in their hair. The sepals are covered thickly outside with small brown hairy glands which secrete the fragrant element. It is particularly worthy of the investigation of perfumie-manufacturers. *Hiptage Madablota* (Madhu-mâlati), a large climbing shrub, throws out large terminal panicles of showy white and yellow flowers with a shade of light crimson. The flowers have a delicate fragrance. The beautiful rich crimson flowers of Bilimbi (*Averrhoa Bilimbi*), shooting out in panicles from the main stem direct, are possessed of the smell of honey. The large cymose panicles of the pink and crimson coloured, small flowered blossom of *Averrhoa Karambola* (Karmar) are not quite so fragrant, yet they are not without the grateful odour of honey. The panicles are very showy. Murray's Exotica, though not a forest plant, is still largely seen in our gardens. Its tufted masses of white flowers are as graceful as they are fragrant; so are the bold delicious flowers of the Pomelo (*Citrus decumana*). The Bombay Mâlis have recently taken to making *venis* (wreathes) of these for the Hindu ladies, by whom they are much prized. These flowers have the delicate odour of the delicious Neroli oil, which is manufactured in Europe and Asia Minor from the flowers of some of the equally odourous representatives of the *Citrus* genus. *Garuuga pinnata* (Kakâd) is in flower in our jungles now. Its large spreading panicles, with tiny yellow tubular flowers, have delicate fragrance and attract the attention of the passer-by with their ample inflorescence amidst tender shoots of fresh leaves.

Among the *Meliaceæ* the Nim (*Azadirachta Indica*) bears small white flowers on long slender pedicels, which have a mixed smell of honey and bitter almonds. The purple white flowers of *Melia sempervirens* in copious panicles are a garden beauty. They smell strongly of honey, hence the name of the plant. Among the *Anacardiæ* the blossom of the Mango (*Mangifera Indica*) is the most fragrant. Its characteristic honey-sweet odour, once noticed, can never be forgotten. The flowers are inconspicuous, but, when closely examined, display a delicate purplish tinge. But the beauty of the blossom lies in the huge compound panicles thrown out by its long terminal shoots and the ample nectar the flowers provide for the honey-making bees of our forests and gardens. The blossom of the Kâju (*Anacardium occidentale*), originally a native of Brazil, but now thoroughly naturalized almost to wildness, has come and gone. Here on this specimen you see that the fruit is already forming. The fleshy peduncle, which is generally used as fruit under the name of Kâju, is not the real fruit. The grey kidney-shaped capsule you see hanging is really and truly the fruit and seed combined. The seed is agreeable to eat and much used for culinary purposes as *Kâju goli*. What is eaten

as fruit is merely the fleshy, succulent juicy peduncle. It is very attractive from its bright red, orange, or yellow colour, but is acrid. The acridity is removed if a pinchful of salt is added and the juice squeezed out. But then the whole pleasure of eating is lost. For, to some, with all its acridity, the juice is agreeable. Our village boys use the fruit almost immoderately and without apparent suffering; but I throw this hint for the benefit of those whose sense of taste would not permit of the slightest acridity, no matter however agreeable the juice may otherwise be. The flowers are prettily marked with crimson streaks and smell strongly of cloves. The flowers of *Spondias mangifera* (Ambâdâ) appear as beautiful white stars when closely examined. Their odour is delicately sweet. The tree is in blossom now in numerous stout erect compound panicles, shooting from terminal leafless branches. Coming to the Leguminous order now, we find many scented representatives in its three sub-orders. Divi-divi (*Cæsalpinia coriaria*), a West Indian exotic of recent introduction into this country, valued so much for the copious tannin contained in its pods, is now one of our most flourishing roadside plants. Its beautiful whitish yellow flowers in dense masses are deliciously fragrant. The plant appears to me to be as worthy of cultivation for its remarkably sweet odour as it is for the tannin it so abundantly furnishes. The *Acacias* and *Albizzias* are mostly productive of more or less fragrant flowers of white and yellow hue. But I must mention one from amongst them particularly. It is the bright yellow globular flower borne by *Acacia Farnesiana*, which we commonly call Kesurdi here. The smell of its flowers surpasses in sweetness and persistence that of any of the other representatives of this order. The Rose order I must pass by as it is well known to you. It would require a separate paper to dwell on the beauties and fragrance of the many cultivated species and varieties of the Rose we have been able to grow, thanks to our European flower-loving coworkers in the field of practical gardening. Among the *Lythraceæ*, our common Heñâ (*Lawsonia alba*) is a highly and presistently scented plant. The flower is pale greenish-yellow and not much to look at, but its large close-packed terminal cymes throw out abundant flowers which fill the air with agreeable fragrance for several yards from where the plant is growing. It is a hardy plant, well worthy of being used more freely for garden and field hedges. Among the *Cornaceæ*, our Ankoli (*Alangium Lamarckii*) is noted for the fragrance of its fasciculate shreddy white flowers. The tree is in full blossom now from head to foot. Leafless as it appears at the present moment, it is none the less charming to the eye with its ample blossom. Among the *Rubiaceæ* the most noted for its delicate fragrance is the *Anthocephalus Kadamba* (Kalamb), the large globular yellow heads of which are so striking to the eye.

The *Gardenias* also are variously scented. It may be observed, however, that in the opinion of some the smell of *Gardenia lucida* (Dikâmâli) is not particularly agreeable, and I am doubtful as to whether it would not be proper to class this under the head of offensive flowers. Its congener, however, *Gardenia florida* (Anant, or Gandh-Râj) is exquisitely fragrant. The softness of its thick white petals marks it as a flower of great beauty in our gardens. Though

originally a native of China, it thrives well in our climate, flowering abundantly before and after the rains. *Randia uliginosa* (Pendhrû) is another of our familiar fragrant foresters. Blossoming in the hot weather, just before the foliage is out, the pure white silver-shaped flowers of this hardy tree, set off with bold yellow anthers peeping over the white frills of hair guarding the throat of their tubes, produce an effect which is exceedingly striking as they, open their buds in the early hours of the morning. Among the *Sapotaceæ*-*Achras Sapota*, known as the Chiku—a West Indian exotic which furnishes us with a deliciously luscious fruit—has a flower not unlike that of the Bakul in appearance; but the noteworthy point about it is that it has the odour of the Kashew Nut oil. The flower of Bakul (*Mimusops Elengi*), popularly known as Ovalê, is highly prized for its lasting fragrance by Hindu ladies, who use garlands of its deciduous corollas in their hair. White, when fresh, the corolla soon turns brown and crisp, and is extremely loth to part with its delicious honey-odour. It has literally to rot before the very last atom of its fragrance departs from it. I know of no Indian flower which is so proudly and justly tenacious of its delicious odour. Thirty years ago, Pears, the pre-eminent soap maker, used to manufacture a scent named "Wood-violets," which always used to remind me of the Bakul of my native land. He has years since ceased to manufacture such a scent, much to my regret. I hope some lover of scents preserves this gift so richly promised to mankind in the Bakul by immortalizing it in a spirituous extract of charming delicacy. Among the Composites we have the *Sphæranthus Indicus* and several species of *Blumea* (Bhâmburdâ), and *Artemisia* (Downâ) which produce the characteristic flowers, indicative of their order, and partake of the strong smell so common to each genus. The tender tops and leaves of the last genus are worn by ladies in their hair. Nor is the *Chrysanthemum* with its varied hues of white, yellow, and saffron denied this high honour of being a flower of domestic importance. The Shewantî, as it is called, is essentially a cold weather plant—a regular visitor of Christmas, as in the colder climate of Europe.

Among the *Oleaceæ*, the Jasmines are the most noted in this country and largely represented. They are as follows (all highly scented):—

1 *Jasminum Sambac* (Mogrâ). Besides the ordinary double petalled creeping Mogrâ, there are three other distinct varieties—(*a*) The compound flower, known as Bâtt mogrâ; (*b*) the Madan-bân (Cupid's arrow), bearing a highly fragrant bold flower, the petals of which are often over an inch and-a-half in length; (*c*) the Kasturi mogrâ, a smaller flowered variety. The odour is delicate and partaking of the smell of the musk faintly; (*d*) there is also the Poona variety known as Motyâ mogrâ.

2 *Jasminum grandiflorum* (Chambeli). This is a pretty flower delicately marked pinkish or light crimson on the back of the petals.

3 *Jasminum officinale* (Sâyali).

4 *Jasminum auriculatum* (Jooi).

5 *Jasminum arborascens*, variety *Latifolium* (Kusari or Mâdhavi). This and the following are wild in our jungles and hedges.

6 *Jasminum hirsutum* (Syn. *J. pubescens*), Roxb. (Kund).

7 *Jasminum angustifolium* (Ran Mograâ).

8 *Jasminum glandulosum* (Van Jâi). This is a climbing shrub cultivated in gardens from the wild variety. Faintly odourous; flowers showy.

All these eight varieties are white. There are two other fragrant varieties which are yellow, *viz.*:— 9. *Jasminum aureum* (Don.) (Piwli Jooi), and 10. *Jasminum revolutum* (Piwli chambeli).

All these varieties of Jasmin, except the last two which are not very common, are great favourites with our ladies. To the Hindu mind the flowers of Jasmin represent all that is the sweetest and loveliest in a Hindu home. See the little girl, the darling of her mother, decked from head to foot with costly ornaments of silver, gold and pearl—borrowed, if not possessed—not on any holiday or special occasion, but in the seasons when the Mograâ, the Jai, the Jooi or the Chambeli is plentiful: the little darling's head is covered with a skilfully woven cap-like wreath of these flowers, of Sâyli particularly; her hair let down on the back in a solitary plait, which is tastefully decorated with rosettes and stars of artistically woven flowers of Mograâ or Jooi interspersed with petals of the scarlet pomegranate flower. To a mind that would look at this decoration with the eye of love, it gives satisfaction. The child thus adorned, sweet in its child-like simplicity, is made sweeter still—nay, more—it looks happy and contented from this special mark of parental regard! Are you thinking of the young bride and bridegroom about to be united—not of their own seeking—in the indissoluble tie of Hindu wedlock? Even there the Jasmines lend enchantment to the scene. Long wreaths or garlands of thickly studded Jasmines, falling in rich profusion from head to foot, and circling round the head, adorn the marrying couple as they stand before each other about to be made one in body and soul! While the priests are chanting the bridal hymns and solemnly invoking the blessings of their household gods and goddesses, fragrance fills the air. Wearing the same garlands the bridegroom leads his young wife to his parental home. Could the couple be old enough to appreciate these sweet yet simple decorations at a time of the utmost happiness in human life, they would look upon the Jasmines with the same devout sentiment which naturally attaches—perhaps in a more appreciable manner—to the bridal orange-blossoms of our more advanced Western sisters. "More advanced" I say deliberately, for they are decidedly so in age and culture, and in consequence more advanced in the appreciation of the responsibilities of a wedded life. Turn again to the custom of the Hindu ladies of honouring their lady-visitors (barring the unfortunate widows) with the present of a *veni* (wreath) of flowers on marriage occasions, and even on ordinary friendly visits. The hostess with her own hands puts on the *veni* over and around the back hair-knot of her lady-guest. Not to do this is understood as tantamount to disregard, if not actual disrespect; and there is

often to be seen a hypercritical lady-guest remarking that such and such a lady-friend of hers did not present the customary *veni* to her on such and such a domestic ceremonial or even on the occasion of an ordinary friendly visit. Judging from the importance attached to such genial exchange of flowers, it is not to be wondered at that at times *intentional* departures from what appears to me to be at once a noble and gratifying custom, are resented in no unmitigated terms. No Hindu sits before his idols in solemn worship of them but has a trayful of flowers for his gods and goddesses. On certain occasions as much as even a lakh (I mean numerically, a hundred thousand flowers) are heaped upon an image, as the humble offerings of an anxious worshipper asking a special blessing from his deity.

