THE MAMMALS OF GREAT BRITAIN AND IRELAND

BY J. G. MILLAIS

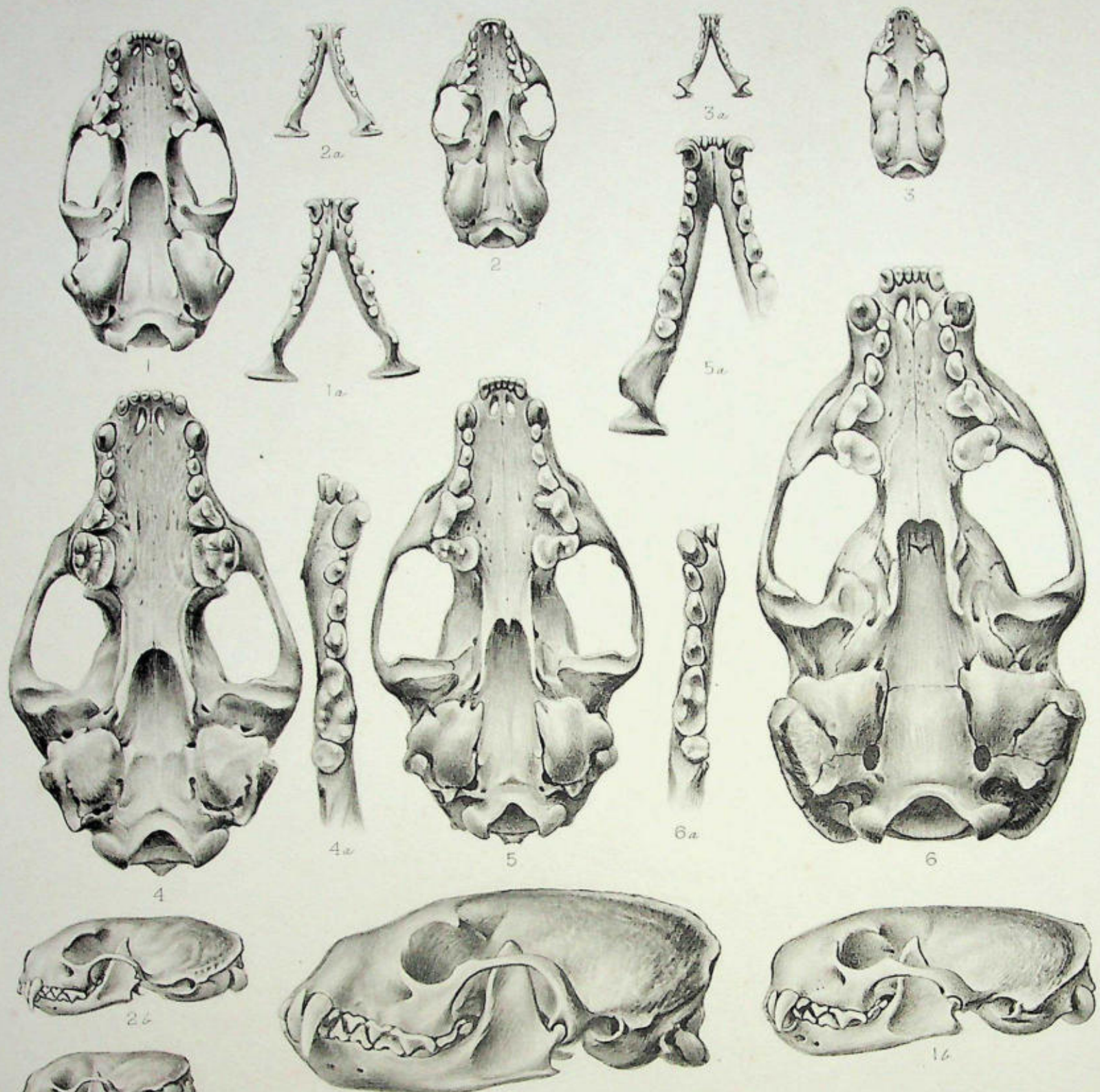
Only One Thousand and Twenty-five copies of this Volume have been printed.

This copy is Number 538

THE MAMMALS

OF

GREAT BRITAIN AND IRELAND



Skulls & teeth of British Mustelidæ. life size.

Fig 1 a b. Polecat
" 2 a b. Stoat
Fig 3 a b. Weasel
" 4 a b. Badger (4 and 4b ½ life size)
Fig 5 a b. Pine Marten
" 6 a b. Otter

The Mammals

of

Great Britain and Ireland

BY

J. G. MILLAIS, F.Z.S.

Author of 'The Wildfowler in Scotland' 'The Natural History of the British Surface-feeding Ducks' &c.

WITH 21 PHOTOGRAVURES BY THE AUTHOR, H. GRÖNVOLD, G. E LODGE, AND FROM PHOTOGRAPHS
19 COLOURED PLATES BY ARCHIBALD THORBURN AND G. E. LODGE
AND 33 UNCOLOURED PLATES BY THE AUTHOR AND FROM PHOTOGRAPHS

IN THREE VOLUMES—VOL. II.

BOOK NO. 563

LONGMANS, GREEN, AND CO.
39 PATERNOSTER ROW, LONDON
NEW YORK AND BOMBAY
1905

All rights reserved

Acc. No. - 427
24/11/05

Acc no 427
24.11.06

599.094109415
MIL
V.2

Mammals - Great Britain - Ireland

599.0941094 15
MIL
V. 2

CONTENTS

OF

THE SECOND VOLUME

	PAGE
ORDER CARNIVORA (*continued*)	1
FAMILY MUSTELIDÆ	1
SUB-FAMILY LUTRINÆ	1
GENUS LUTRA	1
THE OTTER	2
SUB-FAMILY MELINÆ	37
GENUS MELES	37
THE BADGER	37
SUB-FAMILY MUSTELINÆ	71
GENUS MUSTELA	71
THE PINE MARTEN	71
GENUS PUTORIUS	94
THE POLECAT	94
THE STOAT	106
SUB-SPECIES—THE IRISH STOAT	124
THE WEASEL	127
ORDER RODENTIA	140
SUB-ORDER SIMPLICIDENTATA	141
FAMILY SCIURIDÆ	142
GENUS SCIURUS	142
THE COMMON SQUIRREL	143
FAMILY CASTORIDÆ	159
GENUS CASTOR	159
THE BEAVER (EXTINCT)	160
SECTION MYOMORPHA	164
FAMILY MYOXIDÆ	164
GENUS MUSCARDINUS	164
THE DORMOUSE	164
FAMILY MURIDÆ	172

	PAGE
SUB-FAMILY MURINÆ	17
GENUS MUS	17
THE HARVEST MOUSE	17
SUB-SPECIES OF MUS SYLVATICUS: THE BRITISH WOOD MOUSE	18
SUB-SPECIES OF MUS SYLVATICUS: THE IRISH WOOD MOUSE	18
SUB-SPECIES OF MUS SYLVATICUS: THE HEBRIDEAN WOOD MOUSE	18
SUB-SPECIES OF MUS SYLVATICUS: THE ST. KILDA WOOD MOUSE	18
SUB-SPECIES OF MUS SYLVATICUS: THE BRITISH YELLOW-NECKED WOOD MOUSE	18
THE COMMON MOUSE	19
SUB-SPECIES—THE ST. KILDA HOUSE MOUSE	19
SUB-SPECIES OF MUS RATTUS: THE ALEXANDRINE RAT	20
SUB-SPECIES OF MUS RATTUS: THE NORTHERN ALEXANDRINE RAT	20
SUB-SPECIES OF MUS RATTUS: THE BLACK ALEXANDRINE RAT	20
THE BROWN RAT	21
SUB-FAMILY MICROTINÆ	23
GENUS EVOTOMYS	23
SUB-SPECIES OF EVOTOMYS HERCVNICUS: THE BANK VOLE	23
SUB-SPECIES OF EVOTOMYS HERCVNICUS: THE SKOMER VOLE	25
GENUS MICROTUS	25
SUB-GENUS MICROTUS	25
THE COMMON FIELD VOLE	25
THE ORKNEY VOLE	27
SUB-SPECIES—THE SANDAY VOLE	28
SUB-GENUS ARVICOLA	28
THE WATER VOLE	28

LIST OF ILLUSTRATIONS

TO VOLUME II

PHOTOGRAVURES

From Drawings by the AUTHOR, H. GRÖNVOLD, G. E. LODGE, *and Photographs by* D. ENGLISH

SKULLS AND TEETH OF BRITISH MUSTELIDÆ . . . . . *Frontispiece*

CARNIVORA

AN OTTER AT PLAY . . . . . *to face p.* 16
SPRING CLEANING . . . . . ,, 46
THE MISFORTUNE OF ONE IS THE OPPORTUNITY OF ANOTHER. *By* J. WOLF . . . . . ,, 66
WATCHING THE WOODS BELOW . . . . . ,, 90
A POLECAT . . . . . ,, 102
STOATS . . . . . ,, 110
STOAT PLAYING WITH ITS INTENDED VICTIMS . . . . . ,, 116
A WEASEL FASCINATING SMALL BIRDS . . . . . ,, 132
A WEASEL . . . . . ,, 138

RODENTIA

SKULLS AND TEETH OF SQUIRREL, DORMOUSE, BLACK AND BROWN RATS . . . . . ,, 140
DORMICE . . . . . ,, 168
SKULLS AND TEETH OF BRITISH MICE . . . . . ,, 172
HARVEST MICE . . . . . ,, 178
SUB-SPECIES AND VARIETIES OF BRITISH WOOD MICE . . . . . ,, 186
WOOD MICE . . . . . ,, 192
SKULLS AND TEETH OF BRITISH VOLES . . . . . ,, 234
BANK VOLES . . . . . ,, 242
COMMON FIELD VOLES . . . . . ,, 272
THE SANDAY VOLE AND BLACK VARIETIES OF THE ORKNEY VOLE . . . . . ,, 280
A WATER VOLE COLONY . . . . . ,, 294

COLOURED PLATES

By ARCHIBALD THORBURN *and* G. E. LODGE.

CARNIVORA

THE OTTER. *By* A. THORBURN . . . . . *to face p.* 2
THE BADGER. *By* A. THORBURN . . . . . ,, 38
THE PINE MARTEN. *By* A. THORBURN . . . . . ,, 72
THE POLECAT. *By* A. THORBURN . . . . . ,, 94
THE STOAT (SUMMER PELAGE). *By* A. THORBURN . . . . . ,, 106
THE STOAT (AUTUMN AND WINTER PELAGE, AND IRISH STOAT). *By* G. E. LODGE . . . ,, 124
THE WEASEL. *By* A. THORBURN. . . . . ,, 128

RODENTIA

THE COMMON SQUIRREL. *By* A. THORBURN . . . . . ,, 144
THE DORMOUSE. *By* A. THORBURN . . . . . ,, 164
THE HARVEST MOUSE. *By* A. THORBURN . . . . . ,, 174
THE BRITISH YELLOW-NECKED MOUSE AND THE BRITISH WOOD MOUSE. *By* A. THORBURN . ,, 184
THE COMMON MOUSE. *By* A. THORBURN. . . . . ,, 198
THE NORTHERN ALEXANDRINE RAT AND THE ALEXANDRINE RAT. *By* A. THORBURN . . ,, 204
THE BLACK ALEXANDRINE RAT. *By* A. THORBURN . . . . . ,, 206
THE BROWN RAT. *By* A. THORBURN . . . . . ,, 218
THE BANK VOLE. *By* A. THORBURN . . . . . ,, 238
THE COMMON FIELD VOLE. *By* A. THORBURN . . . . . ,, 256
THE ORKNEY VOLE. *By* A. THORBURN . . . . . ,, 278
THE WATER VOLE. *By* A. THORBURN. . . . . ,, 288

UNCOLOURED PLATES

By the AUTHOR *and from Photographs*

CARNIVORA

OTTER AND HERONS. *By* J. WOLF . . . . . *to face p.* 6
STUDIES OF OTTERS . . . . . ,, 10
THE OTTER 'MARKED' AND 'THE KILL' . . . . . ,, 24
STUDIES OF BADGERS (FROM LIFE) . . . . . ,, 42
BADGERS ATTACKING A WASPS' NEST . . . . . ,, 52
A PINE MARTEN AT REST. . . . . ,, 74
PINE MARTENS IN MOVEMENT . . . . . ,, 78
A PINE MARTEN . . . . . ,, 82
PINE MARTENS . . . . . ,, 88
POLECATS . . . . . ,, 98
A POLECAT . . . . . ,, 100

STOATS CAPTURED AT ERISWELL, SUFFOLK, IN THE AUTUMN AND WINTER OF 1903 . . *to face p.* 110
STOATS IN MOVEMENT . . . . . „ 112
STOAT TRANSPORTING AN EGG, AND A RUSE TO CATCH YOUNG THRUSHES . . . „ 114
WEASELS . . . . . „ 130
A MOST UNPOPULAR PERSON . . . . . „ 134

RODENTIA

SQUIRREL DESCENDING A BRANCH, AND A YOUNG SQUIRREL . . . . . „ 150
SQUIRRELS . . . . . „ 156
HARVEST MICE . . . . . „ 180
HOUSE MICE . . . . . „ 200
HOUSE MICE IN MOVEMENT . . . . . „ 202
THE NORTHERN ALEXANDRINE RAT AND THE ALEXANDRINE RAT . . . . . „ 210
HYBRIDS BETWEEN THE NORTHERN ALEXANDRINE RAT AND THE BLACK ALEXANDRINE RAT. THE NORTHERN ALEXANDRINE RAT . . . . . „ 21
THE BLACK ALEXANDRINE RAT . . . . . „ 21
MELANIC BROWN RATS . . . . . „ 22
BROWN RATS . . . . . „ 22
BANK VOLES . . . . . „ 24
THE SKOMER VOLE . . . . . „ 25
FIELD VOLES . . . . . „ 26
ORKNEY VOLES . . . . . „ 28
ORKNEY VOLES IN MOVEMENT . . . . . „ 28
STUDIES OF ORKNEY VOLES . . . . . „ 28
WATER VOLES . . . . . „ 29

Acc. No. 427
4. 11. 06

THE MAMMALS
OF
GREAT BRITAIN AND IRELAND

Order CARNIVORA (*continued*)

Family *MUSTELIDÆ*

OTTERS, BADGERS, AND WEASELS

THE large family *Mustelidæ* includes not only the Otters, but the Badgers, Weasels, and their allies. Except in Australia and Madagascar, members of the family are found throughout the globe. Most of the group are characterised by short limbs and slender, elongated bodies. They have but a single pair of molars in the upper jaw, and usually two pairs in the lower; the inner portion of the upper molar is wider than the outer portion. In fossil forms two molars are generally present in the upper jaw. The family is now generally divided into three sub-families: the *Lutrinæ* or Otters, the *Melinæ* or Badgers, and the *Mustelinæ* or True Weasels.

Sub-family *LUTRINÆ*

The Otters, with the exception of the Sea-otter (*Latax*), which has flipper-like hind feet analogous but not homologous to those of the seals, have short and rounded feet, webbed and furnished with blunt claws; the limbs are short and stout, and the tail usually long. The grinding teeth are one pair of molars in the upper jaw, very square teeth, and two in the lower; generally four pairs of premolars in the upper jaw and three pairs in the lower. Otters are found throughout the world, except in Australia, Madagascar, the Arctic and Antarctic regions.

Genus *Lutra*

Only one species, *Lutra lutra*, occurs in the British Islands. The generic characters are those given above for the majority of the sub-family, for I have not thought it necessary to go deeply into the dental and other differences of certain species.

THE COMMON OTTER

Lutra lutra, Linnæus.

Mustela lutra, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 66 (1766).
Lutra vulgaris, Erxleben, 'Syst. Reg. Animal.' p. 448 (1777); Bell, 'Brit. Quad.' 2nd ed. p. 167 (1874); Blanford, 'Mam. Brit. India,' p. 182 (1888); Lydekker, 'Brit. Mam.' p. 135 (1895); Johnston, 'Brit. Mam.' p. 137 (1903).
Lutra nair, F. Cuvier, 'Dict. Sci. Nat.' vol. xxvii. p. 247 (1823).
Lutra roensis, Ogilby, 'Proc. Zool. Soc.' iii. (1834).
Lutra indica, Gray, 'Mag. Nat. Hist.' vol. i. p. 580 (1837).
Lutra lutra, Thomas, 'Zool.' 4th ser. ii. p. 100 (1898).

Local Names.—*Otter*,[1] *Common Otter* (English); *Balgaire*, *Cudoun* (Burn-dog), *Matadh* (Hound) (Scotch Gaelic); *Tek*,[2] *Dafi*, *Dratsi*[3] (Shetland); *Madri-ga* (Water-dog), *Maclaidh uisce*, *Dobharchu* (Irish Gaelic); *Dwr-gi* (Water-dog) or *Dyfrgi* (Welsh).

Character.—Body long yet strongly formed. The general colour of the upper surface varies from rich umber brown to almost black; of the under surface—chin, throat, belly, and inner surface of limbs—from grey to yellowish grey. The long outer hair is rich shining brown or nearly black at the tips and greyer at the base; the under fur is soft and dense, yellowish grey at the base and brown-grey towards the tips.

The legs are short and strong, and the feet webbed and furnished with claws on all the toes. The tail is broad at the base, narrowing towards the end, whilst on the upper part it is flattened horizontally; vibrissæ thick, strong, and yellowish grey in colour; ears short and rounded.[4] An average adult male will measure 25 to 30 inches in the head and body, and 16 to 20 inches in the tail.

The whole general structure of the Otter shows a mustelid form specially adapted to an aquatic life. The skull is short, oval, broad, and flattened, with

[1] Our English name is from the Anglo-Saxon *oter* or *otor* which is derived from the same primitive root as *uddr* (Icelandic for water) and the Greek ὕδωρ (water).

[2] Same as old Scotch *tyke* and old Norse *tik* = a bitch.

[3] The Otter is called 'Dratsi' from its manner of dragging the tail. Old Norse *dratta*, which means to walk slowly or heavily. In Icelandic *dratthali* is a nickname for the blue fox.

[4] The ear is of very peculiar formation, and the aperture is closed automatically as the animal dives.



THE OTTER.

LUTRA VULGARIS.

the occipital region strongly developed, and the whole character is very similar to that of the seals, and, as in these animals, the intestine is long. As in the badger, the jaws in adults interlock, and the molar teeth have sharp tubercles well adapted to retain their slippery prey. The gullet is small. Bell[1] gives the dental formula as follows: 'I. $\frac{6}{6}$; C. $\frac{2}{2}$; P.M. $\frac{6}{6}$; M. $\frac{4}{4}$'; but it is now generally acknowledged that there are four pairs of premolars in the upper jaw, the first being very small and sometimes absent in adults, and three pairs in the lower jaw; there is one pair of true molars in the upper jaw, very large and powerful, and two pairs in the lower jaw. The fourth premolar is a large tooth with a three-cusped edge. This alters the dental formula to P.M. $\frac{5}{6}$; M. $\frac{2}{4}$.

Under the root of the tail there is the usual small gland secreting a fœtid liquid. The male possesses a penial bone and the female three pairs of teats,[2] though only two pairs may be in milk at one time.

Otters vary considerably in size—a circumstance not necessarily dependent on either age or sex, although males are usually longer than females. The Hon. R. Hill has given the average weight of the Otter as: dogs, 20 lb. to 25 lb.; bitches, 15 lb. to 18 lb., and these weights are very general amongst adult Otters throughout Britain. A 40-lb. Otter is recorded by Pennant as having been killed in the river Lea, but this weight has been doubted.

Captain E. F. Oakley, writing in the 'Field,'[3] says: 'The accepted record weight for an Otter is, I believe, 38 lb., but I have one in my possession, stuffed by Messrs. Rowland Ward, which weighed 42 lb. (wet in a sack), say 40 lb. Messrs. Rowland Ward were unable to accept this as an authenticated record owing to the lack of witnesses, but said the measurements were larger than those of the Otter which weighed 38 lb. As a matter of fact I am satisfied myself that the weight was genuine, since my keeper, a most reliable man, weighed it twice carefully. He trapped it on the Spencer's Oak fishing on the Blackwater in the spring of 1898, underneath the big rock on the left bank.'

An Otter said to weigh 53 lb. and a few ounces, and recorded in the 'Zoologist,'[4] is of such extraordinary dimensions that it cannot be accepted on the

[1] *Brit. Quad.* 2nd ed. p. 181.

[2] Mr. Thos. Southwell says (*Field*, Dec. 19, 1903): 'As to the number of mammæ: I examined one killed on Nov. 24, 1876, which had three teats on each side (six in all), and all distended with milk. On Oct. 26, 1880, a bitch had four teats in milk. On Jan. 4, 1883, one from Weybridge had four teats in milk, and on Jan. 13, 1887, yet another had four teats in milk. The teats are very inconspicuous if not in use, and if the brood does not consist of more than two young ones it is probable that only two will be in milk; but should there be only a single pair and the statement be correct that the brood occasionally consists of five, some of the young ones would come badly off.'

[3] June 27, 1903.

[4] 1873, p. 3487.

evidence of one witness, who did not himself weigh the Otter. Another marvellous Otter killed in Carmarthenshire, and said to weigh 50 lb. and measure 66 inches, is mentioned in 'Land and Water.'[1] An Otter 60 inches in length is recorded[2] as having been captured at Castle Upton, Templepatrick, on the banks of the Six-milewater.

A 30-lb. Otter is not common, yet there are reliable records too numerous to mention of Otters scaling from 30 to 33 lb. Weights above this are, however, extremely rare. In Scotland an Otter exceeding 25 lb. is very rare.[3]

The particulars supplied by Mr. Thomas Southwell as to the length and weight of Otters are to be relied on.[4]

Weight	Length in inches	Sex	Weight	Length in inches	Sex
37	48	Male	23	48	Male
30	53½	Male	18½	49	Male
28	50½	Male	16	43	Female
27	53	Male	16	43	Female
27	50	Male	14	44	Female
23	50	Male			

The largest male met with by Mr. Southwell measured 53½ inches, but weighed only 30 lb.

'Far the heaviest Otter,' says Mr. Southwell, 'which has come under my notice, was killed at Bowthorpe, near Norwich, on December 4, 1872, and was an old male in splendid condition.' The Kendal Otter Hounds killed a 33-lb Otter in August 1886. Another, said to have weighed 34 lb., is now in the possession of Mr. James Hogarth of Kendal; whilst yet another, said to have weighed 36 lb., was killed by Mr. Robert Harrison in Skeggles Water in the same district.[5]

Distribution.—The Common Otter has a very wide distribution in both the Old and the New World, for Mr. Lydekker very properly recognises no difference in the smaller Indian form occurring in Northern India, whilst the American variety seems to me to possess no specific difference, although a considerably larger and finer-furred animal. It is found all over Europe and Northern India, China, Siberia, and in America as far south as Florida.[6]

[1] Vol. ii. p. 51.

[2] *Field*, May 31, 1902.

[3] Captain MacDonald considers that 22 lb. is a good weight, and the largest he has killed in Skye was 27 lb.

[4] *Field*, December 28, 1895.

[5] *Ibid.* December 21, 1895.

[6] American naturalists recognise four species or sub-species of the Otter inhabiting the New World. The Northern Otter, *Lutra canadensis*, ranges Northern America to Central New York; Carolina Otter, *Lutra canadensis lataxina*, ranges Lower, Middle, and South Atlantic States; Florida Otter, *Lutra canadensis vaga*, ranges Florida, Southern Georgia, and coast line to Louisiana; Newfoundland Otter, *Lutra degener*, Newfoundland. A Newfoundland Otter examined in the flesh

Blasius says that the Otter ranges from Lapland and Tobolsk in the north to Italy, Greece, Persia, and Mesopotamia in the south, and from Britain to Japan. In Switzerland it ascends the mountains to the pine regions, and in Norway to above the birch zone.

The Otter is one of our oldest inhabitants, its remains having been found in Norwich Crag, a stratum which belongs to the later Pliocene period. In the Norfolk Forest-bed, the brick-earths of the Thames Valley, and in certain caves, all of early Pleistocene age, numerous relics of the Otter have been discovered. Owing to its retiring habits this animal often lives in security in many streams and lakes where its presence is not suspected. It would be difficult to name any county in England, Scotland, and Ireland where it does not exist, though it is most plentiful in isolated districts which are intersected by rivers which form lakes and ponds. In England it exhibits a love both for rocky streams, such as exist in Devon, Somerset, Cornwall, and the Lake District, where salmon and trout are found, and for the slow-moving rivers of Sussex, Suffolk, Cambridge, and Huntingdon, where eels are abundant. It is equally numerous on the Norfolk Broads.[1] It still exists in small numbers on so thickly populated a river as the Thames, and has even been killed in London itself.[2] On the mainland of Scotland it is numerous from the Border to Caithness, and from Argyll to Forfarshire, in spite of incessant trapping, whilst in the adjacent islands of the West Coast it frequents the seashore and lives in the caves. This preference for the coast is most marked in Orkney and Shetland, where it is especially numerous and seldom molested. In Ireland, too, it is fond of the western sea coast and the western islands, but it is equally numerous on all the rivers and loughs.

Habits.—It is very seldom that the naturalist, however painstaking, has much chance of observing this interesting animal in its quieter moods. The nature of the beast is so shy and retiring that opportunities of seeing the more interesting side of its character are few and far between. The view that the Otter hunter gets, though certainly interesting, is one in which the animal exhibits its wit, swimming powers, and rapid movements, but not necessarily the broader

differed in no respect from a dark Irish specimen; whilst one that I killed in Canada in 1902 was also identical, with the exception of being more finely coated.

[1] In the sixteenth century Otters were so abundant on the river Yare that in 1557 the Norwich Assembly passed regulations to the effect that freshwater fishermen between the tower at Conisford and Hardley Cross should be bound to keep a dog to hunt the Otter, 'and to make a general hunt twice or thrice in the year or more, at time or times convenient, upon pain to forfeit ten shillings.' M. Knight in *Eastern Counties Collectanea.*

[2] *Zoologist*, 1865, p. 9429.

phases of its daily life. One learns little of the stag by chasing it with hounds, but a great deal by sitting on a stone with a telescope at any season. Disappointment, however, only awaits the man who sits on stones and waits for the Otter to appear. It never comes out and disports itself when expected, and only the evening fisherman, moving quietly up the river, sees the round head of our seal-like friend moving across the stream, or a chain of bubbles which marks its path beneath the surface. If he is very lucky he may see an Otter bring a fish ashore, or to some rock in mid stream, and there devour a hasty meal. Or perhaps a female Otter may bring her reluctant babes to the water and give them a swimming lesson, and delight him with their merry gambols. Such sights are, however, rare, and the most we learn of the Otter is by inference and the study of places and things that it has temporarily vacated.

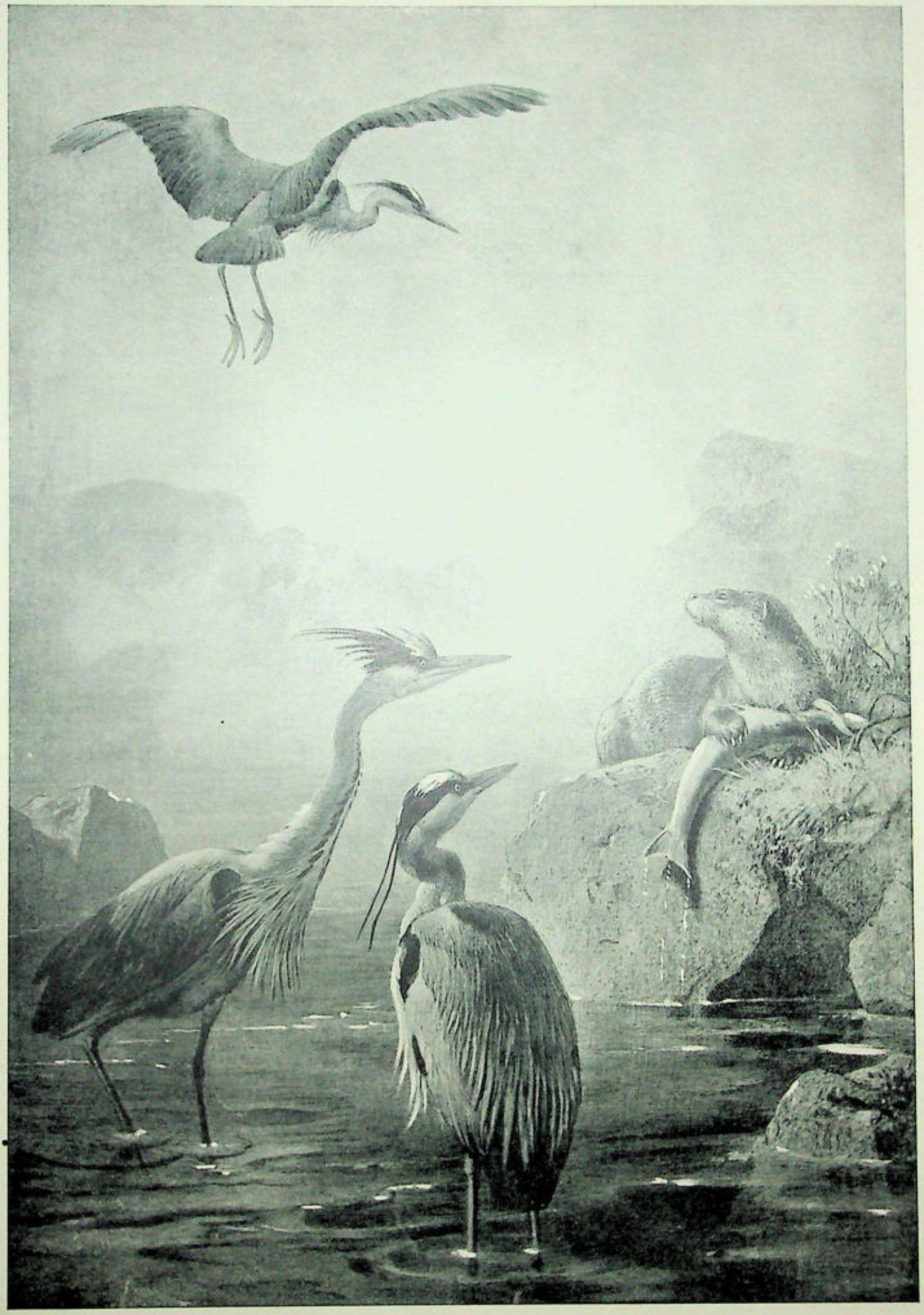
The 'holt' or 'hover' of the Otter is chosen by the animal with careful consideration as to its seclusion and the means afforded of immediate retreat to the water. Generally the exit is under water, so that the animal on being disturbed can slide away without notice. In Bedfordshire the hollow roots of old willows are a favourite resort; in Suffolk the old pollard ashes and alders. In such places the Otters often get right up inside the tree where it is dry[1] and warm. In parts of Sussex, by the slow-moving Arun, it loves dense reed-beds, and on hill-streams may often be found lying up in beds of gorse, bracken, or thicket near to the water's edge.

Where rivers are hunted by hounds the Otter seems to display considerable cunning in the selection of its principal holt. The retreat is then generally large, deep, and with many windings, whereas in unhunted streams it is usually shallow and only a foot or two underground.[2]

On the Norfolk Broads Otters construct large 'nests' of broken reeds, trodden and flattened down, paved with other pieces, bitten small, and lined with the soft and dry panicles, for it is well known that the Otter, however much it frequents

[1] An Otter will roll and dry itself on the turf before going into the 'holt.' It has the same dislike to lying down wet as a dog.

[2] 'Whoa-Whoop,' writing in the *Field*, Aug. 27, 1904, says: 'That there is also gallantry in this species, as in the human race, there can be little doubt. When hunting a river last year a pack struck a trail, and, after driving it for some three miles, hounds put it down in a holt, to which there was more than one entrance. After a little time, and when hounds were tearing at the bank, a cry came from some hundred yards below, and soon after a dog Otter was "gazed" as it tried to make up a ditch, but was eventually killed. Yet the main portion of the pack continued its efforts at the holt, showing full well that it still held another Otter, and there can be no doubt that it was the mate of the one which the pack had just accounted for, it having left its more solid sanctuary in order to draw hounds away so that its better half might escape. I quote this instance to show that they have more intelligence than the world at large will give them credit for possessing.'



OTTER AND HERONS.

By J. Wolf.

the water, likes to sleep and rest dry. These 'nests' have been well described by Mr. Thomas Southwell,[1] who has made a special study of this animal in his own county; they are not only used as retreats, but as breeding places, for young Otters have been found in them on several occasions. On the Devonshire hill-streams and in Scotland the Otter's holt is generally under some large boulder by the riverside, or in a cairn of stones close by; whilst in Orkney, Shetland, and the Outer Hebrides I have seen it placed in a large hole formed by the peat banks breaking down over some small stream. Such a situation, I consider, is almost as frequently resorted to as sea caves.

Otters occasionally travel far from the water; but this does not necessarily mean that they lie up at a distance; these journeys being more probably performed in search of food or change of locality.[2] I remember, as a boy, finding one dead in a wood near Condover, Shropshire, and about two miles from the nearest stream. One was recently killed at West Grinstead (1903) during a day's cover shoot, and quite two miles from the nearest water of any size. Otters have been shot twelve miles from the Severn, while another met its death in the Black Side Moors in Ayrshire, eight miles from the river Ayr. Otters, too, are said to have been traced on Dartmoor as much as ten or fifteen miles from any stream or sheet of water of any size.

Many Otters live by the sea all the year round, but for the most part in Orkney, Shetland, and the Hebrides they repair to the coast about the end of October. During neap tides there is generally a space of a few yards between the mouth of these retreats and the water, where they may be shot after being bolted by small terriers. Harvie-Brown and Buckley[3] say: 'The Otter occupies the far end of dim sea caves, lying on banks of dry sand or shingle, or penetrates into large loose cairns of stones. It hides also amongst the great cracks of the peat-hags of North Uist and the Hebrides.' In both these places I have several times seen the Otter.

Carew in his 'Survey of Cornwall,' written in 1602, alludes to the Otter's love of living by the sea, where 'some keepe to cliffes, and there breede, and feede on sea-fish.' Jonathan Couch, too, writing in 1838 in 'Cornish Fauna,' remarks: 'By far the greatest portion of these creatures in Cornwall derive their food from the sea, where they may be seen diving for fish even when the waves

[1] *Trans. Norfolk and Norwich Nat. Hist. Soc.* 1872–1873.

[2] Otters have often been traced in snow for long distances, which shows the habit of their nocturnal wanderings. In Scotland they cross high mountain ranges without hesitation.

[3] *Vertebrate Fauna of Argyll and the Inner Hebrides*, p. 18.

are very tempestuous.' Several instances are known of their being drowned in crab-pots, into which they had entered in search of prey, and had not afterwards been able to find the opening.[1] Others have been taken far out to sea.[2]

Sir Robert Sibbald long ago noted[3] that 'The Sea-otter . . . differeth from the Land-otter, for it is bigger and the pile of its furre is tougher.' These Sea-otters were said to frequent the Firths of Forth and Tay, but I think there are no (sea) Otters there now.

In Messrs. Harvie-Brown and Buckley's 'Vertebrate Fauna of Argyll and the Inner Hebrides'[4] there is a description of a typical Sea-otter's cave in the Western Isles. 'On the island of Soay, amongst many inhabited holes of the Storm Petrel, a most interesting Otter's resting-place was discovered, and with a spade was laid open for inspection from end to end. After cutting away the earthy peat and close turf of an almost cheese-like consistency throughout the whole length of the tunnel, laying back carefully each square or parallelogram of sod, we measured the length, and found it just fifteen feet. The tunnel was in average size throughout about one foot in diameter, except just at the far end, where it decreased to about four inches. Here and there it was widened out into most evident circular or oval chambers, and the sides and roof were smooth and glossy, rubbed and polished by the passage to and fro of the animal's fur. The habitation had a cunning and gradual incline upwards into the peat bank from the entrance. The latter was simply an uneven, rough, grassy-edged, and semi-concealed doorway in the face of the peat slope. The passage led into and out of these larger chambers over little ridges or elevations across the floor of the passage. Though the walls of peat were damp, smooth, and glossy, and even slimy to the touch throughout both passages and chambers, yet water could not lie in the hole unless just at the aforesaid ridges, which intersected the entrances of the tunnel below each chamber. Near the entrance of the hole, and about two to three feet from it, was evidently the family "kitchen-midden" of the Otters, consisting of a very considerable heap of the domestic "rejectamenta," not less than five or six inches in height and nine inches in width. This occupied a side chamber made to one side of the tunnel. Harvie-Brown gathered up a handful of this material, which on examination was found to consist of fragments of *shells of mollusca*, and upon a more minute examination afterwards remains of fish, *lobster-shells*, and the hair

[1] For an interesting account of the Otter in Cornwall I must refer my readers to *Wild Life at the Land's End.*

[2] *Field*, 1884, p. 560; 1886, p. 331.

[3] *History of Fife and Kinross* (1710).

[4] P. 17.

of some small mammal were identified. It is much to be regretted that we did not have a photograph of the place taken on the spot, laid open as it thus was to the light of day, and the internal economy of the Otters' home displayed.'

Emerging about sundown from its retreat in the bank or the reed-bed, the Otter slips noiselessly into the water for the evening hunt. If you are ever so near you will not hear the slightest sound, as the movement of entering the water is so easy and 'oily' that the animal may almost be said to pour itself into the stream.[1] Otters often hunt alone, but sometimes two join together in attacking salmon, although a full-grown Otter is individually quite capable of killing a large fish. Swimming up stream rapidly, the Otter lands frequently, especially where the rush of water impedes its progress, and, trotting or galloping briskly, cuts off corners or passes up the rocks at the sides of waterfalls, till it reaches some favourite fishing ground where food is plentiful. In this manner Otters range over considerable distances during their evening and nocturnal peregrinations, and their tracks of five rounded toes (called the Otter's 'spur'), with the web mark often showing in the mud or sandy beach, are unmistakable for those of any other creature. The brothers Stuart in their charming 'Lays of the Deer Forest' (1848) long ago noticed this trait of passing up stream overland, where the current was too swift to proceed by water. 'In ascending a river, if the bank will admit, the Otter invariably leaves the water at the rapids, and takes the shore to the next pool; so that if there is an Otter on the stream his up track is sure to be found at those places. In returning, however, he will often float down the rapids with the current.' In further describing the hunting of two Otters the authors mention such a place on the Beauly, close to Aileen Aigus' house, which I know well, and where I have myself seen Otters' tracks. There is a narrow sandy beach, just above the roaring Linn o' Campsie on the Tay, where Otters nightly pass, after coming round the falls. On this bank it is likely that more salmon have been landed by the angler than in any spot in Great Britain, as it is at the bottom of the famous Stobhall Pool. I have killed a good many fish there myself, and have never landed without seeing Otter tracks, if the river was at medium height or low. Curiously enough, I have never found 'spraints' (remains of digested food) there, or salmon killed by Otter; perhaps it is that the constant advent of man makes them suspicious, for they always take their prey to the still water on the south shore, into a small bay where there is a little grassy

[1] A well-known writer on natural history in an article in the *Badminton Magazine* speaks of the 'sullen plunge of the Otter,' surely a most infelicitous description.

island, and devour it there. To show how very rarely one sees an Otter, I have only twice observed them on the Tay, where they are common, although constantly fishing there for twenty years. In fact, in some rivers, where there are always a few, the inhabitants never suspect their existence.

The Otter will eat almost anything that swims and, when pressed for food, such mammals as it can catch and kill; it is fond of lob-worms and likes snakes. In ponds and sluggish streams it lives largely on eels, roach, dace, chub, loach, miller's-thumb, and jack, tench, and bream. Eels seem to be its favourite prey in all waters, and it is said to eat them from the tail-end first. 'Many of these fish,' says the late Captain Salvin, 'take to the sides upon seeing their enemy, and he surprises them under the banks, where they fondly imagine they are hidden from view, and consequently safe.' I have often heard Captain Salvin, who knew a great deal about Otters, describe a struggle which he witnessed between a tame Otter and a large pike, 20 lb. 11 oz. in weight, in a pond in Stoke Park, near Guildford. After a desperate struggle the mammal, weighing 18 lb., landed its heavier antagonist.

In the swifter rivers of the north and in Ireland Otters kill large numbers of both trout and salmon, but seem to prefer the latter fish. They can, without doubt, chase and tire out a full-grown salmon. In the brothers Stuart's book previously alluded to, there is a charming description of two Otters hunting in the Beauly as witnessed by the elder brother John.

'I had sat in the oak for about half an hour, with my eyes fixed on the stream, and my back against the elastic branch by which I was supported, and rocked into a sort of dreamy repose, when I was roused by a flash in the upper pool, a ripple on its surface, and then a running swirl, and something that leaped, and plunged, and disappeared. . . . Presently I saw two dark objects bobbing like ducks down the rapid between the two pools, but immediately as they came near distinguished the round, staring, goggle-eyed heads of two Otters, floating one after the other, their legs spread out like Flying Squirrels, and steering with their tails, the tips of which showed above the water like the rudder of an Elbe *scuite*. Down they came as flat as floating skins upon the water, but their round, short heads and black eyes constantly in motion, examining with eager vigilance every neuk and rock which they passed. I looked down into the pool below me—it was clear as amber—and behind a large boulder of granite in about eight feet of water I saw three salmon—a large one lying just at the back of the stone and two smaller holding against the stream in the same line. They were sluggish and



STUDIES OF OTTERS.

sleepy in the sunshine, without any motion except the gentle sculling of their tails.

'The Otters were steering down the pool, bobbing and flirting the water with their snouts, and now and then ducking their heads till they came over the stone. In an instant, like a flash of light, the fish were gone, and where the Otters had just floated there was nothing but two undulating rings upon the glossy surface. In the next instant there was a rush and swirl in the deep, under the rock on the west side, and a long shooting line going down to the rapid, like the ridge which appears above the back fin of a fish in motion. Near the tail of the pool there was another rush and turn, and two long lines of bubbles showed that the Otters were returning. Immediately afterwards the large salmon came out of the water with a spring of more than two yards, and just as he returned the Otter struck him behind the gills and they disappeared together, leaving a star of bright scales upon the surface. . . . The skill with which they pursued their game was like that of well-trained greyhounds in a course. Whenever they came to the throat of the pool they pressed the fish hard to make him double into the clear water, and one was always vigilant to make him rise or turn, the increased effort of which exhausted his strength. With equal sagacity they worked him at the tail of the pool to prevent him descending the rapid. . . . With this race the fish began to tire, and the Otters continued to press him, until at length, one of them having fixed him by the shoulder-fin, he was dragged up the bank, apparently quite dead.'

I think the Otter often 'corners' salmon or runs them into shallows where they cannot easily turn without being captured; three witnesses tell me that they have seen Otters kill grilse which they had chased to the sides of the river and then snapped their victim as it turned again towards deep water.

I have often examined the remains of salmon eaten by Otters on Highland rivers, and have noticed that in the spring they do not care much for kelts, although they will eat them as well as fish affected by the fungus disease.

They also kill very few large trout in salmon rivers. Fish killed are almost invariably clean run salmon or grilse. The head and shoulders of a mangled fish are generally absent, but they often eat only a small part out of the neck of a salmon.[1] They seldom devour the tail-end and lower part of a salmon. The Otter is most wasteful in his methods of destroying fish, and I have never known one return to a kill after having once left it. He is said to seize his prey from

[1] The nape of the salmon's neck is called 'the Otter's bite.'

below, but I do not know how much truth there is in this statemen and belly wounds are rare in salmon killed by Otters. Large fish ashore and held firmly between the fore-paws, and when feeding the C and champs his teeth and lips constantly exactly like a seal. Sm swallowed whole in the water.

Taking everything into consideration, Otters do no harm to fish, big salmon rivers, and he is a churlish fisherman indeed who grudges creature his share—a share, too, that rightly belongs to him—of the r On nine rivers out of ten Otters live on fish which are not consid angler, and on the tenth the quadruped probably does quite as mu harm by thinning down the old male trout which destroy endless spawn and fry.[1] Otters, too, kill numbers of salmon infected by *Saprolegnia ferax;* and in removing these they are only saving the pollution. This is well known on the Tay and Tweed, and Mr. A. H mentions it[2] as occurring on the Thames, where Otters eat these without any harmful results. After all if Otters do kill a certain nun fish, man has no right to a complete monopoly. The Almighty ne that such selfishness should exist on our part, or He would not so many beautiful things to delight our eyes. A policy of 'live a is without doubt the correct one, though the man of narrow vi with us.

On some rivers where salmon are plentiful Otters molest them they prefer the eels which come up in August and September.[3] In e Otters leave the Cumberland Eden and hunt in small ponds near by eels, and their fondness for cray-fish is so well known that they are almost exclusively on them in some rivers. MacGillivray mentions stomach of an Otter killed in the month of June were larvæ and and Mr. A. H. Cocks says they like snakes. Mr. Coward kindly s following note of another strange food eaten by Otters:

'The stumps of alders and willows which rise from the waters of one of the Cheshire meres, are covered with nibbled anodon shells. night it is often possible to hear the Otters crunching the hard shell

[1] A keeper at Struy, Ross-shire, told me the old male trout are the curse of salmon rivers in the lat repeatedly seen from Struy Bridge (under which there is a spawning bed on the Beauly) a big male trout the spawn immediately it was ejected by a female salmon.

[2] *Zoologist*, August 1890, p. 308.

[3] In this Otters do good, as eels are well known to eat the spawn of both trout and salmon.

shells are nibbled at one end only and in quite a different way from those gnawed by rats.'

Sea-otters prey on cod, pollock, scaithe, and flat-fish. Eyton once shot an Otter in the sea near Holyhead while struggling with a large conger, and doubtless it will eat all kinds of sea-fish, as well as molluscs and crustaceans. Hard pressed for food, the Otter leaves the rivers and wanders great distances in pursuit of birds and mammals. It is fond of rabbits[1] and rats, and Mr. Thomas Southwell relates[2] an instance of a hungry Otter which was killed in a sheepfold at Briston (Norfolk), where it was found regaling itself on a sheep which it had slain. Mr. Hill says that they sometimes prey on lambs in North Wales, eating the belly first.

Otters will attack poultry yards and destroy the fowls and geese.[3] Mr. Coward says: 'One was captured in a village near here (Bowdon, Cheshire) some years ago: it had climbed over two high park walls and entered a farmyard, undoubtedly after the fowls.' There are many instances of their fondness for water-hens.[4] Captain Salvin possessed a tame Otter which would hunt them like a spaniel. There is little doubt that wild ducks are often killed by them.[5] The habit of pulling down ducks from the surface by attacking them from beneath is well known in America. I hunted with an Algonquin Indian in Canada who was a professional Otter and Beaver trapper, and he told me that it was a common practice of the Otter in autumn and spring. On this point Mr. Coward in a letter to me, March 21, 1904, says:—

'I have been watching the ways of an Otter here for some months. Its chief food is bream, but it has had a go at rabbits, and a few days ago I found the remains of a mallard, which looked very much as if they had been devoured by some large carnivore. They lay on the rushes close to the edge of the mere in exactly the same sort of spot where I find other remnants of feasts. I fancy a fox

[1] Mr. Harting quotes a letter from Mr. Tom Speedy, dated December 17, 1885, in which the writer speaks of an Otter robbing his rabbit traps (*Zoologist*, 1894, p. 6).

[2] *Trans. Norfolk and Norwich Nat. Hist. Soc.* 1872, p. 80.

[3] See also the *Field*, December 3, 1904. In an editorial note to the same article an instance is given of an Otter living in a holt close to a farmyard in Westmorland, but in this case the poultry and ducks were never molested.

[4] Mr. Beville Stanier, who has made an artificial holt on the lake on his estate at Peplow, in Shropshire, writes to me: 'The artificial holt is always used now, but unless the Otters are actually breeding in the pool they only come for eight days, and then move on for eight days somewhere else; so they travel about a good deal. I have noticed that when they are here there are very few water-hens and water-voles about. We find many remains of different kinds of fish, but eels are their chief food. When we opened the holt in May (1904) we found bits of water-hens, water-voles, and coarse fish.'

[5] See *Field*, p. 93, 1898, January 15, 1893, and May 31, 1873; also Harting's *Zoology*, 1894, p. 6.

would not have dined within a few inches of the edge of the water, but would have dragged the bird away. There was no fox dung about, and there *was* Otter dung within a few yards of the fragmentary remains.'

Mr. Harting in his excellent article on the Otter[1] mentions an instance of an Otter killing a cock grouse on the open moor at Dalnaspidal in Perthshire in November 1885, and the late James Keay, the keeper at Murthly, showed me the remains of a hen-pheasant undoubtedly killed by an Otter in a covert by the Tay. The track led from the river, which was half frozen over, up the hill, into the wood; and curious to see where the beast had gone, he followed it to the spot where the Otter had pounced on and killed the pheasant, which it had partially eaten.

Although so shy a creature, an Otter has been known to seize a trout hooked by an angler, and to break away with both the line and the fish,[2] whilst an Otter is said to have been actually hooked by an angler.[3] Mr. Douglas English sends me the following note of an Otter taking a live roach from the line of Mr. M. H. Pigou at Dartford, Kent. Mr. Pigou thus describes the incident: 'Whilst fishing for pike with a live roach from a punt on June 23, 1904, an Otter took my bait. I did not see the float disappear, being at the moment engaged in baiting the water. Some line had run out before I raised the rod and struck what I took to be a large pike. This, however, had no effect in checking the line, which continued to run; and so strong was the rush that the rod's point was pulled down to the surface of the water. Possessing only a thin line I had to give way owing to the heavy strain. As I did so the line slackened and an Otter's head appeared out of the water about thirty yards away, looking straight at me. Then he dived and made for the bank, and the strain recommenced, until the Otter landed and disappeared among some rushes, at which the hooks and bait came away.'

Speaking generally of the food of Otters Mr. Arthur Heinemann has an excellent note in the 'Field' (December 17, 1904), which I must quote at length. 'Just as pheasants do not form the staple food of foxes, so trout and salmon do not form the staple food of Otters. Certainly Otters do not get trout and salmon in many rivers and streams in the Midlands or East Anglia, yet they exist there in considerable numbers. Devonshire, again, is pre-eminently a county of trout streams and salmon rivers, yet the Dartmoor and Cheriton packs of Otter hounds have never found Otters half so plentiful there as they are in Somersetshire, whose

[1] *Zoologist*, January 1894, pp. 2–10 and pp. 41–47.
[2] Cf. *Field*, October 16, 1875, and July 1, 1899.
[3] *Field*, October 2, 1897.

muddier waters, containing more coarse fish and eels, have always attracted a larger stock of Otters for the Culmstock pack. Nor is this a question of preservation, for all three countries have been hunted by Otter hounds for many years, and Otters are equally well preserved in each. Personally, I believe that trout are too nimble even for such good swimmers as Otters, and there are many hollow banks and rocky hovers into which they can get and be out of the reach of their pursuers. Moorhens are a favourite food with the Otter, and it is only natural to believe that they will occasionally take a duck, though in this case rats are far more likely to be the culprits. Though an animal in captivity will eat many things it does not get in a wild state, yet one may safely say that careful observation of its preference in the former affords some indication of its preference in the latter.

'I have now a tame Otter which has been brought up from a tiny cub, and these notes may, perhaps, throw some light on the question of what an Otter eats. Loo was dug out one day last June on the Torridge, and then weighed about 1½ lb. She readily took to the bottle, which was a Mawe's patent feeder, filled with much diluted milk, one part milk to three parts of water, and given lukewarm. She would lie on the ground and clasp the bottle with her little pads and suck away contentedly. She is now about the size and weight of a big rabbit, but, as it is unlucky to weigh babies, Loo has not been put in the scales. I find she will greedily devour snails, shells and all, thus differing from a badger, which always spits out the shells. A trip to the seashore discovered her fondness for small crabs, which she would also eat shell and all. She is now fed principally on herrings and rabbits, which latter she will skin and turn inside out like a glove. I have seen a heap of rabbits' skins similarly treated on the Porlock Marshes, which I now think must have been the work of Otters, which I have at various times spurred there. Loo often leaves the heads and tails of fish, but not always, though she will hardly ever eat the roe. Small birds and moorhens she enjoys, but will not look at field-mice. A rat in a cage excited her greatly when put together in a tub, and she went for it, but would not kill it. I have only been lucky enough to get one big frog for her, but this, her first one, she went for at once, and ate every morsel of it, though I have usually found the eyes and skin of frogs left behind by wild Otters. At first Loo did not care much about going into the water, and even now she does not dive very deep. She will retrieve anything like an apple or potato or stick that catches her eye or that I throw in for her. Swimming along the bed of a stream, she will shove her

flat head into the mud, probably searching for eels, but under water she seems to depend more on her eyesight than on her powers of scenting anything. She also likes slugs, but not so much as snails. She has a wonderfully bright and full eye, all black like a boot button, and shows a lot of the white in the corner, which gives her a very wild and fierce look. Running water from tap or waterfall causes her infinite delight as she rolls over and over on her back beneath it. Her cries are many and varied—a hiss when she plays or is frightened, a squeal or scream when she is in a rage or if I show her a bass broom, and a short, sharp, bird-like whistle or call which she utters in answer to mine, or when she hears my voice or footstep. She follows well, comes to my whistle, and will come out of the stream at my call. She has no fear of dogs or cats, and is most mischievous and playful in the house, tearing and shaking rugs and curtains, and delighting to get in behind the books in my bookcase and turn them all out on the floor. She follows well in the dark, is not nearly so shy and nervous of strangers approaching as tame badgers are, and can be handled suddenly without attempting to bite. She has only shed her coat once since I have had her, and she is now doing so, but slowly. She curls herself up to sleep, holding one of her hind pads in her mouth, and keeping it there with her two fore ones.'

Otters are said to hunt their prey by scent under water, but on this point it is difficult to give an opinion. At any rate good old Izaak Walton's estimate was somewhat exaggerated. In the words he places in his huntsman's mouth he says, 'And I can tell you that this dog-fisher—for so the Latins call him—can smell a fish in the water a hundred yards from him, Gesner says much further.' To which we might add that Gesner made even more remarkable statements worthy of the famous Baron Munchausen himself.

At any rate the late Captain Salvin was convinced that Otters had the power to scent fish below the water, for in an interesting letter to Mr. Harting[1] he writes: 'Some years ago, when I found that Otters have the power of scenting under water, I used to amuse myself by sinking a fish on a string with a bullet, and after dragging it some distance I hid it under a stone. Then I turned in the Otter, which soon hit off the scent, and dived beautifully to the spot and brought up the fish. Then I used to take him out in a boat on a pond, and repeat the same thing in very deep water, where I knew the bait would enter the mud at the bottom; but the Otter, diving *in circles* (as they always do in deep water), never failed to find and bring it up. In order to show how easily they can

[1] *Zoologist*, January 1894, p. 7.



An Otter at Play.

take eels, and how much they live upon them, I may relate what an Otter of mine once did in the river Wharfe in Yorkshire. At a turn in the river, below Mr. Scott's seat, Woodhall, the water had formed a sandbank which did not appear above the surface, but could be plainly seen when the water was clear. Upon arriving opposite this place the Otter dived directly for the sandbank, and I could see he intended mischief, for his shovel-shaped head was immediately driven well into the mud, and he came up with such a large eel that it lapped round his thick neck.

'As eels can be scented under water in the mud, their capture becomes all the more certain, for they have no chance to escape by swimming.'

Beneath the water the Otter swims with grace and ease: its turning movements are specially sinuous and rapid. After diving it seems to hunt in circles, as Captain Salvin remarked in the above quoted letter; and tame Otters that I have watched almost invariably follow this method in ponds, commencing in the middle and driving the fish to the sides. In swimming on the surface it uses all four feet like other animals, but when below the water and chasing a fish it only uses the fore-paws. The hind legs are stretched out behind, and the large tail acts as a kind of rudder. In this way it turns and twists with extraordinary rapidity, and is scarcely less quick than the seal. Many fish are evidently seized from behind as they hide their heads in holes in the banks; it must be rare for the Otter to hunt down a trout or salmon by sheer speed.

Like the seal, it can remain a long time under water without coming up to breathe or 'vent,' as it is called. The explanation furnished by some American writers, that when fishing under ice, between which and the water there is no air, the Otter 'presses its nose against the ice: this exhales the air from its lungs, which forms a flat air bubble around the nose,' is almost too ingenious and difficult to accept. It is supposed that by so doing the air in contact with the ice and water is reoxygenated, and after being again inhaled the Otter is ready for a fresh start. As a matter of fact the Otter when fishing under the ice, no matter how much it turns and twists in pursuit of fish, never loses its sense of the direction of the air-holes, and once a capture is made it makes straight for the nearest fresh air. Sometimes this lands it in holes under the banks, and following up these it finds itself in a snug retreat where it can eat its dinner without being seen. This may account for the observations of American naturalists, who find it difficult to account for its long disappearances. In Canada these underground holes are often formed by beavers, who are said to resent the advent of the Otter, and to attack it. Angus,

the Indian previously referred to, described to me a desperate fight which he witnessed between an Otter and a beaver whose domain had been invaded.

When below the surface the air clings to the coat of the animal, and as it emerges on land it appears to be very wet and glistening, especially about the back and root of the tail. However, the moisture is only superficial, for it just gives itself a quick shake, and is nearly dry at once. The gait of the Otter is a brisk trot or the usual 'mustelid' gallop, somewhat lumbering but performed at a fair pace. The cry is a long-drawn whistle; but when brought to bay it hisses like a cat.

Mr. Gerald Lascelles has described the Otter as the 'wiliest and toughest of British animals,' and in conversation I have heard him say that he regarded it not only, proportionately speaking, as the strongest, but as the most agile. An Otter released had by the following morning explored every nook and cranny in the whole room. It had even surveyed the mantelpiece and knocked a lot of bottles off the upper shelves of the room. In fact it visited parts of the room which none but an animal possessed of great leaping powers and agility could have reached. In America and Canada the Otter's power of climbing is well known, for in hard weather it has often been seen high up in trees. In such cases it is in pursuit of mammals and grouse, which are usually tame or sleeping in times of frost.

Otters breed only once a year and in any month. In fact statistics go to prove that young have been found in every month of the year. In England births in spring are rare; the most usual times are the late autumn and winter months. Mr. Thos. Southwell[1] says: 'In forty-eight instances which have come under my observation, in which the date of birth could be fixed with tolerable accuracy, and of which forty-two were quite reliable, I find that in thirty-seven certainly, and in two probably, the birth took place in the months of October to February, both inclusive, and in five well-established instances and four less certainly between March and September, both included.'[2]

This, too, was the experience of the late Geoffrey Hill, who hunted the famous Hawkstone pack, and worked it with great success for a number of years, as also of Mr. Gerald Lascelles, who is a no less experienced Otter hunter, and who has found young Otters in every month.

Captain MacDonald of Waternish says that in his experience female Otters

[1] *Field*, December 19, 1903.

[2] For further information on the subject of gestation and breeding of the Otter I must refer my readers to *Zoologist*, 1877, pp. 17, 100, 172; A. H. Cocks, *Zoologist*, 1882, pp. 201–204; A. H. Cocks, *Proceedings Zoological Society*, February 1882; Thos. Southwell, *Zoologist*, 1888, pp. 248–251; Harting, *Zoologist*, 1894, pp. 2–10 and pp. 41–47.

litter in a wild state at two seasons, spring and autumn, and I believe that his view is correct as regards the Hebrides, Orkney, and Shetland.

The gestation lasts for sixty-three days, and the female Otter produces from one to three young ones at a birth. The last number is rarely exceeded, but several cases of four are known, and one of five. As in the case of the marten the maternal instinct to make a nest asserts itself in the female Otter when ready to breed. She then goes about with little bits of straw in her mouth, which, according to Mr. Cocks, she methodically deposits here and there in an amusing fashion. The place of 'accouchement' usually chosen is a hole in the bank of a stream or pond, the lower part of a hollow tree, an old drain, or a dry bed of moss, leaves, rushes, or grass in England; and in a cairn of stones, a crack in the peat-hags, or some small sea cave in Scotland.

The young cubs constantly squeal during the first days of life. Apparently they grow slowly at first, those first bred by Mr. Cocks being only about eight inches in length at thirteen days old. They are at first covered with a very fine silky coat, but this becomes more 'rough' as the hair grows in length. They are blind until about thirty-five days, and the mother frequently moves them in her mouth, sometimes swimming with the young immersed—a circumstance that seems to have no effect on its respiratory organs. Cubs born in Mr. Cocks's menagerie on October 12 were one foot long and tail six inches on November 29. These cubs suckled until the spring, but entered the water of their own accord on December 9, and on the 13th of the month the mother attempted to get them to eat two small roach, 'taking first one fish, then the other, then both together in her mouth, and moving them about close in front of the cubs to attract their attention, at the same time uttering a peculiar whine or growl, or something between the two, which sounded ferocious.' This she continued to do every day up to January 15. About December 28 they began to eat a little every day, but were shy and bit fiercely. After this their education was rapidly completed, and they were considered adult in June.[1]

As soon as they can see, the mother Otter takes her cubs to the water and teaches them to swim. At first they are said to be very reluctant to enter the water, and as a preliminary training she often makes an exit hole upon the bank above her holt, where she allows them to play and run about for a few days before enticing them to mount on her back and embark on a voyage of discovery. For the first few days in the water she swims with them, but soon dives and

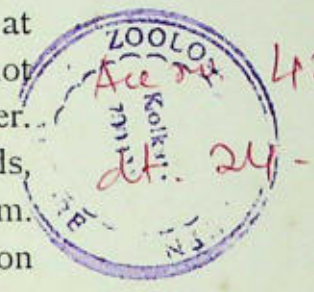
[1] A. H. Cocks, *Zoologist*, 1882, p. 203.

returns to them again and again, until she has induced them to copy her movements.

She teaches them to dive noiselessly, to circle in deep pools, and how to come up quietly behind sleeping fish or drive them into holes in the banks. Then they are taught to stir the mud with their pads, or turn over stones for hidden miller's-thumbs, and bury their heads in the mud after eels, or how to corner the darting salmon.

That the swimming powers and the hunting of fish are acquired habits is shown by the fact that young Otters, kept tame and allowed to run loose, are almost full-grown before they will take to the water; they grow up with stoat-like habits, *i.e.* hunting for their food on land. In their preliminary efforts at natation, young Otters are just as frightened as they can be, and keep querulously calling for their mother all the time she is out of sight. But at first she does not upset their baby natures, and only vanishes for a few minutes. As the young grow these intervals become longer and longer till she induces them to follow her in shallow water or in a still lake. I once had the good fortune to see an old female Otter playing with her three nearly full-grown young ones and evidently teaching them to dive. I was hunting in Ontario with one Angus, a full-blooded Algonquin Indian, who told me many things about Otters, and who knew more about them than any man I have ever met. We were following a not too fresh track of a moose, and found ourselves about five o'clock in the evening opposite one of the many thousands of little lakes that dot the northern wastes. It was perfectly still save for a commotion of what I took to be some mergansers diving in the shallows about 300 yards away. Angus saw the movement, and his hawklike eyes blazed with excitement, as Otters—for such he at once pronounced them to be—were of more value than moose. We approached to within a hundred yards of where visions of heads and tails showed alternately, and Angus eagerly urged me to shoot, cutting short my demands for an explanation of these curious rolling movements. There was nothing to shoot at, but I had to fire at something; so waiting till a brown spot appeared stationary for a few seconds I pulled the trigger and made a most extraordinary shot, breaking the tail-joint and stunning the largest of the Otters. Now this is a perfectly true story, so I will confess at once that the shot was more than nine-tenths a fluke, and I had no reason to accept Angus's joyful congratulations. The Otter meanwhile lay kicking, apparently only stunned. Presently it recovered and dived somewhat weakly, making for a clump of willows where we found the holt. Angus

now cut a spruce pole, and by poking and digging scared the Otter out of its retreat, when I shot it again with the Mannlicher as it bolted and swam through a shallow. I shall not easily forget that day, not for the trifling pelt we achieved, but for Angus's enthusiasm and his stories about Otters and Beavers, which live in the memory after other things have gone. That Otter's skin now forms a collar for my wife's neck, but poor Angus lies under the pine trees by the murmuring Ottawa he loved so well. Never strong, he burst a blood-vessel one day after we had followed a bull moose at a great pace from 6.30 in the morning till six at night. The horrors of that night in the woods with a dying man I shall not forget, but I got him to Mattawa at last, and there he passed away a month later.



4127

In America, Canada, and Newfoundland Otters have regular playing grounds, which are generally steep moss-covered slopes on the banks of some retired stream. These are generally numerous in Newfoundland, where I counted no fewer than six on one quiet brook flowing into St. John's Lake at the head of the Terra Nova River, a remote district which trappers never reach. Sir John Richardson first described these playing and rolling places, which are generally known as 'Otter-slides,' and nearly every subsequent writer on American natural history has referred to them. Mr. J. D. Godman[1] says:

'Their favourite sport is "sliding," and for this purpose in winter the highest ridge of snow is selected, to the top of which the Otters scramble, where, lying on the belly, with the fore-feet bent backwards, they give themselves an impulse with their hind legs, and swiftly glide head foremost down the declivity, sometimes for a distance of twenty yards. This sport they continue apparently with the keenest enjoyment, until fatigue or hunger induces them to desist.'

It must not be supposed that Otters only play and slide in winter, when they have snow on which to 'toboggan.' All the slides I have examined in Newfoundland had been freshly used and were polished smooth, with the grass and moss all worn away, showing that they had been in constant use all the summer.

Audubon thus describes the sport which he himself witnessed:

'The Otters ascend the bank at a place suitable for their diversion, and sometimes where it is very steep, so that they are obliged to make quite an effort to gain the top, they slide down in rapid succession where there are many at a sliding place. On one occasion we were resting on the bank of Canoe Creek, a small stream near Henderson, which empties into the Ohio, when a pair of Otters made their appearance, and, not observing our proximity, began to enjoy their

[1] *American Natural History*, 1826.

sliding pastime. They glided down the soap-like, muddy surface of the slide with the rapidity of an arrow from a bow, and we counted each one making twenty-two slides before we disturbed their sportive occupation.

'This habit,' he adds, 'of sliding down from elevated places to the borders of streams is not confined to cold countries, or to slides on the snow and ice, but is pursued also in the Southern States, where the ground is seldom covered with snow or the waters frozen over.'

Apparently the pleasures of this game appeal to them quite as much as to man, as exemplified by the Canadian-Chinaman's remark, 'Whizz, whizz, walkee back a mile.'

Mr. James Parke, writing from Masham, Yorkshire,[1] says that he had been told of an 'Otter slide' down a soft muddy bank in Wensleydale, 'but have not heard whether it has ever been used for recreation.' After repeated inquiries I have not heard of any authentic sliding place in our islands; yet it is strange if such places do not exist, for the habits of British and Canadian Otters are identical. I have seen many bank slopes where Otters undoubtedly exist, quite similar to those in Newfoundland and Canada which are used for this purpose, but with no signs of their having been used as a playground. The absence of these in our islands may perhaps be accounted for by the fact that Otters are much shyer in our waters, and rarely show themselves for sport and play.[2]

The maternal instinct is very strong in this species, and there are several instances of female Otters attacking dogs in defence of their young.[3] The following touching instance of their affection for their progeny is worth quoting[4]:

'About four years ago, and at the end of February, Freeman, the head gamekeeper at Bendrigg, Westmorland, to Sir Henry Bentinck, was ferreting some burrows near a brook that runs through the estate when a young Otter bolted from a hole, and almost before the shooters knew what it was the little thing was unfortunately killed. It was about 4 lb. weight. Shortly after the old Otter came out, and another cub, which were, of course, allowed to escape. Although the party were shooting round about the place the remainder of the day the dam of the poor dead cub never left the neighbourhood, re-entering the

[1] *Zoologist*, December 1894, p. 457.

[2] In reply to a letter from me on this point Mr. Gerald Lascelles confirms this view. 'The explanation,' he says, 'that occurs to me is that in this country Otters breed where people so constantly pass that they are very suspicious, and careful to leave as little trace as possible. Moreover, as soon as the cubs are about one-third grown they, with the dam, become wanderers up and down the streams, not remaining anywhere long enough to leave much sign.'

[3] *Field*, 1898, pp. 180, 242, 601.

[4] R. B. L., *Field*, January 30, 1904.

burrow and continually calling in the peculiar whistling tones common to the Otter when it has lost its mate or its young, as was the case in this instance.'

There are, as in the above case, numerous examples of Otters being bolted from rabbit-holes by ferrets.[1]

The trail of the Otter in deep snow is a curious one, unlike that made by any other animal, for no footmarks are visible: it looks more as if a log of wood had been dragged along than the spoor of some vanished quadruped. Here and there are gaps when the Otter has made a little spring, but there are no foot-prints to be seen, as the body is so close to the snow that it obliterates these in its passage.

Hunting.—There are various ways of hunting the Otter, and many of them reprehensible. It may be tracked in the snow to its cairn, bolted with terriers and shot, or searched for and ousted with terriers, as is the custom in the Hebrides and Northern Isles. The terrier hunting is great fun, but in all these cases it must be admitted an unfair advantage is being taken of the beast for the sake of his skin, for the only fair way to chase the Otter is with a pack of hounds.

Otter hunting in its legitimate sense has been classed with bull baiting, bear baiting, cockfighting and badger baiting, and designated as 'Glorified Ratting;' but those who have taken up the pen to condemn it evidently write in complete ignorance of the science, for there is no British sport, except salmon fishing, in which the purely natural pleasures of the chase are so predominant or in which so little cruelty is practised. Added to this, in four cases out of six the Otter escapes, and an exciting hunt without a kill is generally the order of the day.[2] Blank days are very common. That famous sportsman Parson Jack Russell, referring to the time in which he started a pack of Otter-hounds, has said: 'I walked three thousand miles without finding a single Otter. I must have passed over scores, but I might as well have searched for a moose-deer.' But then he had no hounds that would take the line of an Otter.

The great charm in Otter hunting consists in the beautiful surroundings into which it draws the follower, and the pleasure of seeing hounds work out a line from start to finish. Otters are followed and eventually killed by a knowledge of the creature's habits, and this in itself forms one of the chief attractions to all

[1] R. B. L. See *Field*, January 2, 1904, and *Shooting Times*, January 1896.

[2] During forty-six days' hunting by Mr. Buckley's Otter-hounds in North Wales thirty-six Otters were found, of which sixteen were killed. This may be taken as a good average.

genuine sportsmen. Consequently we are not surprised that the chase is every year gaining in popularity, and new packs are starting in different neighbourhoods. Those who have had the pleasure of seeing Otter hunting at its best, as, for instance, in the wilds of Dumfries, North Wales, or under the able leadership of Mr. Courtenay-Tracy or Mr. Gerald Lascelles, are indeed fortunate.

The sport for a man of moderate means is well described by a writer in the 'Field,' May 28, 1904: 'For a sportsman of limited means and of sound legs the sport of Otter hunting is most congenial, both as regards practice and precept. It can be enjoyed for some four or more months for as many shillings as it would cost pounds to ride (well mounted) for as many days to hounds. At the same time unless he is privileged personally by the occupiers of the land hunted during each given week, a man cannot expect to have the free *entrée* of the sport of a subscription pack of Otter-hounds through all its season's wanderings; but as a rule he can be a full member of some hunt for a modest guinea or two a year, even if he is not a contributor of any soil for the chase. The migrations of the hunt for a week or so at a time to the streams of this or that adjoining county may for some of those weeks place the morning meets out of reach of railway access, even by the earliest newspaper trains; nevertheless, in the more populous centres it is astonishing how many meets can be worked actually from home by the aid of the rail. Railways are prone to follow valleys, and in these valleys lie the rivers, so that there is a constant prospect of some small station being within hail of the meet; in fact, on many occasions hounds and staff arrive and depart by rail from day to day. When, however, the venue becomes too distant for such diurnal access a social sporting party quartered for the inside of a week at some small provincial inn can find the change of scene highly enjoyable, and withal economical compared with the tariffs of seaside or Thames-side hostelries. Horses cannot be allowed to follow Otter-hounds; and, as far as the speed of the chase is concerned, they would not be needed, though now and then a strong drag is run for some distance at a pace that taxes the best pedestrianism. But it is seldom that a small river does not strike a country road every mile and a half or two miles, so that vehicles with the accessories of luncheons and waterproofs can rely on picking up the hunt from point to point, and, if required, give an interim lift to those who feel the full day's walk beyond their powers, and are husbanding their resources for the final of the hunt after the Otter has been driven from its couch. In some of the more populous districts of Midland meets the propinquity of the hunt may be descried from afar from the stand of vehicles on some





THE OTTER 'MARKED.'
THE 'KILL.'

eminence or bridge, while the more active votaries are enjoying to the full the tramp through the water meadows, the working of the hounds on the drag, and the picture of the scenery. With the opening of June those packs which hunt non-mountainous watersheds, where the rivers glide gently through water meadows, are obliged to suspend operations in fairness to the hay crops; but by the middle of July, and earlier in many a vale, sport can be renewed, and be carried on well into the shooting season.'

Otter hunting has been well described too often to deserve more than a passing notice of its history and some remarks on the packs that hunt in Great Britain and Ireland at the present day. R. B. L., who has written many good articles on Otters in the 'Field' and other journals, speaking of the first mention of Otter-hounds, says[1]:

'The earliest allusion we have to Otter hunting is in the reign of King John, who, history has told us, was fond of his Otter-hounds, although the Otter itself was placed only in the third class as a beast of the chase. Edward II. also had similar hounds, and, moreover, a notable huntsman in Twici, whose name has survived; he, however, probably had subordinates to attend to the Otter-hounds, finding his time fully occupied in looking after the pack which hunted more noble game. There were six couples of "Otter dogges" to look after, their care being undertaken by a man who sometimes lived in the hall and was served there, whilst at other times he resided outside. He had two "boys" to assist him. The duties could not be very arduous, and the emoluments were accordingly not high, the master being given "a robe of cloth yearly, or a mark in money" (the latter 13*s.* 4*d.*), an allowance of four shillings and eightpence for shoes, and twopence per day as wages. The "juvenile" assistants, who were doubtless fully grown men, were paid a penny-halfpenny each per day. No doubt these good hounds afforded capital sport, and, assisted by nets and spears, contrived to account for more Otters than any of our packs do at the present time, when their sport is conducted without such adventitious aid as was continued until a comparatively recent period.'

Henry VIII. kept a pack of Otter-hounds under the direction of one Thomas Hordon, as instanced by the publication of the original Royal Charter.[2] In the eighteenth century spears at the end of a pole were used, and the Otter killed as soon as possible by being impaled—this is the subject of Landseer's famous picture of the 'Otter Hunt'—though the practice has long since been extinct.

[1] *Field*, March 7, 1903.

[2] R. B. L., *Field*, March 7, 1903.

Formerly the pure-bred Otter-hound was used, but with the nineteenth century many masters of Otter-hounds have used other breeds. Mr. Collier, for fifty years master of the Culmstock, used either harriers with a dash of foxhound blood or pure-bred foxhounds, whilst many were drafts from the Devon and Somerset staghounds. Other masters have used mixed packs, whilst the Carlisle pack are true Otter-hounds. Bloodhounds have also been used with success. Though the true Otter-hound may not be so fast as the foxhound, his nose is unrivalled, and he will own a faint scent that the other hound will not acknowledge.

The following is a list of the packs of Otter-hounds hunting at the present day (1904):

The B.O.H. (North Wales).—17½ couple; hunt five days a fortnight; Master, Mr. H. Douglas Thorneycroft; Huntsman, D. P. Jones; Whip, T. Biggs; kennels at Newtown, Montgomeryshire, N. Wales.

Bucks.—17 couple; hunt three or four days a week; Honorary Master, Lord Lilford; Master, Mr. W. F. E. Uthwatt; Huntsman, Mr. G. Uthwatt; Whip, H. Howard; Hon. Sec., Mr. Walter B. Bull, Newport Pagnell; kennels at Great Linford, Newport Pagnell.

Carlisle.—14 couple; hunting days, about two a week; Huntsman and Master, Mr. J. W. Graham; Kennel Huntsman, John Parker; Whip, Jack Parker; Hon. Sec., Mr. J. S. Thompson, 18 Bank Street, Carlisle.

Cheriton, The.—10 couple; hunt five days a fortnight; Master and Huntsman, Mr. Arthur B. Heinemann; Whip, A. Church; Hon. Sec., Mr. C. D. Turrall, Northam, R.S.O.; kennels at Porlock and Barnstaple.

Clay's, Mr. H. Hastings.—(Subscription pack) 12 couple; hunting days, Tuesdays and Fridays; Master, Mr. H. Hastings Clay; Huntsman, John Jackson; Whip, B. Flowers; Hon. Sec., Mr. W. B. Pilkington, The Homestead, Pencraig, Ross-on-Wye; kennels at Chepstow.

Courtenay-Tracy's, Mr.—(Subscription pack) 15 couple; hunting days, Mondays, Wednesdays, and Fridays in each week; Master and Huntsman, Mr. Courtenay-Tracy and a Committee; Kennel Huntsman, Tom Stubbington; Hon. Sec., Mr. Francis Rigden, Belle Vue, Salisbury; kennels at Wilton, near Salisbury.

Crowhurst (Sussex).—15 couple; two days a week; Master and Huntsman, Mr. S. W. Varndell; Hon. Sec., Mr. W. E. F. Cheeseman, 23 Havelock Road, Hastings; kennels at Crowhurst, Sussex.

Culmstock, The.—8 couple; three days a week; Master, Mr. James H. Wyley; Huntsman, the Master; Whip and Kennel Huntsman, Walter Jacobs; Hon. Sec., Mr. E. A. Vaughan, Newhayes, Chard; kennels at The Firs, Ashill, near Ilminster, Somerset.

Cumberland, West.—12 couple; hunt two days a week; Master, Mr. J. H. Jefferson,

Hundith Hill, Cockermouth; Huntsman, the Master; Whips, Messrs. W. M. Armstrong, Dalziell, and Stokes; Secretary, Mr. H. W. Clift, Ellen Bank, Aspatria; kennels at Little Mill, Cockermouth, Cumberland.

DARTMOOR.—14 couple; hunt two days a week; Master and Huntsman, Mr. A. J. Pitman; Whips, Arthur Mason (kennel huntsman) and John Mason; Secretary, Mr. R. W. Baynes, Royal Western Yacht Club, Plymouth; kennels at Glaze Brook, South Brent, S. Devon.

DOYNE'S, MR.—10 couple; hunting days uncertain; Master and Huntsman, Mr. D. H. Doyne; Whip, A. Harvey; kennels at Wells Gorey, co. Wexford.

DUMFRIESSHIRE.—16 couple; hunting days, two a week; Master, Mr. D. J. Bell-Irving; Huntsman, Mr. W. Davidson; Whips, Joe Parker and J. Powman; Hon. Secretary, Mr. G. H. Bell-Irving, Bankside, Lockerbie; kennels at Annan.

EAST OF SCOTLAND.—7 couple; hunting days uncertain; Master, Mr. W. M. Sanderson; Huntsman, vacant; Whips, the Committee; Secretary, the Master; kennels at Amisfield Park, Haddington, N.B.

ESSEX, THE.—16 couple; hunt five days a fortnight; Master and Huntsman, Mr. L. Rose; Kennel Huntsman and Whip, W. Douglas; Hon. Secretaries, Mr. W. P. N. Ridley, Chelmsford, and Mr. W. C. Hyde-Parker, Long Melford; kennels at Waterhouse Farm, Chelmsford.

FORSTER'S, MR. CARNABY.—17 couple; hunting days uncertain; Master and Huntsman, Mr. R. C. Forster; kennels at Easton Park, Wickham Market.

HAWKSTONE OTTER HUNT.—25 couple; hunt three days a week; Master, Mr. H. P. Wardell; Huntsman, the Master; Kennel Huntsman, H. D. Davies; First Whip, H. Nicholas; Second Whip, E. Cope; Hon. Secretary, vacant; kennels at Bromfield, Ludlow, Salop.

KING'S OTTER HOUNDS, THE.—25 couple; hunting days uncertain; Master and Huntsman, Capt. T. W. Sheppard; Whip and Kennel Huntsman, Arthur Lentall; kennels at Derry Knockayne, near Limerick, Ireland.

NORTHERN COUNTIES OTTER HOUNDS.—16 couple; hunt three days a week; Masters, Mr. F. C. Barnett and Mr. T. Robson; Kennel Huntsman, R. Hall; Secretary, Mr. W. A. Hoyle, Northern Counties Club, Newcastle-on-Tyne; kennels three-quarters of a mile from Morpeth Railway Station.

RUG, THE.—10 couple; hunting days irregular; Master, the Hon. C. H. Wynn; Huntsman, the Master; Whips, Messrs. Hugh Edwards and A. R. Wynne; kennels at Rug, Corwen, N. Wales.

WHARFEDALE, THE.—21 couple; hunt three or four days a week; Master, Mr. W. Thompson, Addingham, Yorks; Huntsman, Isaac Fletcher; Whips, Mr. H. W. Stansfield, Mr. J. C. Thompson, Capt. Maurice, D.S.O., Mr. J. D. Barwick, and Mr. B. A. Hirst; Hon. Secretary, Mr. J. Thwaites, 26 Brook Street, Ilkley.

YNYSFOR, THE.—10 couple; hunt two days a week; Master and Huntsman, Mr. Evan B. Jones; Kennel Huntsman and Whip, O. Ephraim; kennels at Ynysfor, Penrhyndeudraeth, Merionethshire.

In nearly all parts the use of the net in Otter hunting has now been discontinued, but in the West of England, in the beautiful 'Lorna Doone' country, it is still used, and there Mr. Arthur Heinemann, who has long hunted the Cheriton pack in this country with success, explains its necessity[1]:

'A man who could harbour a stag in Horner Combe or Haddon when the leaf is on the oak might not be able to spur an Otter on Taw or Torridge, and *vice versa*. Here in the West Country, where there are frequent stickles and shillies, as in Wales and up north, a net is quite unnecessary; but in East Anglia or the Midlands or Hampshire any sportsman who is an Otter hunter as well must know that it is impossible to kill an Otter with hounds in some of the long stretches of deep water that extend perhaps for miles without a break or ford. When hunting such a canal as the Chelmer and Blackwater Navigation or the Bridgewater Canal what would one do without nets? I am not ashamed to admit having used nets on the former, though I was never lucky enough to find an Otter when my nets were down. Which would "Hunting Horn" prefer, a six-hour hunt in deep water a quarter of a mile from top net to bottom net, or a six-minute murder of an Otter up a small brook with an impassable line of men foot to foot at both top and bottom stickles? Again, when hunting an Otter in a very big pool full of impossible hides and holts, the only chance of a hunt, quite apart from a kill, is to keep the Otter swimming. This may often be done by dropping a small net over the holt he keeps sulking in. There are always in an Otter-hunting field critics and grumblers, usually non-subscribers, who always know the huntman's business better than he does, and forget that he is the best judge of whether his hounds should have blood or not. There are in every Otter-hunting country pieces of water where an Otter can laugh to scorn all efforts of hounds and men to capture him if only he makes the most of the natural advantages of hide, holt, and hover, and of his powers of diving and swimming below water. In such water it is only when, from rashness or ignorance, the Otter gives himself away and lands or floats, thus giving hounds their chance, that he may be said to commit suicide. I say nothing about "tailing," which should never be done by anyone of the field except at the huntsman's or master's special request, and is a practice which, in the interests of sport and fair play, is far too favourite a one with many a huntsman of Otter-hounds.'

A curious incident happened to the best Cumberland pack in June 1904. They found at Netherhall Park, and after half an hour along the river Eden the

[1] Mr. Heinemann has now (1905) resigned his mastership in favour of Mr. Loraine Bell.

Otter took the Old Mill Race, over which a modern portion of the town has been built. Here the quarry swam into a subterranean passage which carries the race under the shops and houses of three streets. The pack, eager, and following a hot scent, at once followed, and the huntsman, fearing lest his hounds should be drowned or suffocated, was glad when they all reappeared at an opening two hundred yards lower down. The Otter escaped, having probably found a cellar drain.

Let us now leave the lush meadows and rocky hill-streams of sunny England and see what the chase is like in the wind-swept peat bogs and surf-beaten islands of the Western Hebrides. There are no cheery meetings of old friends and neighbours on the sunlit lawn, no keen-eyed master with his pack of baying hounds—only a dirty old fishing cobble, a solemn-faced Donald reeking of the peat smoke, his master, the laird, and perhaps half a dozen clever-looking 'wee' Skye terriers, with beautiful Gaelic names. It is no social parade, forsooth, we have come to see; work and pluck, such as even the greater hounds cannot surpass, are embodied in those small, wiry, yellow bodies. They look at you with interest, their little heads on one side, with an ear at half cock, for they know you mean business, and that means Otters.

In England, Scotland, and Ireland, Otter hunting is a chase in which all the arts of venery are displayed, but away in the stormy islands of the north-west it is a battle stern and swift. You pass through green islands where the cormorants and seals are sunning themselves, and out through channels where pilot whales are rolling in the tideway, amongst the puffins and razorbills, and on to some rock-bestrewn isle where the oyster-catchers and the great black-backs herald your approach. Here, if your eye is practised, you will note the broken rocks and dark caves, where the water is still, and where the green cormorants sit, and an occasional blue-rock flies. This is the Sea-otter's home, and here you will find him amongst the broken cairns and hidden crevices. The laird knows the likeliest retreat, so amid silence you each seize a little dog and slip noiselessly ashore. Even the grating of the cobble on the rock is to be avoided, for Balgaire has quick ears, and is no fool. The terriers are now let go, and make at once for the cairn they know of old, whilst you and your host station yourselves with rifle and shot gun in a position favourable for a shot as the Otter bolts seawards.