The flowers of the Apocynaceous order are as a class more or less delicately scented. They have the smell of the bitter almond. Our white-flowered jungle shrubs of *Holarrhena antidysenterica* (Pândharâ kudâ), *Wrightea tinctoria* (Kâlâ kudâ), *Wrightea tomentosa* (Kalâ Indrajava), and *Nereum Oleander* of ievery colour and form, crimson, white, pink, cream-coloured, single or double, al partake of the fragrant odour characteristic of this order. The milk-white blossom of *Carissa Carandas* (Karwand), the flowers of which resemble Jasmin, partakes of the odour of that flower. Here is a stout sprig of *Plumeria acutifolia* (Khairchampâ) in my hand. See how its thick terminal leafless branches throw out the flowers in large showy compound cymes of purplish-crimson tinge; with the bold twisted white corolla shining softly yellow inside n the profusion in which you see the flower open or in bud, the effect is striking in our jungles and gardens. A tree or two near the bedroom window will suffice to fill the whole room with a delicious fragrance as the flowers open in the early hours of the morning, welcoming the rising sun whose tender rays set off the golden splendour of their lovely bloom. Let me not omit to mention the fragrant flowers of Tagar (*Tabernæmentana coronaria*), which, with its white long-crimpled dense petals, is an exceedingly pretty flower blooming throughout the year. In the Borage order the blossom of *Cordia myxa* (Bhokar), thrown out in copious terminal and lateral cymes of tiny white flowers, is delicately fragrant. The tree is in full bloom in January and February. Among the scented *Bignonias*, the showy flowers of the *Spathodias* should find a prominent place; the *Stereospermums* also are noted for their fragrance. But *Millingtonia hortensis* must be considered the most exquisitely fragrant representative of this order. Though not a native of these skies, it thrives well in our gardens and by our roadside, and throws out large panicles of pure white delicate flowers from head to foot. Their odour partakes of the fragrance of saffron and honeysuckle combined in an agreeable manner. Among the Verbenas, the wild Lantanas of our jungles, varying in colour from white to pink and deep orange yellow, are conspicuous for their strong odour. To some it may be too strong to bear. Our jungle *Clerodendrons*, however, are more delicate in their fragrance. Among the Labiates the flowers are powerfully scented like the plants themselves. The *Ocymum sanctum* (Tulsi), *Ocymum gratissimum* (Ran Tulsi), *Ocymum basilicum* (Sabjâ) are familiar

enough. The odour of *Pogostemone purpuricaulis* (Pânglâ), so much reputed for curing Phursâ-bite, is overbearingly strong. But the most delicately scented representative of this order is the Pâch—*Pogostemone Patchouli*. The flower has found its way into the laboratories of European scent-makers who send us out a delicious essence under the name of Patchouli. Among the Zingibers, the beautiful flowers of which are more or less scented, we have the Sona-takkâ (*Hedychium flavum*), the delicate flowers of which are much valued by our ladies for their hair. Of the Orchids we have only two or three scented varieties around Thana. Of many others in the Deccan I do not know much from personal experience, so I pass them by. Last but not least among our scented plants is the *Pandanus odoratissimus* (Kevadâ). We have the pale yellow and bright deep golden varieties of the bracteal coverings of its branching staminal inflorescence in which lodge the whole fragrance of the plant. Its profuse pollen also partakes of their strong odour. The bracts are much worn by our ladies in their hair. The avidity with which a Hindu lady flies to them is unsurpassed by any they display in the use of even the most fragrant of our Indian flowers.

I now come to the description of our edible flowers. They are not many. The large thick white flowers of *Agati grandiflora* (Agastâ), some of them tinted red, though smelling of honey, are perhaps mawkish when cooked as curries. Cutlets are made of them also—minus the meat. The white flowers of *Moringa pterygosperma* (Shegât) also are similarly used. I do not think they are agreeable to eat, but some like them; others use them because they can get nothing better. The flowers of *Tamarindus Indica*, tinted delicately brown or orange, with crimson spots, are also used for culinary purposes. Mixed with the tender red tops of the freshest off-shoots of the season, the flowers are bruised between the palms of the hands and dried in the sun. They go in this shape under the name of *Múskât*. This compound is used either fresh or dried. Cooked in butter or teel oil with grilled onions and flavoured with salt and red pepper, the dish is agreeable. Its acid taste has been considered appetizing. The large substantial but fragile bright orange flower of *Cucurbita maxima* (Dângar), especially the male variety, is also used for curries with tamarind pulp and cocoanut milk. The flowers of *Bassia latifolia* (Mahuva or Mowrah), which furnishes the Abkari world with the celebrated Mowrah liquor, bears fleshy cream-coloured flowers which are remarkable for their sweetness, from the various saccharine substances the petals contain. The petals are united into a thick tubular corolla, and when dried look like raisins. The corolla is deciduous and bears with it numerous filaments capped with anthers. The dried flowers are said to be eaten uncooked in many parts of the Konkan. But this is very rare. They can never be eaten in large quantities. They certainly are not the staple food of the people here, as it is somewhat boldly asserted. The flowers of the *Musa sapientum* (Kel) and *Musa ornata* (Chawai), which is the beautiful wild plantain of our jungles, are also used for curries and cutlets.

The jungle variety from the larger proportion of the salines it contains makes more palatable outlets. The best time to use the flowers is after the spadix has formed the plantains from its earlier flowers and left the final close-packed crimson spathes in a tuft at the apex of the flower stalk, several inches beyond the already formed plantains. This special tuft is of no further use for developing plantains, and if left on the stalk, by degrees opens, spathe by spathe, and its non-fructifying flowers fade and drop off day by day. No better use, therefore, could be made of this remnant of the flower-stalk than by using it for culinary purposes. The panicles of small white flowers thrown by the *Helmia bulbifera* (Kârindâ) in abundant beautiful pendulous tassels in the rainy season are also sold in our bazaars. These flowers also are used in curries. The pink succulent mucilaginous spikes of *Aloe vera* (Korkaud) —known by our people as Shelâr—are also used in curries. The mucilage may be soothing and agreeable to some stomachs. The scapose spathe and the tender spadix of *Amorphophallus campanulatus* make a good curry if cooked soon after the flower stalk shoots out of the magnificent tuberous root. The spathe and spadix of the *Pythonium Wallichianum* (Shewlâ) of yet more delicate texture, so abundant in our forests just before the outburst of the monsoons, are also similarly used in curries when fresh. The fruit of *Garuga pinnata* or Kâkud is sold with it. If the Kâkud is mixed with the Shewlâ in curries, much of the acridity of the plant is lost. The acid fruit of Bilimbi (*Averrhoa Bilimbi*) is also boiled with it to reduce the acidity. The acid Potassium Oxalate, which the *Bilimbi* contains, helps, I believe, in destroying the acrid principle of the plant. Both the Suran and Shewlâ have to be used with caution, as sometimes their acridity irritates the throat to an injurious extent. The flower-heads of the common Onion are also used under the name of Powâdâ in stews. They are agreeable. The stalks are delicious when not too old.

We next come to the class of flowers which supply us with some of our dyes. Chief among them we have the petals of *Butea frondosa* (Palas), the dye of which is used during the Holi Holidays. Then we have the *Carthamnus tinctorius* (Kardai); its bright orange or yellow corollas are largely used under the name of Kusumba for making a rich dye. The flowers of Pomegranate are also used for making a light red dye. The bright scarlet tubular flowers of *Woodfordia floribunda* (Dhâiti), which are common in our jungles, is used for dyeing silk. The rich orange-coloured tube of *Nyctanthes arbor-tristis*, which shines in marked contrast with its pearl-white corolla, affords a brilliant dye of orange, which is, however, not lasting. The familiar saffron, though not of Indian origin, is also a floral product, being the dried stigmata of *Crocus sativus*. It is worthy of being mentioned here, as very often spurious saffron is sold in our bazaars, which, instead of being the parts of the female element of the *Crocus*, is made up of the dried stamens of *Poinciana pulcherrima* so common in our parts. The rich orange buds of Surangi mentioned before are largely used for dyeing silks.

Having thus far engaged your attention in the amenities of our floral world, let me for a moment crave indulgence to a brief review of what is disagreeable or offensive in our flowers. The scarlet flowers of *Sterculia guttata* (Goldâr), the white flowers *Sterculia fœtida* (Deodar of Western India), and the small greenish-yellow flowers of *Sterculia urens* (Kândol) are well known for the odour of human ordure they emit when in blossom. The long small yellowish-white flowered spikes of *Terminalia Chebula* (Hardâ) and *Terminalia belerica* (Yelyâ or Behdâ) are equally offensive. I cannot omit to mention here a remarkable incident that happened to me in Thana some years ago in connection with the odour of Yelyâ.

The Thana Military Hospital is close to where the Assistant Judge of Thana used to hold his Court. He was troubled with foul smells which he thought emanated from the backyard of my Hospital. Very naturally he applied to the Municipal authorities to put a stop to the foul smells. In due course, as the sanitary adviser of the Municipality, the papers were passed on to me. I was satisfied that the foul smell did not proceed from the Hospital. For some time it was a puzzle to me to find out the source of the offensive odour, for the odour did pervade the compound of the Court. Closely examining the compound, I came under a leafless tree with umbellate spikes of white flowers. The smell being particularly bad under this tree, I had a few of the flowering tops removed from the tree. A sense of triumph overtook me, for I thought I had at last hit upon the *fons et origo mali*. I had a few of the branches sent to my friend the Assistant Judge, who was soon satisfied that the offensive element was in his own compound! What do you think it was?—It was the *Terminalia belerica* in flower! When the blossom ceased and the purplish-tinted foliage came forth, all cause of complaint vanished, and every one was satisfied, and I had my first experience of the offensive odour of Yelyâ. *Ruta graveolens* is another of our offensive plants, through and through smelling of rancid cocoanut oil, foliage, flower and all. The yellowish terminal panicles of *Mappia fœtida* are also said to smell offensive, thus partaking of the plant. The plant is known as Ghanerâ. I have not seen it. But Mr. Whitworth of the Bombay Civil Service told me two years ago he knew the plant to be distinctly what its name indicated. Brandis says the flowers of our common Bor, *Zyziphus jujuba*, are somewhat fœtid. I take leave to differ from such a high authority in Botany—and from one who is always very accurate in his statements and observations. I do not think the blossom of Bor has the character he mentions. The bold, beautifully pink and white corollas of the flowers of Kumbhâ (*Careya arborea*), so common in jungles, have a very unpleasant odour as they bloom in March and April. The smell, however, is not a long-lasting one, as the beautifully filamentous corolla falls within a few moments of its opening. But the most offensive odour I have ever experienced in the blooming of a flower, is from the specimen of the bold inflorescence of Suran I have placed before you. You see here a full-blown spadix surrounded by a large purple sheathing spathe with a showy crenulate border. The spadix bears stout

prominent crimson pistils in ample rows on the lower third of its globose fleshy body; above this female element are the yellow staminal bodies in equally ample rows with their anthers discharging their copious deeper yellow pollen; this male portion occupies the middle third of the flower-stalk. The upper third of the spadix is conical, crimpled and of deep purple colour. Now let me tell you, although the whole of this arrangement is exquisitely beautiful in colour, when the flower-stalk matures you can have no idea how offensive the plant is. I had hitherto no knowledge of the fact that, at the time for the pollen to escape, the whole spadix literally smells like a rotting carcass. I noticed it in this plant in my own studio. One evening on entering my room I smelt what I thought was a dead rat. As I neared this plant on my table, I found to my horror that the smell emanated from it, and that there was a swarm of blue-bottles over and around it. Now you know that these creatures love the decaying carcass. Here was an object as deeply black as a decaying elephant emitting the odour of rotting organic matter. Why should they not be attracted by it? I remembered at once that I had read somewhere to the effect that the blue-bottles and other carcass-flies seek flowers bearing the colour of decaying animal matter, and that at that moment I was realizing the fact. The offensive odour lasted three full days. Of course when I first discovered the smell, I had the plant removed to a lower room. Every day I had it brought to my studio, and the moment it was left to stand near an open window the flies swarmed over it and deposited their eggs, which if I had allowed to remain would have filled the spadix with maggots. After three days the pollen was thrown out in abundant frills from every one of the anthers, and then the flies disappeared; and now you observe there is hardly any smell you would call offensive. Such is the history of the pollination of this curious specimen of inflorescence among flowering plants. The spadix of Shewlî (*Pythonium Wallichianum*) is equally offensive as the male and female organs mature.