A chorus of miniature yelps and screams of delight proclaim an immediate 'find.' The Sea-otter is at home and the battle has commenced. Confused

noises echo amongst the rocks, varying with the unmistakable sounds of rushing bodies, followed by the hisses and smothered yelps of the contending parties. Now and then a small yellow body, having been momentarily thrown out, will burst from a hole to see if his antagonist has escaped, and entering by another rejoins the carnival of war from another point. The Otter is making a good fight in his last stronghold, as he knows what bolting means, and that men are worse than dogs. Desperately he fights for his life for full ten minutes or a quarter of an hour, and then a black body surmounted by two yellow ones, with a third harassing the flank, are to be seen struggling and running over the rocks for the sea. The advent of the laird and a few loud words of protest to the dogs, and the Otter is rushing alone for the sea. Then the gun speaks, and the tragedy is over. A bungler may easily shoot a dog in this kind of Otter hunting, and the best struggle of tooth and nail is when the terriers kill the Otter in fair fight. In such the victory is often dearly bought, when only three or four terriers make the attack, as I have once seen, and the casualty list is generally considerable.

The earliest writers, such as Albertus Magnus, Aldrovandus, and Gesner, speak of the Otter as being easily tamed and trained, and most of us have read Izaak Walton, whose Piscator expressed a wish to have one of the young Otters the Huntsman had found. 'I pray, sir, save me one,' he says, 'and I'll try if I can make her tame, as I know an ingenious gentleman in Leicestershire, Mr. Nicholas Seagrave, has done; who hath not only made her tame, but to catch fish, and do many other things at pleasure.'

Speaking of tame Otters, Mr. Harting says:[1] 'Goldsmith mentions an Otter which would plunge into a pond at word of command, and, driving the fish up into a corner, would seize upon one of the largest and bring it to land. Bewick, Shaw, Daniel, MacGillivray, and Bishop Heber (in his "Indian Journal") record instances of the animal's docility in this way; and McDiarmid, in his "Sketches from Nature," gives an account of several tame Otters, one of which, belonging to a poor widow, kept her well supplied with fish from the river Urr and its tributary streams. One kept at Corsbie House, Wigtonshire, he says, evinced a great fondness for gooseberries; and another, belonging to Mr. Monteith, of Carstairs, though very tame, would steal away at night to fish by moonlight, returning to his kennel in the morning. A cobbler at Rothbury, on the Coquet, had a tame Otter, which was allowed its liberty, and would go off to fish and

[1] *Zoologist*, January 1904, p. 4.

return to the house, bringing a trout, after helping himself. He lived about five years, and was then accidentally killed in a gale of wind by a door slamming against him and crushing him.'

The late Mr. Assheton Smith, of Vaynol, had a great fondness for tame Otters, and one that he kept, which was eventually drowned by getting under the ice, would follow him everywhere like a dog, fish in a lake, and return whenever his master whistled to him.

In a letter to me Captain MacDonald of Waternish writes: 'I possessed a pair of tame Otters which would follow me everywhere, and when standing still they would climb up my legs and arms and on to my shoulders. They would follow me to the sea, and would go out and catch small fish and eat them. When satisfied they would amuse themselves by tossing the fish up in the air and catch them as they fell. When I moved away from the shore they would rush in and follow me home to their den.'

Mr. Wellington Farnborough, who has kept many Otters in confinement, speaks of their training[1]:

'When Otters are captured young they are easily tamed, and soon get strongly attached to those who may have the looking-after of them; so much so, in fact, that many instances are on record where they have been trained to enter the water in search of fish and bring back their spoils to their owner. Indeed, in India and China the systematic training of Otters for this purpose has been reduced to a fine art, and they are kept almost as frequently as cormorants are in the same countries and for the same purpose. The training, according to Bishop Heber, is very similar to that adopted for falcons; the Otter is taken when very young and dieted on bread and milk alone, fish being particularly eschewed. After a time the actual training commences: an artificial fish is tied to a cord and the animal persuaded to chase it and return with it to its master. After awhile a real fish is used in place of the artificial one; should the Otter mangle it while hunting it or bringing it to its owner it is punished, whilst if the fish is brought back uninjured the animal is encouraged by some particular dainty. The Bishop relates in his journal that the Otters were to be seen lying on the banks of the rivers with collars on their necks, plaited or woven out of straw, to which were attached long cords or ropes to prevent the animals wandering away on their own account and not returning to their owners. Some little difficulty is experienced at first in training the Otter—I am now speaking of the

[1] *Animal Life*, p. 295.

Common Otter—to return to the bank from which it started, and on which presumably its owner is awaiting its return, and many individuals cannot be broken at all of the habit of taking their captures on to the opposite bank and having their meal there before returning to their owner, leaving the partly consumed fish behind them. In such a case the best thing to do is always to use the Otter with a very thin cord—silk for preference—about ten yards longer than the width of the stream at its widest part: this permits the Otter perfect freedom in the water, but also allows the owner to bring it back to the proper bank after a capture. The line must be fine and yet strong. A silk fishing-line is light, fine, and strong, and the most suitable; it also has the merit of being cheap, as it may be got from a halfpenny per yard upwards.'

Nevertheless, so experienced a man with Otters as the late Captain Salvin told me he had never succeeded in training an Otter to retrieve a fish. He managed to get one tame Otter to fetch in a floating board on which a fish was nailed. When success seemed within his grasp the Otter strayed away one morning and was shot.[1]

Otters are fond of being played with and talked to, and I have noticed, a fact to which Mr. Farnborough alludes, that they have the greatest objection to being stroked on the head or touched about the nose and whiskers. In such circumstances they nearly always attempt to bite.

Mr. J. Davison has given an interesting account[2] of an Otter that learnt to hunt his own species.

'One Sunday afternoon, taking a walk down by the Thrum Mill, near Rothbury on the Coquet, to exercise our dogs, on getting to the top of the rocks one of the puppies gave tongue, and out came an Otter, with two whelps by her side, making for the river. We got in front, when the mother gained the rocks; but we secured the two whelps. We took them home, and put them with "Bell," an Otter-hound, who had a litter of three puppies. One of the whelps died, but the other took to the hound, and throve famously: he mixed with the puppies, but fought like a demon, and was soon master of the situation. Wherever they went he went with them, fighting everything that he met with. He also became a pet with all the householders, who never missed a chance of feeding him. His special treat was bowls of milk and broth; to get these he

[1] Accounts of tame Otters are to be found in *Rod and Gun*, October 31, 1889; the *Animal World*, March and August 1896; *Country Life*, April 1, 1899; and the *Field*, March 27, 1897, and December 19, 1903.

[2] *Field*, 1881, p. 111. See also Johnson's *Gamekeeper's Directory*.

would find his way into dairies, larders, &c. Thus he went on, until we had to enter the puppies for Otter hunting. We had him fastened in a yard with high walls, as we felt sure if we took him with us he would join his own species. On our return he bullied and fought the entire kennel of five. About a week after I had to go to Brinkburn Priory, and took the dogs with me. "Sandy," the tame Otter, would go, and in the Coquet they soon got on the lair of an Otter. They swam him through a deep pool, when he took to the bushes. Soon I saw "Sandy," side by side with "Rufus," close to the wild Otter. I said farewell to "Sandy," but presently I heard the pleasant sound "worry, worry." I thought "Rufus" had him, but on coming in sight, to my astonishment, "Sandy" had him fast by the neck, and held him till the dogs came up. From that time he was the leader in all our hunts, and was in at the death of nearly twenty Otters. But, alas! poor Sandy soon came to his end. Love of broth led him into the larder of the Star Inn. The cook, finding him wallowing in the broth, struck him with the wooden ladle—more to frighten than to hurt him, but his skull was fractured—and, after lingering for some days, he died, to the inexpressible regret of all who knew him.'

As long as our 'women must walk gay'—and that will be till the end of the chapter—so long will there be a demand for the beautiful pelt of the Otter, and so long too will men continue to set gin-traps, the cruellest invention of modern times, for their capture. In most Otter-hunting countries the gin-trap is not much in use, but everywhere else in the North of England and Scotland this abominable engine of destruction is set, often to inflict hours and even days of horrible suffering on some of our most beautiful creatures. With wonderful strength Otters often manage to drag one foot out of a trap, and have to go about three-legged for life. On the subject of trapping Otters Mr. Tom Speedy writes:[1] 'A small island on the Tweed covered with a species of dwarf willow, immediately under the rocky eminence and ruin of Norham Castle, used to be a favourite haunt of Otters. I have seen a dozen of his victims—heavy salmon, with a small bit eaten out behind the head—whence I arrived at the conclusion that the destruction to fish life by Otters must be great. Searching round the island, I found the tracks on the sand where he had emerged from the water. Placing a trap carefully covered on the spot, it was evident on the following morning that an Otter had been caught, but that he had managed to drag his foot out and escape. Being anxious that this should not happen again, I placed four traps a

[1] *Field*, August 8, 1903.

short distance from each other, in order that, if caught in one, the Otter, in struggling to escape, would get secured in another. For a fortnight thereafter I do not believe a single Otter landed on the island, as I daily rowed round in a boat, but could see no traces of him. Here I discovered the sagacity of these animals, as it became apparent they communicated to each other that this lonely island in the centre of the river was a place to be avoided. Weeks passed, and, being engaged on another part of the estate, I could only visit the traps in the evening. At last I was rewarded by securing a fine Otter, but as he was caught "fore and aft," and remained in the traps all day under a broiling sun, the cruelty perpetrated haunts me still. Acquiring experience, I subsequently learnt to place traps in the water at the spot where Otters land, and have a long chain attached to a heavy stone, in order that the animal may quickly drown himself.' And again:[1] 'In illustration of the craftiness of these animals, I may state that when a trap is set for their capture it will often be more than six weeks before they will approach the spot where it has been laid, though for months and months previously they had been in the habit of crossing the track nightly. Their power of scent is so acute that they easily detect that something of a strange odour has been in the neighbourhood of their trail, and by natural impulse they well know that there must be danger abroad. Their courage, too, is no less than their cunning—often when caught in a trap they will tug and tug and tug until they free themselves even at the loss of a pad. Some of these three-legged Otters have been killed by hounds, though had it been previously suggested to anyone living in their neighbourhood that traps were still set for their capture it would have been boldly denied, until the barefaced evidence brought disgrace on the population of a country where a pack of Otter-hounds is upheld.'

Otter skins have always been of considerable value. In this country a British Otter fetches ten to fifteen shillings when pulled, *i.e.* with the long outer hairs pulled out. In Canada a good Otter skin is worth twelve to fourteen dollars.

In Ireland rent was formerly paid in Otter skins. It appears from an unpublished Pipe Roll of Henry IV. that in 1408 John, son of Dermod, was charged two Otters' skins for his year's rent of Radon (Rathdown), five Otters' skins for the two and a half years preceding, and 162 Otters' skins for arrears of rent for many years then past, making a total of 169 skins.[2]

The Otter can hardly be said to have any enemies except man.

[1] *Field*, August 27, 1904.

[2] Gilbert, *Hist. Dublin*, 1859.

Young Otters have been found dead in the nests of the marsh harrier, says Sir Thomas Browne.[1] The same quaint observer says they can be made very tame, and that 'in some houses they have served for turnspits.' He also states that 'they are accounted no bad dish by many.'

Albinoes, cream-coloured and spotted varieties of the Otter, are not very rare; most of the large museums possess a specimen. In (the late) Henry Evans's collection there is a pure white Otter, and another is preserved in Kildalton House, Islay.[2]

There is another white Otter in the Belfast Museum, and I remember seeing two others: one exhibited in the Collection of Hunting Trophies at the American Exhibition, 1887; and the other in Mr. Walter Rothschild's private museum at Tring. Two cream-coloured Otters were killed in the river Aln some forty years ago, and another spotted all over the body with white ticks was preserved at Newcastle-on-Tyne.[3] Other references to white and pied Otters will be found in the 'Field,' March 2, 1872; Jan. 15, 1898; Jan. 22, 1898; Jan. 29, 1898; 'Zoologist,' 1869, p. 1926; 'Fishing Gazette,' June 24, 1893; 'Zoologist,' 1894, p. 381; 'Annals Scot. Nat. Hist.' 1903, p. 117. Mr. Gerald Lascelles writes: 'We twice hunted in the autumn of 1873 at Castle Boro', Co. Wexford, a cream-coloured Otter.'

A correspondent of the 'Fishing Gazette'[4] reported that a fine specimen of a black Otter had been caught at Burnharvie in Aberdeenshire. Melanism being almost unknown amongst the Mustelids, the writer may have been mistaken, and I have failed to trace his black Otter.

A curious capture of an Otter during the severe frost in December 1879 is related by Mr. Harting.[5] 'A farmer, residing near the river Irfon, a short distance above Llanwrtyd Wells, when walking by the river observed a great commotion in the water close to the edge of some thick ice; on going nearer he found it was caused by an Otter, which, strange as it may appear, was firmly frozen by its tail to the ice. Probably the Otter had been for some time sitting on the edge of the ice in wait for a passing fish, and on plunging in to secure its prey, found itself in durance vile. The poor beast's nails were quite worn to the flesh by scratching against a rock, and its teeth broken by biting the ice in its vain attempt to free itself. The Otter was secured and taken home by the farmer, but died the same night.'

[1] *Nat. Hist.* p. 56.
[2] Harvie-Brown and Buckley's *Fauna of Argyll*, 1892, p. 17.
[3] *Field*, May 17, 1862.
[4] Oct. 3, 1891.
[5] *Zoologist*, Jan. 1894, p. 3.

Another Otter met its death in a strange fashion on the riverside railway that runs between Newcastle and North Shields, being killed by the electric rail. The spot was in a thickly populated district four hundred yards from the river Tyne. The unfortunate beast had tried to creep under the rail and was electrocuted.[1]

Otters can take distemper. Of this Mr. Harting gives[2] two instances, in which tame Otters died of distemper which they had taken from dogs.

[1] *Field*, Dec. 3, 1904.

[2] *Zoologist*, January 1894, p. 7.

THE BADGERS

Sub-family *MELINÆ*

Genus *Meles*

ONLY one genus of the *Melinæ* is represented in our islands, and that by only a single species. The true Badgers are Palæarctic in range. The claws, strong and curved, are longer on the fore-feet than on the hind-feet; the animals are plantigrade. In this genus there are four pairs of premolars in each jaw, one pair of molars in the upper and two in the lower. The lower flesh-tooth is greatly developed. The lower jaw is firmly articulated to the skull; it is impossible to detach it without fracture.

THE COMMON BADGER

Meles meles, Linnæus.

Ursus meles, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 70 (1766).

Meles taxus, Boddaert, 'Elenchus Animal.' vol. i. p. 80 (1785); Bell, 'Brit. Quad.' 2nd ed. p. 158 (1874); Lydekker, 'Brit. Mam.' p. 126 (1895); Sir H. Johnston, 'Brit. Mam.' p. 143 (1903).

Meles vulgaris, Desmarest, 'Mammalogie,' p. 173 (1820).

Meles meles, Oldfield Thomas, 'Zool.' 4th ser., ii. p. 263 (1898).

Local Names.[1]—*Badget* (Norfolk); *Brock* (Welsh); *Grey*[2] (Cornwall, Wales); *Graye* ('Boke of St. Albans'); *Bawsened-pate*, *The Pate Broc* (Anglo-Saxon); *Earth-dog* (South of

[1] Various origins are assigned to the name of the Badger, but all of these are purely conjectural. That suggested by Mr. Harting is certainly the most reasonable: 'But, in regard to our English word "Badger," may it not be a corruption from the French *bêcheur*, a digger, from *bêcher*, to dig? Our language is full of such corruptions from the French, and our knowledge of the animal's habits renders the suggestion sufficiently plausible' (*Zoologist*, 1888, p. 4). The earliest name of the Badger was *taxos*, of which the modern German *Dachs* is evidently a corruption, whilst the Latin name of the animal, *meles*, may be derived from *mel* (honey), as indicating the creature's love of that product. There are many other suggested derivations of the word 'Badger,' some writers saying it came from the French *blaireau*, or Low Latin *bladius*, whilst others have traced its origin to the method of catching the animal in sacks or bags—hence 'baggers.' But all these are mere guesses, and not very good at that.

[2] 'There is a large family or little clan of people in this neighbourhood [Penzance] whose nickname is "Badger." They are a pugnacious lot, and will never themselves use this word "grey" nor permit it to be used with impunity in their presence. If they want to express the colour grey they use the word "blue"' (Thomas Cornish in *Zoologist*, 1878, p. 333).

Ireland); *Brocach* (Gaelic); *Broc* (Erse); *Le Gris* (French); *Daearfochyn* or *Dyarmochyn* (Earth-pig), *Byrfwch* ('Little Hairy Fellow'), *Prŷ-llwyd*, *Pryf-penfrith* (Old Welsh); *Brath-kye* (Old Cornish).

Characters.—The general colour of the Badger is a pure grey, formed by an admixture of white, reddish, and black variegations. The under parts (including the throat and legs) black; face and cheeks white, with a strong black longitudinal streak passing across the eyes and ears. MacGillivray says that the hair of the upper part is of two textures, a coarse fur and still coarser white hairs which are undulated, flattened, and pointed, and that the distal portion of most of the long hairs on the upper surface is black. The long hairs at the tip of the tail are whitish. The soles of the feet are naked. The cubs are a light silvery grey up to eight months old, after which they become much yellower in their coats, a tint they sometimes keep permanently; but after two years, Sir Alfred Pease says, they generally become of a darker, purer grey. The height at the shoulder is 11 inches; the length of the head and body of the adult male is about 28 inches, the tail being from 7½ to 8½ inches. The female is usually, but not always, slightly smaller than the male.

The weight of the Badger varies considerably. A large male weighs 25 lb., a female about 22 lb., but many exceed this weight. A specimen killed in Warwickshire is said to have weighed 43 lb., but this weight has been questioned. Mr. Arthur Heinemann, who has had great experience in digging out these animals, says:[1] 'The following weights of six Badgers of both sexes dug out by myself may be of interest: Boars, 35 lb., 33 lb., 33 lb., 32½ lb., 31½ lb., 30 lb.; sows, 34 lb., 31½ lb., 31 lb., 30 lb., 30 lb., 30 lb. All the above were taken in winter. The two biggest pairs from one earth were: Boar 33 lb., sow 34 lb.; and boar 33 lb., sow 30 lb. All were captured in Devon and Somerset, except the 35½ lb. boar, which came from Alwalton, Peterborough.' The largest Badger I have ever seen weighed 33 lb., and was killed at Dulverton, Somerset; from which it would seem that the Badgers of this district are of unusual size. One which was killed at Swalwell in the North of England in 1873 weighed 31 lb., but I have no record of a Scotch Badger reaching this weight. Sir Alfred Pease says that Badgers weigh heaviest in September, in which season they are fattest, and refers to the weights of the heaviest in the following terms:

'Badgers have been known to weigh up to or about 40 lb.; the largest I ever dug out and weighed was an old lean dog Badger that scaled over 35 lb.'

[1] *Field*, December 12, 1903.



THE BADGER.

MELES TAXUS.

Captain Staveley, too, records[1] a male Badger weighing 37 lb. which was dug out at Holbeton, South Devon, and more recently (January 2, 1904) Mr. G. Solly records one taken at Hopwas Wood, Congleton, as weighing 37 lb.

In general appearance the Badger is very bear-like, a thickset round-backed combination of bone and muscle. The head is wedge-shaped, and the muzzle fine and long; the ears are small, round, and close-set; the eyes are small, bluish black, and very bright. The legs are very short and strong, and the coat so thick that when the animal is moving it seems to proceed almost *ventre-à-terre*. Like the bear it is a plantigrade animal; that is, it plants its feet, including the heels, flat upon the ground, and consequently the spoor is unmistakable.

A peculiarity of the genus is a remarkable gland, the exit of which is situated under the root of the tail. It contains a fœtid oily matter, the exact use of which has never been determined, though many authors suggest that it is emitted as a means of defence, after the manner of stoats and skunks. This, however, is denied by Sir Alfred Pease, who offers new suggestions as to its uses. He says he has seen the Badger sucking and licking the gland, and believes that the animal obtains some nutriment or tonic from it during the period of retirement in the 'earth.'[2] This theory he finds to be supported by certain French authors whom he quotes.

We can hardly blame the taxidermist for the failures in his work, for he, poor fellow! is often too poverty-stricken to afford the time wherein to study those animals which he constantly sets up so erroneously. A stuffed Badger in motion is one of his usual horrors, because it is not the least like a real Badger in life. The head does not stick up like a stag's, nor does his tail stand straight out like a pointer's, for his usual gait is an easy and somewhat stealthy movement, with his nose close to the earth, and his body depressed—a characteristic particularly noticeable in the tail and hind legs, which seem to creep after him, being held low and flat. The rolling gait of the Badger has for centuries been the origin of the fable in Wales, Scotland, and other mountainous districts that the beast has shorter legs on one side than on the other. This is supposed to assist the animal in running rapidly along a steep hillside, though how it progresses when the short legs are the downhill side has never been properly explained. Thus Macaulay refers to Titus Oates as being 'as uneven as a Badger,' and a certain minor poet gives

[1] *Field*, November 28, 1903.

[2] I have seen Badgers in confinement licking this gland at all seasons of the year.—J. G. M.

publicity to the superstition in language that halts almost as much as the mythical creature of his theme:

> 'One long, the other short, that when he runs
> Upon the plain he halts, but when he runs
> On craggy rocks, or steepy hills, we see
> None runs more swift or easier than he.'

Dental Formula—I. $\frac{6}{6}$; C. $\frac{2}{2}$; P. $\frac{8}{8}$; M. $\frac{2}{4}$.

Bell, 'British Quadrupeds,' p. 165, says: 'The number of grinding teeth is variously stated by different naturalists as being $\frac{4}{5}\frac{4}{5}$, $\frac{4}{6}\frac{4}{6}$, $\frac{5}{5}\frac{5}{5}$, $\frac{5}{6}\frac{5}{6}$, according as a rudimentary false molar exists or is wanting immediately behind the canine, above or below.'

Blasius gives the four rudimentary teeth, and says they fall out.

'From two skulls in my possession,' says Mr. L. Adams, 'it seems that these rudimentary teeth are present in the young but absorbed later. My young skull has all four rudimentary teeth, while the other, that of a mature animal, has them both in the lower jaw, though more minute than the corresponding ones in the young skull; in the mature skull both rudimentary teeth are wanting in the upper jaw, though there are minute holes (nearly closed by the absorbing growth of the bone) showing where they once existed. No one, however, would suspect the loss of teeth from the appearance of the holes alone.'

Bell goes on to say: 'In F. Cuvier's figure and description it is wanting in the upper and exists in the lower.'

This agrees with my adult skull, and seems to prove that the upper rudimentary teeth are absorbed first, and those in the lower jaw later.

The condyle of the lower jaw not only fits into the glenoid surface of the upper jaw, but is partly surrounded by it; the glenoid surface grips it, extending over and under the condyle, so that it is impossible to disarticulate the jaw without fracturing the bone.

Distribution.—The Badger was regarded by Sir Richard Owen as 'the oldest known species of mammal now living on the face of the earth.' Remains of the animal have frequently been found in the Pleistocene deposits of both England and Ireland, and it is probable that it was formerly more abundant than it is to-day. At present it ranges over a greater part of Northern Europe and Asia, whilst in America there is another closely allied genus (although it makes its earths in open plains instead of forests), which is found anywhere from Mexico to Canada.

The Badger is now somewhat scarce, but very generally distributed throughout

England, Scotland, and Ireland. In England it has been reported from no fewer than thirty-two counties, whilst Mr. J. E. Harting, who has made a special study of the distribution of British Mammals within historic times, remarks on the former abundance of the species, as testified in the frequent occurrence of village names and places which have been called after the Badger, such as Brockhurst, Brockenhurst, Brockenborough, Brockford, Brockhall, Brockhampton (in four counties), Brockham Green, Brockholes, Brock-le-bank, Brocklesby, Brockley (in four counties), Brockmoor, and Brockworth. Numbers of families, too, took their names from these places or the animal itself, Brock being a common English name.[1] My friend Sir P. Brocklehurst, of Swythamley, has for his crest a Badger, and always keeps one of these animals as the emblem of his race.[2] In Scotland, too, many places end in this old Gaelic *broc*, of which some instances are given by Mr. Harvie-Brown ('Zoologist,' 1882, p. 1), such as *Alt-nam-broc*, Ross-shire; *Carn-broc*, Ayrshire; *Eas-ham-broc*, Inverness-shire; *Strath-broc*, Linlithgowshire; *Moniabroc*, Stirlingshire; *Monabroc*, Renfrewshire; and *Craig-nam-broc*, Argyllshire. There is also Broxburn in Linlithgowshire, and Brocks-brae in Stirlingshire.

Though scarce in the northern counties the Badger is now on the increase in most of the southern counties of England. In Sussex, for instance, are colonies which are protected at Ashburnham, Battle, Blanport, Catsfield, Crowhurst Park, Fairlight, Guestling, Hollington, Pett, Leddlescombe, Udinore, Westfield, Winchelsea, Denne, Knepp, West Grinstead, Tilgate, and St. Leonard's Forest; and I have recently ascertained that for some years a Badger earth has been regularly tenanted within two miles of the town of Brighton.

It may surprise some of my readers to know that Badgers are to be met with in the outskirts of London itself, for the Earls of Mansfield have long protected them at Caen Wood, Hampstead; and from recent inquiries I hear they are there to-day. Until recently, too, they were seen at Dollis Hill, near Willesden.

It has even been found to exist in several counties where for centuries its presence had been unsuspected. Mr. R. Garnett, writing to Sir A. Pease, in a letter which he kindly sends to me, says: 'The existence of the Badger in Devonshire was first shown by the extraordinary footmarks made by them in the snow

[1] It is possible that the old name of the Broke as well as the Brookes of Colebrooke, Fermanagh, was taken from the Erse or Gaelic *broc*, for in both cases the crest of these families is a Badger.

[2] Since these lines were written this fine old sportsman has joined the great majority. A typical squire of the best English type, who loved all our country sports, and had ever a cheery word and a laugh for every one, he will be missed by many, and by none more than those who knew him best.

early in 1855, and these were delineated in the "Illustrated News" of the time.' Another proof of the unsuspected existence of Badgers was afforded by their discovery in the Wookey Cavern in the Mendips when this was for the first time thoroughly explored. The country people had no idea that there were any Badgers in the district. There are still a few in the Kentish hills, and they are not uncommon in the Cotswolds, whilst in the Hertfordshire hills they are even numerous in certain localities.

In Hampshire the Badger is now common, especially in the New Forest where it is only destroyed when it threatens to become a nuisance, and in Somerset it is common, especially in the sandy soil of the Exe and the Barle valleys. In Devonshire they are exceedingly common. Mr. T. Dening White, Secretary to the Devonshire Badger Hounds, says: 'In the easternmost parts of my native county of Devon the Badger flourishes amazingly; here on almost every hillside, if not in every covert, are heads of earths, which have been "used" doubtless for hundreds of years, forming vast subterranean fortresses, which local tradition often avers extend for a mile or more back into the depths of the hills. Many a good terrier has "gone to ground" in these places never to return; many an anxious day has been spent listening and waiting for favourites who perchance have never come back, until you curse the earths and vow to be level with denizens that haunt them.' Though common enough in the Southern[1] and Midland counties, it is not numerous in the North of England, but a few are always to be found in the North Riding of Yorkshire, chiefly, says Sir A. Pease, in the hilly districts and moors between Scarborough and York.

Mr. Oxley Grabham, who has made a special study of the mammals of Yorkshire, says that Badgers are now common in some parts of that county. In the 'Field'[2] he says he knows of one wood where there are no fewer than twenty or thirty pairs of Badgers, and that in one place their earths cover nearly an acre of ground.

'The Badger still occurs,' says Mr. Coward, 'in certain quiet parts of Cheshire. There are a few in Delamere Forest, near Chelford, and in the neighbourhood of Broxton—a curious coincidence, for the name Broxton is very old.'

In Durham they are practically extinct, but in Northumberland they are still found in half a dozen places, especially in Sir John Swinburne's woods between Alnwick and Rothbury, Swarland.

[1] For an excellent account of the Badger in Cornwall see *Wild Life at the Land's End.*

[2] February 3, 1900.



STUDIES OF BADGERS.

From life.

In the Lake District the late Rev. H. A. Macpherson tells us that Badgers have been practically extirpated since 1835, though since that date they have occasionally been met with on the fells of Windermere owing to the breeding of escaped animals. Recently, however, Badgers have been reintroduced into this district.

They are to be found in every county in Scotland except Caithness. Though nowhere numerous, and seldom molested, they are not uniformly distributed, but exist only in certain areas. There is little doubt that in the north and north-west they are decreasing, but are probably quite as numerous as ever in the South. They exhibit a marked preference for stony hillsides where the soil is sandy, and are generally to be found in large woods where such conditions occur.

Badgers are still found locally in Galloway, Wigtown, Ayr, and Peebles, but they are much commoner in the counties adjoining the East Coast, such as Berwick, where they are numerous, and East Lothian, where they are not uncommon still and until recently were found on every estate (W. Evans). In Dumbarton they frequent Loch Lomond side and the Glenfalloch range, as well as Kilbride and Ardrossan. In wooded Perthshire they are still found about Loch Tay, and occasionally all down the Tay valley near to Perth itself, where in 1880 I saw a fine old male that had just been killed close to the town. Up the Earn valley they are now rare, though once common, and are extinct in the Carse of Gowrie. In a lifetime spent in this county I have seen few Badgers that were killed here, though every now and then an odd specimen was captured up in the hills about Callander and Pitlochry. In Argyll they are sparsely found in Portlalloch, Benmore, Ardlamont, and a few other places; they also exist in Arran. In Inverness and Argyll they still exist in several districts, the last one captured of which I have any note being taken up in the deer forest of Glenfeshie in the spring of 1903. In Western Argyll they used to be very common, but are now considered rare in Lochaber, Locheil, Sunart, and Moidart. Scarce in Aberdeen, and existing for certain only on one property on Dee side (as I am informed by Mr. Geo. Sim), they are still found in the woods of Darnaway and Cawdor, Nairnshire. In Ross they are rare, as well as in Sutherland, where they have long existed at Dunrobin and in the Reay forest. There is no record of Badgers occurring in Caithness, although their bones have been found there. In Western Ross they are rare, but have been recently taken in Fannich deer forest, whilst about Loch Maree, once a great stronghold, they are almost if not quite extinct.

The Badger is not a native of any of the outer islands of Scotland, nor is

there any record of the animal having occurred there; but Mr. Harvie-Brown tells us that the species has been recently introduced into Jura and upon Ailsa Craig.[1]

In Ireland Badgers are about as numerous to-day as when Thompson wrote in 1855. He states that they were found in every county, and they have probably neither increased nor diminished since that date. When living at Fermoy in 1891 I heard of various Badger earths in both Kerry and Cork, generally situated in private 'demesnes,' where they could be protected. The animals, according to various writers in the 'Field,' seem to be fairly numerous about Clonmel, co. Clare, and in the wilds of Galway.

Habits.—Unless the observer goes somewhat out of his way to study the characteristics of this peculiar animal, he is apt to come to the conclusion, based solely on diurnal observations, that the Badger is but a sleepy and slothful sybarite of little sagacity, and consequently of little interest. But this is not the true case, for the Badger is certainly one of the most interesting animals we possess—a beast of strongly marked idiosyncrasies, and, like the bear, full of intelligence, cunning, and pluck. A truly dogged persistence combined with ready resource are characteristics that naturally appeal to a Briton, and these attributes the Badger undoubtedly possesses in no small degree, without exhibiting either the low cunning of the fox or the cruel fierceness of the cat. Hence the abundant literature and notes (most adulatory) that for ever crowd the public press and magazines devoted to British zoology. Every observer of nature who comes across the Badger and sees some of its little ways likes to write about it. Indeed upon this subject whole volumes could be compiled from the notes in the 'Field' and the 'Zoologist' alone. It has even been honoured by a monograph from the pen of Sir Alfred Pease, who has written by far the best personal notes on the animal itself, to say nothing of the mass of material which he has carefully summarised from the pages of the above-mentioned periodicals and others. All this literature of the Badger delineates an animal of considerable strength of character and individual charm, and though its little peccadilloes may bring it into antagonism with either the farmer or the game preserver, yet few animals of its size can boast so blameless a life.

The favourite haunts of the Badger are deep woods or thick copses on the sides of hills where the soil is generally of a light and easily workable character. In this soil with long and powerful claws it digs out its house, which may consist of one or more apartments, reached by a somewhat tortuous passage with but one

[1] *Zoologist*, 1882, p. 1; and Hugh Boyd Watt, *Land Mammals of the Clyde Faunal Area*, p. 9.

entrance. This, however, is not always the case; there may be many entrances to the home. Here it sleeps for the greater part of the day, coming abroad before or after sundown to range the woods, and sometimes the open land, in search of its miscellaneous diet.

During the day Badgers, which generally live in pairs, are said by the best observers to lie close to the exit of their earths, and the same habit is observable in Badgers in confinement. They generally lie close to the door of their shelter, and when quite tame they commonly prefer to sleep right out in the open air, the density of their coats and the strong circulation of their blood making them absolutely indifferent to any inclemency of the weather. During three days of exceptional severity in December 1902, when it was blowing a strong blizzard, I noticed a tame Badger belonging to Sir P. Brocklehurst, of Swythamley, sleeping all day up a tree in a most uncomfortable position, facing the storm. On being disturbed it growled unpleasantly, and when ousted from its perch resumed it at the earliest opportunity.

One of the most interesting accounts of the natural history of the Badger, written from personal observation, appeared in the 'Times' of October 24, 1877. The writer—the late Mr. Alfred Ellis, who lived near Loughborough—had unusually good opportunities for watching the animals, as the 'set' was only some 150 yards away from his house. Some of his remarks touch on points not mentioned by other writers, such as the following: 'The Badger, like the bear, treads upon the whole heel, and in its walk closely resembles that animal. They caress each other in the same grotesque manner while they gambol at play, and at times they utter a cry so loud as to startle anyone ignorant of its source. It is not unlike the chatter of the stoat, but many times louder. On fine evenings we can watch them dress their fur-like coats, and search for parasites after the manner of monkeys.'

Little has been written about the Badger in Scotland beyond Mr. Harvie-Brown's admirable articles dealing with its general distribution.[1] The Lowland Badger, which inhabits principally the central, south, and south-east parts of the Northern Counties, is precisely similar in its habits to its cousin of the south, but in the Highlands of the north, commencing with the rocky Grampians and extending away north to the hills of Ross, there is another Badger which, although externally the same beast, differs considerably in its habits and general mode of life. Living in stone cairns, often on the very summit of the highest peaks, it leads a life of perfect seclusion and freedom from molestation. The

[1] *Zoologist*, 1882, p. 1.

foresters and shepherds who are its only human visitors but rarely see it, and still less rarely interfere with it; many do not even know that it is upon their ground. Above the haunts of either the grouse or the stag, it lives among the mists with the ptarmigan and the mountain hare on which, together with grubs and roots, it largely subsists. I have seldom met a forester who has seen one of these hardy mountaineers, but many know the Badger to frequent certain cairns, for they see the footprints in the first snow. The Hill Badger is seldom taken, for as Mr. J. H. Crawford pertinently remarks, 'He may get into traps set for something else, but the traps must first of all come to him, and, as his is a secluded way lying pretty near home, he generally manages to escape such risks.' Consequently, away up in the clouds, it enjoys an almost certain immunity from danger, and it is a wonder that the animal is not commoner than it is: a circumstance perhaps accounted for by the poverty of the land and the consequent small family. In old times in the Highlands Badgers must have been more common than to-day, for on many Northern estates there was employed a person called *Brocair*, i.e. the Badgerman, whose duty it was to capture these animals.[1]

The Badger's earth is generally called his 'set,' and Sir A. Pease, who has unearthed many Badgers, says that they vary in respect of size, number of entrances, depth of galleries, and choice of site almost as much as rabbit-holes.[2] 'Sometimes,' he continues, 'Badgers will find sufficient room in rocks to make a home, and it is extraordinary the excavations they occasionally make in apparently solid rock. Usually, however, they select some softer material in which to make their underground passages and chambers. They will choose a quiet hillside away from man's habitation, amongst the whin bushes, or in the woods near a stream or small runnel of water. Such a "set," if long established, will penetrate through earth, clay, and subsoil, to some stratum of shale, or sand, or loose rock. Some of the galleries and chambers will be at a great distance from the surface, and some at an enormous depth. When a new earth is made I have always found the Badger appropriate the holes of rabbits, and proceed to excavate, enlarge, and open them out. This operation of opening a new earth takes place constantly in the spring time, great masses of material being thrown out; but as

[1] In Scotland the year 1842 is often spoken of as having been a disastrous one for the poor Badgers, as this year, following on the advent of the Queen's visit and the revived interest in the kilt and its attendant sporan, was responsible for the death of many of these animals.

[2] I am acquainted with a Badger 'set' in Staffordshire in which there are no fewer than forty-four openings to the galleries, all *in view* at once.—J. G. M.



Spring Cleaning

often as not the new house is abandoned before completed, and the subsequent labours of the family are devoted to repairing, enlarging, and making new front and back doors to the old place.'

About the month of March Badgers often have a regular spring cleaning. All the old winter bedding is thrown out, and the animals themselves repair to another of the chambers where the female brings forth her young ones. I have recently seen (April 1903) as much as three or four cartloads of rubbish ejected from an earth in west Sussex, and the keeper told me that he has seen the Badgers at this season carrying fresh litter to form new beds, and on this point I must again quote Sir A. Pease, who gives a charming description of the method employed. 'The Badger will come out,' he says, 'take a look round, and sit awhile close to the mouth of the hole. He will then shuffle about and get further from the hole. You will watch him descend into some bracken-covered hollow, and will see nothing more of him for a while. Then you will hear him gently pushing and shoving and grunting, and know that he is very busy over something. He will reappear bumping along backwards a heap of bracken and of grass or old straw, left from a pheasant feed, under his belly and encircled by his arms and fore-feet. He will continue this most undignified and curious mode of retrogression to the earth, and will disappear, tail first, down his hole, still hugging and tugging at his burden.'[1]

After the female Badger has brought forth her young ones, and they are of some size, the lying-in chamber is said to be thoroughly scoured out, but most writers are agreed that fresh bedding is not taken in until June, July, or August, and certainly the work of keeping the home in good order is continued much later in the year, even as late as November.

The length and variability of the gestation of the Badger have given rise at different times to much discussion amongst naturalists, and now a very generally accepted theory is that when the period of pregnancy has lasted (as sometimes happens in the case of animals in confinement) as long as twelve or even fifteen months,[2] the impregnated ovum undergoes a long period of very slow growth

[1] I have seen the female Badger now in the Zoological Gardens (1903) going through exactly the same manœuvres. She had brought a great quantity of straw out of the retreat and, for want of fresh litter, was collecting it under her belly to take it back again.

[2] There is, too, more than one undoubted instance of a female Badger producing young after fifteen months, during which she could have had no visits from another of her own species. In 1891 a female Badger was imported from Spain and lived in complete confinement for fifteen months, and then gave birth to one young one, which she reared and lost. Mr. Freeland Young (*Field*, September 17, 1864) records a similar instance of a fifteen months' gestation.

before development.[1] These remarkable deviations from the usual course of nature are doubtless due to the unnatural conditions of domestication, for nearly all the observations of warrantable field naturalists tend to show that Badgers at large mate in October, and that the young are born in February, March, or April. Usually the birth takes place in March, very rarely as early as January. So excellent and careful an observer as Sir A. Pease thinks they go with young for as short a period as nine weeks, whilst Captain Salvin, who has kept many in confinement, tells me the period of gestation takes as long as from eleven to thirteen months.[2] Two extremes of opinion are thus entertained, but I am inclined to think that though many instances may be cited in support of both estimates, the general rule is that the female Badger goes with young about twenty-two weeks.[3] When she has thoroughly prepared her place of accouchement she gives birth to two or three young ones, sometimes four, and I have once heard of six.[4] These are blind till about the ninth or tenth day, and do not begin to show themselves at the mouth of the 'set' until they are about two months old. After the beginning of June if you have a good stock of patience and a disregard for the midges, you can see them and the mother nearly every fine evening. In the management of her cubs the mother Badger is a strict disciplinarian. Unlike the vixen fox, who lies up at a distance from her cubs as soon as they are able to take care of themselves, she attends personally to all their wants, comforts, and safety. In a litter of tame Badgers that I have recently had the pleasure of observing the mother would every evening take each cub in turn and thoroughly overhaul its coat for parasites. Grooming each in turn with champing jaws she turned them over and over with her nose till every part of her offspring had been successfully explored and thus relieved them of the annoying pests which at that age they seem unable to destroy. When about to come forth for the evening ramble the old Badger will often come to the entrance of the hole and there

[1] A similar suspension of gestation occurs in the case of the female roedeer. Several writers consider that the ovum undergoes a period of complete quiescence, *i.e.* from August till Christmas, after which the fœtus develops rapidly in the usual manner. This is not, however, correct, as it has been found that the growth is continuous after impregnation, although very slow.

[2] Cp. A. H. Cocks, *Zoologist*, December 1903 and March 1904; also C. Cook, *Zoologist*, January 1904; Meade Waldo, *Zoologist*, 1894, p. 221; J. R. Denwood, *Zoologist*, May 1894, p. 186; and *Zoologist*, 1888, pp. 12, 13; *Field*, July 10, 1897.

[3] Mr. Arthur Heinemann says (*Field*, March 7, 1903) he has thrice found Badger cubs during the first fortnight in February.

[4] Badgers occasionally produce their young above ground, an instance of which is reported in the *Field* of April 4, 1903, as follows: 'While cutting a very thick gorse covert in Staffordshire on March 30 we found a litter of five Badgers lying in a shallow nest with no protection beyond that afforded by the gorse bushes. Is not this unusual? I may add that there are plenty of strong earths in the neighbourhood used by Badgers.—A. E.'

remain motionless, watching and listening to every sound in the surrounding woods in case something may be heard that will give a clue to approaching danger. During this period of precaution she rigidly keeps her family in the rear, and only when she is perfectly assured that all is safe do the family come forth with a rush.