A review of flowers, however brief, would be incomplete if the conditions necessary for their growth and development are not considered. The consideration of these conditions is all the more necessary inasmuch as we require no hot-house. In fact, the country is a veritable hot-house in itself. I shall therefore make a few observations on the essential condition of the growth of our flowers. Flowers are produced when the sap is in a highly concentrated state. It must be perfectly elaborated before the floral organs, such as the petals and sepals, pistil and stamens, develop. Formed of such well-formed material, though orginially were modifications of a leaf, the floral whorls as a body have a higher organization and a higher state of existence which finally tends to the formation and maturation of the fruit and seed, wherewith to propagate their species and perpetuate their kind. It is now a well-established fact in vegetable physiology that for such elaboration of the vital fluid of a plant, a sufficient amount of sunlight is essential; without it plants are unable to perform their proper function. That sunlight is one of the essential conditions of the

existence of plant-life, and pre-eminently of flower-life, is amply proved by the fact that plants kept in a dark room look pale and languid, ill-formed and ill-nourished. Keep them in a room where light is admitted through a small window, the plants will invariably turn in the direction of the light. Under a clear sky and bright sunshine, the flowers will be bright, deep-tinted, and substantially formed. The fruit will be sweeter and more luscious. Place the same flower or fruit under a cloudy or misty sky where the light reaches it in a diffused and only in a partial manner, they will suffer in growth and be poor in substance as well as in appearance. Years ago such a keen observer of Nature as Humbold did not fail to appreciate the importance of pure light. "If the vine," said he, "(to produce drinkable wine) avoids islands, and in almost all cases proximity to coasts, the reason is by no means exclusively the low summer temperature of such situations shown by the thermometer suspended in the shade,—it is also to be sought in a difference which has been hitherto but little considered, although known to be most actively influential in other classes of phenomena—I mean the difference between direct and diffuse light, or that which prevails when the sky is clear and when it is veiled by cloud or mist"—(*Cosmos*). There are some flowers, however, which require very little light. Haldane, for instance, mentions a ground orchid (*Anœctochilus*) in the most shaded depths of the densest jungles in the mountains of Ceylon, which, though it dreads light, is yet remarkable for the lovely tints of its rich sap-green or purple petals traversed by delicate golden and silvery veins.

Flowers have at all times and among all nations, nay among all kinds of men, been objects of singular attraction. "They seem intended," says Ruskin, "for the solace of humanity. Children love them; quiet, tender, contented, ordinary people love them as they grow; luxurious and disorderly people rejoice in them gathered. They are the cottager's treasure; and in the crowded town, mark, as with a little broken fragment of rainbow, the windows of the workers in whose heart rests the covenant of peace." These graphic words of one of the most charming word-painters the world has ever produced, can be applied to all the nations of the earth, to whomsoever flowers display their natural beauty. They not unfrequently suggest as Poet Wordsworth says:—

"Thoughts that do often lie too deep for tears."

To the admiring eye of even such a mighty adorer of Nature as Wordsworth, the meanest flower that bloomed was suggestive of enchantment and exaltation far beyond the comprehension of human language. Well may it be so to every student of Nature, however humble, for such is the ever-recurring beauty of Nature that—

"Age cannot wither her, nor custom stale
"Her infinite variety!"

PRESERVATION OF BIRDS AND HARMLESS WILD ANIMALS IN MALCOLMPETH (MAHABLESHWAR).

The following correspondence has passed between the Government of Bombay and the Bombay Natural History Society on the subject of the preservation of birds and harmless wild animals in Malcolmpeth (Mahableshwar):—

No. 3186 of 1892.

GENERAL DEPARTMENT,

Bombay Castle, 8th September, 1892.

To

H. M. PHIPSON, ESQ.,

HONORARY SECRETARY,

BOMBAY NATURAL HISTORY SOCIETY, BOMBAY.

SIR,—I am directed by His Excellency the Governor in Council to forward herewith a copy of the Rules which the Municipality of Malcolmpeth wishes to be notified under Section 2 of the Wild Birds Protection Act XX. of 1887, and to request that you will be so good as to favour Government with the opinion of the Committee of the Bombay Natural History Society as to the terms of the proposed notification—(1) as regards the birds and animals referred to, and (2) as regards the periods of "breeding season" specified in the proposed Rules. The principal birds at Mahableshwar are, I am to state, the Bulbul, Spurfowl, Junglefowl, Paradise Fly-catcher, Blackbird, and Golden Oriole.

2. I am also to ask whether the Committee would recommend any addition to, or alteration of, the Rules, and to request the favour of an early reply.

I have the honour to be,

SIR,

Your most obedient Servant,

C. G. DODGSON,

Acting Under-Secretary to Government.

The following Rules are made by the Malcolmpeth Municipality in accordance with the provisions of Section 3 of the Wild Birds Protection Act (XX. of 1887)—and with Government Notification No. 921, dated 10th March, 1891, published at page 239 of the *Bombay Government Gazette*, dated 12th idem, Part I.—declaring the provisions of the said Section to apply to—

1. Sambur.
2. Deer, including Bhekor and Pisora.
3. Hares.

I. For the purposes of the said Act in its application to the Municipality of Malcolmpeth—

(*a*) "Wild Birds" mean all birds, excepting Wild Duck, Snipe, Quail, and birds of prey (excepting all Hawks and Kites).

(*b*) The "breeding season" means, in the case of birds, from the 1st January to 31st December in each year, and with reference to animals other than birds, to which by the Notification No. 921 aforesaid the provisions of Section 3 have been declared applicable in the case of—

1. Sambur ... ...
2. Deer, including Bhekor and Pisora
3. Hares... ... ...

(From 1st October to 31st May each year).

II. (*a*) No one shall, within the limits of the said municipality, possess or sell, during its breeding season, any wild bird or any such animal as is mentioned in Rule I., which has been recently killed or taken.

(*b*) No one shall, during its breeding season, import into the said municipality the plumage of any wild bird or the fur of any such animal as is mentioned in Rule I.

III. (*a*) A breach of Rule II. (*a*) or (*b*) shall be punished with a fine which may extend in the case of a first offence to Rs. 5 in respect of every wild bird or animal possessed or sold in breach of Rule II. (*a*), or of which the plumage or fur has been imported in breach of Rule II. (*b*).

(*b*) In case of a subsequent offence to Rs. 10 in respect of every such bird or animal or the plumage or fur thereof.

IV. That these Rules shall, as regards all birds, be in force for a period of five years.

6, APOLLO STREET,
Bombay, 8th October, 1892.

To

THE UNDER-SECRETARY TO GOVERNMENT,
GENERAL DEPARTMENT, BOMBAY CASTLE.

SIR,—I have the honour to acknowledge the receipt of your letter No. 3186, dated the 8th ultimo.

I have duly placed the copy of the Rules for the Protection of Birds, &c., in the Municipality of Malcolmpeth, before the Committee of this Society, and they are of the opinion—whilst fully concurring with Government that total protection for five years will be extremely beneficial to the birds and animals at Mahableshwar, and is much needed, they feel that representing a Natural History Society, they cannot acquiesce in the definition of the "breeding season" laid down by Government in the case of birds from 1st of January to 31st of December, and animals from the 1st of October to the 31st of May.

The breeding season for almost all birds at such altitudes as Mahableshwar is between the months of April and September (both months inclusive) in each year, whilst for animals such as Sambur, Bekri, the smaller Deer, and Hares, the breeding season is principally as follows:—

Sambur	June to October.
Bekri	January and February.
Smaller Deer	May to November.
Hares	October to February.

With regard to Rule I. clause (*a*), defining the meaning of "Wild Birds," it is observed that Hawks are protected. The Committee are of the opinion that Hawks should not be protected, as they subsist to a large degree by preying upon the smaller birds.

In conclusion, I beg to state that the Committee are exceedingly gratified to observe that steps are being taken by Government to provide a close season for the protection of harmless animals, game birds, and birds of plumage, during the breeding season, and hope that the rules may speedily be extended to other parts of the Presidency where the total extermination of some species is threatened.

I have the honour to be,
SIR,
Yours faithfully,
W. S. MILLARD,
Hony. Secretary, Bombay Natural History Society.

No. 3935 of 1892.

GENERAL DEPARTMENT,
Bombay Castle, 29th October, 1892.

To

W. S. MILLARD, ESQ.,
HONORARY SECRETARY,
BOMBAY NATURAL HISTORY SOCIETY.

SIR,—In reply to your letter, dated 8th instant, I am directed to convey the thanks of His Excellency the Governor in Council to the Committee of the Bombay Natural History Society for their valuable suggestions. I am to state, with reference to the concluding paragraph of your letter, that rules have been framed under the Wild Birds Protection Act XX. of 1887 for the Municipalities and Cantonments noted in the margin.

Municipalities of Ahmedabad, Broach, Ankleshvar, Karachi, Jacobabad, Larkhana, Kambar, Rato-dero, Rohri, Ghotki, Sukkur, Shikarpur, Gurhi Yasin, Tatta, Keti, Kotri, Sehwan and Bubak and Cantonments of Belgaum and Karachi.

I have the honour to be,
SIR,
Your most obedient Servant,
C. G. DODGSON,
Acting Under-Secretary to Government.

CORRESPONDENCE.

THE MAMMALIA OF INDIA.

To the Editor of the Journal, "Bombay Natural History Society," Bombay.

SIR,

IN the Journal of the Society for the present year (vol. vii, p. 246) there is a criticism of my "Mammalia" in the "Fauna of British India," and amongst other observations on the work, the critic ridicules the statement that the great one-horned Rhinoceros (*R. unicornis*) "was common in the Punjab as far west as Peshawar in the time of the Emperor Baber." This statement is said to be founded on "a lot of careless quotations, probably at second hand, from an obviously bad translation of a probably corrupt manuscript." One quotation from Erskine's translation of Baber's Memoirs, the work thus stigmatized, is appended (at second hand), and is declared to contain the whole evidence.

The writer of the criticism has not been able to consult Baber's Memoirs and has been misinformed. The matter was fully explained by Mr. Blyth in the Journal of the Asiatic Society of Bengal for 1862, vol. xxxi, p. 199. A reference to Mr. Blyth's paper is given in the 'Mammalia' under *Rhinoceros unicornis*.

The passage quoted by my critic occurs at p. 253 of Erskine's translation. But at least two other passages in Baber's Memoirs refer to the Rhinoceros. Both were quoted by Blyth, but the most important of them which occurs at p. 316 of the Memoirs is worth re-quoting. This paragraph occurs in Baber's general description of Hindustan, and of the animals, plants, &c. Amongst the animals peculiar to Hindustan, the elephant is first described, then comes the following account of the Rhinoceros :—

"The Rhinoceros is another (*i.e.*, animal peculiar to Hindustan). This also is a huge animal. Its bulk is equal to three buffaloes. The opinion prevalent in our countries, that a Rhinoceros can lift an elephant on its horn, is probably a mistake. It has a single horn on its nose, upwards of a span in length, but I never saw one of two spans. Out of one of the largest of these horns I had a drinking vessel made, and a dice-box, and about three or four fingers' bulk of it might be left. Its hide is very thick. If it be shot at with a powerful bow, drawn up to the armpit with much force, and if the arrow pierces at all, it enters only three or four fingers' breadth. They say, however, that there are parts of his skin that may be pierced, and the arrows enter deep. On the sides of its two shoulder blades, and of its two thighs, are folds that hang loose, and appear at a distance like cloth housings dangling over it. It bears more resemblance to the horse than to any other animal. As the horse has a large stomach, so has this; as the pastern of the horse is composed of a single bone, so also is that of the Rhinoceros; as there is a gumek in the horse's foreleg, so there is in that of the Rhinoceros. It is more ferocious than the elephant, and cannot be rendered so tame or obedient. There are numbers of them in the jungles of Peshawar and Hashnagar, as well as between the

river Sind (Indus) and Behreh in the jungles. In Hindustan too they abound on the banks of the river Sirwu (Gogra). In the course of my expeditions into Hindustan, in the jungles of Peshawar and Hashnagar, I frequently killed the Rhinoceros. It strikes powerfully with its horn, with which, in the course of these hunts, many men, and many horses, were gored. In one hunt, it tossed with its horn, a full spear's length, the horse of a young man named Maksûd, whence he got the name of Rhinoceros Maksud."

The other reference to the Rhinoceros in Baber's Memoirs is at p. 292, where an account is given of a Rhinoceros hunt close to Bekram, said in Erskine's foot-notes to be Peshawar. The following brief extracts are sufficient to shew that the animals seen and killed were Rhinoceroses, not deer:—

"Hûmaiûn (this was Baber's son, afterwards Emperor) and those who had come from the same quarter, never having seen a Rhinoceros before, were greatly amused." . . . . . "This Rhinoceros did not make a good set at any person or any horse." . . . "I have often amused myself with conjecturing how an elephant and Rhinoceros would behave if brought to face each other; on this occasion the elephant-keepers brought out their elephants, so that one elephant fell right in with the Rhinoceros. As soon as the elephant drivers put their beasts in motion, the Rhinoceros would not come up, but immediately ran off in another direction."

I think the above will suffice to shew that the occurrence of the Rhinoceros near Peshawar in the early part of the sixteenth century rests upon sound evidence. No one reading the above extracts can reasonably doubt that they are truthful statements by a well-informed writer, and I do not think there is any foundation for the idea that the translation was bad or that the manuscripts translated had undergone any serious alteration from the original. Certainly there is nothing in the quotations I have given to suggest either corrupt text or mistranslation.

The above is a question of sufficient scientific importance to deserve correction, and I think it is a matter for regret that in this case and in some others, my critic, who has not given his name, but who evidently has a considerable amount of zoological knowledge, should have written more emphatically than was necessary. I shall not attempt to reply to his criticism in detail, but I should like to point out another instance in which I think he will find on examination that he has overlooked the real facts.

He writes, "*Bosolaphus tragocamelus*"—save the mark, is nothing but our old friend *Portax pictus*, the Nilgai. The Maratha name *Rohi* or *Rohi* is wrongly given as Rú-i, and a name, given as that used by the Gonds, Guraya, cannot be universal, as Forsyth, an excellent authority, gives Rohi as the Gond name in the Song of Lingo."

Now if instead of Forsyth's Lay of St. Lingo, which I should scarcely have expected to find quoted as an authority for Gond names, my critic had looked at the appendix to Forsyth's Highlands of Central India, p. 469, he would find in the valuable list of Hindi, Gond and Korkoo words there given the only

Gond name for the Nilgai to be *Goorya*, which is of course the same as Guraya. Moreover, the Korkoo name given by Forsyth is Roi (without any *h*) and Rú-i is given by Jerdon as the Mahratta name. It is quite possible that the use of the letter *h* is liable to variation in Western India as well as in Southern Britain.

There is another observation to be made on the sentence quoted. My critic is very severe on my nomenclature; he says that *cemas* is a misspelling (it is spelt according to rules for the transliteration of Greek words that have prevailed for nearly 2,000 years), and that *Boselaphus* is a mere barbarism. That *Boselaphus* is a hybrid term is perfectly true, but surely it is a matter of opinion whether such names should be rejected or not. But it is not a matter of opinion, but a simple fact, that the name *Portax pictus* which my critic quotes as preferable, cannot possibly be used, unless, as he suggests with regard to another of my nomenclatural delinquencies, "we are to give up the Latin Grammar bodily," for the simple reason that *Portax* is undoubtedly feminine.

London, November 18th, 1892. W. T. BLANFORD.

NOTE BY THE REVIEWER.

It is no more than fair play to admit at once that Mr. Blanford has fully made out his case in respect of the Trans-Indus Rhinoceros; and is entitled to the honourable amends hereby tendered to him. He is right in supposing that the Reviewer had not Baber's Memoirs before him. After months spent in endeavouring to get at an English or Turki copy in India, the verification of Mr. Blanford's Statement had to be entrusted to a correspondent in England, who, in the utter absence of any reference to book, chapter, or verse, missed the valuable passages now quoted by Mr. Blanford, and sent extracts of the very unsatisfactory passage already printed in the Review. After this explanation and apology it would be most ungracious to go on sparring with Mr. Blanford about vernacular names. But his remarks upon one important Latin name require notice. "*Portax*" is, as he says, certainly feminine. But the reference to "*Portax pictus*" as an "old friend" was correct, for it is so printed at page 272 of Jerdon's Mammals of India, (reprint), which is the authority most accessible to the main body of our readers. The Reviewer had occasion to observe that Mr. Blanford (in his heading) quoted "*picta*" from this very page; and therefore gave "*Portax pictus*" in inverted commas to indicate that he thought himself more answerable for the accuracy of his quotation than for Dr. Jerdon's concords. The commas dropped out in print, and as no reference to the book or the page had been given, Mr. Blanford's complaint of his Reviewer's grammar was justified by the evidence before him; in a manner amusingly analogous to the Reviewer's own misconception already disposed of. That leaves things "pretty square"; but the

matter would be yet to be regretted if it had not brought Mr. Blanford into a place where we should have been glad to see him long ago; in the columns of this Journal; furnishing us with information not to ourselves accessible. It is to be hoped that more of the same may be to be had from him, and his anonymous critic, at any rate, will not complain of the "emphasis" of any communication from him half as interesting as the present. Reviews and controversies are not best written in butter, and mere mutual admiration would be much out of place between writers who are, as such, public servants, answerable not merely to each other, but to their employers and their readers.

REVIEW.

* Sport in Southern India.

This, the latest addition to the records of Indian Sport, is a large and well-got-up volume, illustrated by many sketches by the author, which shows that he was as great a proficient with his pencil as with the rifle; moreover the book is very modestly written. Col. Hamilton had an extended Indian service from 1844 to 1870, and being one of the early pioneers of the Forest Department, had exceptional sporting opportunities. The first chapter principally deals with Antelope shooting and such like; one form of sport, namely, coursing the fauns, does not commend itself. The second chapter is headed Wolves; several instances are given of how wolves, before they commence their hunt, seem to settle a plan of campaign, as an instance:—"I saw two wolves; after about ten minutes or so, the smaller of the two, got up and trotted off to the rocky hills, and suddenly appeared on the ridge running backwards and forwards like a collie dog; the larger wolf, as soon as he saw that the antelopes were fully occupied in watching his companion, got up and came as hard as he could gallop to the *nullah*; unfortunately he caught sight of us and bolted, and his companion, seeing something was wrong, did the same. Now it is evident that these two wolves had regularly planned this attack; one was to occupy the attention of the antelopes, while the other was to steal up the watercourse and dash into the midst of them. How did they communicate this to each other?" We have a very graphic description of a mongoose and cobra fight; after saying that the mongoose erected its hairs till it appeared twice its proper size, and that the cobra appeared to strike it several times, he gives, as an explanation of the latter's immunity, "Our little favourite killed many cobras, and, I believe, never was bitten. * * I believe, also, that its safety consists in the perfect judgment of the distance the snake can strike, the increase of its apparent size, from all his hairs standing out at right angles, deceiving the snake, so that the fangs never really touch the body of the mongoose, but only the hair." A few pages are given to Pig-sticking at Ahmednagar, but the author says he saw very little of this sport. We now come to big game shooting;

* Records of Sport in Southern India, &c., by the late General Hamilton, published by Porter, London.

we thought that, having once ourselves mistaken a tiger for a light-coloured deer at some little distance off, it was our own stupidity, but the author consoles us; he says:—"At 300 or 400 yards off, more than once I have mistaken a tiger for a light-coloured hind, until I have brought the telescope to bear and seen my mistake." Col. Hamilton accounts for his immunity from accidents with the many tigers he has shot, to carrying out the advice given him by an excellent shikari, a Seedee, named Eman, which was, when shooting tigers on foot, "*never*, if you can possibly avoid it, *fire at a tiger when the line of his body is towards you*"; he gives another of Eman's wrinkles in Deer stalking, to remain perfectly motionless the moment a deer catches sight of you, as the least movement will send the animal away; it may be necessary to stand thus five or even ten minutes, but if you do not move, the deer will commence feeding again; you can then approach nearer, doing so with the greatest caution, but the instant the deer raises its head, you must be exactly in the same position you were when it first saw you; again you may have to wait, but each time if you have not been seen to move, the animal will gain more confidence; a curious thing is that it does not appear to be aware that you have reduced the distance by 100 or 200 yards.

Chapter IV. is taken up with an account of a trip to Singapore, Java, and Labuan.

Chapter V. treats of Bears, by one of which our author was slightly mauled; there is also an amusing little sketch of a wounded she-bear turning on her cub, entitled, "I did not do it, Ma."

Chapter VI.—Ibex shooting in the Neilgherries, &c.; if we were critical we might demur at the dignity title of Ibex. It contains nothing of any particular interest to our mind, be it in the Himalayas, Atlas or Neilgherries, the accounts of stalking and shooting have a great sameness.

Chapter VII.—Elephants; the sketches in this chapter are admirable. One is, "I try to drive him home, but only drive him furious"; our author runs short of ammunition, which he appears occasionally to do, and after blinding an elephant, he cannot finish him off, so attempts to drive him near his camp by throwing stones at him, and such like, from 10 A.M. to 5 P.M., when he gave it up, but found the beast dead the next morning.

Chapter VIII. is perhaps the most interesting, as it deals with Tigers, Leopards, &c., and numerous the former must have been in those days; time after time the author was able, as he says, for an hour or two, to watch them, when unable to get near enough to shoot one; this facility of observation unfortunately is not given to most people now-a-days. However he says: "I have never seen a tiger strike down an animal. I have seen them chase deer, but they never go more than 200 or 300 yards. * * Two tigers will often hunt in concert, generally in couples. I have often watched them thus when approaching a herd of deer. A brother officer told me that he saw a tiger drive a deer up to some rocks, where another one was crouching, ready to spring upon it. On one occasion, whilst out looking for sambur, I saw a stag out feeding above a strip of jungle and noticed a tiger stealing along below it; the deer began bellowing and moved up the hill, followed by the tiger, the latter trotting after the deer, and occasionally breaking into a canter, the deer trotting on with its tail up. The tiger did not attempt to stalk, except by remaining for a moment at a rock. The stag broke into a gallop, and the tiger immediately followed it, just then my shikari said: "Look, there's another tiger above," and there was one bounding down the hills to cut off the deer;" unfortunately, at this interesting moment they were lost sight of. The author gives, as his experience, that tigers do not hunt by scent, and that they have no idea of taking advantage of the wind when stalking; on one occasion, when looking for a deer with a friend, he heard a sambur belling; I whispered to my companion that I thought there must be a tiger in the wood; I had hardly spoken, when we heard a low gutteral growl, and every time the deer belled the tiger answered with a growl. Then a third deer commenced belling, and for several minutes this went on, the tiger answering with a growl every bell of the deer. The tiger appeared to be approaching us, when suddenly the growling ceased, but the belling of the deer continued; a short time afterwards a hind dashed into the open, but no tiger appeared. I have heard a tiger growl to the bell of a deer at other times, but never so persistently as on this occasion; now my idea is that the tiger by growling, sets all the deer belling, and when he has fixed on the exact spot where one may be standing, he suddenly stops answering and proceeds to stalk the animal; if the tiger had sufficient sense of smell to hunt the deer by

scent, I do not think he would reply to their cry of alarm by a growl.

The largest tiger killed by the author measured 9 ft. 3 in.

The concluding chapter deals with Bison and Deer. We will only allude to one incident; after shooting away all his ammunition at a hill bison and failing to kill it, the animal still being able to get up and go a few paces, he finished it off in a most extraordinary way. We will give his own words.* * "I thought he was dead, but what was my astonishment when he again got up on his legs and quietly walked off, and when he laid down again, it was as naturally as if he had not a single hole in his skin. This looked pleasant; I did not like to leave him, and had only one resource, so I tied my hunting-knife to a long bamboo, and creeping up, plunged it into his side just below the elbow; this finished him." There is a sketch shewing the *coup-de-grace* being administered. This in other books of Indian sport we wot of, we should consider a case of the long bow. The knife must have been longer than the ordinary run of shikar-knives, and securing it to the bamboo must have been an excellent example of lashing, but as we have before said, from the modest way in which the book is written, the incident must be taken as above suspicion.

E. F. B.

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* Fur-bearing Animals.

In this book there is a great amount of useful information, in fact its title might be "Things not generally known." As regards the animals in nature there are many slips and inaccuracies; and useless, and in some cases childish, padding; but it is not our intention to pick holes, but to give an idea of its merits. At the commencement there are tables of the quantities of furs imported by various companies. As an example of the enormous number furnished by some animals, we will take the Australian Opossum, of which in 1891 2,254,111 skins were imported. At the great Fur Sales in London the value of fur-skins sold annually is little short of £1,000,000. We commence with the monkeys; the Indian monkeys do not appear to furnish many skins. The Lion Monkey (*M. silenus*) is mentioned, but its skin is not often imported; the fur of the Himalaya

* Fur-bearing animals in Nature and in Commerce. By Henry Poland. Churney and Jackson, 1, Paternoster Row.

Langur (*S. schistaceus*), however, "is much esteemed as a fur, and 200 or 300 skins are imported annually."

In most cases the value of a skin is given, *e. g.*, a perfect black maned skin of a lion is worth £50 to £70: a good tiger (Indian) skin is worth £4 to £6, and the claws 9*d.* to 5*s.* each, but in the case of the Chinese Tiger, the value of the former is from £10 to £40, and of the Turkestan Tiger from £3 to £25: 135 Chinese tiger skins were imported in 1891.