Mr. T. Dening White in his capital article on the Devonshire Badgers[1] says: 'I have seen her (a female Badger) turn back and shake severely a cub that would insist on following its dam away from home, the poor little chap hobbling a retreat, very injured at heart, stopping to perch on its haunches and gaze wistfully in the direction its mother had gone.' If food is regularly placed outside the earth, Badgers soon become comparatively tame, and even the old ones will permit a close approach; but the slightest clumsy movement or unusual sound will send them scurrying into the burrow, from which they will not emerge for some time. A good many years ago I used to go in the summer evenings and watch the Badgers come out of their holes in a disused rabbit warren near Condover Hall in Shropshire, and I found that with due caution and some patience I could get very close without causing alarm. At first they would not leave the neighbourhood of the earth; but as the young grew larger, they would come out into the wood and run about, though ever suspicious and watchful. On fine autumn evenings I think that Badgers leave their homes to go for the usual midnight forage at an earlier hour. Once I was sitting on a bank by the side of Loch Ness,[2] trying to unravel one of those awful messes into which one's flies and minnows entangle themselves when the angler's tin box of fish-lures gets upset, when I heard a rustling sound in the bracken behind me. Turning round I expected to see a stag or a roe—for it was in part of the Balmacaan forest—when a fine old mother Badger, closely followed by her three well-grown youngsters, came shuffling along looking for roots and insects. They seemed to be snouting up the ground as they moved, after the manner of pigs, and were quite unaware of my presence, although I sat within ten yards of them. They performed a complete circle round the small wood above my position, and then passed on right over the open moor towards another belt of bushes where I lost sight of them. To see the Badger at home we must take up our position before sunset and await the coming of night. The fork of a tree is a good site, as most animals, Badgers included, never look upwards, and you can see all things

[1] *Badminton Magazine*, July 1903.

[2] St. John in his *Wild Sports and Natural History of the Highlands*, p. 272, gives an interesting account of Badgers he saw near Loch Ness.

without being seen. In meditative silence you look and listen as the sounds of daily life gradually die and the voices of the evening float through the surrounding landscape. When you have climbed to your perch the cuckoo is still uttering his monotonous call, the woodpigeon cooing, or the turtle dove purring to his mate. The farm boy sings in his raucous voice as he is driving the cows home from pasture, and all nature is preparing itself for rest. Bang goes a distant gun, and you see a wave of scurrying rabbits making for the cover. The sound is perhaps followed by a sharp squeal of pain or the cry of the man to his dog, and then all is silence for a while. The sun sinks below the horizon, and the swallows and swifts alone pursue their prey as the first pipistrelle flitters past your tree. Soon the swallows are gone to roost, and you listen and wonder where the swifts are going to, as their screaming voices sound fainter and fainter away up in the clouds. They have gone, too, and the first notes of the nightingale and the long-eared owl tell you that night is coming on. An hour has gone since you first climbed the tree; you have become stiff and cold, and the midges annoy you; but happily the evening breeze sweeps them all away, and soothed by the gentle rustle in the surrounding foliage you cease to think of your discomfort. You can still see in the hazy landscape the long line of feeding rabbits, for their fears are once more set at rest. When looking towards the 'set' you notice the clean white head with the two black lines that you have come to see. Another head looks out, and yet another, and then with a short run the old Badgers are out and sitting down to listen. They are soon followed by the youngsters, who start a game of romps as their elders gradually wander away to forage amongst the nettles and the foxgloves. Perhaps the harvest moon has risen to show you all you want to see, or you may have to be content with a flimsy grey streak or two, almost indistinguishable from the spots of light discernible in the twilight. You may be lucky and watch for an hour the gambols of the little Badgers and learn things about their natural history the pleasures of which are unknown to the 'desk' naturalist. At any rate you will have spent a pleasant evening, never without interest, where the voice of Nature and her wild creatures have played their part.

Where they receive protection it is not unusual for several Badgers to inhabit the same group of holes. Indeed as many as eight to ten full-grown animals have been known to live thus amicably together. The Badger is not by nature savage, but rather amiable, shy, and evidently fond of company. A female, however, will defend her young with great bravery. Like many Mammals the

adult male lives apart during the period when the female is rearing her young. He either goes away of his own accord, to avoid the noise and bustle of family cares, or is driven off by the female. With rodents it is a natural instinct on the part of the mother to protect her children, for the males will often kill and eat the young; and though we cannot accuse the harmless Badgers of such unnatural practices, yet the fact remains that from the month of February until July he generally occupies another chamber in the earth.

The general characteristics of the species are thus summarised by Sir A. Pease: 'No animal prefers a more quiet life, loving a warm bed in a dry dark corner of earth and rocks. He loves to sleep and meditate in peace for the greater part of the twenty-four hours. He lies not far within his entrance hall during the spring and summer, and on a hot day he will sometimes come to the mouth of his hole. In the evening in June and July he will come outside, sit looking into the wood, or shuffle round the bushes, stretch himself against the tree stems, or have a clumsy romp with his wife and little ones; and when the daylight dies he will hurry off, rushing through the covert for his nightly ramble. In the summer he will travel as far as six miles from home, but he is in bed again an hour before sunrise. . . . At other times of the year, when the days are short and the nights longer, he comes out later in the evening, waits for a moment at the mouth of his earth, takes a preliminary sniff round, and then rushes off at his top speed into the cover.'

During his hours of movement the Badger is one of the most restless animals in existence. He is constantly busy about something or other, scratching, working in the earth, searching for parasites, romping or bullying his wife when she shows a disposition to go to sleep, rubbing his back, or rolling about and jerking and jumping from one thing to another. This makes him one of the most heart-breaking models an artist can engage. After spending a day trying to 'draw' a Badger in the pictorial sense of the word, you will find him almost as refractory as a fox terrier, and may feel inclined to kick him out of the studio without wages. Even in sleep he is just as fidgety, seldom lying in one position for two minutes together, and gives you the idea that he dines perpetually on lobster salad. He is, too, of all creatures, the most inquisitive. He wants to know the why and the wherefore of everything, and his persistence in pursuit of knowledge is remarkable. Not even bricks and cement can prevent him from indulging his curiosity about things that were much better left alone, and with his powerful claws he will work away for hours at an obstacle that would discourage anyone but a genius or an

Irish member of Parliament. Consequently he sometimes achieves surprising results in boring operations, and men are astonished at his strength and perseverance. When he has been particularly busy about any operation nothing annoys him more than for his wife to go to sleep. He cannot stand it for a moment, and at once goes and wakes her up. This is very human, for we are all more or less annoyed with people who evince no interest in our work. 'Ur—r—r; go 'way; lemme go to sleep; it's too hot for that job,' says the sleepy lady in badgerian language. 'No, you must come and see what I've been doing,' he urges. 'Shan't.' 'All right; then I'm going to bite you,' and he does it in no gentle fashion, too, making her cry and chatter with pain. She sees it is no good, and so, thoroughly aroused, has a good-natured romp with her husband and goes to inspect his work. If the male goes to sleep whilst the female has been digging at a difficult place, she will act in a precisely similar fashion and go and disturb his slumbers; but he is seldom so amiable as his wife, and will sometimes give her a very severe bite.

As regards the sounds emitted by the Badger, I have never heard one bark or yelp, as Sir Harry Johnston states they do.[1] Their usual cry of pleasure is a chuckling sound or a grunt. They will also chatter loudly with a stoat-like cry in fear or discomfort, and Mr. Arthur Heinemann[2] says he has heard them cry like a hare when hounds have seized them. These noises, with their growls of anger, are the only sounds they make.

The food of the Badger is like that of the bear. As before remarked, the animal is omnivorous. It will eat almost anything in the way of fruit, meat, or vegetables, showing a marked preference for roots, nuts, birds' eggs, reptiles, small mammals, young birds, frogs, and insects, and especially worms, slugs, and snails of various kinds. It also likes pig-nuts and hyacinth bulbs, acorns, slowworms and vipers, and seems especially partial to the grubs of wasps, which it extracts from the combs regardless of the attacks of the adult insects, which are incapable of penetrating its wiry coat. There is little doubt, too, that the Badger kills a certain number of young rabbits, and takes now and then a few pheasants' and wild ducks' eggs; but unless the earth is situated in the midst of temptation it is a pity to molest these harmless creatures. I know of one place in the Wiltshire Downs where Badgers come almost every spring to make a fresh burrow close to a large rabbit warren, from which they are as regularly evicted or killed. Yet fresh Badgers always keep turning up from the neighbourhood.

Colonel Reid tells me that when he was living in Somerset a pair of Badgers

[1] *British Mammals*, p. 145.

[2] *Field*, December 19, 1903.



BADGERS ATTACKING A WASPS' NEST.

came to an earth close to his house, and from their quarters there they made such attacks on the wild ducks' nests as not to leave a sound egg in the vicinity. Yet these sins of individuals, as in the case of certain hawks, gulls, and rooks, are only slight errors from the sportsman's point of view, and not necessarily the natural habit of every pair of Badgers. The keeper, however, seldom discriminates, and so the Badger, as a rule, finds little favour in his eyes. A crime, in the eyes of the foxhunter, is the Badger's supposed hostility towards fox cubs when the two animals have formed their homes close together, as they occasionally do. Such neighbourly quarrels were supposed to have occurred one summer in the large 'earths' in Epping Forest, when both juvenile Badgers and foxes were found lying dead outside the holes. But the evidence against either species was purely circumstantial; and even if the Badger mother had slain one of her neighbour's children in a fit of jealous rage, it by no means follows that Badgers make a practice of attacking fox cubs. In another colony in Sussex where both animals lived side by side for many years no such internecine warfare has ever been reported, and many more instances could be cited where the two species have lived amicably together. There is very little doubt, however, that jealous Badgers do occasionally commit vulpicide. Young foxes have often been found bitten to death, but these atrocities are not always traced to the Badgers. An alien dog fox or a barren vixen will often kill strange cubs of its own species.

Even if the foxhunter can be convinced that the Badger is no vulpicide, he is none the less irreconcilable. In his eyes the Badger's greatest sin is quite indefensible—namely, his digging out of 'stopped' fox-earths—and it is useless to argue in favour of the harmless night wanderer with those who are already convinced of its wickedness.[1]

There is a curious instance of a fox and a Badger being trapped from the same earth, related in the 'Field' of May 15, 1886. A keeper, who had set the traps overnight, found next morning a Badger trapped in one hole and a vixen fox suckling her young in the other. The fox was released, and seemed none the worse for her misadventure, but the Badger succumbed a few days after to paralysis of the tongue.

Badgers generally take very young rabbits, to which they are partial, by scenting the nest from above ground. They then dig directly down to the spot where the nest is situated. There are many people still who regard the Badger as an evil-smelling beast, and foul in his habits. 'Stinking as a Brock' is a

[1] In the West of England Badgers are said to injure crops by rolling in the standing corn.

common remark in rural England. Yet Buffon long ago dwelt on the cleanly nature of the Badger, and certainly the 'sets' that I have seen unearthed were not the offensive places that many writers would have us believe. There was a distinct 'badgery' smell, but by no means a disagreeable one; it has nothing of a repulsive nature, like that of the fox's home. It is unusual for a Badger to foul its den, for as a rule it goes to some little distance, digs a hole, and leaves its excrement there.[1] True, the animal is afflicted with certain parasites and fleas, but so are all British Mammals except seals and whales,[2] and in this respect it is no worse than rabbits and mice.

Sir A. Pease says that they sometimes foul their dens, but this is surely exceptional, for the late Mr. Ellis and his brother-in-law, in writing of the cleanly habits of the Badger, make allusion to the fact that the animals will not take into the earth the mud that clings to their feet after a wet night, but, so to speak, carefully wipe their feet on the mat, the mat being, in the particular case of the Loughborough Badgers, a silver birch tree that overhung the entrance to the 'set.'

The idea, too, entertained by many gamekeepers, who are often the most unobservant of men, that the animals fully hibernate and remain in their holes the entire winter, is another fallacy, at least so far as Britain is concerned. They certainly possess a strong hibernating tendency, and seem less disposed to move about in cold and snow than at warmer seasons; but that they remain sleeping in their holes for even a week or two at a time has not been proved. Badgers' tracks can frequently be seen in the snow, though there is a disposition amongst the animals living in Scotland to move about less in winter than their English cousins, probably owing to the difficulty of obtaining food. The Badger is capable of enduring considerable fasts without inconvenience, and doubtless eats far less in winter than in summer, his condition in the winter months enabling him to undergo a long abstinence. About Michaelmas the Badger is fattest; it then becomes restless, is said to come out less, and those in confinement will eat little at this season. As the winter advances they gradually become more and more dormant, until a state of semi-hibernation takes place, varying according to season and climate.

In Germany, Sweden, and South Prussia Badgers may be said to hibernate completely, for in most winters they sleep continuously from November to March;

[1] Mr. Harting amusingly remarks that Badgers were evidently the original inventors of the 'earth-closet,' though modern patentees have sought to deprive them of the credit which properly belongs to them (*Zoologist*, May 1894, p. 186).

[2] Mr. N. C. Rothschild now informs me that seals are attacked by a parasite, whilst whales, especially the Hump-backed Whale, are often infested about the head by parasitic crustaceæ.

but Ekstrom remarks that their winter sleep is not deep, for, like bats, they will emerge to feed if a long thaw sets in. The late Mr. Ellis, writing from Loughborough, says: 'I have known the mouth of the earth covered with a coat of snow for fourteen days, and it might have been much longer before they came forth, while they may sometimes be tracked in a thin snow for a long distance.'

The Badger is captured in various ways,[1] the most common one being to place a sack at the entrance of the hole, and in the evening, when the beast is out feeding, to drive it into this. The sack is fixed with a running noose at the mouth, so that when the animal charges into its den it is both enveloped and held. Another method is to hunt the Badger with beagles, after stopping the entrance of the earth; so the animal, finding its retreat closed, soon turns to bay, and is dispatched by a blow on the nose, perhaps its most vulnerable point.

The following account of hunting the Badger at night is taken from a Western newspaper: 'When hunted after the fashion generally adopted in the West, he affords excellent sport to those who are prepared to face a long tramp and the loss of some of their night's rest. The prosaic way of digging them out of the earth involves much labour, and has in it no element of sport, while attempting to catch Badgers in traps is about as feasible as trying to catch birds by putting salt on their tails. Driving them into sacks fixed in the earth is unsatisfactory, as a good game dog is necessary to press the Badger hard, or he will turn from the earth and seek shelter elsewhere; while, if you have a good dog, the sacks are unnecessary except for the reception of the Badger when caught by the dog.

'The paraphernalia of the chase are simple, namely, a good dog, a pair of badger-tongs, and a sack. A really good dog is very difficult to obtain. The favourite kind is a cross-bred bull terrier, about forty pounds in weight. Pure-bred bull terriers, for some reason or other, do not seem to give satisfaction. The "tongs" have wooden handles and iron heads with blunt teeth for grasping the Badger when held by the dog. For a successful hunt it is necessary to observe which way the Badger travels from the earth. A favourite spot is the slope of a hill, or high-lying fields where they may be easily tracked by the "roots," *i.e.* small holes which they scratch in the ground in search of beetles and roots of various kinds. They rarely descend into low-lying meadows except to drink.

[1] Sir Harry Johnston, in *British Mammals*, p. 148, says that 'in parts of Germany, when the situation of the Badger's burrow was located, an instrument like a huge corkscrew was driven down from the soil above till it either transfixed the Badger or drove him out of his hole,' a legend on which Mr. Arthur Heinemann amusingly comments (*Field*, December 19, 1903) saying that this was probably the origin of the phrase 'to draw a Badger.'

Choose a starlight night with a slight breeze blowing, and approach the earth up the wind. Do not hurry your dog: if he knows his work he will range freely, but he often takes a long time to puzzle out the track. If you miss him go on slowly in the direction in which you last saw him, often stopping to listen.

'What is that? The dry sticks crack in a hedge far below you. Hark! two sharp eager barks; what does it mean? Why, that "Grip" is wheeling out in a half-circle to gain slightly on the Badger, and then to dash in and get him by the head. Run now as you never ran before. Head over heels into a ditch; never mind, up and on again—the best dog can't hold a Badger for ever. There they are, out in the open, Grip with a tight hold of the Badger by the side of the head, with his legs tucked back out of harm's way. Grasp him with the tongs as near the neck as possible. Take off the dog, someone. Hold the bag; hoist our grey-coated friend into the air, and lower him into the sack; he weighs at least thirty pounds. The dog is hardly marked, and you have not torn more than three rents in your nether garments getting through that last thorn hedge. Altogether everyone agrees that it was a satisfactory little run.

'The old English sheep-dog I have known do well for the other method. The Badger, when pursued, makes straight for home, blunders headlong into the hole, only to find that his efforts to get in are closing the mouth of the sack; that retreat and fighting are alike in vain; and that he is an imprisoned bag-man without having struck a blow in self-defence. It is not uncommon for a Badger thus pursued to stand at bay, when a good dog may keep him in play, or hold on, till you come up and secure him. No doubt there is excitement and amusement in the moonlight chase, and to some it is preferable to the arduous labour with pick, spade, axe, and terrier.'

These modes of taking the Badger are most often resorted to where the animals have become destructive, and it has been found impossible to trap them. There is no European animal which is so difficult to take with a gin. I do know of a certain method by which the Badger may be easily caught with an ordinary spring trap, but it is unnecessary to give it here. The Badger has an excellent and delicate sense of smell, and its power of detecting a hidden danger is extraordinary. Instead of avoiding the engine of destruction, it seems to take a peculiar pleasure or thoughtfulness for future safety, call it what you will, in springing the trap. This it does by turning a somersault over the dangerous spot, its weight being sufficient to set off the trap, and its long back hair being so resilient that its back escapes being gripped.

I first heard of this from an old keeper in Wiltshire, who, wishing to destroy a Badger that had become mischievous, set many gins under a rookery where the animal came nightly to hunt for young rooks that had dropped from the nests. He placed a circle of traps round a young rabbit or rook, and one or two of these were always sprung in the morning and the bait gone; sometimes hairs from the back of the Badger were left in the trap. So one fine evening he determined to see for himself how the marvel was done, and accordingly ascended a tree from which he had a good view of the bait and the circle of traps. It was still fairly light when the Badger came beneath the tree in which he was hidden, and he distinctly saw the cunning animal walk boldly up to the nearest trap and stop and sniff at it. Then to the wondering eyes of the man the Badger turned a quick head-over-heels over the gin, and walked up to the bait—a young rabbit—part of which it ate. After nosing about for a bit the cunning old fellow again turned a somersault over another of the traps, in which it left a few of the long hairs of its back. These the keeper showed to me in proof of his story, which was without doubt perfectly correct in every detail.

I may add that on this and two subsequent occasions the keeper fired at the Badger with his gun at close range, but without any other effect than to make the beast turn further somersaults and bolt with great rapidity. Needless to say that after this the simple countryman entertained the most exaggerated ideas on the subject of Badgers, insisting that they are impossible to slay with either snare or lead!

Mr. Beville Stanier of Peplow has told me a similar story of the cunning of a Badger he endeavoured to trap, and has also seen the long hairs from the Badger's back left in the gin. Colonel Reid corroborates this trick on the part of the animal, for his keeper in Somersetshire has observed a Badger perform a flying somersault out of a hole and set off the trap placed in the sand at the mouth.

Badgers are sometimes trapped with the ordinary steel trap, especially when first set, as then they are not always suspicious. When caught, they will employ their great strength in attempting to escape, and will frequently pull out the peg which holds the engine of destruction. If they are unable to wrench out the peg, like rats, otters, and stoats they will bite the captive leg or foot clean off.

The strength of the jaw of the Badger and the whole vitality of the animal are proverbial. Athough not a large beast, the massiveness and strength of the

skull are such as to render the brute impervious to the blows and bites that would at once kill another animal twice its size. One has only to glance at the admirable mechanism of nature by which the lower jaw fits into the upper, to see at once how the Badger gets such a wonderful grip of its enemies, and is able to retain its hold almost to the death.

It is related by Sir A. Pease that a keeper in Wales, mistaking a Badger's leg for its tail, paid for the error with the loss of his hand; there is an old saying that 'a Badger never leaves go while his teeth meet.' The same writer, speaking of the vitality of the tribe, gives an instance of a Badger which was worried by a pack of foxhounds. It received no hurt itself, although inflicting some damage on the hounds. The gallant fighter was then knocked on the head and stunned by one of the whips, but was soon afterwards as lively as ever; even a bullet from a revolver did not terminate its career at once.

Many sportsmen assert that a couple of game terriers will draw and kill a Badger, but this is not the case. So invulnerable is it, owing to the difficulty the dogs find in getting a grip, that not six terriers, however brave, can kill a Badger. Mr. Gerald Lascelles, who can speak with authority, tells me that he has only once known a Badger actually killed by a dog. In this instance, a powerful bull terrier seized the animal by the nose, and hung on and worried it to death.

In East Devon Badgers have of late years increased to such an extent that a pack of eleven couple of foxhounds was got together in the summer of 1902 to hunt them. Of these hounds and their success in the hunt a most interesting article appeared in the 'Badminton Magazine' of July 1903 from the pen of Mr. T. Dening White, who acts as Secretary under the leadership of Mr. A. G. Pape of Colyford. In the year 1901, during thirty nights' hunting no fewer than forty-five Badgers were killed. 'These results,' says Mr. White, 'having been attained mainly by the kindly support of landowners and farmers over a wide district, and by good earth-stopping: here is the key of success, for without a thorough and extensive system of earth-stopping carried out in silence, with the wind in your face, at midnight, good sport cannot be expected. These duties have been undertaken and most efficiently carried out by some twenty-six game-keepers, who, of all men, seem the most enthusiastic of Badger-hunters. . . . The fields vary with localities; where approachable by rail as many as fifty to one hundred sometimes turn out. Sport, too, varies with the weather, for your Badger is a great coddler, rarely sallying forth on a very cold or wet night; why this is so, is somewhat difficult of explanation, but it is an undoubted fact. Taking the

season of 1902 as an instance, all the first half of which was very cold, with a good deal of wet, for the first fifteen nights that we were out—that is, to the 26th of May—we killed twelve Badgers, and ran eleven to ground. With the month of June, the weather becoming hotter, sport improved considerably in consequence; in the last fifteen nights' hunting no fewer than thirty-three Badgers were killed, and only five marked to ground. Quite a record week's sport was June the 16th, 18th, and 20th, when Badgers seemed to be everywhere, for no sooner had hounds killed one than they were on after another, as many as fourteen big Badgers being killed during the three nights' hunting, never one getting to ground for the entire week—a tribute to efficient earth-stopping over square miles of rough country.'

The most common method of taking the Badger is by an attack on its underground fortress as previously described, and most of us who know anything of English country life and have joined in its sports have taken part in one or two digs after Badgers. It is exciting work in which bone, muscle, and pluck play their several parts, and not infrequently the close of the day sees victory for the Badger. Even when cornered, the strength of the Badger and its general invulnerability are such that the bravest and most fierce of terriers can inflict no injury upon it,[1] although it can hamper the animal's movements and allow time for a man to seize it with his 'tongs,' or 'tail' it as it rushes forth. But frequently the Badger's stronghold is found impregnable; or finding that things are going against it, the creature will sometimes rush forth from the hole and face the odds in the open. I have seen a male Badger thus escape when surrounded by terriers. He forced his way through all obstructions and got clean away into the woods.

I shall not readily forget my first Badger dig in the West Woods near Marlborough, in Wiltshire, as it involved the usual punishments that follow the cutting of games and 'call' at a public school. Sir Arthur Cayley, a keen Yorkshire sportsman, was, I think, my companion, and we tramped the five miles out of bounds with light hearts to get our first view of a wild Badger. The keeper and three men were there to meet us, and we assisted their labours for three or four hours in a sandy hillside, being finally rewarded with joining in at the death of a very large female Badger and three half-grown young ones. After sundry payments we bore the carcasses towards Marlborough and deposited them in a ditch, so that they should not be seen when we were going

[1] In three seasons 161 Badgers have been killed by the Axe Vale hounds.

through the town. However, with the aid of another boy, I got them next day to one Colman, a local birdstuffer, and in my youthful days they were counted amongst my most valued trophies of the chase.

'There are, of course,' says Sir A. Pease,[1] speaking of the chase, 'the fortunes of war—a lucky engagement, a wrong turn on the part of the defender, a successful trench quickly cutting off his retreat—which may deliver him unexpectedly into your hands; or the enemy may outwit you altogether, conducting a masterful retreat, with gallant sorties on the dogs, and by continually changing his front drive you to abandon works, trenches, and operations which have cost great labour and time; thus you may be left with a tired and wounded pack of terriers, exhausted sappers, and the Badger, having barricaded his retreat with soil, stones, and sand, is lost. The war thus made is an equal one: you attack him on his own ground in his fortress, where he is acquainted with every passage, gallery, and casement; he is armed to the teeth and armour-plated, and can drive a road forward, downward, or upward with extraordinary rapidity. It is true you may have many terriers, but he has an advantage over your forces. Only one of your dogs can engage at a time, and the Badger has the advantage of weight, size, knowledge of the ground, and familiarity with the dark; in fact, in every respect except those of courage and endurance, which in some terriers may equal his own.'

Hardly anything could be better than Sir Alfred Pease's description of a spirited engagement, which I quote here:

'. . . A Badger when attacked generally bites upwards, *i.e.* he lowers his head and turns the back of his head downwards. Nothing makes the heart beat faster than, with head to the earth, to hear the din of this subterranean warfare carried along the dark galleries to the day. You have sent in one of your best terriers: he has tried by cajolery and caresses, by straining at his chain, to be allowed the honourable distinction of first blood. You have dispatched him with your blessing, and he has quickly and silently started on his journey into the unknown. You listen to him forcing his passage, drawing himself round corners, scratching away some accumulation or fall from the roof, and hear his eager panting as he winds his foe. Presently you hear a low sharp bark, then another, then two or three more, next a bumping, thumping noise; it is the Badger who has waited to see who the intruder is, and rousing himself is retreating. The

[1] I must apologise for quoting my friend Sir Alfred so freely, but in excuse I must plead that I have done so with his permission, and that it is hardly possible to write anything new bearing on the chase of the Badger which has not already been effectively treated by that accurate observer and good sportsman.

terrier barks no more, but you can hear the thump, thump of the Badger, followed by the efforts of the dog to keep up with him. They are now a long way in, and you can plainly hear the bark again. Soon the fight draws nearer, and the terrier's cry comes to your ear with regularity and clearness; but the Badger is only disputing the way; he has not yet been driven with his back against the wall. The terrier redoubles his activity; you can hear him feinting at the Badger, sharp give-and-take, but no foolish attempt to take hold. After ten minutes the Badger again retreats, probably up the hill, and you have to listen on the surface or at the higher holes of the set till you can hear them again. At last you catch a faint sound: they are still moving, now stationary, now further on; then they seem to stay in one place. There is the steady yap, yap, yap of the dog just distinguishable to the ear.

'Quick, every hand to work. A trench six feet deep, or deeper if necessary, must be cut across the set to cut off the Badger from the passages. With pick, spade, and shovel, the work goes on, while someone listens to know whether the scene of battles moves. If it does, the Badger may have found a side gallery and gone far enough, or he may have charged the dog. He may have passed by a different road beneath your feet in the trench, but if the terrier has succeeded in keeping him face to face, and engaged, yet not driving him so hard as to make him charge, you may be successful in an hour or two, and find that your cutting intersects the passage in which the Badger and the terrier are engaged. If the Badger suspects you are cutting off his only means of escape, he will charge and fight, and the terrier will sometimes be unable to back fast enough; then there will be a meeting of teeth and jaws, the Badger holding the dog through the head, jaw, or nose. The dog's smothered cries of anger and pain make you strain every nerve to get to his relief.

'When the Badger at last leaves go, the terrier's turn comes, and now with blood up, he drives back the Badger to his end of the hole with every determination to keep him there. After two or three turns like this, if the dog has been in an hour or two, he will probably come out for a breath of air for a moment. He should be immediately taken, fastened up, watered, and kept in reserve for future contingencies, and the best terrier for sticking up be sent in with the utmost haste. If a minute has been spent in doing this, every moment will have been used by the Badger in barricading the passage against the dog and burying himself. This once accomplished, you may as well whistle for your Badger as continue digging, for he may have got down into some other gallery, or have buried himself so

that neither dog nor man can find him. Of one thing you may be sure, that whilst you are speculating as to what has become of him, he is digging at a prodigious rate, or has already made his escape by some secret stair.

'If, however, you are quick, terrier No. 2 has interrupted Master Badger as he is at work, and lets you know: "It's all right," "Come on," "He is here," "I've got him," "He's got me!" "You beast!" "Get back!" "I'll hold him;" and spade and shovel and pick are hard at work again. Backs and arms are aching with lifting at high pressure out of the deep trench. You dig on, blocking the hole as the roof falls in, but every now and then the shovels clear it for a moment to give the dog air. And now the game has shown itself. A terrible charge down the hole sends out the terrier; and the Badger, seeing the men at work, backs again, followed by the dog. Now all is excitement. Every snap, punch, grunt, groan, and yell in the fight is heard. A favourite's life in the balance! The prize in view! The other terriers are tugging at their chains, frantic to join the fray, yelling fit to split their throats. It is maddening for them to see the dust and commotion in the trench, to hear the sound of battle so near, to wind the enemy, to hear the cry of their fighting and perhaps wounded companion, and not to be allowed to share in the glory of the final action. You are close up to the Badger; he cannot be an arm's length off. Draw your dog, the Badger will then turn his tail to you to dig, or he will charge out. Be ready with the tongs, and a good dog in case he charges. But if he turns tail get hold of it with a good grip. A long pull and a steady pull will draw him out, bouncing, lunging, and snapping. Now, boys, ready with the sack! Dogs off! All want steady nerves now; three hands on the sack mouth to keep it open, and take care of your fingers! A twirl round and a quick plunge, and a Badger is in the bag. Don't let go his tail till you have slipped the cord on his hind leg, and made the other end of the cord fast to the bag mouth and to a tree. I have seen a Badger go through a sack like a bullet through paper, and it is well to make all as safe as possible.'

Mr. Gerald Lascelles tells me that in the New Forest it generally takes about twenty minutes to dig out a Badger. That so short a time is needed is accounted for by the fact that Badgers in this part of Hampshire will not break down through the hard sandy rock soil, for it brings them at once to water, which of course stops their further progress. A small 'finding' terrier is generally used to locate the Badger in his earth. He also tells me that the longest dig after Badgers which has come under his notice was recently performed in Cheshire by

Mr. B. Jones and a friend, who with spades and terriers followed some Badgers for two whole days. On the second day the roof of the 'set' began to tumble in, and had it not been for the chance appearance of a practical miner, who assisted the keen sportsmen to support their gallery with props, they would have had to desist. As it was, Mr. Jones and his friend persevered till late in the second evening, and eventually killed the Badger or Badgers after following them for forty feet.

Mr. A. Dorrien-Smith informs me of a still more remarkable dig after Badgers that occurred at his place, Ashlyns, in Hertfordshire, about the year 1890. Eight men dug steadily for ten days without coming up with the Badgers.[1] For centuries Badgers, rabbits, and foxes have all lived together in an immense series of subterranean galleries situated in a dell close to the house. Colonel Alfred Lucas, the then tenant of Ashlyns, undertook this foray against the Badger, and has kindly given me the following account of this remarkable hunt:

'During the middle of the hunting season, a frost occurring, I thought it would entertain some of my guests to have a dig after the Badgers in the dell. Three of us undertook the task by sinking cross shafts to cut the passages by which we supposed it would be easy to reach the animals in their apartments. By the evening, however, we found that our efforts were too puny to have any effect, as we could hear the Badgers digging away dozens of feet below us.

'Many men were thrown out of work at this time on account of the frosts, so on the following day I employed eight able-bodied fellows to attack the Badgers' stronghold, thinking that we should soon make a termination of the affair; but we little knew the magnitude of the task before us. Even by following the main galleries the network of passages was so confusing, and the solid chalk of which the ground was composed was so intractable, that little impression seemed to have been made. Matters were no better the next day, nor the next. We continually cut cross shafts, and could generally hear the Badgers before us; but after ten days' arduous toil we had to consider ourselves defeated, and leave the Badgers masters of the situation. On summer evenings we often used to creep up to the dell and watch the Badgers and foxes come out. I have seen as many as eight well-grown Badgers follow each other out of the holes, and pass into the wood in a foraging party.'

The abominable practice of Badger baiting, so commonly practised in England in the eighteenth century, is now happily extinct. Dandie Dinmont's characteristic

[1] This surpasses even the great attack described by M. le Masson, which lasted three days and three nights, the men working in relays.

expression of 'Lord save us, to care about a Brock!' only voices the opinion of the bar-loafers and idlers who formerly indulged in this cruel pastime. Things have changed, however; human nature is undoubtedly more kindly disposed towards the lower animals, and this relic of barbarism has vanished with bull baiting, the pillory, and the stocks.

The Badger is easily tamed if taken young and brought up by hand. Two of these animals, kept by a friend, would follow him anywhere like dogs, though always showing a certain distrust towards strangers. They are easily kept on young rabbits and bread and milk, and when thoroughly domesticated will eat almost any animal or vegetable food. If played with, and kept close to the person who looks after them, they prove most interesting and amusing pets; but should their keeper go away for a time they will revert to their usual shyness and love of seclusion. The 'Field' is full of interesting accounts of tame Badgers. In the issue of February 8, 1902, the following is quoted as being compiled from the pages of a Swedish magazine:

'The animal was dug out on April 20, when still blind and only a couple of days old. The owner of the estate, having a retriever bitch which whelped the following night, gave it the young Badger to suckle, and although at first somewhat astonished the bitch eventually accepted the stranger philosophically. The puppies were then removed, and the orphan, which was a female and was christened Lisa, was carefully tended by its foster-mother as an only child. She could not bear it being out of her sight, and if taken from her for even a short time she would, on seeing it again, carry it back into her kennel. The little beast grew and waxed fat; when six weeks old it began to take food other than the bitch's milk—at first eggs and milk, then fish and meat. It liked bread and potatoes, but only when crumbled up and mixed with milk. It also ate wild strawberries, larvæ, and beetles, but not with such gusto as meat and fish. Shot birds were offered to it, but were taken with discrimination. The larger it grew, the more playful and mischievous did it become, romping with the bitch Vassa and a brother of the latter, a big, somewhat surly-tempered dog called Gask. To spare the bitch the Badger was at last removed from the kennel, evidently to the great dissatisfaction of both, and after constant labour the latter succeeded in burrowing her way back. In the interval she made a new friend of a pointer called Glory, and the two constantly played together. Lisa was afoot nearly all day long, but liveliest in the evening. If I called her when going out to walk she obeyed at once, and followed me like a dog. She had a good nose, for she

could easily track my footsteps. Although somewhat troublesome at times I allowed her to do much as she liked. Her intelligence was undoubtedly great. She would never follow a stranger, and hardly anybody but her owner. If she wanted to go through a door which she could not open by either pushing or pulling, she would seize hold of clothing—for choice a lady's dress—with her teeth, and draw the individual towards the door with the evident intention of getting the human being to help her. She was extremely cleanly in her habits, did not take to water voluntarily, but if thrown in could swim well. Once in July she went off to the woods with Vassa, and I heard them hunting all the afternoon; in the evening the bitch returned alone, and I thought the Badger had taken to a wild life for good. But at ten o'clock at night she turned up, quite tired out, and in a very bad humour.

'Shortly afterwards she was sent off to a neighbouring estate. There, in spite of the kindest treatment, she was very unhappy, and, evidently with the idea of being taken home again, she would creep into the box in which she had been brought away. At first she would not go into the main building, and one night made her way into a hen-house, where she despatched five of the inmates—a crime of which she had never before been guilty, although she had had every opportunity. One day she had a visit from the retriever Gask, and both seemed rejoiced at the meeting, which ended in dog and Badger going to sleep close together. After this Lisa took to spending most of her time in the garden, returning only in the evening for food. When her owner, accompanied by the pointer Glory, appeared, she recognised them at once, and followed him throughout the house wherever he went; after this she gradually took more kindly to her new abode, and became quite at home there. In the beginning of September, however, she disappeared, and it being considered very unlikely that she would voluntarily desert those to whom she had been always accustomed to go for food, it was believed she had got accidentally killed.—G. L.'

Miss E. Lort, who has had a wide acquaintance with Badgers at Vaynol in North Wales, has contributed perhaps the best account of a tame Badger. She says:[1] 'The fact that Badgers are nocturnal in their habits and seldom seen abroad by daylight causes them to be very little known even by those who live in a district where these animals are common; hence few people seem to know anything of their ways or their mode of getting their living. As a rule Badgers are characterised as destructive to game, inimical to foxes by dispossessing them of their

[1] *Field*, March 15, 1902.

earths, generally obnoxious and to be get rid of wherever and whenever practicable. Having lived for many years in a part of North Wales where Badgers not only are numerous, but also, I am glad to say, receive consideration and protection, I am not of this way of thinking. I believe the Badger is a much maligned animal, and only deserves to be better known to be more appreciated. Moreover, having brought up one of these animals from a cub and made it tame enough to follow me about like a dog, I have had ample opportunity of noting its interesting ways and friendly disposition. Sally was considered to be about three months old when she was unearthed after two or three days' hard digging in an old stronghold, at which several men had to be employed. A tremendous male Badger, said to weigh 40 lb., was first got out, and immediately afterwards a big vixen. Next came my Sally and her brother Jack, who, sad to say, subsequently died, notwithstanding an attempt to tame and rear him. I am thus able to say that I have met Sally's father and mother, in fact all her near relatives.

'I shall never forget how hopeless it seemed to try and tame this Badger cub, for when she was not rolled up in a touch-me-not sort of a ball, she was snapping and biting at everything. There was nothing for it but to tackle her in a determined way, and this I did by getting hold of her by the scruff of the neck—not by any means an easy thing to do, for she could so raise the muscles of her neck that her skin became perfectly tight and rigid. I found that, like other animals, she enjoyed being rubbed and scratched, and upon closer inspection I discovered that behind her ears a small parasite (*Trichodectes*) often found upon puppies lived in profusion. A scientific friend assured me that these vermin could not live on man; and thus emboldened I got still further into her good books by destroying her troubles with vinegar and water.

'The taming of Sally was made more awkward than it would otherwise have been by the fact that she refused to eat anything for the first fortnight, though she afterwards took milk with evident relish. The first thing she condescended to eat was a fresh rabbit's liver finely chopped. By spending much time and patience with her, she eventually surprised everyone about the place by following me everywhere, and anxiously giving tongue for fear of losing me when I went too fast for her.

'In this old oak-panelled house when we first came to live here, beetles sorely vexed our housekeeper, and indirectly vexed us too, for every time she saw one she gave such a heartrending scream that I thought she must have seen a ghost, for somehow the old place was creepily suggestive of one. Well, I chanced



The misfortune of one is the opportunity of another

By permission of J. E. Harting

one day to mark an extra fine black beetle, and I persuaded the old lady to keep an eye upon it while I ran for Sally, when the prompt way in which she dispatched that beetle after hunting it from under the stair carpet redounded to her advantage in the pick of the bones and plenty of stock-pot meat, so ticklish to her taste, and Sally continued her useful attentions to the beetles. As for moles, she must have been born with a perfect knowledge of the art of catching them; in fact in Sally's paws it became a science. She first listened along the ground, and having located her quarry promptly dug down. The firmest turf on the driest summer day gave way to her claws in a way that was simply marvellous, and when I essayed to help her it is clear she regarded me as an interfering bungler and a spoiler of sport. I never saw Sally pursue rabbits or game of any kind. Literally speaking she was a "pouncer," and a good one too, for she never let go. Judging by what I saw when we two took our walks abroad, I think that, could Sally have had her say, she would have told us that field slugs and worms were the titbits, and that an entrée of beetles took some beating. She delighted in slugging expeditions in a field of long aftermath, and when the worms she had hold of attempted to retreat into the ground she made a sucking noise, and in pressing all her weight excitedly forward, she almost invariably tilted right up until she nearly went heels over head. And now when I see in the early morning a track all over the grass fields, like that which a broom would leave upon the dew, I know Badgers have been hunting for worms; and I can see the shiny places too where they, like Sally, have pressed their noses hard into the earth. Notwithstanding our long rambles I was never apprehensive of her halting and going to ground. She gave earths of all sorts merely a passing sniff. She would often let herself out from her yard, and, incredible as it may seem, she managed not only an awkward latch, but cleverly, while hanging on, pulled the door towards her. Once when I was away from home Sally entered the house, went straight up to my room, and refused to come from under my bed. Keepers had to carry up the barrel which served as her kennel, and force her into it, and so carry her down.

'The taming of Sally was not accomplished without my having painful proof of the strength of the Badger's jaw. An eighteen-pound Badger hanging to the ends of one's fingers a time or two is, to say the least of it, calculated to make a serious impression. Those who have had their digits shut in a door will best realise the sensation. This happened in early days, though, and generally through my grabbing at her without due warning when picking her up in the dark. Later

on, when she was accustomed to be handled, there was no biting, no matter how or where I took hold of her. Fat, round, jolly, and good-tempered concisely describe her figure and her character. With the exception of that already mentioned, uncooked meat was never given to Sally in early life; that is to say, not until she was eight or nine years old, and then only when a rabbit was given to a wild Badger from the South of England that lived in the same house. Dog biscuits and the bones of cooked meat kept her in fine coat and condition.

'Sally had a wild serenading lover of her own, daring and devoted to a degree—too daring indeed for the deep bass voice of the yard dog to inspire any terror. No one ever saw this brave Badger arrive, but many saw his hurried departures. Could the hieroglyphics he left upon the slate doorstep only have been deciphered, his tale of love touchingly told might have turned the tide in his favour, instead of a contemplated alliance with a Somersetshire Brock. This matchmaking of mine, as I might have expected, found no favour with Sally, and she gave the Somerset swain not only the cold shoulder but the outside of the kennel too. It was not until Sally had more than once returned to me, weary and wet after having been out slugging for hours, that I was convinced that she would never leave me in preference for a wild natural life of liberty. She would come into the house at all times to look for me, and once appeared while we were at dinner. Another time I had almost given her up for lost; she had been out for some hours, and I went to fix her yard door open more firmly, when to my delight the barrel which served as a kennel shook from side to side: she was back and busy drying herself. Out she came, so flurried and so fussy, such a lot to tell me about her long lonely ramble without me to run to when she got frightened. Yet Sally was not nervous, as one might have expected, with ordinary gentle dogs. She scampered about and played beautifully with a collie. If the collie got too familiarly pawing her about, she made no attempt to snap or bite, but just drew up her back in a dignified way as if to say, "I shall not play if you will not observe the rules." And old Tich seemed to know at once her playmate's meaning, and waited until Sally made the first move to continue the game, and then off they went round and round until Tich in her excitement again forgot the rules.