There appears in India to be an idea that the skin of the Snow Leopard is of great value, but Mr. Poland dissipates this idea; the value, he says, of a good skin is from £2 to £6 10*s.*, and £7 is the highest price paid; those of the Chinese Leopard fetch from £5 to £10 10*s.* The extreme price of an ordinary Panther skin is from 12*s.* to 42*s.* Of all the animals, whose skins are an article of commerce, the Sea Otter furnishes the most valuable one; it is only 4 or 5 feet long with a very short tail; a skin has been sold for £200, and £100 is not considered an extraordinary price. About 2,400 skins were imported in 1891, but it doubtless will soon share the fate of the Great Auk.

The Yak next claims our notice. "Many tails are imported annually for the manufacture of wigs, etc.; the white are worth 2*s.* 6*d.* to 3*s.* 6*d.*; the black and grey are in less request for wigs, and fetch 4*s.* and 2*s.* respectively."

Under the head of the Common Goat we find that in 1891 7,259,212 skins were imported tanned from India alone. The only Indian Deer we find any mention of is the Cheetal; "a few skins are sometimes bought by the United States, also a few by English furriers, for foot-muffs, etc., but the majority are now purchased for leather; a good large skin is worth 6*s.* to 7*s.*"; the horns are also an article of commerce.

E. F. B.

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* Rowland Ward's New Book.

The *raison d'être* of this book is explained in the first few words of the preface:—"My object in producing this book is to start a record of horn measurements of the Great Game of the World." The

* Horn Measurements, by Rowland Ward, published by same.

measurements are on the outside of the horns from tip to base, circumference at base; with Deer above first time. Mr. Ward gives the weight of various animals, but as he says, "weights taken in the field should be accepted as approximate," we should be inclined to say that they should not be accepted at all. We will mention the best measurements of some of our Indian animals and hope that some member be able to "cap" them.

The best barking deer is 6½ inches with a circumference of 3 inches; this is from the collection of A. O. H.

A great number of Sambar measurements are given, and again A. O. H. is first as regards length, *viz.*, 46½ inches; the circumference is however not equally good, *viz.*, 6⅝ inches; the thickest has a circumference of 7⅛ inches, length 44½, from Rangoon C. P., owner Col. W. J. Morris. He also gives the span and the extreme width inside measurements, which, especially the span, as might be expected, vary considerably. The number of points are given; out of 87 measurements a single horn from Nagpur has 7 points, two 4×4, one 7×6 (A. O. H), several 4×3, and of course the majority 3×3: Mr. Ward makes two species of the Sambar, 1st, *Cervus aristotelis*, habitat India, Burmah, and China; 2nd, *Rusa hippelaphus*, habitat Central and Southern India; but as *C. aristotelis* and *R. hippelaphus* are synonyms for one and the same animal, and as there is one Sambar, not two Sambars, we do not know what Mr. Ward means, unless it is the latest invention of some species monger.

A. O. H. again has the second Hog-deer as regards length, *viz.*, 19¼ inches with a girth of 3⅛ inches, the greatest girth being 3¼ inches of an 11¼ inches horn.

Major Cumberland has a very fine Swamp-deer, head 41 inches, but unfortunately one horn is broken, shot in the C. P. in 1891; this deer seems to belie its name of *Barasingh*, as out of 36 measurements only 8 have 12 points, two specimens from Nepal have 8×8 and 9×8 points respectively; both are in the British Museum.

37½ inches is the best Cheetal-head (A. O. H), and 47 inches the best Barasingh (Kashmir); again 12 points is the exception; the best has 8 × 8 points.

We now come to the Antelopes. The best Four-horned Antelope has horns 4⅛ and 2¼ inches. The Blackbuck 28½ (straight);

40¼ (round curve). The best Chinkara is 14½ inches, but Mr. Ward notes "owner's measurements"; 13¾ comes next; only two measurements of females are given, *viz.*, 7½ inches and 4½ inches.

An animal, which Mr. Ward calls "Arnee" for some reason, is only a Buffalo under an incognito. A single horn at the British Museum measured 77⅜ inches, a long way ahead of the next measurement which is 65¾ in., and one cow is given 58¼ inches; it would have been interesting if some measurements of the Domestic Buffalo had been given. The best bison is 33¾ inches. The book closes with various tiger measurements. We have omitted to note the best pig tusks, *viz.*, 10 inches outside the curve.

We do not know the price of the book, but from its appearance expect that it is rather expensive. We think that if Mr. Ward had brought out a small and cheap book, it would have been probably more useful, and would have been a suitable addition to one's shikar kit; but Mr. Ward's clients doubtless are chiefly sportsmen who hunt on magnificent lines, with lacs of rupees and tons of kit, like the latest expedition to devastate Somali land, and the ordinary Indian sportsman with an 80 lb. tent and a few depreciated rupees is more or less unknown to him.

E. F. B.

MISCELLANEOUS NOTES.

No. I.—FOOD OF THE FLYING FOX.

In Mr. Blanford's Mammals of India, p. 258, is an interesting note about the Flying Fox: "They (Flying Foxes) are also fond of the fruit of *Terminalia catappa*; and are said by Day to extract the kernels often, utilizing the verandahs of houses as a resort while thus engaged, and alarming the inhabitants by sounds suggestive of house-breaking." *Terminalia catappa* is the so-called "Almond" or "Walnut" of our gardens. A handsome tree, chiefly noticeable for the beautiful colour of its large leaves when dying. Dr. Day's observation has been verified by two seasons' experience of burglarious bats at Tanna. When the tree is out of fruit the bats are "not a-burgling."

W. F. SINCLAIR, I.C.S.

No. II.—BIRDS OBSERVED BREEDING IN KHARAGHORA.

I write to record the fact that I have found a large colony of the Large Cormorant (*Phalacrocorax carbo*) breeding here in our lake. I see that Mr. Barnes states in his Birds of Bombay (page 439), and also in his series of papers on "Nesting in Western India," published in Vol. VI. of this Journal (page 304), that as far as he knows the only part of the Presidency in which this bird is a permanent resident is Sind, where it was seen breeding in the Eastern Narra District by Mr. S. B. Doig. I visited the colony on the 1st instant and found between 70 and 80 nests, all of the large kind, together with a few of the Lesser Cormorants. No nest had more than 5 eggs, and in some instances all the eggs were hard set. I noticed that some of the birds were entirely white on the breast.

It is also worthy of note that the Black-winged Kite (*Elanus cæruleus*, Desf.) is breeding here in large numbers this year, some 10 or 12 nests having been found by Mr. J. Davidson, C.S., and myself during the past 20 days. In only one case have the eggs been hard set, and in this instance there were 5 eggs in the nest. In other cases 3 or 4 eggs have been found slightly set, but most of the nests are either being built or just completed.

I have seen no more Crested Grebe breeding here this year.

H. BULKLEY.

Kharaghora, 1st December, 1892.

No. III.—NOTE ON PSILOTUM TRIQUETRUM.

The genus *Psilotum* belongs to the N. O. *Lycopodiaceæ*, and is represented by only one species—*P. triquetrum*. No Bombay, or, as far as I am aware, Indian Botanist mentions this plant as growing in India. Its habitat is given as tropical climates, and it is indigenous in the United States of Brazil, Central

America, Madagascar, and in the Moluccas and Sandwich Islands. A short note on this plant, as I have found it growing in the Savantvadi State, may not be uninteresting to some of the members of this Society. I forward herewith a specimen of the plant for the Society's Herbarium.

HABITAT.—As yet I have met it growing only in one locality, that is on the roots of a cocoanut palm. I have looked for it on the roots of other cocoanut palms in other likely localities, but without success. Possibly it may be found growing in other parts of the Konkan? There is no doubt however that it is indigenous.

DESCRIPTION.—The plant is parasitic; when fully developed it is 7 to 8 inches in height. The root, or properly speaking the underground stem, was deeply embedded in the roots of the palm. The stem is erect, herbaceous, triquetrous, and divided dichotomously. The leaves are very small, sessile and bristle-pointed. Fructification in the axils of leaves, consisting of three-celled capsules or sporangia. The capsules burst when placed in water, and present, under the microscope, numerous small spores.

USES.—The plant is cultivated in hot-houses in Europe. Its economic uses, if any, are unknown.

My identification of this plant has been kindly verified for me by Professor Woodrow, of the College of Science, Poona.

The specimen which accompanies this note is not fully developed.

D. G. DALGADO, M D.

Savantvadi, 26th September, 1892.

No. IV.—NOTE ON INDIAN BREEDS OF DOGS.

The November numbers of *The Field* have contained a somewhat desultory correspondence about Indian breeds of dogs, which suggests the following notes on some formerly known to me as kept pretty pure by natives in this Presidency. The most famous strain is the Wanjari dog (in Chee-Chee Brinjary), but many and discrepant are the descriptions of him. The Wanjaris or Lambánis, nomad-carriers and cattle-breeders, are being driven off the roads by the improvement thereof, which enables the bullock cart to supplant their pack-bullocks even on short routes. For long distances, of course, they cannot compete with the Railways. They are consequently settling down to agriculture and trade; losing their sporting tastes and less in need of watch-dogs than when their "tandas" were the main transport agency for grain and salt. The natural result will be the degeneracy and ultimate extinction of their special breeds of hound. But in the sixties and seventies they were still great carriers to Panwell and Kalyan, where their freights were shipped for Bombay. The crowded island itself afforded even then no space for pasture for their numerous cattle.

In those years I knew them to breed several strains of hounds. The first, which I think is the true Wanjari hound, was more like the Danish boar-hound than anything else, though somewhat inferior in size and beauty to that fine

brute; probably from worse fare. Perhaps an imaginary cross between the Dane and a rather coarse Greyhound (or even Pointer) would give the best idea of these "Asal Wanjari" dogs. They were very fierce and brave, and were kept in order chiefly by force; though not at all dangerous to their friends. An old Wanjari lady once reduced a dog who attacked me to order by throwing her skirt over his head and sitting down on him.

These dogs had fine short coats, commonly black, or mostly black, but sometimes fawn or brindled. I never saw nor heard of one of this race in the possession of any one but a Wanjari, and even amongst that caste they were not very common.

A second breed kept by the Wanjaris was a coarse lurcher-like greyhound usually of a deep fawn-colour; with short, harsh, and rather scanty but uniform hair. These resembled what have been shown to me as "Rampur hounds" (whether rightly so called or not I cannot say); but the Wanjari Greyhound was the bigger and handsomer brute of the two.

A third breed, chiefly owned (as far as I saw) by half settled Wanjaris in the East of Khandesh, was a sort of large coarse Spaniel something the sort of dog that one might suppose to be obtainable by crossing the English Spaniel with the Scotch Collie; and the offspring with a big stout village "pie dog."

I have repeatedly known the Wanjaris to sell pups of this and of the second race, and have owned them, and their hybrid descendants, myself. Their vile temper renders them undesirable pets, and their dishonesty makes them bad neighbours. But they are good watch-dogs and lurchers, hardy, and very good at running into wounded game, though too little amenable to discipline for such services as we break the sporting dogs of Europe to.

The Thilaris, a race of wandering shepherds, goat-herds, and pony-breeders, have or had a breed of dogs called by their name. This is a tall shaggy lurcher-like dog, whose appearance suggests a cross between a Greyhound and a black Newfoundland of the lesser race. The Thilaris sell these dogs to other natives, who sometimes value them highly and use them well. The finest Thilari hound that I ever saw was in the possession of a Wanjari. But I never owned one myself nor saw one with an European.

The Ramusis of the Deccan and especially of the low hills between the Bhima and Nira Valleys, had a breed of Greyhounds that they called "Lut." These were true Greyhounds in form, though not equal in size, beauty, or speed to the English race. They have, however, very hard feet, and are less apt to be lamed in a course over stony ground than imported Greyhounds. Their usual colours are blue and fawn; the blue are the most valued. The hair is short, stiff and scanty, sometimes almost to nakedness.

I suppose these to be allies of the Polygar dog, if there be indeed a true Polygar race. For Polygar is only a Madras word for a local chief, hardly worth calling a Raja, and the Ramusis are believed to be an immigrant race from the South, or else the remnant of a race whereof the main body has gone South.

Their affinities with the Southern Bedars and Berads are hardly to be doubted, and their dogs may well be distant cousins of the packs of Mysore and Madras. The Ramusis often sell their dogs. None of these Indian dogs, however grey-hound-like, have had the advantage of Lord Orford's cross with the bull dog, whence we trace the English Greyhound's weak power of scent and fierce energy. Therefore they all use scent more or less, (as indeed will he, if allowed), and all, to some extent, give tongue upon a scent, though not in anything like the tone of a hound, with one odd exception. This is at a village on the Bhima, whereof I have forgotten the name, but there was a bungalow there, where some early Victorian Collector of Poona once kept fox-hounds. There, when I last visited the place, two and twenty years ago, the fox-hound cross was still observable in the face and voice of the local "pie."

All the races named, to the best of my belief, are apt to have the so-called "dew claw," especially the short-haired greyhound-like types, and most especially the "Lut." It is usually removed in puppyhood, as exposing the dog to injury in running. I have seen and performed the operation, "cruel only to be kind"—the wound heals in a few hours, because, I suppose, the soft tissues of the puppy give way easily. All who have kept Greyhounds, know that injuries to the claws of the adult are often a serious matter, and the dew claw, when retained, seems to be specially liable to these, while functionally useless.

Of imported dogs, a small European-looking greyhound, usually fawn-coloured-is known to me as the Arab Greyhound, and a taller race, with the shape of a grey, hound and the coat of a rather smooth black and tan Setter, as the Persian. But I am not aware of any better authority for these names than that of the horse dealers who sell them.

In this Presidency, as we go North-west, the village "pie" gets bigger and bigger, more and more "audacious" and aggressive, until in Upper Sind, I have known the "pies" to drive out of his own head-quarter town a newly-arrived Assistant Collector from the Peninsular Provinces, who had dared to walk into it without a stick. He returned, however, in arms and in wrath; and great and grim was the slaughter. On the border, the brutes are still more savage; and beyond it I'm told, nearly as big and quite as dangerous as the men. What's worse, as they are useful watch-dogs, your defence may involve you in feud. But all that I have seen of these dogs, including the pack of so great a Nimrod as the Amir Ali Murad Khan of Khairpur, were merely highly developed "pies"; evidently near of kin to those of every village in the Peninsular Provinces of Bombay.

Thana. W. F. SINCLAIR, I.C.S.

No. V.—A GAZELLE'S FOOD.

The following peculiarity in a Gazelle which we have on board may be of interest. It was presented to the ship about two years ago by the Sultan of

Muscat, during which time its principal food has been teakwood shavings, which it seems to prefer to any kind of green food. Potato peelings, rope-yarns, and tobacco are amongst the other curious things which this animal appreciates. It thrives wonderfully well on this diet, and hardly ever touches water. It is exceedingly tame, and firing the guns does not disturb it.

SEYMOUR D. VALE,
Lieut., R. I. M.

R. I. M. S. "Lawrence," December, 1892.

No. VI.—A LYNX ATTACKING A MAN.

The following curious incident happened a few weeks ago in this district, while I was out in Camp, and is interesting as showing how courageous such a small animal may become when pressed for food. It appears that three coolies were going along together in single file, through the jungle, in the south of this district, on their way to Camp at night. When passing through some fairly high grass, an animal sprang upon the last coolie from behind and fastened itself upon his shoulders. He happened to be walking along at the time with a blanket over his head, and had the presence of mind to quickly turn up the edges and envelop the animal within its folds. The animal fell to the ground, and with the addition of the blankets belonging to the other coolies it was effectually smothered and brought into Camp. It was a perfect specimen of a Red Lynx (*Felis caracal*), so accurately described by Jerdon in his Treatise, but it is a curious fact that not one of the natives inhabiting this part of the country had ever seen such a creature before. I do not recollect having heard of a previous instance of a Lynx attacking a man. It was miserably thin, and evidently pressed for food, and perhaps had, in its eagerness to catch some prey, mistaken the coolie for a buffalo, calf, or some animal. I have the skeleton, and am sending it down to the Society's Museum.

H. E. DRAKE-BROCKMAN, F.R.C.S., F.Z.S.,
Surgeon-Captain, I.M.S.

Mirzapore, N.-W. P., December, 1892.

No. VII.—ON THE OCCURRENCE OF THE SPOTTED GREY TREE-CREEPER AT AHMEDNAGAR, DECCAN.

When out nesting this morning, in the vicinity of the European Cemetery, in company with Messrs. Eccles and Tooth, we obtained a specimen of the Spotted Grey Tree-Creeper (*Salpornis spilonota*, Frank). The bird, when first seen, was creeping round the trunk of a rather large Acasia tree. I at first sight mistook the bird for a Wryneck, and was nearly passing it over. On account of its active movements, little or no chance was given for close observation, but having caught a momentary glimpse of its long curved bill, I had it shot. It was very tenacious of life, as, although the crown of its head was shot off, it continued clinging to the

bark of the tree, for at least five minutes, when it gave a convulsive flutter and fell to the ground, being quite dead when picked up. Although we spent some time observing it, it uttered no notes.

The bird was very lively in its movements, first alighting at the base of a tree, which it crept round rapidly, until it reached the upper branches (merely stopping occasionally to investigate a likely looking crevice), when it would fly to an adjacent tree, and recommence its perambulations.

The bird was an adult male, as ascertained on dissection, and as its testes were in a normal condition, it could not have been near the breeding season. I shall nevertheless keep a good look-out for other specimens, which, if found, I shall not molest, but carefully observe, with a view to learn more of this little-known but interesting species. Although unlikely, yet it is still possible that it may be found breeding here.

The occurrence of this bird at Khandesh was communicated to me by Mr. Davison, as recorded in the appendix to my "*Birds of Bombay*," and this extended the Southern limit of the species from Mount Abu to Khandesh, Colonel Butler having found a specimen at the former place, which for a long time remained the only recorded instance of its occurrence in the Western Presidency. My discovery carries the limits about one hundred miles further South.

Not much appears to be known about these birds, but Mr. Cleveland found two nests, containing young, in the Gurgaon District, of which an interesting account is given in "*Hume's Nests and Eggs of Indian Birds*," *2nd Edition*, edited by Mr. Oates.

H. E. BARNES, F.Z.S.

Ahmednagar, 1st February, 1893.

P.S.—With the exception of the length, Jerdon has omitted the dimensions in his description of this bird, I therefore append them, as they may prove useful:—

Length, 6"; expanse, 10·5"; wing, 3·7"; tail, 2·2"; tarsus, 0·6"; bill at gape, 1·15"; bill at front, 0·9".

The colours of the soft parts are: bill, blackish, beneath whitish at base; legs and feet plumbeous-black; iris, dark brownish.

H. E. B.

No. VIII.—MOONLIGHT SHADOWS.

The effect of mixed lights related below seems to deserve record.

The shadows of Passion flower leaves, trained over a white wall, were observed of a cinnamon colour, under a rising full moon. It required actual touch to convince eye-witnesses that they were not dead leaves hanging against the wall.

On the removal of a *single* candle, which had been throwing light upon the light shadows, though not strong enough to cast a noticeable shadow itself, the moon shadows resumed their natural black. This happened at Tanna a little over 19° North Latitude.

W. F. SINCLAIR, I. C. S.

No. IX.—MEASUREMENTS OF BLACK-BUCK HORNS.

On page 392 of the *Journal* of the Society, No. 3, Vol. VII., it is entered that Mr. Blanford mentions a pair of Black-buck horns 28¼ inches long, &c.

I shot that buck at a place called Jaisingpura, about seven miles south of Jeypore, in Rajputana.

At the request of Mr. A. O. Hume, I sent the horns for him to see, when he happened to be staying at the Jeypore Residency, and he verified the measurements in the presence of some other visitors, one of whom I rather think was Mr. Blanford.

The horns were 28¾ inches long, but in a subsequent correspondence about them, Mr. Hume asserted most positively that they were 29¾ inches, and that they are so recorded in his notes.

I think Mr. Hume must have made an illegible 8, which he afterwards read as 9; his writing never was very clear; but Mr. Blanford probably also took a note of their length, and he has it correctly.

Horns of 24 inches are common in Rajputana and about Sirsa in the Punjab, and horns of 26 inches are not infrequently met with, but anything over 26 inches is rare.

A pair of 27⅜ inches are in the Sappers' Mess at Roorkee, shot by General Blood of Agra at Jeypore.

B. W. BLOOD.

Ajmere, 7th February, 1893.

No. X.—A BOLD PANTHER.

I send you the following account of a night in a *machan*, as I think the extreme boldness displayed by the panther concerned was somewhat remarkable :—

On the morning of the 4th instant having received *khubber* that a panther had killed a 3-year-old cow within a mile of my bungalow, I had a *machan* got ready and went out at dusk to sit over the kill. It was about 6-30 when I got comfortably settled, and as the moon was not to rise till 10 or ½ past, I had 3 hours of darkness to get through, but as the kill was only 70 or 80 yards from a row of native houses, I hoped that the panther would wait until all was quiet. As the kill was a larger one than the panthers about here usually prey upon, I did not think there was any likelihood of its being dragged away, and consequently did not tie it up. I had not been in the *machan* more than ¾ of an hour, when the panther came; it was too dark to distinguish him, but I could tell by the noise he made that he was dragging the kill away. There was heavy jungle quite close, and thinking that my only chance was to fluke a shot, I aimed at something black which I could distinguish about the right place, and fired. There was no answer to the shot, and all was quiet, and I knew that I had missed him altogether. Meanwhile the occupants of the neighbouring houses came running out with torches, so I got down to see what

had happened to the kill. I found it had been dragged 3 or 4 yards, and that I must have aimed at the black patch of ground on which the kill had originally fallen. As the panther had evidently not been touched, I thought he might possibly return before morning, and determined to finish the night in the *machan*. I had the carcass of the cow dragged back to its original place, which was in better view of the *machan*, and tied by the horns and quarters to adjacent saplings. The villagers were very noisy and talkative, but eventually I got rid of them and went back to my *machan*. While settling myself into a good position, I saw that the stump of a bamboo torch which the villagers had left on the ground close to the kill had been fanned by the wind and was glowing brightly. However, I thought it would soon burn itself out, and did not trouble to move it. I had not been in the *machan* more than 10 minutes, and the villagers were still talking loudly within earshot, when I heard the same sounds, as of the kill being dragged. I could hardly believe that the panther had returned so soon after being shot at, but so it was. This time he found it more than he could manage, and proceeded to begin his meal where he was, in spite of the still glowing embers within a couple of feet of him. At this time it must have been about 7-30, and I could distinguish nothing in the darkness, so I held my hand in the hopes that his meal would last until the moon rose. This was not to be however; the crushing of bones went on for about ¾ of an hour, then suddenly the sound ceased, and I thought I heard him moving off. I still hoped he would return towards morning, as I knew he could not nearly have finished the carcass, and this time I was not disappointed: he returned about 2-30 A.M., when the moon was well up, and began sucking up the blood which had collected in the stomach of the kill. I could now see his outline clearly, and made a lucky shot—he went a few yards and then fell dead. The panthers that hang about the villages here are usually very suspicious and wide awake, but this one was a remarkable exception. He was a young male in very good condition, measuring 6′ 6″.

P. L. COX, Lieut.

Savantvadi.

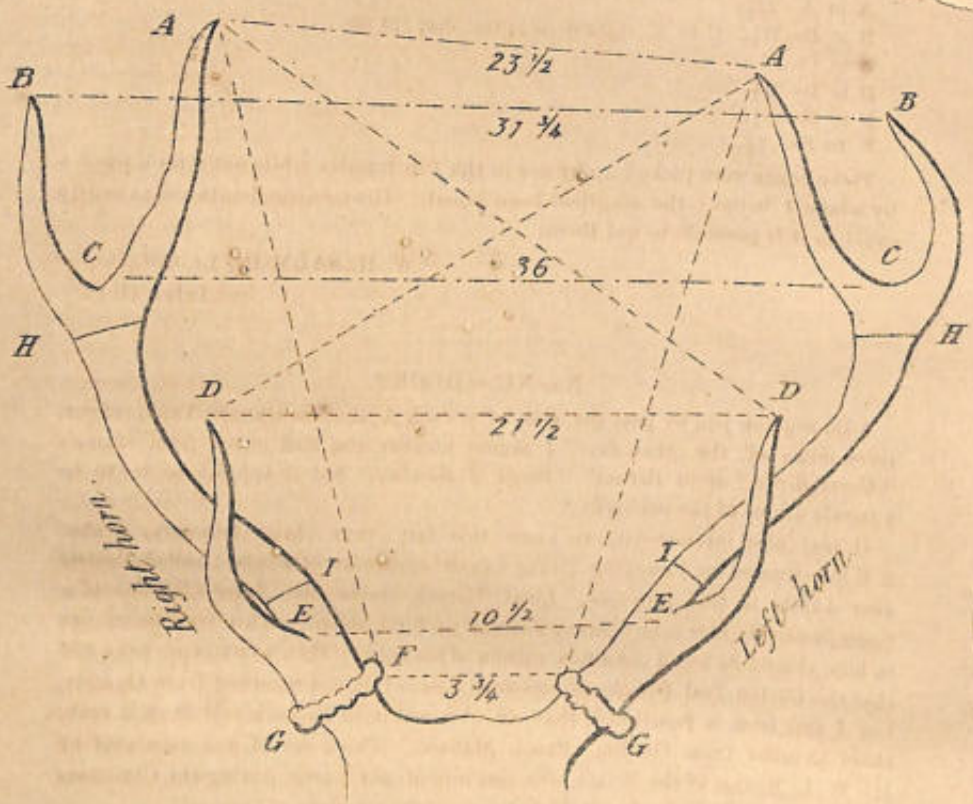
No. XI.—MEASUREMENT OF SAMBUR HORNS.