'In Sally's public life one important rôle she played was that of drag to a pack of hounds. I used to take her for a long walk, after giving strict injunctions that the hounds should not be unkennelled until I came to say Sally was safe in her yard; and as a further safeguard, notwithstanding her tremendous weight, I always carried her the first and last part of the way. She weighed twenty-six

pounds at her best (or rather worst, for it was most difficult to keep her down), and was a solid dead weight most tiring to carry, though she kept quite still and often fell asleep under my cape. If one of my brothers touched her, even through a thick tweed cape, she resented the liberty and snuffled angrily; but, as before stated, she was well-behaved with strangers so long as they observed the rules and abstained from touching her. Though she was constantly in request for exhibition to visitors, she never showed a sign of hurting anyone who let her alone. There seemed to be a weird fascination about her society which made people say at first they wished to see her, and then repent having said so. I remember once being eagerly asked to show my tame Badger, and Sally was no sooner in the room than the family lawyer and one or two other men were to be seen perched in a row upon the high back of an old-fashioned sofa, like so many rooks; quite unnecessary nimbleness on their part, for she ignored everyone but myself, and gambolled over and over and played in a frivolous way quite unknown to those writers who describe the Badger as an uninteresting, heavy, and slothful animal.

'It is true that I never thought of calling upon Sally until late in the afternoon or early in the evening, because I knew she would not until then be, so to speak, "at home" to me, if she had her choice. When taken out in the morning she followed with great care and caution close to me, while at night her lively tricks were delightful, romping round and round until she was quite out of breath; her puppy-like playfulness never left her even when she grew old. When winter came she was more sleepy by day and not nearly so lively by night, feeding only at intervals of two or three days; indeed the one favourite paw which was almost invariably in a sticky state at this season, from her habit of sucking it while asleep, seemed to supply almost sufficient nourishment for her. She was perfectly clean and well-behaved in the house. I used to bring her in on wet days, but after exploring the room for a time and looking inquiringly at the stuffed birds, she rolled herself up at my feet with a sigh which I feel sure was one of content, and not only slept but snored.'

Considering the small number of Badgers annually captured in comparison with the enormous number of other British wild animals, albinism may be said to be almost common. I have examined eight or ten such varieties, the usual colour being a pale straw with dark and sometimes pink eyes. Mr. Walter Rothschild has a beautiful specimen, and recently visitors to the Zoological Gardens, Regent's Park, had an opportunity of seeing a pale straw-coloured

Badger which lived there for several seasons. Hardly a year passes without instances of such varieties occurring,[1] but I have never seen an instance of melanism in the species.

In Germany, Sweden, and South Russia the hams of Badgers are still eaten, being dressed like those of a bear, whilst at the end of Jones's 'History of Brecknockshire' is a curious poem in Welsh (with an English translation) showing that Badgers were eaten in Wales as late as the end of the eighteenth century.

[1] See *Field*, June 29, 1872; *Zoologist*, 1872, p. 3180; *Field*, May 1, 1875; *Zoologist*, 1880, p. 252; 1886, p. 263; *Field*, March 10, 1888; March 12, 1898. A white Badger was killed on April 30, 1885, by the terriers of the Vine kennels at Overton, Hants, and another, pure white, was trapped at Milton Abbey, Dorset, in January 1896 (*Field*, February 15, 1896); *Zoologist*, 1897, p. 327; and *Field*, March 7, 1903.

THE MARTEN

Sub-family *MUSTELINÆ*

THE Martens, Polecats, and Weasels occur in both the Old and the New World. The toes are united for part of their length by a web of skin; the short sharp claws are in some genera partially retractile: the animals are digitigrade. There may be three or four pairs of premolars in each jaw; the lower flesh tooth has three main cusps on its cutting edge, but has only a small cusp or is without a cusp inside the second lobe. Two genera, including one and four species respectively, are found in our islands.

Genus *Mustela*

Four pairs of premolars are present in each jaw of the Marten. The soles of the feet between the pads are densely furred. There is little or no smell from the anal glands.

THE MARTEN

Mustela martes, Linnæus.

Mustela martes, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 67 (1766).
Viverra martes, Shaw, 'Gen. Zool.' i. p. 410 (1800).
Martes sylvatica, Nilsson, 'Fauna Skand.' 1st ed. vol. i. p. 41 (1820).
Martes vulgaris, Griffith, 'Cuvier's An. King.' v. p. 123 (1827).
Martes sylvestris, Nilsson, 'Fauna Skand.' 2nd ed. i. p. 171 (1827).
Martes abietum, Fleming, 'Brit. Anim.' p. 14 (1828); Bell, 'Brit. Quad.' 2nd ed. p. 217 (1874).

Local Names.—*Pine Marten*, *Common Marten*, *Marten*, *Sweet-mart*, *Mart*, *Martern*, *Martron*, *Merteron*, *Matron*, *Martlett* (English); *Taghan*, *Taoghan* (Scotch Gaelic); *Bele*, *Bele'r graig* (Rock-haunting Marten), *Bele-y-goed* (Wood-haunting Marten) (Welsh); *Wild Cat*, *Madaidh-crainn* (Tree-dog), *Cat-crainn* (Tree-cat) (Irish).

Characters.—Until the year 1879 it was considered that there were either two species of Marten inhabiting our islands, or that the Pine and Beech Marten were

specifically identical. Amongst the British workers on Mammals we find Pennant, Bingley, Shaw, Fleming, Jenyns, and Bell affirming that two species—the Pine Marten, *Martes sylvatica* or *abietum*, and the Beech Marten, *Martes foina* or *fagorum*, as they were generally called – occurred; while E. T. Bennett, MacGillivray, and Thompson recognised only one species. The late E. A. Alston practically cleared the air, although when the second edition of Bell's 'Quadrupeds' was published in 1874 he still was not convinced. Later, however, after careful investigation and examination of all the skins and skulls he could find, he came to the conclusion that the Pine Marten alone inhabited Great Britain and Ireland. In 1879 he contributed the results of his investigations and the conclusions he had arrived at to the Zoological Society, and also stated his case plainly in the 'Zoologist.'[1]

Blyth came to similar conclusions; MacGillivray the elder found that juvenile Scotch specimens of the Pine Marten possessed yellow throats, whilst adults and old animals had the lower neck and breast ornamented with white, greyish white, or pale grey patches. This was also the view entertained by Thompson as regards Irish Martens; he observed that the yellow colour gave place to white with advancing age, and those who have kept Martens in confinement, notably Mr. Pemberton, Mr. A. H. Cocks, and Mr. D. English, have all noticed a similar transition. I have observed that this colour change is also seasonal and that this yellow tint in both young and old is not permanent. Moreover, it fades after death in preserved specimens. Mr. Alston summed up his conclusions as follows:[2]

'The fact is, as I believe, that *M. foina* is not, and never was, a member of the British fauna. During the last ten years I have missed no opportunity of examining native Martens, and have endeavoured to trace out every supposed "Beech Marten" that I could hear of. I have thus seen a very large number of specimens from various parts of England, Wales, Scotland, and Ireland; and *every one* has proved to be the Pine Marten. The late Mr. Blyth, who paid some attention to this question, assured me, shortly before his death, that his investigations had led him to the same result; and I have been unable to find any competent observer acquainted with the true characters of the species who has ever seen an authentic British-killed specimen of *M. foina*. MacGillivray and Thompson were certainly correct in saying that the pale-chested individuals which have usually received that name in this country are merely aged examples of the Pine Marten, or specimens

[1] *Proc. Zool. Soc.* 1879, pp. 468, 474; *Zoologist*, 1879, pp. 441–448.

[2] *Zoologist*, 1879, p. 443.



Litho. W. Greve, Berlin

THE PINE-MARTEN.

Mustela Martes.

which have faded in museums. Nor does there appear to be the slightest evidence in favour of Mr. Vyner's suggestion that *M. foina* has been recently exterminated in this country. Such a fate has not overtaken the species on the Continent, where it holds its own fully as well as its ally; and a sub-fossil skull found in Burwell Fen, Cambridgeshire, and exhibited to the Zoological Society in 1873 by Mr. J. W. Clark, is certainly referable to *M. sylvatica*. The true Beech Marten is undoubtedly a more southern species than its congener, finding its northern limits in Denmark and the Baltic Provinces; for Professor Lilljeborg has proved that it is not, as has been stated, a native of Sweden. Until an authentic British specimen has been produced, it must also, I think, be struck out of the lists of British fauna.'

The following are the characters of the Pine Marten as exemplified by Mr. Alston:

'Outer fur rich dark brown; under fur reddish grey, with clear reddish yellow lips; breast spot, usually yellow, varying from bright orange to pale cream colour or yellowish white. Breadth of the skull across the zygomatic arches, rather more than half the length; the arches highest posteriorly, whence they slope rather suddenly downwards and forwards. Sides of muzzle nearly parallel; anterior opening of nares oval; post-orbital process about equidistant between the frontal constriction and the anterior root of the zygoma. Palate comparatively narrow, with a distinct azygos process on its posterior margin. Upper premolars placed regularly in the line of the series; the fourth as long as the upper molar is broad; its inner cusp large and placed nearly at right angles to the axis of the tooth. Upper molar broader than long, its flattened inner portion considerably longer and larger than the outer part; in the latter the external tubercle fills the space between the anterior and posterior tubercles, so that the external outline of the tooth is slightly convex, *not* emarginated. First lower molar with a slightly developed inner tubercle at the base of the main cusp. The differences between the crania and dentition of the Martens was pointed out by Dr. R. Hensel in 1853,[1] and by Blasius four years later.[2]'

In the Beech Marten, *Mustela foina* of Erxleben,[3] *Martes foina* of Nilsson, and *Martes fagorum* of Fleming, the outer fur, Mr. Alston shows, is dull greyish brown, the under fur greyish white, and the breast spot pure white. The skull across the zygomatic arches is much more than half the length; the arches are regularly curved and highest near their middle. The sides of the muzzle converge

[1] *Arch. f. Nat.* xix. 17–22. [2] *Säug. Deutsch.* 211–219. [3] *Syst. Reg. An.* 1777, p. 458.

slightly, the opening of the nares is heart-shaped. The palate is comparatively broad. The upper premolars are crowded and often placed diagonally; the inner cusp of the fourth is smaller. The upper molar and the first lower molar also differ in shape from those in the Pine Marten.

The following weights and measurements are taken from my own specimens and from four recorded in the 'Field':

Locality	Length from Nose to tip of Tail	Tail only	Head only	Weight	Sex	Date
1. Glenelg, N.B. . .	2 ft. 10 in.					
2. Glenmoriston, N.B. .	2 ft. 11 in.					
3. Dunalastair, N.B. .	2 ft. 8 in.	12 in.	$5\frac{1}{2}$ in.	3 lb. 2 oz.	male	Oct. 1886
4. Ambleside . .	2 ft. 5 in.	12 in.	5 in.	3 lb.		Oct. 14, 1897
5. Co. Clare . . .	2 ft. 5 in.	12 in.		2 lb. 5 oz.		
6. Co. Down . .	2 ft. 4 in.	12 in.	$5\frac{1}{2}$ in.		female	Nov. 1887

Dental Formula.—I. $\frac{6}{6}$; C. $\frac{2}{2}$; P. $\frac{8}{8}$; M. $\frac{2}{4}$.

The young when first born are white, but in a few days become grizzled like young polecats. They are blind for about three weeks; in a few months they are coloured like the adults, but they are pale at first, the pelage[1] darkening with age.

Mr. Alfred H. Cocks thinks there is a slight difference between Irish Martens and those found in Great Britain. He considers the former have larger ears.

Distribution.—The Pine Marten is found throughout Northern Europe, but in North-eastern Asia, about the mouths of the great rivers which flow into the Arctic Seas, it is replaced by the finer-coated but closely allied species, the Sable (*M. zibellina*). The Beech Marten has a more southerly range, but in both Europe and Asia the ranges of the two species overlap. The American Sable or Pine Marten (*M. americana*) differs but slightly from its Old World ally. In Newfoundland and North Labrador sub-species of the American Marten occur; the Labrador Marten is considerably larger, and both are darker in pelage than our British Marten.

In the British Islands remains of the Pine Marten have been found in the

[1] Mr. Meade Waldo tells me that the old fur is shed almost simultaneously, and that he has drawn his hand along the body of a tame Marten and taken off the whole coat at once.



A PINE MARTEN AT REST.

From a photograph by D. ENGLISH, F.R.P.S.

Norfolk Forest-beds and the Cambridgeshire Fens, in the caves of Bleadon, Long Hole, Ravenscliff Tor in England, and Shandon in Ireland.

In Scotland we are without knowledge of its existence prior to the age of the peat mosses, but this omission may be due to insufficient research. As regards the present distribution of the Marten, broadly speaking it may be said to have disappeared from all cultivated areas, and to be only holding its own in the wildest districts of Northern England, Scotland, Wales, and Ireland. Every year, however, pushes the Marten further back and curtails its range, though sporadic instances of its occurrence in parts where it has long been thought to be extinct are by no means infrequent. The principal range of the Marten in England is North Lancashire, Westmorland, and Cumberland, where it is still hunted with hounds at all seasons. These three counties, especially the last, may be said to be the only parts of England where the species now has any foothold, though until the destruction of the forests the Marten was fairly common in every county from Cornwall to Northumberland.

In the sixteenth century, according to Mr. J. E. Harting,[1] constant references are made to Marterns or Matrons,[1] in English medieval records, and it is even supposed that they were included in bills of fare in the reign of Henry VIII. Mr. Harting suggests[2] that 'in Elizabeth's time the Marten was considered by the chroniclers to be getting scarce, presumably because its fur was so much sought after, or because it was killed as vermin. Harrison in his "Description of England" prefixed to Holinshed's "Chronicle" in 1577, referring to this animal as a beast of the chase, remarks that "for number I worthilie doubt whether that of our Beavers or Marterns may be thought to be the lesse."'

Gradually, as the country became deforested, the Marten in England was driven north and north-west, but from the tenacity with which the animal has been able to cling to some of its old haunts, appearing till quite recently in isolated woods from Cornwall to Norfolk, and Sussex to Yorkshire, we may conclude that the species, if protected, would be again abundant in all parts where suitable forests existed. Personally I despair of seeing intelligent legislation for the protection of creatures that ought to be protected, such as the Otter, the Wild Cat, the Marten, and the Weasel, when destroyers of such pestilential rascals as certain gulls and other really destructive vermin are threatened 'with the utmost rigour of the law.' There ought to be a duly qualified and highly experienced 'State' naturalist, not a body of men who would only quarrel and spend public

[1] *Zoologist*, 1891, p. 404.

[2] *Ibid.* 1891, p. 405.

money, but one whose opinion should be consulted as to the birds and animals that ought to be protected or condemned in particular districts. Thus we might arrive at something which would meet both the practical and the æsthetic view of the case.

It is somewhat difficult to say definitely whether the Marten can be said to 'still linger' in the various counties where its presence has been reported within recent years, and a review of Mr. Harting's careful summary of these[1] and more recent records of capture causes one to wonder how these few isolated individuals have so long defied capture, even granting that their numbers are added to by occasional beasts which had escaped from confinement. Putting aside Cumberland, Westmorland, and North Lancashire, the other English counties may be summed up as follows, whilst for further particulars I must refer my readers to Mr. Harting's own notes and the pages of the 'Zoologist' and 'Field.'

Northumberland.—Now probably extinct throughout the greater part of the county; a few linger in the Border fir woods. Twenty years ago it was rare. One was trapped in April 1905 at Bardon Mill.[2]

Durham.—The same applies to Durham. Perhaps the last killed was in 1882.

Yorkshire.—According to Clarke and Roebuck[3] the Marten was common in many districts at the beginning of the last century, but its occurrence is now exceptional. One was trapped at Swainby-in-Cleveland in February 1900.

Lancashire.—Extinct throughout South Lancashire.

Cheshire.—Martens have been reported several times as having been seen or killed within the last fifty years, but only one specimen is preserved—one which was killed at Eaton in 1891.

Shropshire, Stafford, Derbyshire, and Nottingham.—Extinct. Formerly existed in Needwood Forest, Sherwood Forest, and the limestone district.

Lincolnshire.—Several have been recorded within the last fifty years; but some of the most recent occurrences are supposed to be of animals which had escaped from confinement. In the early part of the last century the Marten must have been fairly common.

Hereford.—Probably became extinct about 1884, when one, perhaps the last, was seen on the river Dore.

Worcester.—Formerly existed at Malvern Chase, but no recent records.

Leicester.—As in the Midlands generally, the Marten considered to be extinct. One was reported as having been seen in December 1902.[4]

Norfolk.—The Marten was considered 'extremely rare' in 1834, when the Pagets published their 'Sketch of the Natural History of Yarmouth,' and Mr. Southwell thinks that no truly wild Marten has occurred in the county during the last half of the nineteenth century. Mr. Harting, however, does not agree with him that the more recent captures were

[1] *Zoologist*, 3rd series, November–December 1891.
[2] *Field*, April 15, 1905.
[3] *Fauna of Yorkshire*.
[4] *Field*, January 3, 1903.

all animals which had escaped from confinement. One trapped at Heydon in 1879 was supposed to be an escape.

Cambridgeshire.—No records since 1844.

Northampton.—Now extinct; no recent records.

Suffolk and Essex.—The latest recorded captures were in 1845 and 1853, and long before that time it was considered rare. Lubbock[1] says that it 'is occasionally found in Essex.' This was written in 1879, but further confirmation is needed.

Hertford.—Apparently lingered until 1872 or thereabouts.

Buckingham, Berkshire, Oxford.—No recent records.

Worcester, Gloucester, Wiltshire.—Now extinct; in the last county it is said that it was exterminated so long ago as the end of the seventeenth century.

Kent.—A Marten was captured in 1898 in Crayford Woods, but as it was examined by Mr. Oldfield Thomas and Mr. de Winton and declared to be a Beech Marten there can be little doubt that it was an escaped animal. It appears to have been extinct for about seventy years.

Sussex.—In most parts of the southern counties the animal is undoubtedly extinct, but in a few localities it may still linger, though records get scarcer and scarcer year by year. Since 1840 some five or six have been taken, and it is hardly likely that all these are escapes; yet how the animal manages to survive in the neighbourhood of thickly populated districts is a mystery. In November 1904 I heard of one having been trapped near Horsham.

Surrey.—My friend Mr. George Lodge saw one in a wood near Dorking in May 1879.[2] There are, however, few other records for this county since the first half of the last century.

Hampshire.—A few may linger in the New Forest, but there are no recent records, and the animal has long been extinct in the Isle of Wight.

Dorset, Somerset, Devon, Cornwall.—In the western counties the animal has shared the usual fate. Perhaps the last date for Dorset was 1851, for Devon 1871, and for Cornwall 1878.

In Wales the Marten still lingers, and thirty years ago it must have been fairly common. There are stuffed specimens in most of the inns in the wilder parts, and the few records that exist are fairly recent.[3] In Carnarvonshire and Merioneth several examples exist which were killed in the late seventies; three were killed in 1879 near Bethgelert; in Brecon several were seen or killed in the eighties, perhaps the latest being in 1886, and in Montgomery three are recorded in the 'Field' for February 8, 1896. Near Conway two were killed so recently as 1890, and there is no reason to suppose that in such suitable country all have been exterminated.

In Scotland the Marten is still found, though in greatly diminished numbers,

[1] *Fauna of Norfolk.*

[2] *Zoologist*, 1878, p. 127.

[3] The last killed in the neighbourhood of Cardiff was taken in 1866, as I am informed by Mr. R. Drane, who examined it.

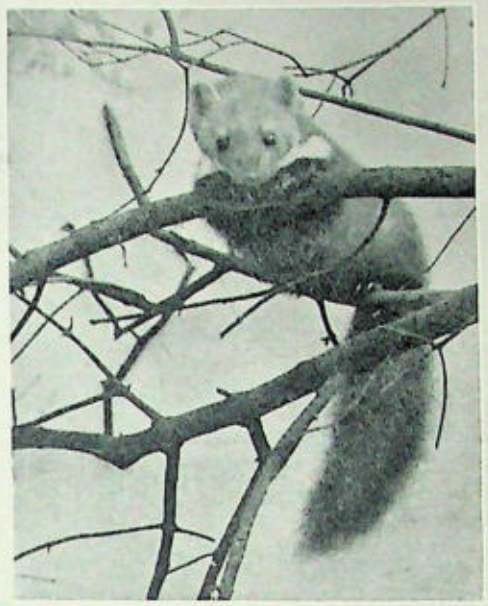
in the northern Highlands: it is most numerous in Inverness-shire, but it may be considered rare even there. Mr. Harvie-Brown, writing in 1881 of its general distribution, says: 'Extinct in many places frequented by the latter (the wild cat), but, curiously enough, it has survived over a larger area up to a later date; that is to say that, while the boundaries of the country at present inhabited by the wild cat are easily defined and are gradually contracting, the occurrences of the Marten are more sporadic, it often turning up in localities far distant from one another where no records had previously occurred for many years.' Until the beginning of the nineteenth century the Marten was found all over the Highlands and as far south as Ayrshire.

In these northern counties it occurs in small numbers over the wood and deer forest areas. It was common in Assynt until 1870, but in the 'Annals of Scottish Natural History' there are several records for the last few years. In fact, a few are killed every year in Inverpolly, Scowrie, Stoir, parts of Assynt. In East Sutherland it has quite disappeared. In Ross-shire the Marten is now extremely rare: it disappeared from the valley of Strathgarve and the Ullapool district about 1860. In Torridon and Dundonnel it lingered much later, and recent records show that it is not extinct there. From Caithness it seems to have disappeared; but though scarce in Inverness, a few still frequent the great woods stretching round Grantown, Abernethy, Glenmore, and Rothiemurchus; it is also found in the deer forests of Glenfeshie and Invereshie. All along the north of Loch Ness it is not rare, being regularly trapped in Balmacaan, Glenmoriston, and occasionally in Guisachan.

In Aberdeen it still lingers in the south-west of the county, especially about Lochnagar and Braemar; there are records of several until about 1899, but it has not been common in Aberdeenshire for very many years. In Argyllshire it was fairly numerous until 1845, but now only a few remain in Glen Etive, Glencoe, and the Blackmount, and perhaps Portalloch; there are captures recorded in 1900. In Perthshire it is extinct, though it existed in the valley of the Tay in 1881; one was killed at Glenartney in 1879. In Ayrshire one was captured in 1874 and one in 1875–6, and more recently still one was seen on the Solway in 1878 or 1879; it is not now found in any of the southern counties. At Kilmory, Lochgilphead, one was taken in 1896.

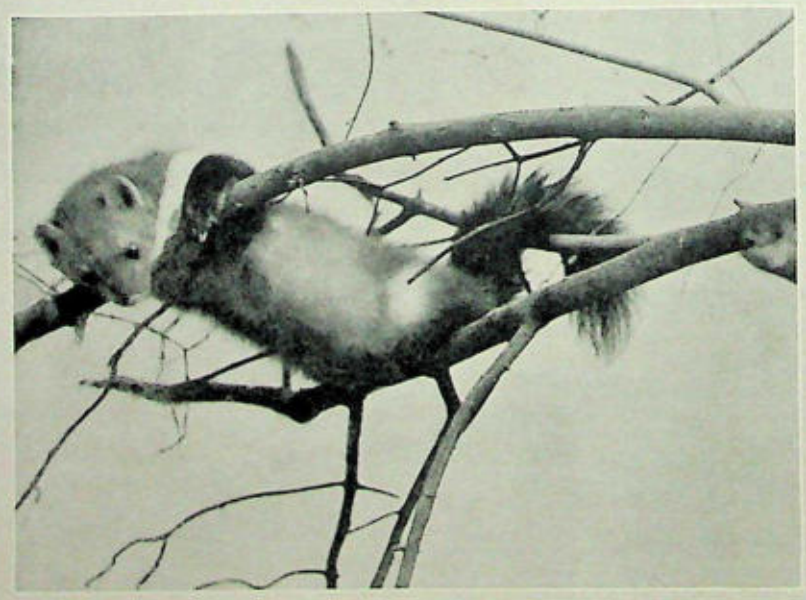
With reference to the occurrence of the Marten in the outer islands of Scotland the 'New Statistical Account' (1845) mentions it as being *extinct* in Jura, implying that the species was the inhabitant of the island at no very distant













PINE MARTENS IN MOVEMENT.

From photographs by D. ENGLISH, F.R.P.S.

date, whilst we know that it survived until quite recently in the Lews, the men of the Outer Hebrides having a Gaelic name for it. Harvie-Brown[1] says that about 1860 it was abundant in the Lews, and on Park Lodge shootings, between 1865 and 1869, nine were seen or killed.

In Ireland the Marten has met with the same fate as in England and Scotland. At one time it was common throughout the island, but with the advance of civilisation—railways, cultivation, and the deforesting of woods—it has gradually been driven to the wildest parts of the country, but not necessarily to the north and west.

Writing in 1857, Sir William Wilde says:[2] 'The Marten formerly abounded in our woods, and a few still exist in some localities where portions of the ancient forests remain, among which I may specify Ballykyne, near Cong, co. Mayo, and Kylemore, Connemara, co. Galway.'

'To these localities,' adds Mr. Harting,[3] 'might be added the woods and crags near Loughs Mask and Corrib in Mayo and Galway. Martens were also formerly common on the borders of Clare and Galway, where they were preserved in the woods on the estate of Raheen, Tomgraney, co. Clare.' Thompson, the Irish naturalist, writing a little later, also bears testimony that the Marten was found all over Ireland in his time in suitable localities, but was then becoming scarce.

The districts most frequented by the Marten in Ireland are the wilds of the Mourne Mountains in co. Down, and of the Killarney woods, on the estates of Kenmare and Muckross in co. Kerry. A few are still to be found in some parts of Kilkenny, in counties Leitrim, Tipperary, and Carlow; whilst in Sligo and Wexford, and Wicklow and Waterford, an occasional straggler is trapped. Captain G. E. Barrett-Hamilton, in some interesting notes on the distribution of the Marten in Ireland,[4] gives many particulars of recent occurrences of the animal, showing that it is by no means so uncommon as is generally supposed. He says (p. 134): 'No doubt the Marten is *now* driven out from the east and south; but it is only of late years that this has been the case, and I contend that even in the more highly cultivated parts of the eastern counties of Ireland it would be an impossibility to name a county in which the animal has not occurred recently.'

The same writer says that he has no records from Louth and Meath, but thinks that stragglers occur there; nor are there recent records of its occurrence in the counties of Monaghan, Cavan, Limerick, and Roscommon.

[1] *Zoologist*, 1881, p. 89.
[2] *Proc. Royal Irish Acad.* vol. vii. p. 194.
[3] *Zoologist*, 1894, pp. 100, 101.
[4] *Ibid.* 1894, pp. 134–141.

Habits.—This swift and graceful creature is seldom seen by man. Living as it does far up in the rocky recesses of the boulder-strewn hillside, or amid the shaggy fir-woods, where only the mountain shepherd or the deer watcher passes at rare intervals, and generally hunting for its food at night, dawn, or sundown, it lives a life of more complete seclusion than any other British Mammal except the hill badger. Even where it is fairly numerous it is no uncommon thing to meet men who have spent their lives in close vicinity to this shy animal, and who have never seen it or even suspected its presence. No wonder, then, that few save the regular Marten-hunters ever see it in England and Wales, or the Scotch keeper whose business it is to destroy 'vermin,' and who finds one morning a poor bedraggled ball of brown fur struggling in one of his gin-traps, for the Marten is an easy beast to trap. Amongst those who have seen the Marten hunting its prey there is a general opinion that its methods of taking game on the ground are very similar to those of the stoat. The Marten is the shyest of all creatures that dwell 'amidst the untrodden ways,' and most of us who love to watch the ways of our wild creatures must be content to study the movements of this graceful beast when it is penned up in the narrow confines of a cage.

On the Continent the Pine Marten is to a great extent of arboreal habits, feeding principally on squirrels, which it catches with the greatest dexterity, but, driven from the oak woods and small covers of British lowlands, it seems to have lost the habit in our islands, especially in England and Wales. In Scotland it frequents the open deer forests more commonly than the fir-woods, except in winter and early spring; but when pursued by hounds or terriers it is always more prone to 'tree' than to go to ground in cairns. In Wales and Westmorland, and in the wilds of Ross and Sutherland, the female Marten resorts to mountain 'screes' and cairns in which it makes its summer home, but in Ireland and sometimes in Scotland it frequently chooses the deserted nest of 'hoodie,' buzzard, or a squirrel's 'drey.' In Westmorland Martens frequent the high fells until April and May, when most of them descend to the valley woods and make their home in old magpies' or squirrels' nests, but a few breed near the tops of the highest hills.

The activity and grace with which the Marten runs and leaps along and over branches through the forest are delightful to see. Now down over the old dead windfalls, along the stems and through a maze of rotten boughs, now up the bark of a pine, and out along one of its main offshoots, it runs at such a pace, and with such certainty of purpose, that the man who would follow it afoot must

needs be young and strong. If the pace is too lively, it will drop to earth and bound along through the forest till some mass of evergreens or tangle of dead trees causes the breathless pursuer to stop. The Marten seems to know their impenetrability to clumsy man, and I have seen one stop and look back impudently, as if certain of one's impotency to follow, ere it disappeared. But this was in the Canadian forests, where the Marten is commoner than here.

The favourite food of the Marten in our islands is the rabbit and the squirrel, and in the chase after the latter it exhibits its greatest activity. It also catches partridges, pheasants, grouse, and blackgame, and any young birds that may come in its way, as well as small mammals, young roe, and occasionally lambs and domestic poultry. Martens will also eat several kinds of fruit and beechmast. The Marten has been known to rob hives of the honey.[1] It is said to resort to the seacoast at low tide and search for fish and molluscs, but I do not know on what authority. When pursuing hares and rabbits it hunts by sight, and when view of the game is lost will follow the trail by scent, frequently stopping to gaze in all directions, after the manner of the stoat. The final onslaught is delivered with a rush which the terrified victim feebly tries to avoid.

Mr. Geoffrey Mortimer, writing in the 'Field,' December 7, 1901, gives some notes on the food of Welsh Martens. He says:

'In the district referred to [the wilds of Merioneth] there are great stretches of unfired heather in which blackgame breed, and it is here that the Marten finds much of its provender. Eggs, nestlings, poults, and mature birds are esteemed in the dietary of this rapacious prowler. The young are caught and snapped up before they can fly; the older birds are surprised and seized while sleeping on the ground at night. Even those that roost in trees like pheasants are exposed to the nocturnal onslaught of the Marten, for its agility in climbing and leaping from tree to tree excels the nimbleness of the squirrel. When blackcock are not easily found the Marten may be compelled to feed upon the lizards that come out to sun themselves among the stones on the mountain slopes, or descending to the swamps at the head of rivulets it captures frogs. Lower down the mountain, and especially in the reclaimed and fenced-in pastures, moles are frequently abundant. Failing other fare the Marten slinks by the mounds of freshly turned earth, watching closely for the least movement of the soil, in the same way that foxes and terriers lie in wait when hunting for this subterranean game. The earth gives a scarcely perceptible heave as the mole tunnels just below the surface; but the Marten is

[1] *Field*, May 17, 1873; April 4, 1874; and February 10, 1877.

quick to perceive the motion, and, digging with rapidity, grips the soft velvety coat and drags out the impotent prey.

'It may be questioned whether field-mice are often caught by the Marten. Shrews are not found very far from cultivation, and other kinds of mice are scarce on the bare highlands. But all the members of the weasel family subsist upon mice when they can catch them and when other food is not obtainable. An animal so wary as the Marten is rarely surprised, even in such a wilderness as that described. Its scent, sight, and hearing are exceedingly acute. Long hours, and often whole days, of watching must be spent by one who wishes to see the creature, whether at work or play. It is, indeed, easier to trap a Marten than to observe one at liberty. Foxes, and especially fox cubs, may be seen on a moonlight night by any enthusiastic field naturalist who possesses the patience to remain perched for an hour or so in a tree near an "earth." The otter will sometimes show itself to the salmon fisher in a summer twilight, or before the sun is up; but an opportunity seldom occurs for watching the Marten on the track of a hare or sneaking up to a sitting grouse. It is not surprising that the oldest native of a locality wherein Martens are still to be found shakes his head at the assertions of a naturalist who has been at pains to make the discovery.

'In the stillness of a winter's morn slight sounds are borne from afar. The scream of a rabbit is heard, and, coming nearer, the cry of the hunted animal is repeated. A streak of grey, the glimpse of a white scut, and a terrified coney dashes by, making for the boulders; in a moment or two a lank, brown creature, not unlike a fox cub at the first glance, comes along sniffing on the warm trail. Its features are sharp and cruel, its whole appearance fierce and bloodthirsty; the chest is patched with white, or it may be with yellow; the tail is long and bushy. No wonder that this beast of prey is the terror of the warren and the grouse moor. Shuddering in darkness beneath the rocks the rabbit sits and listens, but the amber eyes of its pursuer can penetrate the darkest of these crannies, and the keen nostrils are pitilessly unerring. Mute with fear, the panting, crouching fugitive feels the grip of the Marten's teeth upon its neck, and unresistingly succumbs.'

Mr. Harvie-Brown gives an interesting description of a curious death of a Marten as related by Mr. O. H. MacKenzie.[1] The incident took place in the Forest of Morsgail in the Lews in 1875. 'I suddenly came to a place where there was a lot of wool scattered about, and there was every appearance of there

[1] *Zoologist*, 1881, p. 89.



A PINE MARTEN.

From a photograph by D. ENGLISH, F.R.P.S.

having been a struggle between a sheep and some other animal. I knew there were a few stray sheep in the forest, but knowing there were no foxes in the island we thought this sheep must have been attacked by an eagle. I continued my stalk. About one hundred yards from where we found the wool I came upon a large Cheviot wedder lying dead, with its head down hill and its shoulder jammed up against a stone which was sticking out of a bank. In passing I gave the forequarters of the sheep (which appeared to have been dead about a fortnight) a kick, and under its shoulder and neck lay a dead Marten. The wedder in rushing madly down hill with the Marten at its throat had dashed itself against the sharp stone which killed the Marten. The sheep's throat being cut, it had not had strength to get upon its legs, but bled to death where it lay.'

Both before and after capturing its prey the Marten is often mobbed by small birds, which display an equal interest in the movements of the stoat and the weasel. There is, however, no instance on record of its rolling and playing to entice a nearer approach of its victims as has frequently been noticed with the smaller Mustelids. Mr. W. Fleming gives an interesting note on the mobbing of a Marten[1]:

'On the 21st of this month (June) I was walking through the beautiful woods of Curraghmore, which adjoin Coolfin (Waterford), when I heard a regular uproar by birds. It came from a spot a hundred yards or so away. Walking in the direction as quietly as possible, I expected to see a fox carrying off a young bird. Among the branches of some low oaks was a large party of blackbirds: one of them, a fine cock with bright orange bill, being greatly excited, scolding away at the top of his voice, and with outspread wings facing a point from which he expected trouble for himself and family; and there among the leaves, lying close along a branch, was a Marten, crouching low as if he was going to spring. It was a most interesting sight, and neither the Marten nor birds seemed to pay much attention to me as I watched them. Nothing can exceed the gracefulness and quickness of movement in the Marten. It twists and turns its lithe and supple body in every direction, and with wonderful rapidity. One must see it in a state of nature to appreciate what a deadly foe it must be to birds both old and young. Having watched them for some time I went away, and on my return both Marten and birds had disappeared. He was probably having his supper on the old cock, or a younger member of the family.'

The Marten is somewhat bloodthirsty, and occasionally slaughters more than it

[1] *Zoologist*, 1897, p. 327.

can eat or carry away, but in this respect it is not nearly so great a sinner as the stoat or the fox. In severe winters it will often attack hen-roosts and play much havoc with the poultry, and being a beast that is easily trapped it generally pays the price of its temerity.

The Marten is fond of passing the day ensconced in a tree-trunk or squirrel's drey, and when not asleep loves to lie with its nose just poking out, watching all that is going on in the woods round about. As the evening shadows fall it goes for a hunt, and a pair may sometimes be seen chasing each other and romping amongst the branches.

The surprising leaps of this animal are executed with a certainty and ease that are truly wonderful. It runs up the main stem with all four limbs extended and ascends rapidly, somewhat after the manner of the squirrel, to the angle of some protruding limb, where it often squats for a moment to mark out its subsequent line of movement amongst the interlacing boughs. Along here it runs or gallops, often stopping to gaze, and when small branches are encountered it scrambles over the twigs with a delicious boneless grace. Its actual leaps seldom exceed ten feet, but when a drop is necessary to catch some bough below, its aerial flight seems still greater, although it is not so in reality. Mr. A. H. Cocks showed me one of his cages which contained a beautiful Irish Marten. Its breadth would be about 14 feet, and in the exuberance of play the animal would often spring from a platform at one end right on to the wire front at a single leap.

The Marten is a shy, timid creature, resenting confinement, though not so much so as the American fisher. It is wonderfully loose-jointed, and can squeeze itself through very small apertures. In America and Canada Martens frequently make use of the holes of the great black woodpecker, and are said to do so in Norway; but in this country they have not been seen to enter woodpecker holes, and Mr. Harting doubts the possibility of their using such small apertures. However, if we turn to Mr. A. Heneage Cocks's notes in the 'Zoologist'[1] we find that a tame adult female Marten found her way out of an inner cage and then squeezed back again through an opening of only one inch and a half. Green woodpecker holes are often larger than this.

Martens usually have one litter in the year of from two to five in number, but seven have been noted in Ireland, and in good seasons when food is plentiful the female may perhaps breed twice. Mr. A. H. Cocks bred Martens in confinement in 1882, 1884, 1885, and 1893 from two different females. The first pair,

[1] June 1897, p. 270.

which bred on three occasions, died well on in their seventeenth year. He discovered that the young when born were white—a remarkable fact. His notes on the breeding in captivity of the Marten are so full of interesting points that I give them in full.

'So far as I have been able to ascertain, there is no instance recorded of this Pine Marten (or other species of the genus) breeding in captivity; and but little appears to be known concerning its reproduction in a wild state, for in no book that I have met with is mention made of the remarkable difference in the colour of the young when first born, which surely would have been noticed had the fact been known. An adult female Pine Marten sent to me from Cumberland in May 1876 had for the last two if not three years shared a cage with a male of the same species without showing any signs of breeding until at about 11 P.M. on April 7, 1882, I heard the unmistakable whimpering or squealing of young ones proceeding from one of the bed-boxes in this cage. I had fed the Martens about six o'clock, and feel certain that no young were then born. I at once shut off the male animal, not knowing how he might treat the youngsters. On the morning of the 10th I ventured to take out one of the young ones. It was about 6 in. long, including the tail, which was about, or nearly, 1¾ in. long, and appeared out of all proportion in so young an animal, and was in shape and in proportion to the head and body like that member in an adult stoat. It will, I believe, be a surprise to others, as it certainly was to me, to learn that this species is at first quite *white*, the coat being, of course, fine and short. On the 14th I again looked at the young, and found them to be three in number—two males and one female. They were *white*, getting grizzled like very young polecat ferrets, coats longer and rougher than before, and bodies heavier and stouter, but not perceptibly longer than on the 10th. Certainly if I had met with these cubs without knowing their parentage I should not have guessed them to be Pine Martens, but should have been inclined to suppose they were young polecat ferrets, or perhaps, chiefly in consideration of their tails, young stoats, with the young of which species I am unacquainted.

'On the 18th the cubs were shifted by their mother to the other bed-box, probably in consequence of my having disturbed them. I was obliged to go into the cage at least once a day to attend to the male, which I had shut into a smaller cage, enclosed in the other, and also to two other Martens in a cage beyond, to which the only access was through the cages tenanted by the nursery party.

'The mother is an exceptionally shy specimen, and these constant visits and

also, perhaps, the close proximity of the other Martens kept her in a restless state, and on the evening of the 22nd I saw her with one of the cubs in her mouth; and on May 3rd, on going into the cage to clean it out, I found one of the young ones lying almost dead on the top of one of the bed-boxes, where it must have been carried and left by the mother. I took it indoors immediately and carefully warmed it; but it was too much exhausted to swallow milk, and died an hour and a half later. I have preserved it in spirit: it was a male, length $10\frac{3}{16}$ inches.[1]

'The following evening I put some fresh straw into the cage, which had the effect of frightening the Marten; and taking one of the cubs out of the box in which it was she carried it behind a box out of sight, and presently let it fall on the ground, a drop of about five feet. However, no bones were broken, and I replaced it in the box with the other cub, and fortunately had no further disaster. The eyes were still closed. I left home the next day (the 6th) for a fortnight, during which interval they acquired the use of their eyes. On the 25th one of the cubs showed itself for the first time, trying to climb out of the bed-box and calling loudly. On the 29th the mother took three young greenfinches which I gave her and tried to induce the young to eat, uttering a peculiar chuckling or clucking noise. The cubs made repeated efforts to get out of the box, with a view of finding a place where they could eat by themselves, but were each time pulled back by the mother. One cub, however, at length succeeded in getting out, and ate and growled in a most satisfactory manner.

'The next day the cubs had a scrimmage over eating a sparrow, and one or both came out. On June 5th one of the cubs being out scrambled back into the box, which is rather more than a foot high, by helping himself up by the wall, which formed an angle with the side of the box, and by the next day was able to *jump* on to the top of the box. On the 23rd they made, I believe, their first descent to the ground, having been born at a height of nearly five feet above it, by means of a carefully arranged inclined plane, or chicken-ladder. I first actually saw them do so on the evening of the 25th. On July 2nd, being the anniversary of the date on which I had measured the young Marten the previous year,[2] I endeavoured to measure this young male, but it proved so extremely fractious that I could not succeed in measuring it even as accurately as on that occasion. It was, however, just about the same size as, or if anything

[1] Nose to eye-slit, $\frac{3}{4}$ inch; eye-slit to ear, $\frac{3}{8}$ inch; head, 2 inches; neck and body, $5\frac{3}{4}$ inches; tail, $2\frac{1}{2}$ inches.

[2] Cf. *Zoologist*, 1881, p 333.

slightly larger than, those cubs at that date. I therefore think my estimate of the age of the former couple was pretty correct, as the fact of having been taken from their mother when quite small, and possibly not very suitably fed by the shepherd before they were sent to me, and then the journey, would be likely to throw them back somewhat and slightly retard their growth.

'The young Martens were quite full-grown by the autumn, and are still flourishing. I regret that I am unable to state the length of gestation, but may hope for "better luck" if there should be a "next time."'

The actual pairing of Martens seems to take place at night, and Mr. Cocks has observed that the female when in season scatters about little tufts of straw. In a short note[1] the same careful observer has recorded his views on the subject of gestation. He says:

'Pine Martens (*Mustela martes*) first bred in my collection in 1882, a note on which was published in the "Zoologist" for 1883, p. 203. Various details concerning the rate of growth of the young were recorded, including the interesting fact, which seems to have been previously unsuspected, that the young are at first perfectly white. Since then other litters of this species have been bred in my collection; but as we never could discover when the female came in season (and have never even yet seen this species pairing), all attempts at breeding were extremely hazardous; the allowing of a pair to run together was apt to result in the death of the female, in consequence of one or more of the long canines of the male penetrating her brain, the damage being inflicted so instantaneously that there was no possibility of a timely separation.