I beg to send you, as a matter of interest and for publication in the Society's *Journal*, the dimensions of a Sambur head found by my friend Colonel Salmon in the Pili jungles of the Satpura Hills in the Ellichpur District of Berar.

I may add that I assisted him in taking the measurements, and can therefore add my testimony to his that they are as exact as care could make them. The head is an exceptionally fine one.

KENNETH MACKENZIE, Col.

Amraoti.



		Right horn.	Inches.	Inches.	Left horn.	Difference. Inches.
	L.	Outside M. ...	46½	44	Outside M.	R+2½
		Inside M. ...	44	42	Inside M.	R+2
	S.	Outside M. ...	42½	42½	Outside M.	*Nil.*
		Inside M. ...	40⅝	40⅝	Inside M.	R+ ⅛
(A to C)	L.	Inside M. ...	17½	16	Inside M.	R+1½
(B to C)	S.	Do. ...	13½	14½	Do.	L+1
(D to E)	T.	Do. ...	14½	14½	Do.	*Nil.*
(F G)		Around base ...	10¼	10	Around base	R+ ¼
(I)		Six inches above.	6½	6¾	Six inches above... ...	L+ ¼
(H)		Below upper bifurcation.	8	8	Below upper bifurcation.	*Nil* ...
		A to F	37	34	A to F	Pand a[illegible]
		B to F	32¾	32	B to F	a+ ¾
		D to F	18	18½	D to F	L+ ½

Ins.
A to A—23½.
B to B—31¾. C to E, right horn 21 ins., left 19¾ ins.
C to C—36.
D to D—21½.
E to E—10½.
F to F— 3¾.

These horns were picked up by me in the Pili jungles while out after a tiger—by whom I believe the stag had been killed. The measurements are as nearly exact as it is possible to get them.

W. H. SALMON, Lt.-Col.,
3rd Infy., H. C.

No. XII.—DUCKS.

I am sending you by post the skin of a duck I shot at Dhonsa Tank, about, seven miles off, the other day. I cannot identify the bird either from Hume's "*Game Birds*," or in Barnes' "*Birds of Bombay*," but it appears to me to be a female of one of the pochards.*

It may also interest you to know that last year (14th February) I shot 3 White-fronted or Laughing Geese (*Anser albifrons*) at a place called Deviria near Anjan, in this province. Lieut. Barnes states that *Anser albifrons* is a "comparatively rare cold-weather visitant to Sind alone." This may be of use to him, should he bring out a new edition of his book. He also states on page 398 that the Cotton Teal (*Nettopus coromandelianus*) is not recorded from Guzerat, but I find from a pencil note that we obtained it in December 1888 on a tank, about 15 miles from Godhra, Panch Mahals. Three out of five were shot by Mr. W. L. Souter of the Police, who was one of our party during the Christmas holidays. I believe the Panch Mahals are in the province of Guzerat.

C. D. LESTER, Lieut.

Bhuj, Cutch.

No. XIII.—THE GIANT BETEL-NUT TREE.

I am sending you two specimens of the fruit of the *Rám-adki* or Giant Betel-Nut tree with three of the common betel-nuts for comparison. The nut is of no value, and can be eaten only when quite unripe, and is used as a medicine. The tree is of the same height as the Betel-nut palm, but the stem is from twice to four times as thick. The leaves more closely resemble those of the Cocoa-nut palm, the stem being half as thick as the latter, but in outward appearance it is the Betel-nut palm. It is in fact a half-way link between the Betel-nut

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* The duck has since been identified by Mr. S. B. Doig as an immature specimen of the pin-tail duck (*Dafila acuta*).—*Ed.*

and Cocoa-nut palm trees. Only a rare specimen or two of the *Rám-adki* is to be found in the spice gardens of Kanara, as the young plants are not allowed to grow up. I have not met with it below ghâts. The garden cultivators, in whose garden in the Sirsi táluka I found it growing, told me that it was grown to prevent lightning from striking their garden, but they could assign no reason for their belief beyond the fact that their ancestors believed the same thing.

C. HUDSON.

N. Kanara District.

No. XIV.—WOLF-HUNTING.*

It is a well-known fact that a black buck can be caught by a horse without difficulty, if the latter is in condition; but I believe a wolf is not often ridden down, perhaps because the animal is not often found in a rideable country. An account of a wolf-hunt may, therefore, be of interest to some of your readers.

We had *khabar* of a pack of wolves living near the sea-shore, along the edge of which there was, for many miles, a mangrove swamp, from which the wolves are in the habit of making raids upon the neighbouring flocks of sheep. Young wolves are not infrequently killed in their earths by the shepherds in revenge for their depredations; but the favourite prey of these animals appears to be a donkey, if they can find one astray. The country is mostly flat and open, except in the neighbourhood of the sea, where it is intersected by nullahs and contains quicksands and marshy ground. We, therefore, skirted the sand-hills as close to the sea as possible in order to drive the wolves towards the better ground inland. The mirage which magnifies objects in these plains led to our following a pair of jackals for some distance, but discovering our mistake we returned to rest under some babuls near the shore, while we sent a number of coolies into the mangroves to disturb the wolves. After waiting an hour or so we saw some sowars, whom we had posted on the look-out, about half a mile to our right, riding inland; and coming up to them we found that a wolf had left the swamp, and was ahead of them. Riding on for some distance we picked up the wolf, heading well inland and going at a leisurely trot. We gave chase at once, and had a hard gallop for seven or eight miles. The wolf went straight away at first, but gradually bore to the left, and was finally killed, after describing three parts of a circle, within a mile or a mile-and-a-half of where he started. His action was remarkably easy, and he seemed to go almost stride for stride with a big waler; for three or four miles we did not gain a yard on him, and crossing some nullahs and broken ground he gained a further advantage. Luckily he took to the flat again, and presently began to come back. After another mile I could see by his hanging tongue and standing mane that he was getting beaten; and I was soon near enough to make him jink.

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* The above appeared in the *Times of India*, and is republished by permission of the writer. The feat of riding down a wolf single-handed was performed by another member of this Society, Mr. N. S. Symons, as reported in the *Asian* on 25th October, 1881.—*Ed.*

Here the other two riders were able to cut in and help to finish him off. He was too exhausted to make any resistance beyond biting at the spear, and was quite rigid within a minute of death. The pace throughout was very fast: it is needless to add that condition in the horses is an absolute essential for such a ride. Two of us were on Walers; the third man, on an Arab, was nevertheless up before the wolf was dead.

The next morning our camp was joined by the sporting Thakore of the district, with half a dozen of his followers; and going out again in the same country we found a couple of wolves almost at once close to the sea-shore. In trying to get on the inside of them, so as to drive them inland, we let them get too far away, and by the time we were riding in earnest they had a start of half a mile. This mistake cost us a great deal. A long stern chase followed; the wolves took a course parallel to the sea, and after a mile or so, separated, one crossing a salt-water creek and over some low cliffs down to the sea-beach, the other keeping on some way inland. Both were followed, but the long run-up had tired the horses, and after five or six miles more of it they were getting beaten. The wolf, which had run along the beach, now turned inland and crossed another creek, where the two riders who had followed him, but had never got on terms with him, pulled up in despair. Here, however, some of the rest of the party, who had followed the other wolf and lost him also, came up, and we determined to try to pick up one of them again and ride him in concert. Spreading out into a long line we worked inland, and a mile further on picked up one of the wolves. Then another long ride began, for the horses had not enough left in them to gallop him down, and he had to be gradually tired out, one man after another taking up the riding. He was beaten at last and speared, after a run of fourteen or fifteen miles altogether. The horses were very much done, the Walers more so than the Arabs; a 13-3 Arab pony with a light weight went from beginning to end and was the least distressed, while one of the Walers fell during the run from exhaustion. Our experience showed that a wolf may be ridden comparatively slowly and tired out, as is done with black buck; but I doubt whether a single horse could accomplish it in this way.

Rajkot. C. W. WADDINGTON.

No. XV.—NEW SUMATRAN BUTTERFLIES.

1. DANAIS (*Caduga*) TYTIOIDES.

Differs in both sexes from *D. tytia*, Gray, but more especially in the male, in both wings being narrower, the male has the outer margin of the forewing deeply excavated, the outer margin of the hindwing cut off, in both sexes the anterior half of the discoidal cell of the forewing is black, and in both sexes the hindwing on both sides is of a much duller-red colour.

2. EUPLŒA (*Narmada*) MARTINII.

Male, upperside, both wings deep velvety black. Forewing with a marginal

series of fourteen small pure white spots, and an interior apical series of four or five spots. Hindwing with a double submarginal series of white spots, sometimes coalesced. Underside, both wings paler than above, spots similar, but the forewing has in addition a costal, a discoidal cell, four discal, and the hindwing one discal spot. Female, upperside, both wings paler than in the male. Forewing with a complete series of eight submarginal spots, and with three costal spots in a bunch beyond the upper outer end of the cell. Underside, both wings with the same differences as above, but the hindwing with a spot in the cell and four spots outside the cell.

3. TERINOS TEOS.

Male and female, upperside, hindwing differs from *T. robertsia*, Butler, in the absence of the two large triangular white spots, one each in the second median and discoidal interspaces, and on the underside of the same wing in the highly zigzaged submarginal broad line being violet-coloured instead of white.

4. ATHYMA ASSA.

Male, upperside, forewing differs from *A. nivifera*, Butler, in the streak in the discoidal cell being narrower and much shorter, and the three subapical white spots half as wide. Underside, both wings with the ground-colour castaneous instead of hair-brown, all the bands glossed with purple instead of being dead white, forewing with the cell-streak quite undivided, hindwing with no series of dark brown spots between the discal and submarginal bands.

5. EUTHALIA (*Tanaecia ?*) ELONE.

Male, upperside, hindwing differs from *T. nicévillei*, Distant, in having a broad submarginal white band not reaching the outer margin and bearing on each edge a metallic greenish band, these being broadest and meeting towards the anal angle. Underside, hindwing with the white band as above, but not edged with greenish, the black markings on both wings much more prominent than in *T. nicévillei*.

6. EUTHALIA (*Nora*) ERANA.

Male, upperside, forewing differs from *E. salia*, Moore, in the discal band being broader, more deeply zigzaged, not posteriorly bearing a sprinkling of metallic green scales. Hindwing with the discal white band much broader, the marginal area on the anal half of the wing bluish-purple instead of green. Female, upperside, both wings have the discal band narrower and far less white.

7. CYRESTIS (*Chersonesia*) CYANEE.

Male and female, upperside, both wings differ from *C. risa*, Doubleday and Hewitson, in the entire absence of purple markings, the third black line from the margin lacking the series of pale yellow triangular markings placed internally against it found in *C. risa*, the fourth black line from the margin much broader, the fifth and sixth as well as the seventh and eighth lines filled in with fuscous, forming two broad blackish bands, instead of enclosing merely a portion of the tawny ground-colour.

8. ABISARA AITA.

Male, both sides, hindwing differs from *A. neophron*, Hewitson, and *A. savitri*, Felder, in having the outer third white.

9. YASODA PITANE.

Male, upperside, forewing differs from *Y. pita*, Horsfield, and *Y. tripunctata*, Hewitson, in the apical and outer black areas being much broader, and the hindwing having the posterior half black, that is to say the area from the black discal band shewn in the original figure of "*Myrina*" *pita* to the margin is entirely black, instead of having a large area of the yellow ground-colour posterior to the discal band.

10. DELIAS DATAMES.

Male, upperside, hindwing, the black marginal band differs from that of *D. momea*, Boisduval, in not bearing a series of white spots; underside, forewing bears seven marginal and one discal spot, the two uppermost of the marginal spots yellow, the rest white, while in *D. momea* there are five marginal and three discal spots, all white; the yellow discal area is also more extensive.

11. DELIAS DANALA.

Male, differs from *D. singapura*, Wallace, in the apex of the forewing being rounded, not produced (*D. singhapura* appears to have the outline of a *Prioneris*); on the underside of the forewing the black area appears to be more extensive, and bears five spots only; and on the hindwing the outer black margin bears five instead of six spots, the uppermost spot of *D. singhapura* between the subcostal nervules being wanting in *D. danala*.

12. DELIAS DERCETO.

Apparently nearest *D. crithoë*, Boisduval, from which it differs in having on the upperside of the forewing two white spots at the end of the discoidal cell instead of one, a submarginal series of seven spots instead of three, no discal white patches posterior to the discoidal cell; on the hindwing the white and yellow discal area approaches nearer the outer margin, and is consequently further removed from the base; and on the underside of the hindwing the discal crimson band is more than twice as broad, thereby greatly reducing the yellow area beyond, which area in this species is cinnamon rather than gamboge-yellow, the forewing with the same differences as on the upperside.

All the species above-mentioned will be more fully described and figured in a forthcoming part of this Journal.

LIONEL DE NICÉVILLE, C.M.Z.S., F.E.S.

PROCEEDINGS.

PROCEEDINGS OF THE MEETING HELD ON 29TH NOVEMBER, 1892.

A meeting of the members of this Society took place on Tuesday, the 29th November, Brigade-Surgeon-Lieutenant-Colonel G. A. Maconachie, presiding.

THE LATE MR. W. E. HART.

Mr. N. S. Symons proposed, and Brigade-Surgeon-Lieutenant-Colonel G. A. Maconachie seconded, the following Resolution :—"That this meeting records with deep regret, its sense of the great loss which the Society has sustained through the death of one of its most valued members, Mr. W. E. Hart, and that a letter of condolence, expressing the sympathy of the members, be sent to Mrs. Hart."

Dr. Maconachie spoke of the great interest in the Society taken by the late Mr. Hart, and of the numerous important papers which he had contributed to the *Journal*, in conjunction with Mrs. Hart, from the time of its foundation.

ELECTION OF MEMBERS.

The following new members were duly elected :—H. H. Maharaja Scindia (Gwalior), Vety. Lieutenant A. C. Newsom (Bombay), Mr. P. Henry K. Lee (Mysore), Mr. G. E. Howse (Bombay), Surgeon-Major J. S. Wilkins (Bijapur), Mr. R. C. Lees (Bombay), Mr. F. D. Topham (Bijapur), Dr. Moreshwar Gopal Deshmukh (Bombay), Captain Frank Oswald (Aurungabad), Dr. Sadashiv Waman Kane (Bombay), Captain J. S. Nicholson (Mhow), Mr. Cowasjee D. Mahaluxmiwalla (Bombay), Mr. A. F. Woodburn, C.S. (Hyderabad, Sind), Mr. J. Bowen (Bombay), Lieutenant F. L. Vincent (Jacobabad), Surgeon-Captain J. Vaughan (Fyzabad), Mr. R. B. Booth, C. E. (Rajkote), Lieutenant F. T. Oldham, R.A. (Ahmednuggar), and Captain Stanley Smith, R.A. (Bombay).

CONTRIBUTIONS DURING SEPTEMBER AND OCTOBER.

The Honorary Secretary then acknowledged the following contributions received since the last meeting :—

Contribution.	Description.	Contributor.
1 Snake (alive)	Zamenis diadema	Mr. B. W. Blood.
1 Black Buck's Head (Horns 25½ inches).	Antelope cervicapra	Col. D. Robertson.
2 Palm Civets (alive)	Paradoxurus niger	Mrs. Aston.
3 Snakes	Tropidonotus stolatus Tropidonotus plumbicolor. Dipsas trigonata	Mr. J. H. Dickinson.
1 Ground Thrush	Pitta brachyura	Mr. P. Clutterbuck.
2 Badgers' Skulls and Skins.	Mellivora indica	
2 Snakes	Tropidonotus piscator	Mr. C. E. Kane.
1 Porcupine Fish	Diodon hystrix	Mr. H. M. Chichgar.
A large number of Butterflies and Beetles.	From Mysore	Mr. Henry K. Lee.
1 Snake (alive)	Dipsas trigonata	Mr. J. Maclean.
1 Tawny Eagle	Aquila vindhiana	Maj.-Genl. Anderson.

Contribution.	Description.	Contributor.
1 Lizard (alive)	Hemidactylus sp.	Mr. E. A. Bulkley.
1 Woodpecker	Species unknown	Mr. W. F. Sinclair, C.S.
1 Robin		
1 Snake	Dipsas trigonata	Dr. Langley.
A collection of rare Butterflies.	From Darjeeling	Dr. E. Harold Brown.
1 Snake	Halys himalayanus	
1 Elephant's Tooth	From Travancore	Mr. W. Gaye.
2 Fœtal specimens of Bekri.	Tetraceros quadricornis	Dr. K. R. Kirtikar.
2 Snakes	Typhlops deutus Oligodon subgriseus	Mr. E. H. Aitken.
1 Red Shank	Totanus calidris	Mr. N. Burrows.
6 Snakes and several Rat, &c.	From Matheran	Mr. J. A. Betham.
A collection of Butterflies		
A collection of Stuffed Birds (mounted).	From Australia	Mrs. Shewen.
1 Skull of the Barbarusa	Barbarusa alfurus	Mr. H. M. Phipson.
4 Crimson-crowned Weaver Birds (alive).	Euplectes flammiceps	
1 Dhaman	Ptyas mucosus	Dr. Weir.
A collection of Sea Shells.	From Karachi	Capt. Townsend.
1 White-breasted Water Hen (alive).	Erythera phœnicura	Mr. Symons.
7 Eggs of the Snow Pheasant.	Tetraogallus himalayensis	Mr. J. H. Hurst.
1 Python	Python molurus	Lieut. Waller.
1 Kingfisher	Alcedo sp.	Mr. W. F. Sinclair, C.S.

MINOR CONTRIBUTIONS.

From Professor R. Oxenham, Mrs. Langley, Mr. J. Black, Major Orr, Mr. T. J. Scott, Mr. R. B. Smith, Dr. Baker, Mrs. Birdwood, Mr. W. F. Sinclair, C.S., Mr. S. P. Leggett, Miss Prentice, Dr. Langley, Mr. B. W. Blood, Mr. E. A. Corke, Mr. P. J. Gomes, and Lord Colin Campbell.

CONTRIBUTIONS TO THE LIBRARY.

"The Flora of British India," Part XVIII., from Government of India.

"The Victorian Naturalist," Vol. IX., Nos. 5 and 6, in exchange.

"The Indian Forester" for October and November, in exchange.

"Le Monde des Plantes" for October and November, from Mon. Leveillé.

"The Proceedings of the Zoological Society of London" for 1892, Parts II. and III., from Mr. W. F. Sinclair, C.S.

"The Zoological Record" for 1891, from Mr. W. F. Sinclair, C.S.

"Les Mémoires de la Société Zoologique de France," from 1891-92, in exchange.

"Proceedings of the Royal Society of Victoria," Vol. IV., Part I., in exchange.

"A Monograph of the Oriental Cicadidæ" (Distant), Part VII., from Trustees of the Indian Museum.

"Curiosities of Natural History" (Buckland), 4 Vols., from Miss Phipson.

"The Canadian Entomologist," No. 10, in exchange.

A large Photograph (framed) of a Python crushing a Monkey, from Mr. W. R. Woodrow.

A steel engraving of Charles Darwin, from Mr. H. M. Phipson.

"Proceedings of the Royal Society of Edinburgh," Vol. XVIII. in exchange.

"Transactions of the Royal Dublin Society," Vol. IV., in exchange.

LIFE MEMBERS.

Mr. H. M. Phipson gave notice that at the next meeting he would propose that the following be added to the rules of the Society:—"Any member may, on payment of Rs. 150, become a Life Member of the Society, and will thereafter be exempt from any further subscriptions."

Mr. Phipson considered that it was of the utmost importance, for the permanent welfare of the Society, that a Reserve Fund should be formed, and he hoped that those members who were likely to remain in India for some time, and also those who wished to continue to receive the *Journal* after they had left the country, would avail themselves of this rule.

THE BULBULS OF NORTH CACHAR.

The third part of Mr. E. C. Stuart Baker's series on the "Bulbuls of North Cachar" was also read, and the sketches by the author were much admired. The birds described in this part of the paper were the Himalayan Black Bulbul (*Hypsipetes psaroides*), and the Bengal Red-Whiskered Bulbul (*Otocompsa emeria*), an excellent illustration of which will appear in the next number of the *Journal*.

THE POISONOUS PLANTS OF BOMBAY.

Surgeon-Major K. R. Kirtikar read the third part of his paper on the above subject which is now appearing in the Society's *Journal*, illustrated by means of coloured plates, executed in London, from sketches drawn from life by Mr. Isaac Benjamin, of the School of Art, Bombay. The particular plant referred to in this part of the series was *Pythonium wallichianum*, and specimens of it were exhibited. The bulb is exceedingly acrid, but the flower-stalks are largely used as an article of food in the neighbourhood of Bombay. Unless they are boiled for a long time, they are apt to cause violent irritation in the mouth and throat, and consequently are generally eaten in conjunction with the fruit of the Kákad (*Garuga pinnata*), the acid quality of which counteracts the acrid properties of the flower-stalks.

A vote of thanks to Dr. Kirtikar for his interesting paper was passed, and the meeting ended.

PROCEEDINGS OF THE MEETING HELD ON 21ST DECEMBER, 1892.

The usual monthly meeting of this Society took place on Wednesday, the 21st December, Mr. J. Wallace, C.E., presiding.

NEW MEMBERS.

The following gentlemen were elected members of the Society:—Mr. J. J. Whiting, C.E. (Bombay), Lieut. H. P. E. Parker (Hyderabad, Sind), Mr. L. [illegible]

mp, C.S. (Rutnagherry), Colonel J. C. Doveton (Nagpur), Lieut. D. O. Morris ngabad), and Captain H. M. Prior (Bombay).

LIFE MEMBERSHIP.

llowing Resolution was passed unanimously :—"Any member may, on pay- of Rs. 150, become a life member of the Society, and will thereafter be exempt om any further subscriptions."

UP A HILL.

Mr. W. F. Sinclair, C.S., the Collector of Tanna, read a very interesting account of an excursion he had recently made to the hill known as Raygad in South Kolaba. Mr. Sinclair referred to the principal plants, birds, fish, &c., which he had noticed on the sides and top of the hill, and made his remarks all the more interesting to those present by means of specimens taken from the Society's collection. His paper will appear in full in the Society's *Journal* (see page 452).

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1892 to 31st December 1892.

RECEIPTS.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.
Balance in Bank on 1st January 1892	1,454	11	3	Rent of the Rooms from 1st December 1891 to 30th November 1892, at Rs. 100 per month	1,200	0	0
Subscriptions for 1891 (in arrears)	290	0	0	Salaries from 1st December 1891 to 30th November 1892	1,252	9	2
Do. do. 1892	7,921	12	0	Furniture Account	178	2	1
Do. do. 1893 (in advance)	450	0	0	Cost of Printing Journals and Coloured Plates from England	5,676	1	8
Do. do. Life Membership	300	0	0	Printing and Stationery	549	0	3
Do. from Members out of India	344	5	0	Society's Prize at the Arts Society's Exhibition	100	0	0
Entrance Fees	1,140	0	0	Library Account	195	5	0
Sale ⅞ J. Wallace	132	0	0	General Expenses	1,815	3	10
Sale of Back Journals and Miscellaneous Receipts	1,034	5	6	Balance in Bank on 31st December 1892	2,059	11	9
				Cash with the Honorary Secretary	41	0	0
Total...Rs.	13,067	1	9	Total...Rs.	13,067	1	9

Audited and found correct.

N. C. MACLEOD,
Honorary Auditor.

ANDREW MURRAY,
Honorary Treasurer.

Bombay, 31st December 1892.