'At last, this year, we noticed little mouthfuls of short straw deposited here and there in the cage of a female Marten—a sign of her being in season, which I first observed some years ago in the case of otters.

'Accordingly, a male was admitted from the adjoining cage on January 5; shut off again on the 16th, but readmitted the next day, and the pair were finally separated on the 18th. Pairing probably took place on the nights of the 8th, 10th, and 13th, though quite possibly at other times also.

'Young, which proved to be two males, were born early on April 22; and by the end of July they were already bigger than their mother.

'The probable period of gestation of this species is therefore a few hours over 103 days, the extremes of possibility ranging from ninety-four to 106 days.

'Beyond certain contributions towards determining the gestation of the badger,

[1] *Proc. Zool. Soc.* December 4, 1900.

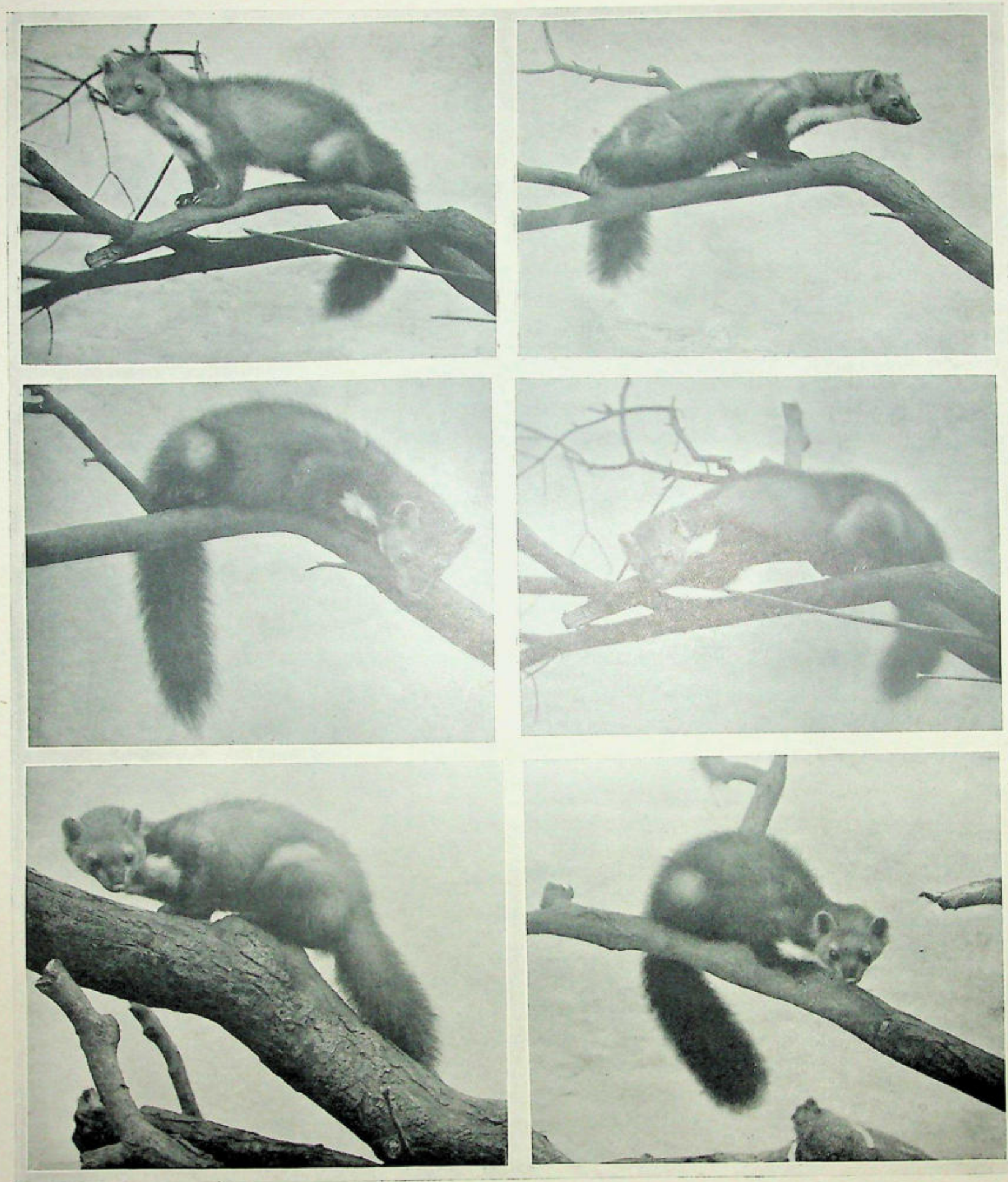
among which I would specially refer to that of Mr. E. G. Meade-Waldo ("Zoologist," 1894, p. 221), and the common statement that the ferret "goes about six weeks," I know of no published record of the gestation of any of the *Mustelidæ*, except in the case of two species in my own experience, viz. otter, 61 days (*cf.* "P.Z.S." 1881, p. 249; "Zoologist," 1882, p. 201); and polecat, 40 days ("Zoologist," 1891, p. 344). Although I had long suspected that the gestation of the Pine Marten must be a good deal longer than that of the polecat, yet the actual state of the case was unexpected, and is certainly remarkable.'

On the subject of Pine Martens in confinement Mr. Cocks says in a letter to me (November 6, 1904): 'The example now in the Zoological Gardens, Regent's Park, was perfectly tame while in my possession. I could pick her up anyhow, like a domestic dog or cat, and she would even perch on my head, and I have had others equally tame. They all show cupboard love for their keeper; one that I have now will shake hands for food, and the others I can stroke or pull about by the scruff of the neck when they are feeding; but they will not allow my man to take such liberties. Martens can easily recognise different footsteps as well as voices. They are great fruit eaters for the few weeks that wild berries are ripe.'

Hunting.—The Marten affords a short but merry chase, and in the fells of Westmorland is hunted with small wire-haired terriers. These little dogs are noted for their pluck and endurance, and at first run the trail at a good pace, being as keen on a Marten as on fox or otter. On flat ground the Marten bounds away with long leaps, six or seven feet apart, and holds his own for a while, making at once for the rocks and crannies in the hillside, where he is generally run to ground. Sometimes it will get into rough places where the man and dogs cannot follow, but more often it is smoked out if the terriers cannot get at it. It is said to fight desperately with tooth and nail.

Mr. Geoffrey Mortimer thus writes of the pursuit of the Marten in Merioneth:[1] 'The most favourable time for tracking Martens is when the mountains are lightly, but evenly, covered with unfrozen snow. If snow falls at night the hunter should be astir before the sun rises. Before he ascends beyond the region of inclosed grass fields he will see the footprints of rabbits crossing and recrossing in irregular lines. The clean impress of a fox's pads runs along the slope, and it is curious that the track frequently encircles the mountain several times before it leads off to the valley, which seems to prove that hill foxes carefully quest on the high ground before descending to the ravines. The return track to the rocks

[1] *Field*, December 7, 1901.



PINE MARTENS.
From photographs by D. ENGLISH, F.R.P.S.

near the summit may be found crossing the serpentine lines around the mountain; and if the trail is steadily followed by the keeper he is almost certain to trace reynard to his kennel. Although the impression of a Marten's foot is smaller than that of a fox, the marks are very much alike in the soft snow, and in a thaw the prints of both are larger.

'Near the streams there are the web-footed impresses of teal and duck, the finger-like marks left by the feet of herons, and the prints of snipe, plovers, and titlarks. Where the rivulet descends to the vale water-voles have left their tracks, resembling in miniature the "seal" of the otter; and here, too, are the imprints of the moorhens' long and slender claws. Amongst all these traces of beast and bird the cat-like impression of the Marten's pads is distinct and easily recognised. Very often the trail is a long one, for Martens will travel as far as foxes during the night, and they take a straighter line across the shoulders of the mountains. Tracking a Marten in the snow is, therefore, a severe exercise, requiring patience and experience in climbing. If the wind changes to the south or west the snow may melt before the hunter can follow the footprints up to the lair. In such case a dog is of no assistance, as the Marten is free from that powerful odour which the stoat leaves in its track.

'There is a spice of danger in hunting the Marten during hard weather. The snow has hidden the treacherous bogs, the cliff ledges are slippery, and there is always the risk that a snowstorm may overtake the hunter upon a desolate height of perhaps 2,000 feet. But the sport is novel, and the mountain air dispels a sense of fatigue. The chase leads on through steep masses of heather, over great boulders, and across boggy places to the summit.

'For hours there is not a sound or glimpse of animal life. The track of the Marten may be seen for fifty yards ahead on the snow-clad slope which descends to the bay. Striding along the ridge, the Marten tracker and his terrier reach the rocky summit. Thence the footprints lead to the pass of A., and across the lonely glen of M., where they disappear amongst the boulders. The rough-coated black and tan Welsh terrier begins to whine and sniff, and darts into a cavern. His master cocks the trigger of his gun and stands keenly expectant. Within the cave there is a snapping and growling. The Marten swells out its brush, erects the hair on its back, and spits and hisses like a cat. Pinning the dog by the nose the plucky beast fights viciously and retreats. But presently the Marten chooses flight, and makes a bolt from one of the many outlets of the fastness. The keeper levels his gun and fires, and the wildest life of the mountains is at

an end. To the preserver of grouse the upshot of the chase is gratifying, but to the student of animal life it is a matter for regret. The day is probably not far distant when the Marten will no longer range in the haunts referred to, and the largest and scarcest of the British Weasels will be extinct.'

'Hunting the Mart' was an ancient British field sport in considerable favour in olden days, and Beckford,[1] Scott,[2] Daniell, and other writers all bear testimony to the excellence of the sport, the Marten being a good beast at which to enter young hounds. Scott says: 'The Marten, when hunted, will sometimes run miles in large coverts, and will engage the hounds a considerable time, showing great sport, and taking many opportunities to climb trees and recover his wind, the hounds baying him until frightened or cudgelled down, when he shows an almost miraculous agility; for although he frequently alights in the middle of the pack, and each hound is mad to catch him, he is seldom so caught, and his escape is greeted with a loud general halloo.'

Mr. W. Durnford has written the best account of Mart hunting in Cumberland,[3] and it is so descriptive that it ought to be given in full.

'The meet,' he says, 'was at Wastdale, one of the grandest and most secluded valleys in the Lake district. Long before daybreak we were awakened at the little inn by the voice of the huntsman, who had arrived with six couple of hounds, varying in size from a beagle to a foxhound, together with three wire-haired terriers. As the mist still hung like a wet blanket on the hills, and the day had not yet broken, it was decided that we should begin by trying our luck on the low ground at the head of the valley, and thither we accordingly bent our steps. We proceeded thus for nearly an hour; and though an occasional whimper from one of the hounds led us to think that something had passed that way during the night, if it had done so we were quite unable to hit off its line. Being particularly anxious to show some sport, the huntsman now resolved to take to the hills, notwithstanding the mist; and, having received instructions to keep well together, we commenced the ascent of Yewbarrow, a mountain rather over 2,000 feet in height. It soon became evident that something was on foot: the hounds showed evident signs of excitement, eagerly examining every nook and crevice, and stopping now and again to drink in, as it were, the scent from all the rocks. Still they seemed at a loss, until an old dog, which had been steadily hunting at a little distance from the rest, suddenly commenced to give tongue. The others made a rush towards him, and the whole pack was quickly off full cry up the

[1] *Thoughts on Hunting.* [2] *Field Sports.* [3] *Field*, December 6, 1879.

Climbing the woods below



face of the mountain, raising a chorus which resounded from crag to crag across the valley below, and was re-echoed from the sides of Scawfell and the adjoining heights. The object of our early start now became manifest: the knowing ones proclaimed that it was a Mart which we were in pursuit of, and that we were probably close upon it, having no doubt taken it unawares before it had returned home from its nocturnal rambles. The hunting now commenced in earnest—no easy galloping over well-kept pastures, no awaiting one's turn to pass through a crowded gate or well-worn gap, no convenient check at a pleasant covert side, but downright hard work, not unaccompanied with the spice of danger: at one time clambering on hands and feet up a perpendicular precipice, at another crawling through a narrow crevice between two high boulders; now running across a sea of stones, which give way at every step and render it impossible even to think of standing still; now stepping from ledge to ledge, and trusting one's life to the sturdy alpenstock with which each one has armed himself before setting out. The hounds meantime are clambering up with an agility which would astonish their relations further south, resembling a party of squirrels rather than members of the canine race, as they vie with one another in their anxiety to be to the fore.

'About an hour of this sort of work brought us to what was, comparatively speaking, level ground, and here we for the first time met with a check. The Mart had considered discretion the better part of valour, and had taken refuge in a deep crevice in the face of a rock. As the efforts of the terriers were of no avail, artificial means were now brought into requisition in order to dislodge the varmint. We all set to work to collect as much grass as the locality afforded; the huntsman produced from his capacious pockets a box of matches, a little gunpowder, and an old newspaper, and in a few minutes a fire which consisted of smoke rather than flame was burning as far down the crevice as the fuel could be thrust. We had not long to wait. All stood back, and in less than three minutes a long dark object was seen scampering over the rocks above our heads, having escaped out of a hole a little distance off. Away we went again, both hounds and men more excited than ever, leaping from crag to crag, and performing acrobatic feats from which anyone would have shrunk in cold blood. The ground now became of a rather less difficult nature, and we were able, without imminent danger of destruction, to take a glance at the surrounding scenery. The rising sun had dispelled the mist, and the atmosphere had by this time become quite clear, though a few clouds hung on the summit of the

higher peaks. From our elevated station we looked across to the rugged face of the Screes, one of the grandest hills in the district. Beneath us Wastwater lay like a duck pond, the cultivated fields at the head of the lake contrasting well with the dark sides of the surrounding heights. Towering above, Lingmell, Great Gable, and Scawfell Pikes seemed to watch over the scene, while away to the west the waves of the Irish Sea sparkled under the rays of the morning sun. Close to us a pair of ravens and a buzzard, attracted by our presence, were doubtless wondering who it was that had ventured to invade their domain. But it would not do to linger; already the hounds were out of sight, and nothing but their baying would enable us to follow in their track.

'Another check, this time amongst a quantity of loose boulders extending for some hundreds of yards in each direction. Again the terriers were set to work, and again the Mart continued on his way unharmed. It was, however, the beginning of the end. We were now on the summit of the mountain, and before us extended a grassy plateau, only here and there broken by fragments of rocks. The quarry was evidently making for the Pillar Mountain, which stood out in the distance, a notable stronghold for birds and beasts of prey, and which, if once reached, would afford a certain protection. Bravely the little creature raced on, no longer stopping to take refuge in the rocks, which it knew could not give it shelter, but staking all on its swiftness of foot. On the level ground, however, it had no chance, though it managed to head its pursuers for about a mile after leaving the rocks. The actual circumstances of its death need no description; in fact, the hounds alone were present at the critical moment. The huntsman, however, arrived in time, and we were able to carry off the skin as a memento of our day's hunting amongst the Cumberland mountains.'

Martens do not appear to be very suspicious of traps, as some wild animals are, but range so far and in such varied directions, seldom following the same 'run,' that they are only taken by accident. A writer (Lex) in the 'Field,' March 1, 1902, says: 'One of the quarry owners on Coniston told me that when a Marten was found killing poultry belonging to the men on the mountain side they made a small stone inclosure, tethering a hen inside, covering it with a flat stone, and leaving an opening in which a rabbit trap was placed. In this way they had got three or four Marts in a few days. I have one in a case which the keeper trapped at the entrance of a sneuk, where it had killed all the inmates (ten) during the previous night.'

The fur of the Marten has always been a valuable article of trade in this and other countries. To-day it is worth from ten to thirty shillings. Mr. Harting says[1] that it was formerly used for the borders of kings' robes, and that in the 'Laws of Howel Dda,' A.D. 940, a Marten skin was priced at twenty-four pence, a large sum at that time. Prior to 1707 the fur of the Marten formed a lucrative article of export from Scotland. Up to the sixteenth century Marten fur is constantly mentioned as being in use by the wealthier classes of England. Now no trade is done in the fur of the English Marten, all the skins coming from Norway and Sweden, Canada, Russia, and a few from Lithuania.

[1] *Zoologist*, 1891, p. 404

THE POLECATS

Genus *Putorius*

THREE pairs of premolars in each jaw. Feet hairy between pads. Strong scent from anal glands. This genus includes the Polecat, Stoat, Irish Stoat, and the Weasel.

THE POLECAT

Putorius putorius, Linnæus.

Mustela putorius, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 67 (1766); Bell, 'Brit. Quad.' 2nd ed. p. 203 (1874); Lydekker, 'Brit. Mam.' p. iii. (1895).
Viverra putorius, Shaw, 'Gen. Zool.' i. p. 415 (1800).
Mustela Eversmanni, Lesson, 'Mam.' p. 144 (1828).
Fœtorius putorius, Keyserling and Blasius, 'Wirb. Europ.' p. 62 (1840).
Putorius fœtidus, Gray, 'List Mam. Brit. Mus.' p. 64 (1843).
Putorius vulgaris, Owen, 'Brit. Foss. Mam.' p. 112 (1846).
Putorius putorius, Thomas, 'Zool.' 4th ser. ii. p. 100 (1898).

Local Names.—*Polecat*, *Foulmart*,[1] *Foumart*, *Fulimart*, *Fitchew*, *Fitche*, *Fitchet Weasel*, *Fitchet*, *Fitchet Ferret*, *Black Ferret*, *Jill* (female), *Hob* (male) (England); *Ffwlbart*, *Gwichydd* (Wales); *Foumaire*, *Focalan*, *Feocoullan* (Scotch Gaelic); *Polecat*, *Foumart* (Scotland).

Bell[2] suggests that the word 'Polecat' is nothing more than 'Polish Cat.' This, as Mr. Harting points out,[3] is most improbable, as the name is used by Chaucer. 'Professor Skeat,' says Mr. Harting, 'suggests "pool-cat," *i.e.* a cat living in a hole or burrow, since the Gaelic *poll* and the Cornish *pol* signify a hole or pit, as well as a pool.' Sir Harry Johnston, however, suggests another explanation:[4] 'The origin of the name of the large Weasel is very doubtful. It appears in early English after the Norman Conquest, and is written *pol-cat*. The second syllable explains itself, but *pole* or *pol* is possibly derived from the French *poule*, a hen, because of the fondness this creature shows for attacking domestic poultry;

[1] Called Foulmart from its disagreeable odour. Thus the Pine Marten is often referred to as the Sweet-mart.
[2] *Brit. Quad.* 2nd ed. p. 206.
[3] *Zoologist*, 1891, p. 289.
[4] *Brit. Mam.* p. 154.



Litho. W. Greve, Berlin.

THE POLECAT.
Mustela Putorius.

or it may be a variant of the Anglo-Saxon word *ful* (foul). . . . In Old French this animal is called *fissau* (corrupted in English into *fitchew* or *fitchet*), and this was derived from an old Low German and Scandinavian verb, *to make a disagreeable smell.*' The Latins called the ferret *viverra*, and the word 'Ferret' may be derived from the French *furet*, which is probably Celtic in origin.

Characters.—Average length of adult male, from nose to tip of tail, 20 to 26 inches; tail, 7 to 9 inches; adult female, 16 to 22 inches; tail, 6 to 7 inches. Body long and thin; somewhat massive and strong head; limbs short and strong. Outer fur long and dark brown, almost black in some specimens, and when in good condition with a slight purplish gloss. Under fur yellowish; throat, underparts, and limbs blackish brown; lips white; a yellowish white band extends across the forehead and down the cheeks; outer fringe of ears white. Ears short and broadly rounded; eyes small and dark brown; vibrissæ black. Males are more richly marked than females. Average weight of male 2¾ lb., female 1¾ lb. A very large male has been known to weigh 4¾ lb.[1] Before changing the coat in early May the fur undergoes the usual process of fading. When first born the young are very pale in colour, but soon assume a grizzled appearance; the full colour is acquired when about eight months old.

Dental Formula.—I. $\frac{6}{6}$; C. $\frac{2}{2}$; P. $\frac{6}{6}$; M. $\frac{2}{4}$.

There are three pairs of premolars in each jaw.

Distribution.—The Polecat is found throughout the greater part of temperate Europe. In Russia it occurs as far north as the White Sea, and seems to prefer a cold climate. Another sub-species takes its place in Western Asia, whilst in summer it is said to ascend above the forest growth in the Alps and the Austrian Tyrol. Throughout Northern Siberia it is also to be found. In Europe it is not met with farther south than the north of Spain and Italy. In the New World it has no very closely allied representative. In England the Polecat is now a rare animal, chiefly owing to the destruction of the forests and the incessant warfare waged against it by game preservers and farmers. Moreover it is of a bold and somewhat careless disposition and very easy to trap. Its love of destroying domestic poultry so frequently leads to its death that it is a wonder that any wild Polecats survive at all. In all civilised parts, sooner or later, when food is scarce, these animals find their way to farms and outhouses, and then their fate is sealed, for the Polecat has a predilection for using the same run and raiding the same kind of prey when once it has been successful.

[1] *Cf.* Macpherson, *Fauna of Lakeland*, p. 32.

Apart from the numerous Polecat-ferrets, which are constantly escaping, the species cannot be considered quite extinct even in the southern counties. Hardly a year passes without records of its capture being reported from Surrey, Kent, Sussex, Hants, Oxon, Dorset, Devon, or Cornwall. A few certainly linger in North Wiltshire, Suffolk, Norfolk, and Cambridgeshire, where I saw four freshly killed specimens brought into Cambridge in 1884, and one was killed so recently as 1892 at Swavesey. In Lincolnshire there are also some left in the large unreclaimed woods, and I received a beautiful male from the neighbourhood of Horncastle this year (1904). It still exists, though it is very rare, in Leicestershire, Rutland, and the Western Midlands, whilst the late Lord Lilford noted its survival in Northamptonshire. Mr. F. Coborn reports it as still existing in the King's Heath and Handsworth district of Staffordshire,[1] whilst it has recently been captured on the Chartley estate in that county. In Shropshire and Cheshire it is almost extinct, and of the last-named county Mr. Coward sends me the following note:

'The Polecat is almost extinct in Cheshire, but a few are captured from time to time in the unpreserved districts bordering the manufacturing towns of the east. Very many years ago there used to be organised Polecat hunts in certain districts of East Cheshire. The leading dog of a scratch pack carried a bell as a guide to the others, and the happy possessor of this belled dog was a proud man. One of these bells is still in existence, but I have failed to trace it, as the owner has now left the district. Within the last three years I have not heard of more than three or four being captured in the county. In Cheshire the name "Foumart" is now frequently applied to the Stoat.'

'A taxidermist of Oxford,' says Mr. Harting,[2] 'in September 1885 had no fewer than eight sent to him,' so the Polecat probably still exists in the county, though it is probably extinct in both Essex and Middlesex, where forty years ago it was comparatively common. Mr. Harting mentions Lord Mansfield's woods at Hampstead and Highgate, Hendon, Edgwarebury, Stanmore, Harrow, Willesden, and Kingsbury, all close to London, as places where it used to occur.

Messrs. Clarke and Roebuck[3] describe the Polecat in Yorkshire as 'irregularly distributed, extremely rare, and fast becoming extinct, although half a century ago it was generally abundant.' It was considered still plentiful in 1864 in Northumberland and Durham,[4] but it is now very rare.

[1] *Zoologist*, 1892, p. 402.
[2] *Ibid.* 1891, p. 284.
[3] *Fauna of Yorkshire.*
[4] *Trans. Tyneside Nat. Field Club*, vol. vi.

In Cumberland the Polecat was once common, and was hunted regularly with hounds, but so recently as 1883 the Rev. H. A. Macpherson[1] considered it 'virtually extinct in East Cumberland' and very rare in the Lake district. It still, however, holds its own in a district extending from Solway Plain to Wigton and Maryport, especially about Weddholm Flow. In North Lancashire it is now extremely rare, as well as in Westmorland.

In Wales, especially in Merionethshire and Montgomeryshire, Foumart hunting with hounds was extensively practised until the middle of the nineteenth century; and though the chase is now discontinued the animal is not so rare as is generally supposed, either in these counties or in Pembrokeshire and Cardiganshire.[2] In fact the Polecat is probably more common in these counties than in any parts of Scotland. In South Wales, Mr. Drane informs me, it is almost, if not quite, extinct.

Mr. J. A. Harvie-Brown[3] has carefully traced the past and present distribution of the Polecat in Scotland. His general summary is that the animal, once common in all counties of the mainland, is every year becoming rarer. This he attributes to the constant practice of rabbit trapping with gins. 'Rabbit trapping has proved fatal to it; for whilst the increase of the rabbit has provided abundance of food, it has been the indirect means of causing the decrease of the species by the agency of steel traps. Inland localities, formerly inhabited by Polecats, have been deserted by them, for drawing down towards the sandy burrows, to prey upon the rabbits, they themselves become an easy prey.'

Throughout the whole of the Lowlands of Scotland the Polecat is practically extinct,[4] and it is now extremely rare in Perthshire. A reference to Mr. Robert Service's article[5] on 'The Old Fur Market of Dumfries' will illustrate the rapid decrease of the species. In 1829, 400 Foumarts were sold; 1831, 600; in 1854 they were becoming scarce; in 1858 they were very scarce; in 1866 only twelve were offered for sale; after which date none were forthcoming. The supply came from Dumfries, Galloway, Ayr, Lanark, Peebles, Roxburgh, Cumberland, and Westmorland. Ross, Sutherland, and Inverness seem to be its last stronghold in the north, and even here it is far from numerous. Mr. Macleay of Inverness and Mr. Bisshopp of Oban inform me that they annually receive about five or six.

In Sunart and Ardnamurchan, Argyllshire, there are still a few Polecats, but in Aberdeenshire it is practically extinct. In Inverness more records come from the country to the north of the Caledonian Canal than from any other part of

[1] *Zoologist*, 1891, p. 343. [2] *Ibid.* August 1892. [3] *Ibid.* 1881, pp. 161–171.
[4] Mr. Hugh Boyd Watt gives 1868 as the date of its extinction in the Clyde area. [5] *Scottish Naturalist*, July 1891.

Scotland, and it is not uncommon in Badenoch. In Sutherland it is now very scarce, though eighteen were taken between 1890 and 1899 in Assynt, and two were recorded in 1903.

There is little doubt that the Polecat is not an Irish Mammal. Professor Leith Adams does not accept its past or present existence, although Thompson received notes of several which were supposed to have occurred. Polecats have been taken in Ireland, but those were doubtless escaped Polecat-ferrets lost in rabbit hunting.

Habits.—The Polecat is one of the early inhabitants of Europe, its remains being found in the Pliocene deposits of France, Hungary, Germany (Cuvier), and Belgium (Schmerling), and the Upper Pliocene strata of Suffolk. The bones of this animal are also not uncommon in the Pleistocene deposits of England as well as in caves,[1] and it must have been a fairly common animal throughout this period. No fossil remains have as yet been discovered in Scotland or Ireland, but in course of time they may come to light in the former country. Early English and Scotch writers mention the Polecat, either speaking in eulogistic language of its excellent fur or disparagingly of its disagreeable odour and destructive propensities.

Living in woods, thickets, rabbit-holes, and in retreats amidst the rocks, the Polecat sleeps the greater part of the day and emerges at sunset to seek its prey. Its ferocity and cunning render it a formidable enemy to whatsoever it may attack. Where rabbits are fairly plentiful, it will live almost exclusively on these animals, and does not range far afield like the marten. Its agility has been much exaggerated; compared with other Mustelids, such as the weasel, stoat, or marten, it is somewhat clumsy and slow in its movements, but it can both climb fairly well and pursue and catch a rat if the quarry has not gone too far from the hole from which it has been bolted. If rabbits are abundant, there are sure to be men after them with traps and guns, and so the Polecat shares the fate of its victim; thus it can only exist in the wild and little frequented parts of England, Wales, and Scotland, where rabbits and other game are sparse and widely scattered. In game preserves it will destroy quantities of young grouse, pheasants, partridges, hares, and rabbits, though it seems to have no especial partiality for the small Mammals which stoats and weasels love. Eggs, fish, and frogs are included in its bill of fare, and are greedily devoured, and in the pursuit of fish it will resort to the

[1] Owen instances the finding of skulls in a cave at Berryhead, Devon, and in one of the raised beaches near Plymouth. Owen, *Brit. Fossil Animals and Birds*, pp. 113, 114.







POLECATS.

From photographs by D. English, F.R.P.S.

banks of rivers with almost as great assiduity as its cousin the mink, which is a most persistent and skilful trout-catcher. Bell[1] gives an instance of a Polecat that constantly resorted to the bank of a river to catch eels, and says that no fewer than eleven of these fish were found in its retreat. Mr. Harting says that Polecats catch eels[2] as they slide over dewy grass in the early morning.[3] The Polecat is a fine, bold swimmer, though no better than the stoat, and is said to be capable of diving and taking food from the bottom of a bath or stream. I have experimented with Polecats in the water and have found that they get very angry, just as stoats and weasels do, if you attempt to head them off from their landing place.

Bell gives an example, quoted from 'Loudon's Magazine,'[4] of the fondness of the Polecat for batrachians. Telling of the discovery of a female Polecat's den, the writer of the note says: 'In a side hole I picked out and counted most carefully forty large frogs and two toads. These were all alive, but merely so; capable of sprawling a little, and that was all; for the mother had contrived to strike them all with palsy . . . and on examination I found that the whole number, toads and all, were bitten through the brain.' In days gone by it was a constant practice of the Polecat to attack domestic poultry, generally when shut up for the night. Not content with one victim, this bloodthirsty ruffian simply revels in slaying all the occupants of a hen-house, however numerous they may be. So blind and excited does it become with the lust of slaughter that it will often move away without eating, simply sucking the blood. It will attack even such large birds as turkeys, and 'no less than sixteen of the latter large and powerful birds have been known to be killed by a single Polecat in the course of one night,' says Bell. In Scotland one has been seen to attack and hold a full-grown brown hare. With small animals and birds it may crush the skull and eat the brains first, but with all larger victims it invariably attacks the throat or back of the ear, biting and holding on till the struggles have ceased.

In some rabbit-hole or cranny in the rocks the female Polecat brings forth from four to six young ones in May or June.

Some interesting particulars of the habits of the Polecat during the breeding season in the wild country of North-east Northumberland are given by Mr. Thomas Farrall in a letter to the 'Field,' May 8, 1883. He says:

'Nests are often found by the hunters when digging out an animal that has

[1] *Brit. Quadrupeds*, 2nd edit., p. 205.

[2] Mr. A. H. Cocks, who has had great experience with these animals in confinement, says they like eels, but no other fish seems to be particularly cared for, though they will eat them *faute de mieux* (*Zoologist*, September 1891, p. 344).

[3] *Zoologist*, 1891, p. 292.

[4] Vol. vi. p. 206.

gone to ground. Scottish-like, they are made up of "but and ben;" that is, they consist of two distinct parts—one made of leaves for the reception and rearing of the young, and the other serving as a storehouse for food. In the latter compartment have been found young rabbits, leverets, partridge chicks, ducklings, larks, frogs, and even eels. The frogs, though alive, were stunned by a puncture on the top of the head, and were thus in a half-unconscious state. In the spring of the year the poultry yards of the Abbey Holme farmers suffer much from the depredations of Foumarts. On two holdings at Plaskett Lands over sixty head of young poultry disappeared in a short space of time.

'The female Polecat generally selects her lair in the autumn, occupies it during the winter, and brings forth her young in it in the spring. She has usually four or five at a time, so that the species multiplies rapidly, notwithstanding that they are assiduously watched and trapped by local gamekeepers.'

Mr. A. H. Cocks considers that the period of gestation is forty days, and that 'the male and female pair in the day time, remaining together one hour and from ten to thirty minutes.'[1] The cubs are at first blind and covered with buff-white hair. The eyes begin to open on the twenty-first day, and may be quite open on the thirty-third day.

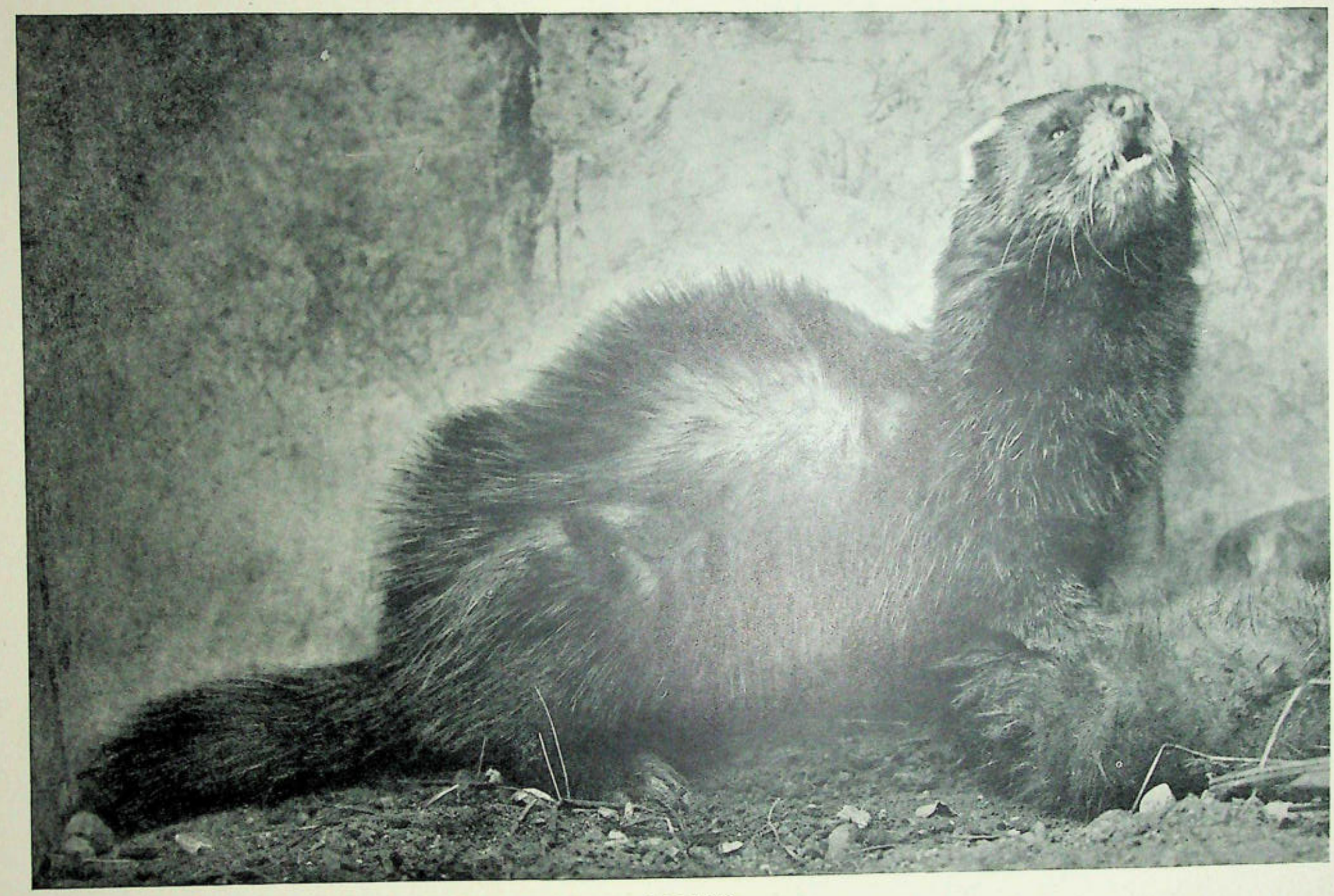
Mr. Cocks has noticed that cubs come out of their retreat on the thirty-ninth day, and are almost full-grown on the sixty-sixth day. 'Polecats,' he says, 'probably begin to eat rather before they are three weeks old. It was a very easy job to rear the cub which I rescued on the thirty-first day. He very soon despised milk, and for some time before I left him on his fifty-first day hardly drank a couple of teaspoonfuls of milk in a day. However, when adult they take to it again, and are very glad to get it.' If kept in a clean state Polecats and Ferrets have little disagreeable smell unless they are irritated or wounded, when they make use of the scent-gland.

When associating in a body, Polecats have been known to attack man, although such cases are extremely rare. The following letter from Lady Lloyd appears in the 'Field,' August 1, 1903:[2]

'A boy of fourteen called Evan Jones, son of Mr. and Mrs. Jones, of Penpynfarch Farm, near Llandyssil, in Cardiganshire, noticed a batch of Polecats, nine in number, gambolling in a field on this farm. Finding the stones he threw

[1] *Zoologist*, 1891, p. 345.

[2] Other instances will be found in the *Naturalist*, 1854, vol. iv. p. 95; and John Colquhoun, *Feræ Naturæ of the British Islands*, 1873, p. 13.



A POLECAT.

From a photograph by D. ENGLISH, F.R.P.S.

did not disconcert them, he advanced towards them with a short stick in his hand. No sooner had they seen him than they rushed at him, so the boy ran home, though they tried to climb up his body. Later in the evening Mr. Tom Davies, of Cromcathan, hearing of the episode, went to the field with a stout stick. Again the Polecats rushed at him. They jumped at his hands and face, and swarmed round him, trying to climb up his body. The next day they were there again, and three of them were shot, since when they have not returned. This farm is close to Sir Marteine Lloyd's estate in Cardiganshire, and Sir Marteine thinks that it is very unusual; he has heard of weasels doing the same some years ago. Polecats are common in Wales. Sir Marteine destroyed thirty-six in one season in 1886.'

Hunting the Polecat was at one time a favourite pursuit amongst the country squires of Cumberland, Westmorland, Lancashire, North Wales, and Cheshire, but it is now practised only to a very limited extent in Cumberland and North Wales. Writing in the 'Field,' May 5, 1883, Mr. Thomas Farrall thus describes the chase of the Polecat in Solway, Abbey Holme, and Weddholm Flow districts of Cumberland:

'Hunting the Polecat, or Foumart, has long been a favourite sport on the lowlands of Cumberland. Mr. Thomas Ruston of Aspatria, an enthusiastic sportsman, has hunted this animal for nearly fifty years, and within that period packs of hounds for this particular branch of sport have been stationed at Ellenborough, Isell, Wigton, and Thurstonfield. The only pack now kept for the purpose is that owned by Mr. Joseph Langcake, of "The Outgang," Aspatria.

'Polecats may be hunted either by day or by moonlight, but William Barnes, who hunts Mr. Langcake's pack, prefers the latter. The hunting season commences with February, the chief months being March and April (the breeding season), and lasts until the meadows are well clothed with grass, and likely to sustain injury from the trampling of too ardent sportsmen. At this time of the year male Foumarts have been known to travel many miles in the course of a night, so that it is far more easy to drop upon one as he takes his "walks abroad" than to surprise him in his lair. On being pursued, he instinctively makes for his native ground; but if hotly pressed will, if possible, take refuge in any drain which chances to be in the immediate locality. Once *sub terra* he is very difficult to unearth. A little explanation is here needed. It must not be supposed that the Polecat enters a pipe which is discharging water. The run he takes is what is known as an old sod or stick drain, put down in the moss in the primitive

days of agriculture; and the land having since been drained deeper with pipes or tiles, the original watercourses are left dry, and form famous places of refuge for any small animal which goes to ground. Thus the chances of killing in such a place are not very great. . . . In the early part of the season the hunters seek the Polecat on the banks of the open cuts, locally designated "sowes;" later on they quest the fallow breaks and drier grounds. The usual time for "throwing off" is 10 in the evening (by moonlight) and 3 to 4 in the morning (by daylight). The average length of a run is from three to five miles, but occasionally an old "varmint" affords a chase of from eight to ten miles. An aged Polecat always dies game, being sure to make a spring and bite some of the dogs before he receives his *coup de grâce*. One recently taken was very old, without a single tooth in either jaw, his coat ragged and poor, and his skin covered with ticks.

'In April 1883 the Aspatria pack, consisting of otter-hounds and a quartet of terriers, had two splendid runs with what was believed to be the same Foumart, for he led them exactly over the same ground, a distance of seven miles. On April 21 they found him on the high land overlooking the village of West Newton, gave chase as far as Allonby, where he doubled and made a circuit by way of Cooper, and down into the meadows, then took refuge in a sod drain, and, as it was getting on towards midnight, the pack was called off, no attempt being made to unearth the "varmint."'

Mr. Harting also gives further quotations,[1] from a correspondent, of Polecat hunting in Wales, and the North-west of England, written in 1883.

'Foulmart hunting,' he says, 'has for a length of time been carried on in a scratch way in Westmorland, Lancashire, and other counties. Captain Hopwood of Hopwood, in Lancashire, achieved the greatest success in this branch of sport, and became the possessor of a fine pack of Foulmart-hounds, unequalled for beauty, nose, and staunchness. It required great skill and time to bring them to perfection, and make them hunt free from riot (such as fox, otter, or sweet-mart), and in this he thoroughly succeeded. None of his pack would own any scent but that of the Foulmart. They were of the same breed as the modern otter-hound, but superior in size and make to any I have seen in the different packs now existing. Captain Hopwood chiefly hunted in the vale and moorland country of North-east Lancashire and in the Lake country of Lancashire and Westmorland. In Wales, in Merionethshire and Montgomeryshire he was able to follow the

[1] *Zoologist*, 1891, pp. 288, 289.



A Polecat.

From a Photograph by D. English, F.R.S.

chase mounted, as were also his whips; but in Lancashire and the Lake country this was impracticable, owing to the boggy nature of the moors and steepness of the fells. To such perfection in nose and dash did he bring his hounds that it was impossible for anyone, except himself and the best Lancashire runners of the day, to keep at all on terms with them. He usually began hunting at daybreak, casting on till a drag was struck of a Foulmart, that had been travelling in the night. The length of the runs in the spring and early summer was extraordinary—often ten, fifteen, and over twenty miles, usually straight, and over a wild mountainous country. They generally ran the Foulmart to ground, and would often have another long run the next day, from the spot where they had marked and left him. To give an instance or two of the length of runs with the Foulmart, I will quote the following. In Wales they struck a drag on the left bank of Bala Lake, opposite Bala, and ran him into the country above Nannai, Sir Robert Vaughan's place, near Dolgelly—a real wild mountain run, without a single cast being made, and the distance at least twenty-two miles. In the Lake country I remember a run wonderful in length and the roughness of the country traversed. A drag was struck in the woods near Newby Bridge. They ran him through Greythwaite and Hawkshead, over the Braythy River, across Laughrigg Fell and the deep Rothay River, and killed him in the fells above Ambleside. This run must have been from eighteen to twenty miles in length. I could name several others, but space forbids. In conclusion I may state that Captain Hopwood never hunted at night—a course which is only taken for the purpose of killing the Foulmart, by hunting up to him while still travelling, giving him little or no chance of escape. Nor were the Foulmarts ever caught in traps or turned out to hunt. The Captain hunted only on the strictest principles of wild and fair sport, and his pack will long be remembered in the counties over which he hunted.'

The Ferret is a pale variety of the wild Polecat, slightly deteriorated by domestication, and is much improved in stamina by crossing with the wild Polecat. The best Ferrets for use are not, however, the large strong males. On the Downs of Wiltshire, where ferreting rabbits is brought to great perfection, no large adult Ferrets are used, these being considered useless, but only small immature females, which cannot hold a rabbit, but nevertheless hunt and worry them unceasingly. Consequently they need not be muzzled and the rabbits come out freely. In December 1899, shooting from 12.30 to 4, as the guest of Lord James at Fern, I killed 107 rabbits with Ferrets of this description.

Mr. Harting[1] gives examples of the ancient use of Ferrets. They were employed by Genghis Khan in 1221, and were mentioned by Frederick II. of Germany as animals used for hunting in 1245.

Prof. Mahaffy[2] shows that the use of Ferrets was known at a very early date. He says 'that Strabo, who flourished B.C. 30–A.D. 25, states that the South-west of Europe, as far as Marseilles, including the islands, such as Corsica and the Balearic Isles, suffered from a plague of rabbits, which destroyed trees and crops. The Spaniard had devised various remedies for this serious evil, among others the domestication of the "African Weasel," which they muzzle and send into the holes, when it either pulls the rabbit out with its nails (?) or makes it bolt for the men and dogs standing ready.'

Mr. Harting says that in Richard II.'s time 'a statute was passed prohibiting anyone from keeping or using greyhounds and *fyrets* who had not lands or tenements of the annual value of forty shillings.'[3] *Fychew* and *fyrets* are also mentioned in 'The Storye of Reynard the Foxe' as printed by Caxton in 1481.

Ferrets bitten by rats frequently die, generally from not receiving immediate treatment of their wounds, and then being kept in close and unhealthy surroundings. Mr. Cocks suggests that wild Polecats so bitten seldom succumb, owing to the curative power of damp earth in which wild animals which have been wounded roll themselves. In the 'Zoologist'[4] Mr. Southwell, quoting from the 'Journal' of Robert Marsham of Stratton Strawless, mentions a curious case of hydrophobia which resulted from the bite of a wild Polecat. To keep Ferrets in good health a very considerable amount of meat is necessary. As a rule they are given too much bread and milk and are frequently kept in an uncleanly state. Except in the sleeping compartment the upper floor should be of wire-netting and the lower tray of sand should be removed daily. They like plenty of water, and rats are a good regular diet. Ratcatchers have many superstitions regarding Ferrets, and often cut off the tails of rats, as this part of the rodent is considered poisonous.

Ferrets are supposed to possess a strong homing instinct,[5] but the numerous instances of Ferrets returning home in no way prove that the occurrences were anything but accidental.

A writer in the 'Field'[6] gives an interesting account of some hybrids between the Stoat and the Ferret then living in Mr. Alfred Heneage Cocks's collection at Great Marlow.

[1] *Zoologist*, 1891, p. 291.
[2] *Greek World under Roman Sway*, p. 195.
[3] *Zoologist*, 1888, p. 20.
[4] 1878, p. 55
[5] *Field*, January 25, February 1, and February 8, 1873; and January 23 and 30, 1886.
[6] November 1, 1899.

'Perhaps the most striking novelties in the collection are the hybrids between the Stoat (♂) and the Ferret (♀). Mr. Cocks did not make the first cross himself, but noticed the advertisement of a man who, he afterwards found, had reared six litters of the parentage described. Mr. Cocks procured six specimens, and has proved them to be fertile *inter se*; indeed, he has succeeded in rearing a third generation. Hybrids are always interesting, but fertile crosses between two species of animals are specially noteworthy on account of their rarity. The specimens in question resemble the Polecat in size, and, as in that species, the males are larger and have more massive heads than the females. The general colour, though by no means so dark, also approximates to the Polecat ancestry of the female parent. One of the purchased specimens is decidedly lighter than the rest, and this has been attributed to the fact that its mother was in all probability a white Ferret.

'The tame Ferret has larger ears than the wild Polecat, but the hybrids with the Stoat have still larger ears, such as are found in the last-mentioned species; they are not only broader and longer than those of the Polecat, but are of the same colour as in the Stoat. Points of likeness to the male parent are also to be found in the large feet, suddenly becoming white; in the bright yellow throat, and in the patches of white on the true knees. The mystacial bristles are also, so far as the comparison has been made, finer and more numerous than in the Ferret. No signs of discontinuous variation in the hybrids have appeared. Members of the second generation, though possibly somewhat lighter in colour than their parents, do not approximate to either grandparental species more than the latter did, and the third generation is also true to the original hybrid type. One of the hybrids has been used as a Ferret, and works continuously without "giving up." Some of the Polecats have been tried, but they get so excited for the rest of the day that it is not advisable to make use of them for rat catching.'[1]

So many Ferrets and Ferret-polecats escape and take to wild life that it is almost impossible to say if either pale varieties or albinos of the wild Polecat have ever occurred.

The Bishop of Thetford, speaking recently (1904) at a Norwich bazaar, told an amusing story of a sick man whose doctor sent leeches with which to bleed him. When the doctor inquired subsequently to see how his patient was doing, the wife said, 'Those little worm things were no good, so I got a Ferret and put it on him, and it did him a power of good.'

[1] I have recently seen these Stoat-ferret hybrids, of which Mr. Cocks has bred several. One of them was put in a cage with three full-grown rats and killed them quickly by crushing in the skulls.

THE STOAT

Putorius ermineus, Linnæus.

Mustela erminea, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 68 (1766); Bell, 'Brit. Quad.' 2nd ed. p. 191 (1874).
Viverra erminea, Shaw, 'Gen. Zool.' i. p. 426 (1800–1826).
Fœtorius erminea, Keyserling and Blasius, 'Wirb. Europ.' p. 69 (1840).
Putorius ermineus, Owen, 'Brit. Foss. Mam.' p. 116 (1846).
Putorius ermineus stabilis (sub-species of *P. ermineus*), Barrett-Hamilton, 'Annals and Mag. Nat. Hist.' vol. xiii. 7th ser. No. 77, pp. 394, 395 (May 1904).
Local Names.—*Foumart*, *Fomart*, *Clubster*, *Clubstart* (Yorkshire), *Lobster*,[1] *Lopstart* (Norfolk), *Weasel* (Suffolk), *Clubtail* (Lancashire and Lincolnshire), *Royal Hunter* (Oxford), *Hob*, *White Weasel* (English); *Big Weasel*, *Weasel*, *Whittret* (Scotland); *Neas-gheal* (White Weasel) (Gaelic); *Easog* (Irish Stoat) (Irish); *Carlwm*, in some places *Wenci* (Welsh).

Sir H. Johnston[2] gives some derivations of the words 'Stoat' and 'Ermine.' 'The word "ermine,"' he says, 'in English is derived through the Norman-French from the Teutonic *harmin* (Anglo-Saxon *hearma*). This, again, seems to come from a Lithuanian word, *sharmu*. In its summer dress the Anglo-Saxons seem to have often confused the Stoat with the Weasel. It was called the Stoat, or Stot Weasel, meaning the bigger, more pushing, energetic of the two beasts. "Stoat" is derived from a Scandinavian and Low German root represented by the Gothic *stautan*, to push. It was a term often applied to male animals in general, and is met with in dialectal English (*stot*) in the sense of a stallion or a young bullock.'

Characters.—In the Stoat the whole body in both sexes is much elongated. The outer hairs of the upper surface, except those at the end of the tail, are in summer nut-brown, whilst the under-coat is of a pale undetermined brown. In July and August the outer and longer hairs become sparse, and the under fur is visible in many examples. The under surface, as well as the inside of the legs and the upper lips, are white, with tinges of yellow in adult individuals. The tail

[1] Sir John Paston, writing about the year 1490, refers to the 'Lobster' as a provincial name of the Stoat (*Zoologist*, 1888, p. 65). See also *Zoologist*, 1884, pp. 112, 153, and 1888, p. 20.
[2] *British Mammals*, p. 160.



THE STOAT (SUMMER).

MUSTELA ERMINEA.

hairs are longer and darker towards the extremity; at half way they become black; the tail terminates in a tuft of long black hairs. The ears are fairly large, broad and rounded, with a slit on the posterior margin, which forms a lobe. The vibrissæ are long and black in colour, with three or four white hairs on each side, and individual Stoats often have one or two long stiff hairs of a similar character to the mystacial bristles growing about the elbow-joints. These are, I think, of much use to the animal in feeling its way in the dark and in warning it of the proximity of obstacles. The feet vary a good deal in individuals, some being partly or wholly white, others brown on the upper surface. The soles of the feet are furnished with fine hairs.

In the winter dress the white may extend upwards over part or the whole of the body, with the exception of the end of the tail, which always remains black. The margins of the ears are generally the first parts to turn white, and a large percentage of Southern English Stoats only show this slight alteration from the summer dress, whilst many have the addition of white feet, white upper legs, and a tendency to a slight fading of the brown on the upper surface. Pure white Stoats, especially males, are rare in the South of England, less rare in the Midlands, and not uncommon in the North of England and the South of Scotland, whilst in the North Highlands the change to white is, with few exceptions, universal in both sexes.

The actual winter change is, I think, accurately described by Mr. O. V. Aplin in the 'Zoologist' for May 1898:[1] 'The change to ermine dress is produced by the white of the belly extending up the sides of the body and over the limbs, until only the top of the head and a band down the middle of the back remain brown. The white then spreads across the lower part of the back (leaving for a time, in some cases, a detached portion of brown near the root of the tail); the spinal line becomes gradually shorter and narrower, and at last disappears. Meanwhile the white on the head has increased, the ears and the region about them have become white, and a space round the eyes and a patch on the top of the head alone remain brown. The latter disappears, and the patches about the eyes decrease, until only a narrow ring of brown round each eye is left. This is actually the last part to turn white. Stoats in this condition have a "spectacled" appearance; I have handled several.'[2]

The change to white does not depend on season, though possibly it may be affected by age. In midwinter brown Stoats are often seen, whilst the Stoats

[1] Pp. 193, 194. [2] Cp. Wheelwright, *Ten Years in Sweden*, p. 219, and *Spring and Summer in Lapland*, p. 229.

living on the summit of Ben Nevis have been observed at all seasons in their pure white dress.

As a rule Stoats begin changing their coats in December in England, and about a month earlier in Scotland. Mr. Henry Ellman, writing of English Stoats, says that by the end of January they are about half and half, and by the beginning of March are quite white; but this is a point on which it is not safe to dogmatise, as Stoats vary greatly in different seasons and in different localities.

The winter dress is acquired by a gradual change of the colour of the hairs, and not by a change of coat: a fact that was noticed by Mr. O. V. Aplin.[1] A change of coat, as he remarks, would be inconvenient to the animal in severe weather, whilst it is not usual for Mammals to have a further change of hair when a new coat had only been assumed in October. Partially white Stoats are often noticed as early as September, and I have seen them nearly pure white as late as May in Scotland. Mr. Hudson, a naturalist of Ipswich, commented[2] on the rarity of white or partially white males in winter in the South of England, and says that only two occurred amongst forty-eight female specimens. I give a photograph of an interesting series of Stoats, all killed at the same place, Eriswell, in Suffolk, in the autumn and winter of 1903, and kindly lent to me by Mr. E. S. Montagu. The figure on the left is a perfectly white male.

Adult males average in length from 15 to 26 in.; tail, from 5 to 6½ in.; females from 13 to 20 in. Weight of males 5 to 10 oz. Females weigh considerably less. Capt. G. E. H. Barrett-Hamilton gives[3] some useful measurements in millimetres of British Stoats taken from specimens in the Natural History Museum.

	Skin.				Skull.			
	Head and Body.	Tail.	Hind Foot.	Ear.	Greatest Length.	Basal Length.	Palatal Length.	Zygomatic Breadth.
Males . .	269	111	48	22	51	47	30	22
Females .	244	90	42	20	46	42	25	19

The skull of a very large male Stoat, taken by Mr. C. Nash near Stafford in October 1898, measures 51½ mm. in length and 29½ mm. at zygomatic arches.

Dental Formula.—I. $\frac{6}{6}$; C. $\frac{2}{2}$; P. $\frac{6}{6}$; M. $\frac{2}{4}$.

Captain G. E. H. Barrett-Hamilton in an able paper on Stoats[4] says that the 'true *P. ermineus* of Scandinavia may be distinguished from its southern representatives, such as those of Britain, by the fact that it has the under side

[1] *Zoologist*, 1888, p. 140. [2] *Field*, May 28, 1904. [3] *Annals and Mag. Nat. Hist.* vol. xiii. no. lxxvii. p. 395.
[4] 'On Some New Species and Sub-species of *Mustelidæ*,' *Annals and Mag.* no. lxxvii. May 1904, pp. 394, 395.

of the tail (except the distal part occupied by the terminal pencil) of the same colour as the under side generally, whereas in British Stoats the tail (except in cases of winter whitening) is unicoloured all round. A second, and to my mind (since it is of deep physiological significance) far more important, distinction is the absence of winter whitening in southern Stoats.'

For our Stoat he proposes the sub-specific name of *Putorius ermineus stabilis*. Putting aside the very slight difference in the under side of the tail, which is in itself hardly sufficient to establish a sub-species, the second explanation seems to be wholly unsound. A point of difference depending entirely on temperature and local environment, and subject to such irregularities as occur between Cornwall and Caithness, is not sufficiently constant to warrant separation. Moreover it is agreed that any British Stoat taken to the North of Europe in winter could turn white. If we accepted as a type the Dorset specimen to which Captain Barrett-Hamilton refers, we must create many further sub-species occurring between this county and the North of Scotland.

Distribution.—The Stoat or Ermine, an inhabitant of this country since the Pleistocene age, is a circumpolar animal, ranging through the colder parts of Europe, Asia, and America. Various sub-species of the Stoat are found in America (*Putorius noveboraceus*, *P. arcticus*, and *P. arcticus imperii*), and several other sub-species are found in North Carolina, Maine, Ontario, and Eastern Minnesota; whilst, according to Captain Barrett-Hamilton, two distinct forms occur in Greenland (*Putorius audax* and *Putorius arcticus polaris*). In Western Europe we have the true *P. ermineus*, and in Northern and Eastern Siberia the slightly smaller and more beautifully furred variety of the same, the Ermine of commerce.

In England and Scotland the Stoat is still abundant in spite of relentless persecution, and it exists on several of the islands adjacent to the latter country, namely, Jura, Iona, Skye, Rum, Islay, Bute, but not in Arran.

In the Outer Hebrides it is absent from North and South Harris, and I have failed to trace it in either North or South Uist; I doubt if it was ever an inhabitant of these islands. Nor is it an indigenous inhabitant of either the Orkneys or the Shetlands, although introduced into both these groups of islands. In the Orkneys it is probably extinct again. Brand, in his 'Brief Description of Orkney, Zetland, Pightland Firth, and Caithness,' written in 1701, speaks of the Stoat, under the name of 'Weasel,' as a species introduced to Orkney. The same author gives the seventeenth century as the date of the introduction of the Stoat into Shetland. There is some evidence that it may have been known in Shetland

early in the seventeenth century, for the 'Shetland Times'[1] speaks of an ancient title-deed, headed 'Animals of the County of Welland,' in which the Statute (dated 1615) demands that every Baillie, Minister and Gentleman was to present to the Head Court the first Tuesday in August the head of 'quhitred (Whittret, *i.e.* Stoat) craw corbie and earne.' At the present day it is irregularly dispersed over the mainland from Dunrossness in the south to the point of Felthaland in the north, where I saw one in August 1901. It is also fairly numerous about Scalloway and Mossbank, but keeps close to agricultural lands for the greater part of the year, only roving on the moors about the nesting season. It is still found on the island of Colsay, and till recently on Whalsey, but is now extinct there. It does not occur on Unst or Yell.

In Ireland and the Isle of Man *Putorius ermineus hibernicus* takes the place of *P. ermineus*, and is described later.

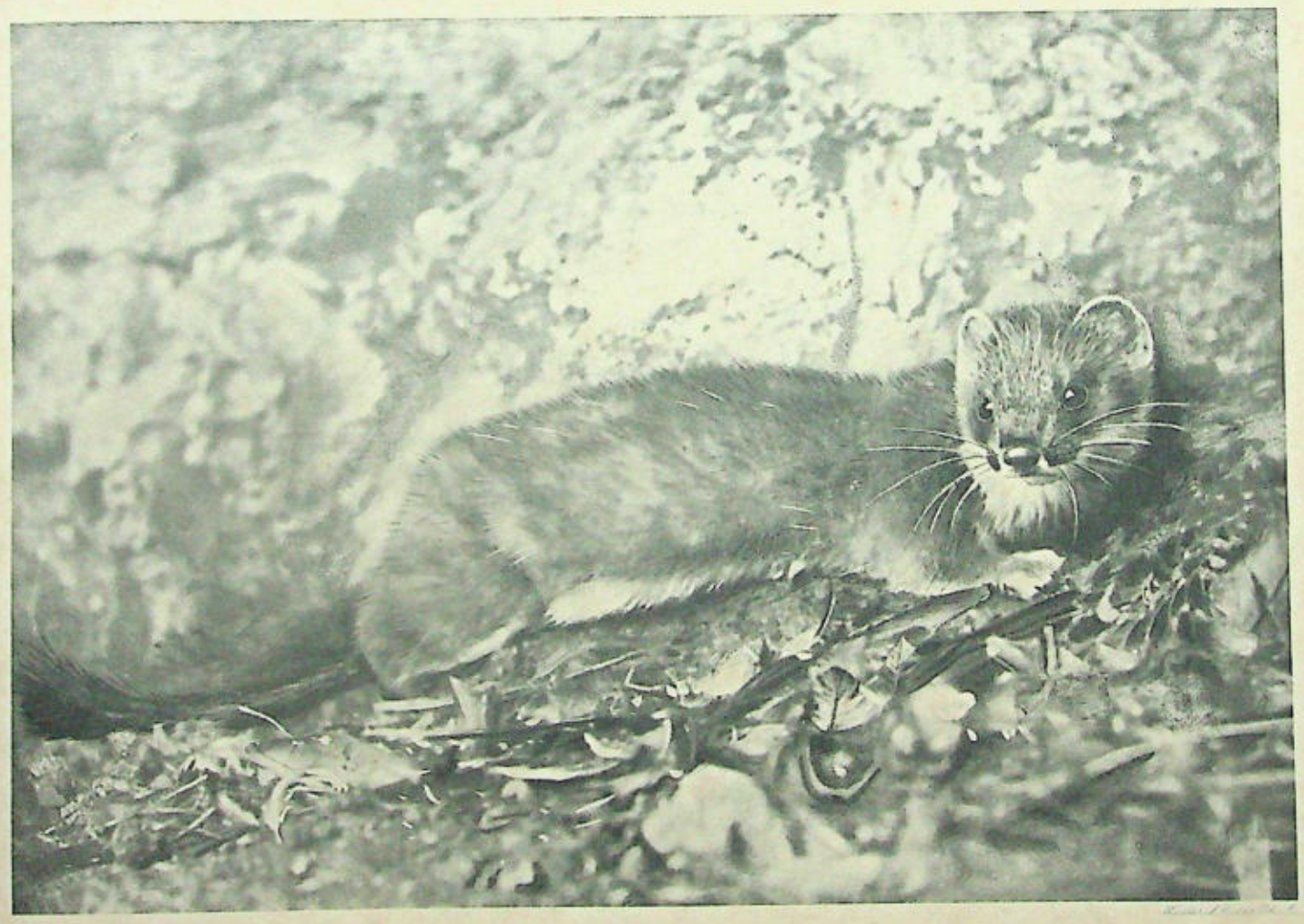
Habits.—Stoats like to frequent stone walls, thickets, and rough places bordering on cultivation. Here they make their home in some hedge-bank, wall, or rabbit-hole, and range the whole neighbourhood for their prey. They are especially fond of roadsides, where mice, voles, and rats abound, and thickets of furze, on the edges of which they can surprise young rabbits and birds. Stoats are great wanderers[2] and foragers, and can consequently make a living in such high situations as the summit of Ben Nevis, where mice and young game-birds are found, or the shores of the outer islands of Scotland, where mice, rats, and young shore-birds and eggs are provided. Stoats hunt tirelessly, following their prey by scent or sight. They will stalk some rabbit, like the large carnivores, and then rush upon it, seizing the throat or a point at the back of the ear of an animal or bird five times as large as themselves, holding on and biting at the main arteries till the victim's struggles have ceased. More frequently they hunt in old stone walls, squeezing themselves into every crevice that may hide a mouse or rat, and have a considerable turn of speed in overtaking these animals when bolted.

The food of the Stoat consists of birds as large as turkeys and domestic poultry down to the small fledglings of any species that may come in its way, and Mammals from hares and rabbits to the smallest mice. Doubtless it catches a few spent fish that come to the sides of ponds and rivers. An instance is recorded in

[1] May 7, 1898.

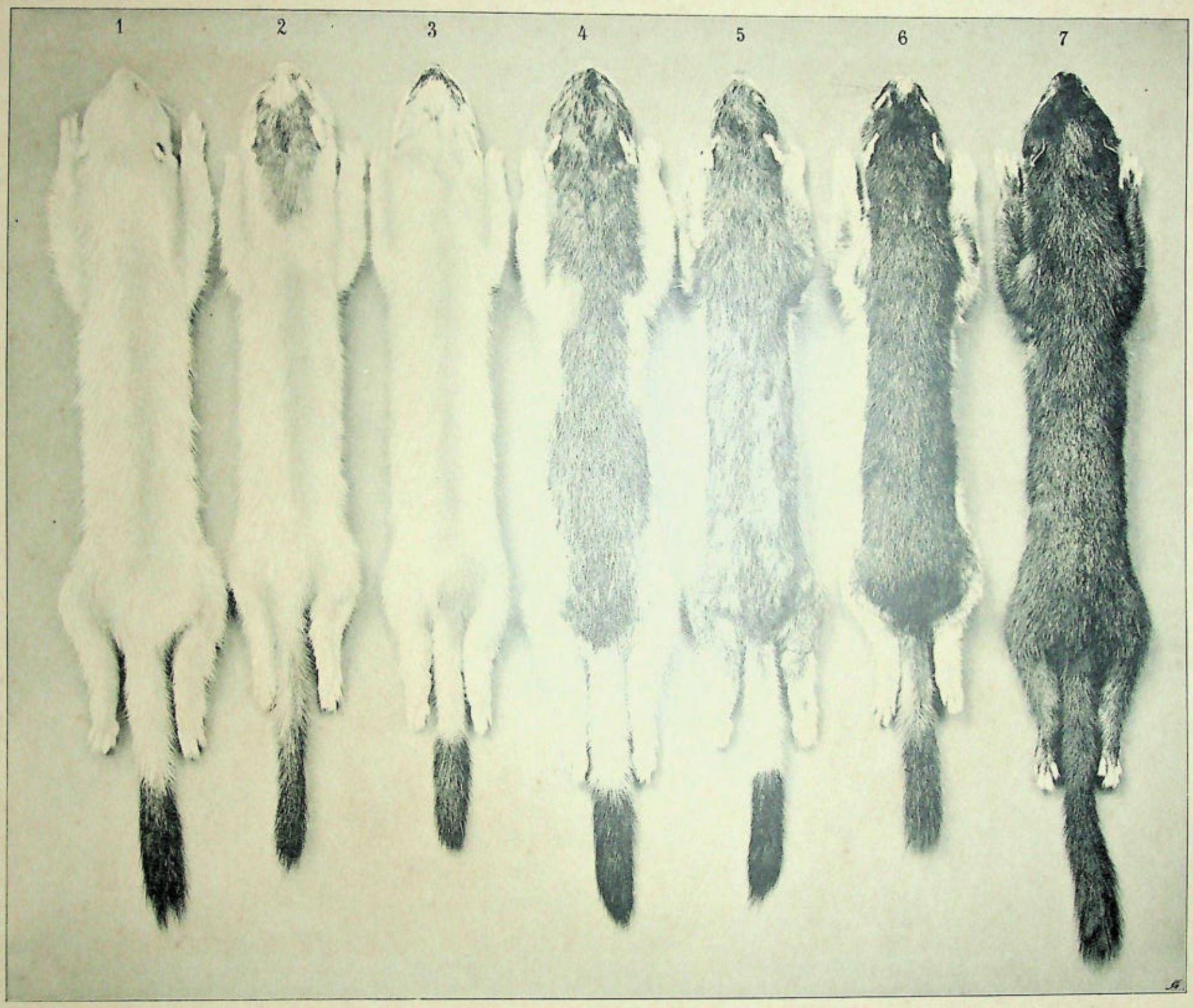
[2] Stoats sometimes travel great distances and into strange places. On August 31, 1885, a Stoat was found alive in the area of a house in Edwardes Square, South Kensington, London (*Field*, September 5, 1885).





Stoats

From Photographs by J. English 1844



STOATS CAPTURED AT ERISWELL, SUFFOLK, IN THE AUTUMN AND WINTER OF 1903.

The figure on the left is a White Male.

the 'Field.'[1] Stoats are bold and very strong swimmers, proceeding with the head well erect. They kill numbers of water-voles, but their powers of capturing fish are doubtless very limited as well as their powers of diving.[2] An interesting instance of a Stoat when in pursuit of a young waterhen being repulsed by the parent bird is cited in the 'Zoologist.'[3]

H. D. Graham, in his charming book, 'The Birds of Iona and Mull,'[4] after stating that Stoats regularly hunt the seashore in Iona and prey on ring dotterels, gives the following note of the animal's boldness when attacking birds swimming on the water: 'He (a humble friend) saw a Stoat watching a flock of young ducklings swimming in a pool, and after some hesitation he plunged in, and, swimming unperceived among them, caught one and brought it ashore. My friend, the owner of the ducks, now rushed forward to resent the liberties taken with his property, not in time to save the poor duckling though, as its throat was cut. Accordingly he threw it in the midden in front of the door (the usual locality of the dung-heap in the Highlands), the robber having taken refuge among the stones of a dyke. In a short time he was surprised to see the defunct duckling moving away, the persevering little quadruped having watched what was done with his prize, and actually returned to appropriate it.'

A propos of the Stoat's swimming power, the captain of a steamer plying between Oban and Lochmaddy told me that he once met one swimming strong and high in the Minch four miles from the island of Rum, and heading straight for the coast of Scotland. It seemed in no wise disconcerted by the steamer, and pursued its way over a calm sea with hurried strokes. The fishermen on the river Tay in Scotland used to say that so bold a swimmer is the Whittret that it is impossible to divert it from its point of landing. I have myself thrown stones at a Stoat which was approaching the bank where I was fishing, and been unable to prevent its landing almost at my feet, when it immediately disappeared amongst the undergrowth. I well remember another amusing instance of this. My father was sitting at luncheon one day on a bank of stones near Delvin on the Tay. He tried to intercept a Stoat that was about to land on the shingle. At about fifteen yards from the shore my parent began hurling stones at the gallant voyager. The bombardment increased on the nearer approach of the enemy, and finally the brave little beast, chattering and showing its teeth, rushed between my father's outstretched legs and away across the shingle to safety in the Stenton Woods.

[1] May 7, 1904.
[2] *Field*, March 27, 1880; and also in the *Angler's Note Book*, p. 115.
[3] 1887, pp. 255, 256.
[4] Pp. 99, 100.

I have experimented with a Stoat in a pond and found it impossible to turn it from its point. Nothing short of death itself would deter it from its purpose of landing.

The following communication illustrative of the Stoat's cool manner of killing rats is sent to me by Mr. T. H. Coward, to whom it was communicated by Mr. L. Brigg of Keighley:

'A friend of his who lives near Keighley was much troubled by rats which came for the corn provided for the hens and worked havoc with his chickens. One day a Stoat appeared and took up its abode in a rockery opposite the windows of the house. When the rats were feeding on the corn the Stoat used to appear at the mouth of its hole; the rats immediately ceased feeding and remained still until the Stoat, without show of haste, walked up to one, seized it by the neck, and dragged it backwards into its hole; then the other rats would run away. This curious episode was often repeated until both rats and Stoat left the house. The Stoat killed only the rats, and never attempted to touch a chicken, although it had many opportunities of so doing. The rats did not return for some months.'

Mr. T. D. White gives an interesting instance of the strength and ferocity of the Stoat.[1] Writing from Colyton, Devon, he says: 'Within the past few days I have seen two instances of the great strength and ferocity of the Stoat. In the first case a Stoat had killed a rabbit in the middle of a field which had a gentle slope downwards to some gorse bushes about 120 yards distant. I did not witness the tragedy, but when I came upon the scene the Stoat was making great efforts to transport its victim to the shelter of the gorse below. There may be nothing uncommon in this, but its method of transportation was highly entertaining. The weight of the rabbit was more than the Stoat could drag, but by taking the rabbit by the neck and wriggling its little body underneath it just managed by stupendous efforts to move its victim a few inches at a time. After forty-five minutes (by the watch) this energetic little beast had transported the rabbit to a distance of about two gun-shots, when a charge of No. 6 put an end to its career. The weight of the Stoat was under 12 oz., that of the rabbit 3 lb. 5 oz.; thus it had been shifting a dead weight more than four times its own. In the other case referred to there was a sudden rustle under an oak tree in the hedgerow twenty yards on my left, when a hen pheasant rose with some brown object hanging to her, for a moment undistinguishable. When about 25 ft. or 30 ft.

[1] *Field*, November 12, 1904.



STOATS IN MOVEMENT.

From photographs by D. ENGLISH, F.R.P.S.

high, however, a Stoat dropped to the ground and escaped to the hedgerow, seemingly none the worse for its fall.'

Hunted Stoats will burrow in the snow and into the ground for safety, and will do so simply to find rat-runs. They constantly climb trees, for the purpose of hunting squirrels, catching young birds, or stealing eggs, and for safety when pursued. Crossing Warnham Park one summer's day in 1899 I intercepted a Stoat which at once took to a high thorn tree, where I shot it with my small catapult. About three weeks later I chased a weasel in similar fashion into the next thorn tree to the one in which I had killed the Stoat, and slew it in similar fashion amongst the branches. The weasel seemed to be more active than its larger cousin.

A remarkable instance of the Stoat's cleverness and climbing powers took place at Mr. Meade-Waldo's place near Lyndhurst, in Hampshire, in the spring of 1904. A male Stoat climbed a 14-foot wall, partially covered with ivy, slid down a glasshouse, and endeavoured to enter a large cage containing some rare Algerian desert squirrels. This at first he found impossible, as the only entrance was down the narrow zinc rain pipe, and the top of this was covered with a fine-mesh wire netting for preventing leaves &c. from entering and blocking the pipe. However, after considering the matter, the clever Stoat managed to force this upwards. He then glided down the pipe and entered the cage, where he quickly killed every occupant. A natural assumption would be that the clever beast was now trapped, and that retreat was impossible by the same route by which he had entered. But this was not the case: the Stoat actually climbed up inside this slippery pipe and made good his escape—for one day at least. On the following morning Mr. Waldo trapped his unwelcome visitor in the cage itself, the murderer having returned to seek fresh victims.

In the final onslaught of Stoats and weasels, hares and rabbits are paralysed with terror, close their eyes, and seem incapable of movement. I have seen both a rabbit and a hare thus pursued, and feeling that escape was hopeless suddenly cease running, sit down, roll about, and scream in the most heartrending fashion. I once witnessed an interesting chase of two snow-white Stoats after a brown hare on the shores of the Moray Firth, and saw the whole tragedy, till the two hunters had claimed their victim. Stepping ashore from my wildfowling punt, I added the party to my collection. It was hardly fair to the poor hare, but I was young then.

After biting through the main arteries of the neck, Stoats like to open the back of the skull and eat the brain.

The voracity and apparently senseless lust of slaughter are the chief causes of the enmity of man to this graceful creature. It is not so much on account of what it kills and eats as what it kills and leaves that farmers and gamekeepers hold it in detestation. That the Stoat does a very great deal of good in reducing the superabundance of rats, mice, and voles cannot be disputed; but on the other hand its attacks on game are so considerable that thousands annually pay the penalty of unpopularity. *À propos* of the innate savagery in the Stoat, Colonel E. A. Butler sends me the following note: 'One day I caught the mother of a family of full-grown young Stoats in an ordinary steel trap, and on visiting the spot found all the young ones—seven or eight in number—tearing her to pieces in the act of sucking her. A charge of shot accounted for most of them, and the others I trapped shortly afterwards, when they returned to the scene of the massacre.'

Yet so fruitful and so resourceful is the Stoat that in spite of the numbers killed year after year in open land districts, where it would seem easy to exterminate them, they nevertheless remain as plentiful as ever. Constant persecution has certainly made the animal scarce locally—about the pheasant-shoots of Sussex for instance—but immediately the war is relaxed it increases as fast as ever. Consequently we need not waste much sympathy on the Stoat, as in its case the balance of nature is to a certain extent retained. It is different, however, with the weasel, which has only occasional lapses into sin (*i.e.* from the gamekeeper's point of view), and is an almost wholly beneficent animal.

The bravery instilled by motherhood into the breast of so timid a creature as the rabbit is a wonderful thing. The rabbit when actually hunted by the Stoat displays the most abject terror, and yet where the two live in close proximity, as I have myself witnessed, she will permit a certain degree of familiarity, strange as it may appear. What, then, must be the impulse that inspires a female rabbit actually to attack and chase away a Stoat from her young ones whose lives have been threatened? And yet this has many times been witnessed by good observers. A buck rabbit too, has been seen to drive away a Stoat.

An example of this will be found in the book of the 'Rabbit,' by J. E. Harting, and a more recent instance is given by Mr. Tachbrooke Mallory.[1] He says: 'It is well known that the most timid animals will display heroic courage in defence of their young. The following example has been reported by

[1] *Field*, September 17, 1904.



STOAT TRANSPORTING AN EGG.



A RUSE TO CATCH YOUNG THRUSHES.

my gardener, James Ingram; and it is so rarely such a combat can be witnessed that it may be of general interest. I asked Ingram to write down exactly what he saw, and I will let him tell his own tale: "I was in the orchard on the morning of September 7 when I heard a noise on the other side of the hedge; on looking over, what was my surprise to see a rabbit running after a Stoat. She ran the Stoat into the hedge just where I was looking over, and sat there watching for it to come out, taking not the slightest notice of me, although I was not two yards off them. The Stoat ran up the hedge, coming out higher up and behind the rabbit. It ran about thirty yards into the field, pulled a young rabbit out of a bunch of grass, and commenced dragging it to the hedge. When the old rabbit turned and saw the Stoat it went for it again, and jumped on it, and bit it in the most infuriated manner, driving it away from the young rabbit, and running it squealing with terror into the hedge, where they both eventually disappeared. I then picked up the young rabbit, which was about six weeks old, and quite dead."'

Here is an instance of the mad love of slaughtering everything within its power which I noted in March 1904. Returning home one evening from ferreting out some rabbits which had taken up their abode in too close proximity to a wheat field on the edge of St. Leonard's Forest, I chanced to notice a new hole, such as is made by a female rabbit when she breaks away from a main burrow and looks for some quiet place in which to deposit her shortly expected family. When I looked into the hole I saw the leg of a rabbit protruding. I drew forth the warm body of a young rabbit about a fortnight old, and the lacerated neck and head showed plainly who had been the culprit. Procuring a hedge-stake, the keeper and I proceeded to dig out the hole, in which I expected to find the Stoat and kill it; but on coming to the bottom of the burrow, which was quite a short one, we discovered no fewer than eight other young ones and the mother, all lying murdered in similar fashion. None of the flesh had been eaten, and it is doubtful whether the murderer intended to return, as we failed to trap him.

Strange as it may seem, rabbits and Stoats will live together in a certain degree of amity. In so doing the carnivorous animal exhibits a deep cunning in appeasing the rabbit's fears by friendly advances of a rough-and-tumble nature, which are only blinds as to his real intentions on his thoroughly dull and stupid neighbours, whose young he slaughters at leisure.

I witnessed an instance of this at Denne Park, Sussex, one May Day in 1899. I was sitting against the trunk of a large elm close to Denne House, and making

sketches of fallow deer, when a large Stoat emerged from a rabbit warren about fifty yards away. There were about fifty rabbits round about, but none of them betrayed the slightest alarm at the presence of the Stoat. After running about for a few minutes the Stoat made a rush at a young rabbit and knocked it over, as if in play, and then commenced mauling it about the neck and pretending to worry it. The rabbit meanwhile crouched down and evidently was not very frightened, as it commenced to feed again as soon as its persecutor had left it. The Stoat then, after several snake-like gyrations on the grass, went up to two other rabbits, one of them a full-grown one, and repeated the same performance, every movement of which could be plainly seen through my powerful telescope. It was then apparently satisfied, and retired to one of the holes, into which it disappeared. There is not the least doubt that this cunning fellow was making his home amongst the rabbits on whose young he lived, and that this daily play was practised so as to accustom his nervous neighbours to the presence of a murderer. During his antics only such rabbits as were within a yard or two displayed any concern; others just stopped feeding and dropped their ears.

Another instance of this is cited by 'Derg' in the 'Field.'[1] He says:

'When shooting rabbits the other day I was much amused at watching the antics of a Stoat on the sunny side of a wall in the midst of a number of rabbits grazing and sitting up on all sides of it, apparently quite unconcerned, though they must have seen it. Although I watched it for more than a quarter of an hour, I could not perceive that it had any intention whatever of attacking the rabbits; but its motions were most surprising from their rapidity and activity, apparently without any object, unless perhaps for sport. Moving in a zigzag direction, it constantly turned a somersault in the air, and would then continue its zigzag journey, which was not continuous, but up and down the fence, through the midst of the rabbits, and occasionally into the walls.'

On one occasion in June 1899 I was sitting drawing deer in Warnham Park when I heard an unusual commotion amongst the blackbirds and thrushes in the small cover at my back. Out in the open park, about thirty yards from the cover, were some twenty or thirty young thrushes hopping about and waiting for their parents to bring them food. Presently a Stoat looked out of the bushes opposite the young birds, some forty yards from me, and at once commenced turning a series of somersaults. After each performance it would advance a foot or two towards the stupid youngsters, who seemed lost in wonder at its curious antics.

[1] January 1, 1887.



Stoat playing with his intended victims.

It had got within ten yards of its unconscious victims when two old thrushes came flying from the wood shrieking with all their might, first above the Stoat and then over their threatened offspring. The young birds at last took the hint and flew slowly one after another into the wood, whither the disappointed diner promptly followed them.

A writer in 'Country Life' describes two Stoats which he watched playing one winter's day in Yorkshire.

'I verily thought they must have gone mad. They rolled over and over each other, twisting along the ground like snakes, and at times would jump fully four feet in the air, sparring at each other for all the world like a couple of boxers.'

Mr. C. B. Moffat, writing from Ballyhyland, Enniscorthy, charmingly described the tameness of some Stoats which he witnessed in June 1890.[1]

'The day had been wet, and in walking out—about eight in the evening—I came quite suddenly on a group of three Stoats engaged in a great game of play on the road: they had a hole, or at any rate a niche, among the stones of the fence on each side, and retired for a moment on discovering an intruder, for they caught sight of me at the same instant as I did of them; but apparently they have just as great an objection to be balked of their play as their victuals, for they almost immediately returned, and, as I remained perfectly quiet a few yards away, the game was resumed, and proved extremely lively. From their behaviour I suppose the animals were young, but they seemed quite full-grown: two of them (males I should think) were longer and redder than the third. A curious crowing sort of note—"curoo, curoo, curoo," uttered very quickly—was frequently uttered, and invariably when they ran at full speed. Great part of the game consisted in all three animals careering across the road again and again, frequently crossing each other, when they sometimes sprang high in the air and cannoned against one another, all evidently in the height of fun. Then there was a ceremony, which I could not quite understand, of pressing their noses on the bare ground and running along for a foot or so, making a slight grating noise, I do not know how: they all did this. Then they would play with one another like kittens, one chasing another, knocking it down, and running off crying "curoo, curoo," to be knocked down in its turn. And *one* of the three could turn as perfect a somersault as any boy I have seen, doing it, moreover, in exactly the same way—placing his head very deliberately on the ground as the first step, and then turning quite gracefully over, and righting itself just in time

[1] *Zoologist*, 1890, p. 381.

to avoid falling on its back, by standing erect on its hind legs. It did this several times, but as far as I could make out it was always the same one. At last one of the two ruddier fellows ran up a tree, and left his comrades alone for a while, and then the most curious part of the affair began. The two Stoats regularly set themselves to enjoy a game of "Tom Tiddler's Ground" with *me*: it was the most barefaced piece of impudence that I have ever experienced from a pair of wild animals yet, although the hedgehogs up in the woods have often come thrusting their snouts under my feet to see if there were beetles there: *they* took me for an old tree, so might be excused. But these Stoats knew perfectly well that I was not a tree. Their game consisted in trying how near they dared to approach me: they would come side by side with a graceful and joyous trot straight towards me, like lambs or fawns coming to be petted; then suddenly both would turn tail and, whistling "curoo, curoo," rush off at full speed, almost tumbling in their desperate haste, fully persuaded I was after them; then discovering that I had stood stock still, they again came bounding along with the same agile grace and sociable expression, and when within a very few feet of the mysterious object fled again with the same expressions of wild alarm. Anything in the animal world so like the play of human children I could not have conceived. At last the redder of the two became satisfied that he had shown enough valour (for I ought to have told you that on each adventure they came a *little* closer than the time before); so he took his post on a stone, and contented himself with watching his comrade. She came on as before, but, without the least appearance of any disposition to turn back, came springing towards me till within about six inches. I verily believe she would have run up my legs this time, but the one sitting behind began "curoo curooing" as shrilly and vehemently as possible, and at that call she turned and galloped back to him. She returned, however, this time running round me, and quietly took a seat behind me some six inches from my feet. Pretty as her movements were, I was not quite easy at this situation, for I know the Stoat's agility in running up the trunks of trees very well. However, she was soon trotting round me again. I had my stick in my hand, the end resting on the ground, and the little animal, coming up to this, reared on her hind legs, put both her fore paws on the stick, and began licking it very contentedly! Anyone coming up at that moment would have taken the creature for a very well-tamed pet, instead of a wild Stoat running about "on her own hook." She continued in this position for a little while, and then returned with a self-satisfied air to

her comrade, who showed great delight at her safe return. The third Stoat soon after returned, and the games were continued for some time longer (until a cart appeared); but none of the three showed the smallest interest in their human spectator from the time he had been proved innocuous by the liberties taken with his stick; there were races, and somersaults, and romps, but no more Tom Tiddler's Ground; I suppose there was no fun without the element of danger.'

George Taylor, the headkeeper at Warnham, tells me that he has seen a Stoat roll head over heels from the top to the bottom of a grassy bank, at the bottom of which were some young blackbirds, and springing up suddenly catch one of them. This sounds almost too clever, but I have confidence in the observation of the man who made the statement.[1] Mr. Moffat, in the article previously referred to,[2] gives an interesting account of the boldness of a Stoat:—

'On June 28th, hearing a rustling in a furze bush by a roadside, I struck the bush with my stick, when a large rat ran out. On the spur of the moment I struck at it, and rather unexpectedly killed it; and somewhat regretting that I had not let it alone, I laid it on the other side of the road and walked on a few paces, when a Stoat came and began carrying off the rat. On my looking back the Stoat disappeared, but shortly returned, and began carrying the rat away in the opposite direction. As I continued to approach it again ran off, but kept returning at intervals, and by circuitous paths to prevent my seeing its approach —ridiculously fruitless efforts, however, as a pair of stonechats had discovered it and followed it everywhere, keeping alongside of it with a courage that made it plain the little animal was much too intent on his rat to pay any attention to the birds, which he could easily have got. At length it seemed to become quite indifferent to my presence also, and a peculiar procession might have been seen walking *abreast* along the road: on the right the Stoat, carrying the rat; on the left myself; and in the centre, hopping along, regardless of the two-edged danger, the hen stonechat. The cock-bird was keeping up with us too, but using his wings and the tops of the furze bushes in preference to the path. The Stoat looked a beautiful object, with his long neck perfectly erect and the rat almost lifted off the ground in his mouth. This continued for some distance till the stonechats left us. Finally the Stoat made a sudden rush up the hedge bank, his burden of course still in his mouth, and being, I suppose, a

[1] Since the above was written I have further corroborative evidence that Stoats will roll down a bank. Mr. Charles Tracey, ferreting rabbits at Holtye, Kent, in December 1904, saw three Stoats bolt from a hole. One of them he shot and the other two at once curled themselves up in a ball and rolled down a sandy bank for a distance of twenty feet.

[2] *Zoologist*, 1890, p. 380. For another account of similar behaviour see *Field*, vol. xcviii. p. 83.

little puffed with the effort, lay in hiding among the bushes and grass at the top. Peering in I failed to see the Stoat, but saw the dead rat lying by itself, so—thinking to prolong the interesting spectacle a little—I put in my stick, and began drawing out the body of the rat, meaning to put it on the road again. Suddenly there was a spring: the Stoat seized the rat, and, though I resisted as well as I could, he pulled it by main force from under my stick, and sprang down the other side of the fence with his prey in his mouth, and I saw them no more.'

Stoats have a habit of storing provisions and forming larders, and this seems to be a general practice of the smaller Mustelids. In some hole in an old tree or stone walls they will pack a heterogeneous mass of dead rats, rabbits, small birds, and eggs. I think they sometimes forget all about their stores when game is plentiful, as I have found a mass of small skeletons and eggs, which had apparently never been touched since they had been collected together.[1]

Mr. De Winton, writing in 'Lydekker's British Mammals,'[2] says that old Stoats whose teeth are worn are inveterate egg-stealers. Colonel E. A. Butler says in a letter to me: 'I once saw a Stoat in the act of rolling a hen's egg across a road, and as the way in which it is done may not be generally known I will briefly describe what took place. The Stoat held the egg under its throat, with its chin resting upon it to keep it steady, and pushed it along rapidly with its fore feet until it caught sight of me, when it dropped the egg and ran into the fence. I stood perfectly still so as not to frighten it, and in a few seconds it reappeared, took up the egg, and rolled it down a bank into the ditch by the side of the road. I went up to the spot, and on seeing me it ran away, leaving the egg unbroken. Mr. Hunt, gamekeeper on the Somerton Estate, near Bury St. Edmunds, where Stoats are unusually common, told me that he had also once seen a Stoat rolling a partridge's egg from a nest in exactly the same way that I have described.'

If you hear an unusual commotion amongst the small birds in a wood you may be sure that the cause of excitement is either a Stoat or a weasel. Blackbirds, thrushes, chaffinches, and tits all pay particular attention to the movements of these small Mammals—partly, it seems, out of curiosity, and partly from fear. When the marauder has succeeded in capturing some of their number the excitement is tremendous, and they will rush and peck at the sinner with the greatest boldness. Birds seem much shyer of the Stoat than the weasel, and I have not

[1] For accounts of Stoats' larders see *Field*, vol. xcix. pp. 445 and 477.

[2] P. 120.

yet satisfied myself whether the former ever actually captures fascinated birds as the latter does. Many chaffinches are found in Stoats' larders, and Mr. Boyes suggests that they are captured at roost; but they may be caught by fascination.

Mr. Lionel Adams kindly sends me the following interesting note of a Stoat which had attacked a pheasant: 'C. E. Wright was informed by a keeper at Weekly Hall Wood, Northants, that he saw a pheasant rise into the air carrying with it a Stoat that had fastened upon its neck. He fired and brought both down. This occurred on September 28, 1896.'

No one seems to have bred Stoats or weasels in confinement; consequently we do not know for certain the period of gestation. Mr. A. H. Cocks says in a letter to me that he expects it to be 'about forty days,' that being the time of gestation in certain Stoat-ferret hybrids which he bred. That of the polecat is about forty days and the ferret forty-two.

The number of young produced by the female Stoat seems to vary more than in the case of any other British Mammal. The usual number is from five to eight, but as few as two and as many as twelve and thirteen young ones have been noticed by reliable observers.[1] The young, which are generally deposited in holes in stone walls, banks, stumps of trees, or rabbit-holes, have even been found in a nesting box up in a tree.[2]

Mr. Lionel Adams sends me the following account of a Stoat's nest in a tree:—'C. E. Wright, writing from Rockingham Forest in April 1900, says: "I found a Stoat's nest to-day up a tree, fourteen feet from the ground. The nest was composed of fine grass lined with rabbit's fur, and placed in a hole in the trunk. My friend Abbot put his hand in the hole, when the Stoat screamed out. Then I went up and got my hand in the hole, but the animal got out and escaped. We gave chase, but the Stoat got away down a rabbit-hole. In the nest was a young rabbit with its head off, and we had already found the fore feet lying at the bottom of the tree. The Stoat must have used much strength to take the rabbit up the tree, which was perpendicular. The Stoat was heavy with young, but very active."'

Concerning the climbing powers of the Stoat, Colonel E. A. Butler sends me the following note: 'I once saw a Stoat in winter, when the ground was covered with snow, curled up asleep in an old thrush's nest in the middle of a thick hedge, about eight feet from the ground. I should probably have passed without

[1] See Corbin, *Zoologist*, July 1896, pp. 253, 254, and Davenport, *ibid.* August 1896.

[2] Meade-Waldo, *Field*, May 14, 1904.

noticing it if I had not caught sight of its tail projecting on one side of the nest.

'A Stoat had a family of young ones high up in the ivy of the church tower at Herringfleet, near Lowestoft, a few years ago, and the mother was seen constantly climbing up the ivy with young rabbits in her mouth to feed them.'

Young Stoats are blind for nine days after birth, and the eyes open slowly, when they soon become active and follow the mother in her forays.

The mother rapidly teaches the young to take part in her killing operations, and in the autumn it is not unusual to see two family parties of Stoats joined together and formed into a pack. One August day, at Murthly, I fired a snap shot at a large Stoat just as it was entering a stone wall. The animal was not killed, so started squeaking loudly. In a moment the whole wall was suddenly alive with Stoats. They seemed to exhibit no fear at my presence, nor any disposition to attack me, although several came out of cracks within a few yards of where I stood. I killed nine before the remnant disappeared for good. After I had shot four or five the rest vanished into the wall; but as I sat down and kept quite still three of the number, which seemed almost full-grown, kept trying to run out and examine the first Stoat I had fired at, which, now dead, was lying a few yards from the wall. I think that if I had not fired and killed these three individuals they would have carried off the carcass. James Keay, the Murthly keeper, told me one day when I had shot a Stoat running across a road near Birnam Hall that if the carcass were hung up in a bush the mate would come to carry away the dead body. As we returned to the same spot in the evening the body of the animal had disappeared, and this removal of the dead partner may be a common practice. I have seen rats do the same thing; but whether the motive which prompts the action is purely generous or for the unworthy purpose of cannibalism I cannot say.

There are several instances on record of Stoats attacking men and dogs. The late E. T. Booth, writing in the 'Field,'[1] says: 'Small wandering parties of six or eight up to a dozen Stoats have often come under my notice. On one occasion, in East Lothian, my attention was attracted by the loud screams and growls of a terrier who accompanied me, and on hastening to the spot I discovered him fighting for his life, surrounded by from twenty to thirty Stoats. Having gripped one of his small antagonists successfully, I distinctly saw him shake his head, when three or four, which had fastened round the jaws, were flung off. Luckily

[1] October 6, 1883.

we were within call of a workman, who was instantly despatched for my gun, lying some hundred yards distant. In the meantime a heavy hedge-stake was my only weapon, and with this I managed to disable three or four. On the arrival of the breechloader the animals, which had hitherto exhibited a disposition to attack (hissing loudly and rising up on hindquarters), were rapidly put to flight. A dozen or fourteen were accounted for.'

In confinement the Stoat is spiteful and inquisitive, and is very difficult to tame unless obtained very young. Even then, if deserted by its regular attendant, it will become shy in a few days.

Stoats will stop and 'bark' for a long time at some object that puzzles them. One dark night in 1902 Dr. Juckes, of Horsham, was going to visit a house in St. Leonard's Forest, and as he opened the gate leading into the forest he heard a Stoat 'barking' in the ditch by the roadside. After visiting his patient he returned by the same road in three-quarters of an hour's time, and found the Stoat still yapping in the same spot. At this moment the rural postman came along; so, borrowing his stick and using the lantern of his bicycle, the Doctor went to inquire into the cause of the trouble. As he advanced down the ditch the Stoat came out of the grass right up to him—so close, in fact, that he knocked it on the head and killed it.

When playing Stoats give out a chuckling, happy sound, uttered in a high and a low key. When angry they make a loud chattering noise, and when hunting in packs and in full cry are said to 'give tongue.' Mr. Heatley Noble says that a 'pack' which he observed in full cry at Henley gave vent to 'faint whines.' They hunt in a line just like hounds, one taking up the trail and using its nose, whilst the others follow in a body behind. Dogs and men have several times been attacked by parties of Stoats.

Stoats are easily trapped, and may be lured with a small mammal as a bait. They have few enemies except man. Foxes are said to kill them at times,[1] and a cat has been known to kill a Stoat,[2] whilst Mr. J. B. Lucas records[3] a remarkable case in which a dog flushed a Stoat from a bunch of flags near Dudley. The Stoat, being pressed, jumped into the water, and swam away across a pool, when it was taken by a large pike.

A Stoat suddenly flushed in the open by a dog makes for cover in a series of bounds. It often escapes a swift dog, which, although faster, cannot always catch the active little animal. It is said that there exists great animosity between

[1] *Field*, vol. xcviii. p. 432.

[2] *Ibid.* vol. xcviii. p. 863.

[3] *Ibid.* November 1904.

the Stoat and the weasel, and that the latter are often killed but not eaten by the former; but I can obtain no satisfactory proof of this.

Charles St. John thus describes Stoat hunting in Scotland:[1] 'My rabbit beagles ran him for a long time, full cry in some rough ground. Whenever the Stoat went into a rabbit-hole I turned him out with a ferret, in this way running him until I killed him.' For many years a pack of hounds called 'weasel hounds' have hunted this animal in Cork, and there are many accounts in Irish papers of the sport. The hounds used are a cross between the Welsh beagle and the Irish foxhound, about 15 or 16 inches in height. In an account before me 'The Irish Sportsman'[2] says of the Stoat: 'A wonderful little animal, which can run in the open like a fox, swim and dive like an otter, double and twist like a hare, and climb the highest tree with more agility than a cat, all of which we have many times seen him do. On a good scenting day the hounds will hunt up a "weasel" (Stoat) in about twenty or thirty minutes, if the country is open and the fields extensive; but if scent is not good, and there is much cover, the weasel generally stands up before them for four or five hours, and beats them in the end.'

A curious variety of the Stoat, which was said to be *black and white*, was noticed in Ireland and recorded in the 'Field.'[3]

Mr. Harting records[4] a perfectly white Stoat, tail and all parts white, eyes dark brown, which was shot at Llandovery Court, Usk, on August 3, 1887. The specimen is now in the Natural History Museum at South Kensington.

Mr. J. Whitaker, of Rainworth, informs me that he has a pure albino Stoat.[5]

SUB-SPECIES.

The Irish Stoat.

Putorius hibernicus, Oldfield Thomas and G. E. H. Barrett-Hamilton.

Putorius hibernicus, Oldfield Thomas and G. E. H. Barrett-Hamilton, 'Zoologist,' pp. 124–129, April 1895.

Local Names.—*Easog* (pronounced *Assogue*) (Irish Gaelic); *Assag* (Isle of Man).

Characters.—As given by the discoverers of this sub-species,[6] the characters are as follows: 'Smaller than *P. ermineus*, the male scarcely exceeding in size

[1] *Tour in Sutherland*, p. 179. [2] May 21, 1892. [3] March 31, 1883.
[4] *Zoologist*, 1887, p. 345. [5] *Field*, February 22, 1897.

[6] Marked dental distinctions or peculiarities of structure should alone be sufficient to make a species. Slight differences of pelage are insufficient in the creation of a sub-species, but differences in the colour of the hair that are well marked and constant should, I think, be considered conclusive. Consequently I have treated this animal merely as a sub-species of *P. ermineus*.



THE STOAT (AUTUMN, WINTER AND IRISH STOAT)

MUSTELA ERMINEA.

the female of that species. Tail rather shorter. Ventral surface white or with a faint tinge of yellow,[1] and the distribution of the colours very much as in the weasel, and not as in the Stoat. The white, limited beneath the head to the chin and throat, not extending to the upper lip, contracted on the chest to a narrow median line (or even interrupted altogether), and similarly narrowed on the belly, but keeping its full breadth across the axillary and inguinal regions.[2]

'On the fore limbs the white ends about the middle of the forearm, and on the hind limbs at the middle of the tibia; the feet, above and below, are usually entirely brown, except for a few scattered hairs on the toes.

'Skull of male about equal in size to that of a female *P. ermineus*, and just intermediate between those of the male *P. ermineus* and the weasel.

'Dimensions, measured in the flesh, of the specimen we propose to select as the type—an adult male, killed at Enniskillen, Co. Fermanagh, on January 7, 1895, and presented to the British Museum by Mr. J. E. Harting: Head and body, 228 mm.; tail, 88 mm.; hind foot, 40 mm.; ear, 21 mm. Basal length of skull, 41·2 mm.'

In certain respects, such as the colouring of the under parts, the Irish Stoat certainly bears a somewhat close resemblance to the weasel, which may in some part account for the name of 'weasel' being used for the Stoat in Ireland. Another point is the rarity of the winter whitening. In describing English and Scotch Stoats Capt. Barrett-Hamilton has referred to the absence of the winter change to white as a mark of specialisation: a point in which I fail to agree with him; but in the present instance we have a type of Stoat whose change to white in winter is so rare that it need hardly be taken into consideration, and therefore I think that the absence of colour change is a good feature in entitling the animal to sub-specific rank. Although neither Thompson nor A. G. More had ever seen or heard of a white Irish Stoat, there are several instances of both white and pied ones, notably the pure white specimen with black tail-end in the Museum of Science and Art in Dublin. Mr. R. M. Barrington also has a specimen, killed near Ashbourne, Co. Meath, which is pure white, except the end of the tail, the forehead, and two small spots on the back of the neck.

[1] In old male specimens it is as yellow as in the female or immature Stoats; but, comparing the sexes and ages, *P. hibernicus* is decidedly less yellow below than *P. ermineus*. (O. T. and G. E. B.-H.)

[2] No British specimen has been found to resemble the Irish Stoat, but in the Natural History Museum there is an Irish Stoat with pure yellow white throat and ventral surface which it would be difficult to distinguish from a British Stoat in autumn pelage. The edges of the upper lips are brown.—J. G. M.

Mr. G. H. Kinahan says[1] that piebald Stoats are not uncommon in Ireland. Mr. Oldfield Thomas and Capt. Barrett-Hamilton offer a suggestion that Irish hares probably turn white on account of the exposed situations in which they live, whereas Stoats, which frequent more sheltered places in the low grounds, are not subjected to such severe climatic conditions, and consequently retain the normal colour. This is a good argument, since we know that Scotch Stoats subjected to severe climatic conditions—as, for instance, those found dwelling about the summit of Ben Nevis, over 4,000 feet in height—frequently remain white all the year round. The Irish Stoat is found throughout Ireland and in the Isle of Man.[2] Mr. Lort believes that it occurs also in Carnarvonshire.

The habits and life of this sub-species seem to be identical with those of the British Stoat.

[1] *Land and Water*, June 11, 1892.

[2] O. Thomas, *Zoologist*, 1895, p. 226.

THE WEASEL

Putorius nivalis, Linnæus.[1]

Mustela nivalis, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 69 (1766); also adopted by Hellenius, Retzius, Holmgren, Lilljeborg.
Mustela vulgaris, Erxleben, 'Syst. Reg. An. Mam.' p. 471 (1777); adopted by Bell and Lydekker.
Viverra vulgaris, Shaw, 'Gen. Zool.' I. ii. p. 420 (1800).
Fœtorius vulgaris, Keyserling and Blasius, 'Wirb. Europ.' p. 69 (1840).
Putorius vulgaris, Richardson, 'Fauna Bor. Amer.' vol. i. p. 145 (1829); adopted by Sir H. Johnston.
Putorius nivalis, Thomas, 'Zool.' p. 177 (1895).

Local Names.—*Kine*, *Cane*, *Mousehunt*, *Beale* (Sussex and other counties), *Weasel*, *Ressel*, *Rezzela* (Yorks), *Mouse-hunter* (Norfolk), *White-throat* (male), *Mouse-hunt* (female) (Suffolk), *Fairy*, *Fairy-hound*, *Lonennan*, *Codnagwidr* (Old Cornish, Harting) (English); *Game Rat*, *Whitrick*, *Whittret*, *White-throat*, *Mouse-weasel*, *Futteret*[2] (Scottish); *Neas*, *Nios* (Scotch Gaelic); *Bronwen*, *Wenci*, *Waenci* (Welsh).

Characters.—The Weasel is a much smaller animal than the stoat; besides this it may easily be recognised by the fact that the black tip to the tail of the larger animal is absent, and that the tail is shorter and less bushy. In general colour it is paler, and not so red as the stoat in the summer months, and in autumn and winter this lighter pelage is even more pronounced. The pelage of the stoat, when the animal does not turn white, is darker in winter than in summer. The upper lips, lower cheeks, and under surface of the Weasel are

[1] There has been considerable difference of opinion about the correct specific name of the Weasel. Mr. Oldfield Thomas (*Zoologist*, 1895, p. 177) pointed out that *nivalis* of Linnæus has priority, but Mr. J. E. Harting argued (p. 178) that *Mustela nivalis* of Linnæus was not our Weasel, but a female stoat which had turned white in winter. Mr. Thomas explained at some length (pp. 225, 226) why he could not accept this view; and Mr. Harting acknowledged that the Weasel might be the animal so named, but so long as the matter was doubtful preferred to make no alteration in the name. He did not like the adoption of Cuvier's genus *Putorius*, preferring to retain *Martes* of Nilsson for the martens and *Mustela* for the Weasels. There is much to be said on both sides, but I have decided to retain Linnæus's specific name *nivalis*, while giving the genus the name *Putorius*.

[2] In Scotland there is a very general idea that there are two Weasels, which are often called the Big Brown Weasel and the Mouse Weasel. This is exclusive of the stoat, which is recognised as another species.

pure white. The body is elongated and the limbs are short; the toes are almost concealed with hairs. The vibrissæ on the muzzle, brows, and elbows[1] are long and black; the head is small and flattened, the ears rounded; the eyes, darker than in the stoat, are almost black; the tail is brown to the tip. In the male the head and body measure about 8 to 8½ inches; the tail from 2 to 2½ inches. The female is smaller, and averages about 7 inches, and 2 inches in the tail.

Dental Formula.—I. $\frac{6}{6}$; C. $\frac{1}{1}$; P.M. $\frac{6}{6}$; M. $\frac{1}{1}$.

The males are said to outnumber the females.

Mr. Oldfield Thomas says[2] that 'even in Britain occasional specimens of the Weasel occur with black tips to their tails,' but I have never seen one myself, nor has Mr. Harting. Albinism is common in the Weasel, so I do not think that white Weasels found in this country are necessarily examples changing as the result of climatic severity. The Weasel certainly turns white in Northern Europe, but I do not think that we have proof that it does so in our islands, for this reason: albinos and examples with more or less white in their pelage are met with at all seasons of the year. The colouring matter in the fur of the Weasel seems to be highly evanescent; a stuffed Weasel placed in a shop window and exposed to the sunlight will become quite white in three or four years.

Distribution.—The Weasel has a circumpolar distribution, very similar to that of the stoat. It is exceedingly common in England, Wales, and Scotland, but is unknown in all the islands to the west or north of Scotland, except Islay, Bute, and Skye. The animal is included in a list of vermin for which Maclaine of Lochbuie was prepared to pay rewards in the island of Mull in 1825, but that is not direct evidence that it ever occurred there.

In Ireland, where the species has often been reported in error,[3] it is also unknown. A tradition exists that the Weasel was introduced into Shetland by the King's falconer out of revenge, as some of the inhabitants had refused him rabbits for his hawks,[4] but the animal referred to is evidently the stoat. The Weasel has been an inhabitant of this country since the Pleistocene age.

Habits.—The general habits of the Weasel are very similar to those of the stoat. It frequents much the same places and hunts in similar fashion, although, as we should expect from its size, paying more attention to smaller mammals than its larger cousin. Occasionally it will attack mammals and birds so large

[1] It is not perhaps strictly correct to call these elbow hairs 'vibrissæ,' but they closely resemble the long lip-hairs.

[2] *Zoologist*, 1895, p. 225.

[3] For reported occurrences in Ireland see *Zoologist*, 1877, pp. 73, 291, 379.

[4] Low, *Fauna Orcadensis*, p. 29.



THE WEASEL.

MUSTELA VULGARIS.

as hares or poultry, but this is exceptional; the Weasel is often blamed for the depredations of the stoat, a stronger and more daring little beast.

On the whole the little Weasel is a most beneficial animal, especially to the agriculturist; every naturalist who has studied its habits will affirm that nine-tenths of its food consist of mice, voles, and immature rats. It cannot be denied that the attractions of young pheasants,[1] rabbits, and partridges are overpowering when encountered, and that large numbers pay the penalty of 'getting in the way'; but the balance for good works is decidedly on the side of the animal which keeps in check the superabundant stock of small rodents, and saves us from inevitable plagues of these little pests. Weasels are almost exterminated in my neighbourhood (West Sussex), and the result is a never decreasing plague of rats in the hedgerows and barns. We are in danger any year of the plague of rats assuming serious proportions, and indeed in any season the rats do more damage to game, ducks, and poultry than a plethora of Weasels. If you watch a Weasel hunting, it is in ninety-nine instances out of a hundred threading its way in and out of the rat and vole runs in the hedgerows, through the crevices of stone walls or along the small paths made by mice and voles in grass and bracken. It is searching for the makers of these paths and runs. This, the smallest of the Carnivores, seems to be tireless: swift in its movements, it can chase and capture its prey with extraordinary ease. I remember once walking along the Methven road near Perth, in company with Mr. P. D. Malloch, when a Weasel appeared about thirty yards away, crossing the road and carrying a bank vole in its mouth. A shot from my catapult either struck the vole or sent the dust into the Weasel's face. At any rate it dropped its prey and scampered off into the ditch close at hand. When less than a minute had elapsed, and while my companion and I were examining the dead vole, the Weasel suddenly reappeared, again crossing the road about forty yards further on with a fresh vole kicking and squeaking in its mouth. It was a smart piece of work. Weasels should never be destroyed in the neighbourhood of ricks and farm buildings, and even in the woods frequented by game there are always a large number of rats and mice on which they subsist.

Mr. Harting in his papers on the Weasel[2] says (p. 423):

'The utility of the Weasel in checking the devastation of field-mice was never more clearly established than by the evidence which was tendered to the Committee

[1] It must be admitted with regret that once Weasels attack young pheasants in the rearing field they become a great nuisance. Making use of the mole runs, they use these lines of advance to further their operations, and the amount of damage they can do in a few days is very great. Under these circumstances they should be trapped and shot without mercy.

[2] *Zoologist*, 1894, pp. 417–423, and pp. 445–454.

appointed by the Board of Agriculture to inquire into the plague of field-voles in Scotland in 1892. In the Minutes of Evidence appended to the Report of this Committee, issued in 1893, will be found numerous statements, elicited by cross-examination of the witnesses, which tend to prove beyond doubt that the Weasel is the natural enemy of field-mice, and that no greater mistake could be made than to destroy Weasels where mice or voles are numerous, and are likely to become a plague.'

In this report, which I have read, the most direct evidence is that of one witness, David Glendinning, a shepherd, who, in reply to a question whether he had ever seen a Weasel kill a vole, replied:

'Yes; about three weeks ago I came upon a small brown Weasel which had killed five in one of the sheep-drains. I followed it up, and found it killing a sixth. A week past on Sunday morning I came down a drain for 250 yards or so. A Weasel had been before me, and there were twenty-two dead voles in the bottom. I secured a specimen last night in order to show you the way a Weasel destroys a vole. The blood is entirely drawn from behind the left ear. There is not a bit of the vole marked otherwise, except by the tooth-marks on the head. All those I have seen were killed in the same way.'

Mr. Harting thinks that there is a movement in favour of the Weasel, and cites examples of the Duke of Buccleuch's head keeper and others having received orders not to molest them. These few cases of intelligent landlords are but a drop in the bucket; the great mass of keepers, who pay no heed to advice, will go on doing the same stupid things their fathers did before them to the end of the chapter, unless laws are made and enforced.

Mice and voles are killed by the Weasel crushing their skulls, when it at once eats the brains; but when larger animals are attacked the arteries of the neck are first assaulted. It does not generally suck the blood of its victim, which dies from nervous exhaustion. In nearly every instance after having obtained a hold it flings its body over that of its victim and holds on despite mad rushes, falls, and struggles. I was shooting in December 1902 with Mr. Fletcher at Dale Park, near Arundel, and when posted forward under a steep bank about seventy yards high I suddenly heard a rustling and commotion in the dry leaves on the top of the hill. Next moment a half-grown rat bolted from a hole at full speed, immediately followed by a Weasel. They had not run ten yards when the Weasel gripped its victim, and squealing and struggling the two combatants came rolling straight down the hill almost to my feet. I shot them both, for I needed a Weasel as a model, and also wished to see how the rat had been seized. The













WEASELS.

From photographs by D. ENGLISH, F.R.P.S.

canines of the Weasel were so deeply imbedded behind the ear of the rat that the two dead animals had to be pulled apart.

Pluck in holding on to its victim is characteristic of this gallant little beast. An instance is reported[1] of a Weasel still holding on to a rabbit which was being retrieved by a dog, and the subject of one of Wolf's most famous drawings, called 'The Biter Bit,' is that of a Weasel killing an owl which has carried it off.[2] The following instance of the courage and sagacity of the Weasel is related by the late W. Borrer in the 'Zoologist':

'As a nephew of mine was walking through one of his meadows at Springfield, near Dorking, Surrey, about the middle of December last, he saw a kestrel struggling with something on the ground, and on getting nearer the bird rose about thirty feet in the air and let something drop. On going to the spot he found a Weasel hanging on to a dead rat about three parts grown. The Weasel immediately made off to the hedge some twenty yards distant. My nephew then picked up the rat, and removing it to another spot retired to a ditch to watch. He had not been there more than a minute before the Weasel came out and commenced hunting for the rat, behaving exactly like a dog working a field. The Weasel was some little time finding it. He repeated the experiment half a dozen times, moving the rat each time to a different spot, and each time with the same result, viz. its eventual discovery by the Weasel. He then left the Weasel and the rat to settle matters between themselves. This appears to me a remarkable instance of courage and perseverance on the part of the Weasel, especially after his little aërial trip with the kestrel.'

Being expert climbers Weasels prey largely on small birds, which they surprise in the foliage or at roost. Mr. Ruskin Butterfield tells me of the following incident, which shows that the Weasel also chases birds in the open:

'The incident took place on September 2, 1902, near St. Leonards. While I was watching a tree creeper ascending a large oak, a Weasel emerged from the rank herbage at the foot of the tree and ran nimbly up the trunk. At the time the Weasel came into view, the creeper was about four feet from the ground. Upon reaching a height of about ten feet the bird stopped, thereby allowing its pursuer to get within two feet, when it flew away. The Weasel then turned and ran down the trunk until it was near the ground when it sprang from the tree into the grass. The agility and grace with which the feat was accomplished very much engaged my attention.'

[1] *Field*, Oct. 9, 1886. [2] For a similar instance in which a Weasel killed a kite see Bell, *British Quadrupeds*, 2nd ed. p. 186.

One January day in 1902, when I was returning from shooting in St. Leonard's Forest, and was about to pass through a right-of-way gate which leads from the forest to my garden, I noticed a commotion amongst the tits and chaffinches—a sound which generally means that a stoat or Weasel is on mischief bent. Putting down my gun I crept forward until I arrived within thirty yards of a number of birds which were flitting round or perched on some low brambles. In the midst of the brambles I could see a gleam of white appearing and as suddenly disappearing; then a Weasel flashed into the open, turned a somersault, and vanished as if by magic. Two robins and a chaffinch were within a yard of the spot, but seemed more interested than frightened; several long-tailed tits, two goldcrests, a couple of wrens, and a coal tit flitted round the brambles where the Weasel had vanished, and a thrush and blackbird, more timid than the others, clamoured a few yards away. At first the birds had a better view of the performance going on under the brambles than I, but presently the Weasel came out within full view and began a series of those snake-like rolls and somersaults which we notice when any of the Mustelids are playing. I observed, however, that it jerked its head up swiftly after every movement, and kept rolling and edging towards the two wrens, which now seemed almost within jumping reach. How the play would have ended I do not know, for something suddenly seemed to scare all the birds at once, and, to my great chagrin, I did not see the completion of the fascinating game. I think the Weasel was just as disappointed as myself, for it came out and sat up to have a look round for its credulous admirers, and then galloped off to search for something more easily captured than those pretty flatterers.[1]

The late E. T. Booth thus describes[2] the attitude of birds fascinated by a Weasel: 'While driving between Shoreham and Lancing I noticed four creatures perched in the middle of the road, attentively regarding a small dark object, which eventually turned out to be a juvenile Weasel. The animal was running backwards and forwards across the road, followed closely by a whitethroat, which fluttered with quivering wings from six inches to a foot above its head. A robin also, on a sprig of whitethorn in the hedgerow, intently regarded the proceedings, but made not the slightest attempt to approach. . . . The whole of the birds were apparently helpless from fear or amazement. The actions of the four wheatears were especially strange: they stood motionless in the middle of the road, with

[1] Accounts of Weasels fascinating small birds will be found in *Hampshire Days*, by W. H. Hudson, and in the *Zoologist*, 1862, pp. 78, 79.

[2] *Field*, October 6, 1883.

Nest of Nesting small birds



necks drawn out to the fullest extent, simply slowly turning their heads to watch the movements of the Weasel. This tiny creature only ran backwards and forwards across the road.'

Weasels will devour frogs, and occasionally, at any rate, toads[1]: they will follow mice in mole-runs, and at times kill moles, as stated in the article on that species.[2]

Weasels form larders in crevices, and often use holes in trees as storehouses for future supply. 'W. M. C.,' writing from Denbigh, in the 'Field'[3] says: 'While out bird's-nesting with two friends last week one of us climbed up to an old woodpecker's hole in a dead tree. Out of this hole he extracted the following dead bodies &c.: three wrens, one goldcrest, one chaffinch, one mouse, two pigeons' heads, one pigeon's leg, and there were many more remains which he was unable to extract owing to the depth of the hole. It was the only hole in the tree, about 2 inches in diameter and some 18 feet from the ground.' This was probably a Weasel's store, as the editor of the 'Field' suggests.

Weasels often run about hedges and search for the young and eggs of small birds, and will burrow in the snow to get at mice-runs. In the water they are quite at home, a favourite prey being the water-vole. They are strong swimmers, moving in a similar fashion to the stoat; they have even been seen swimming whilst carrying a young rabbit.[4] Bell does not consider that Weasels kill snakes, but shows by an experiment with one in confinement that the two will attack each other in self-defence.[5] The same author gives an excellent description of the Weasel's mode of hunting, both by sight and by scent. On p. 185 he says: 'The Weasel pursues its prey with facility into small holes and amongst the close and tangled herbage of coppices, thickets, and hedgerows. It follows the mole and the field-mouse in their runs; it threads the mazes formed in the wheat-rick by the colonies of mice which infest it; and its long flexible body, its extraordinary length of neck, the closeness of its fur, and its extreme agility and quickness of movement combine to adapt it to such habits, in which it is also much aided by its power of hunting by scent—a quality which it partakes in an equal degree with the stoat. In pursuing a rat or a mouse, therefore, it not only follows it as long as it remains within sight, but continues the chase after it has disappeared, with the head raised a little above the ground, following the exact track recently

[1] Stanford, *Field*, November 21, 1896. [2] Vol. i. p. 137. [3] May 21, 1904.

[4] *Field*, June 17, 1876. The late Rev. H. A. Macpherson says that a Weasel was killed when crossing Ulleswater at a point where the lake is three-quarters of a mile broad (*Fauna of Lakeland*, p. 26).

[5] Bell, *British Quadrupeds*, p. 184.

taken by its destined prey. Should it lose the scent, it returns to the point where it was lost, and quarters the ground with great diligence till it has recovered it; and thus, by dint of perseverance, will ultimately hunt down a swifter and even a stronger animal than itself. But this is not all. In the pertinacity of its pursuit it will readily take to water and swim with great ease after its prey.'

Weasels, on the other hand, have a few natural foes. Raptorial birds occasionally kill them, and there is an instance given in the 'Field,'[1] of a Weasel attacking a rook, and both being killed whilst in mortal combat. Mr. James Cullen[2] cites a similar case. 'A Weasel attacked a grouse, and was lifted by the bird for a yard or two. It lost its hold, when the grouse immediately returned and battered in the skull of the Weasel; the attacker was killed, but the attacked escaped with the loss of but a few feathers.' Cats have been known to catch Weasels and to play with them,[3] and Weasels are said to feign death when attacked by cats and other animals.[4]

Like the stoats, Weasels will hunt in company. I have seen three Weasels following the tracks of some animal, but they passed out of sight before I could observe the chase. Richard Jefferies, in his 'Gamekeeper at Home' (p. 121), wrote from personal observation:

'Weasels frequently hunt in couples, and sometimes more than two will work together. I once saw five, and have known of eight. The five I saw were working a sandy bank drilled with holes, from which the rabbits in wild alarm were darting in all directions. The Weasels raced from hole to hole, and along the sides of the bank, exactly like a pack of hounds, and seemed intensely excited. To see their reddish heads thrust for a moment from the holes, then withdrawn to reappear at another, would have been amusing had it not been for the reflection that their frisky tricks would assuredly end in death. They ran their quarry out of the bank and into a wood, where I lost sight of them. The pack of eight was seen by a labourer returning down a woodland lane from work one afternoon. He told me he got into the ditch, half from curiosity to watch them and half from fear—laughable as that may seem—for he had heard the old people tell stories of men (in the days when the corn was kept for years in barns, and so bred hundreds of rats) being attacked by these vicious little brutes. He said they made a noise, crying to each other, short snappy sounds; but the pack of five I myself saw hunted in silence.'

There are several instances of Weasels attacking man, and such cases are

[1] January 9, 1886. [2] *Field*, February 20, 1897. [3] *Ibid.* October 26, 1895. [4] *Zoologist*, 1864, p. 8945.



A MOST UNPOPULAR PERSON.

placed beyond doubt by observers who are to be trusted.[1] They have also been known to attack dogs.[2] I have twice witnessed the actual onslaught of a Weasel on a rabbit, and noticed that the attacker put its tail straight up in the air in its final rush.

The habit of Weasels to travel and hunt in company at night most likely explains a superstition which still lingers in the West of England to the effect that hares are hunted at night by packs of little fairy hounds, locally called 'Dandy Dogs,' and these some of the country people will assure you they have seen and watched with awe.

It is probably also in connection with this superstition that some of the West Country folk call the Weasel 'fairy' (pronounced 'vairy' and 'vair'). A purse made of Weasel skin was considered lucky. Oliver Goldsmith puts into the mouth of Dr. Primrose, the Vicar of Wakefield, the following curious expression: 'My wife was usually fond of a Weasel-skin purse, as being most lucky, but this by the bye.'[3]

The gestation is said to be the same as in the polecat, namely, six weeks.

In some hole in a wall or tree-stump the female Weasel makes her nest of grass or leaves. Here she brings forth from four to six young, about April or May, and in Scotland a month later. In this country Weasels breed only once, but on the Continent a second litter is said to be produced occasionally.[4] The young are at first blind and helpless, and do not see until they are more than half-grown, when the mother may frequently be seen carrying them about in her mouth.

Mr. T. A. Coward tells me that in June 1903 he saw a Weasel run across the road in front of him carrying something in its mouth. He went to the spot where the animal had disappeared and there found a young Weasel, much darker and greyer than its mother, feebly struggling in the grass. He placed it in the road and retired for a distance of about thirteen yards. After a short interval the female, a little 'mouse-killer' that looked far slighter than her offspring, peeped from the grass at the edge of the road. She crossed the road several times, each time coming a little nearer to the young one, which lay feebly

[1] Couch, *Illustrations of Instinct*, p. 297; Mitchell, *Fauna of Gloucester*, 1892, p. 20; Shand, *Field*, July 21, 1891; and of Weasels in packs, *Field*, 1900, p. 126.

[2] *Carlisle Journal*, June 26, 1891.

[3] Harting, *Zoologist*, 1885, p. 313.

[4] The gestation is probably forty days, or thereabouts; but as they are difficult to keep in confinement this point has not been definitely ascertained. Even in this country there is a popular idea that Weasels have two litters; but this is quite contrary to the nature of the Mustelidæ, and there is no evidence whatever to support the statement.

squeaking, and with its eyes just open. She sat up in the grass, ran into the road and back again several times, and at last stopped within a foot of the little one; for a second she hesitated, and then like a flash darted to her babe, seized it by the neck, and carried it with wonderful speed into a wall at the side of the road.

Mr. Douglas English has kindly sent me the following interesting communication on the subject of Weasels in confinement:

'I have kept all the British Mustelidæ in confinement at one time or another, but the Weasel is the only species which I have had the opportunity of observing from an early stage of its existence.

'In the middle of May 1904 I secured a litter of five Weasel-kittens during the threshing of an oat-stack. They were found about half-way down the stack, well furred all over, but quite helpless and incapable of supporting their own weight. Their eyes were closed, but apparently sensitive to a bright light, and in three or four days were completely opened. I considered it would be impracticable to rear the whole number, and accordingly gave two away the same evening. One of these was evidently the weakling, and died the following day. The other, being skilfully looked after, reached maturity, and, owing to incessant handling and a very liberal diet, became comparatively tame. He was allowed at times to roam loose in a sitting-room, was easily handled, and displayed no particular objection to being recaptured and put back in his cage.

'The three remaining kittens I fed for four days on cow's milk, at first holding a drop or two in the hollow of the hand and putting their noses in it, then, when they had got accustomed to their new diet, using a milk-soaked rag. They were fed to repletion as often as was practicable—every two hours in the daytime—and I should record their indebtedness to my cousin, Miss M. Jekyll, to whose unremitting attention they certainly owed their lives.

'Their note at this time was a high whimper, and could be exactly imitated by rubbing the moistened finger on a pane of glass.

'On the fourth day I shot a sparrow, pulled it to pieces, and gave it to them while warm. They took readily to this, and there was no further difficulty in feeding them. By the time I had had them a fortnight their whimper ceased, and they developed the power of hissing. About this time, too, they could manage a dead mouse or bird for themselves, but it was three weeks before they would tackle anything alive.

'It was noticeable that their "hissing" was always under cover. The "yap"

(its sequel) was always accompanied by an extremely swift lunge and recover of the head, forelegs, and body.

'I had subsequently the opportunity of noting that the Weasel under cover who suspects mischief arches his back and gathers his four feet beneath him. He may or may not "hiss." His "yap" (the ultimatum) is accompanied by a lunge and recover from the hind legs as a base, which can only be compared with that of an expert fencer.

'It is impossible to disregard the serpentine character of these tactics. Personally I could never face the attack without flinching from its suddenness, unexpectedness, and vehemence, and, judging from a human standpoint, its value, both as an aggressive and as a protective measure, is easily understandable.

'Apart from this muscular adaptation for quick forward movement the anterior portion of a Weasel's body admits of an extraordinary amount of lateral "play."

'A favourite exercise of my Weasels, when fully grown, was to swing the portion of themselves anterior to the pelvis from side to side through something like a right angle at the rate, which I timed on several occasions, of about 150 strokes a minute. The motion can best be conceived by swinging the hand, held vertically, from the wrist at about this rate, imagining the Weasel's hind legs to be fixed at the wrist, while his neck, body, and fore legs correspond to the hand.

'Another example of this body flexibility was noticeable when a pair, as was by no means infrequent, had some disagreement to settle. Before one got a grip it was impossible to follow the inextricable confusion of their bodies. I never saw the throat-grip, which was presumably intended; but on more than one occasion I saw one fasten on the other's nose. The victim's procedure was always the same. He flung his hind quarters off the ground and described a complete revolution, his vertebral column being the horizontal axis. The aggressor, of necessity, followed suit, so that the pair of combatants formed an animated spiral, the revolution of one body being a shade in front of that of the other. I have counted twenty-three of such revolutions, which leads to the consideration of the Weasel's tenacity of grip.

'It was a favourite amusement of mine to give my pair (I released number three when full-grown) a long thin strip of raw meat. The first who secured the meat would promptly bolt with it; the second would pursue the trailing end. When the tug-of-war was fairly established I would insert a stout wire under the middle of the meat and lift the pair of them off the ground. No amount of shaking would dislodge them, and finally the meat itself would yield.

'There is good evidence as to "packs" of Weasels being seen together, but from the behaviour of my pair in captivity I should judge the adult Weasel to be essentially a solitary animal. Each had his own corner in the cage, which he defended *vi et armis* against his fellow. Frequently they fought, and in the end one killed the other; yet at times they played like puppies. The game was a kind of hide-and-seek, one taking cover, waiting till the other approached, "yapping" at him, and, if he took to flight, pursuing him round the cage and up and down its wire-netting sides. As in the case of dogs, it was easy to distinguish these mock combats from the real thing.

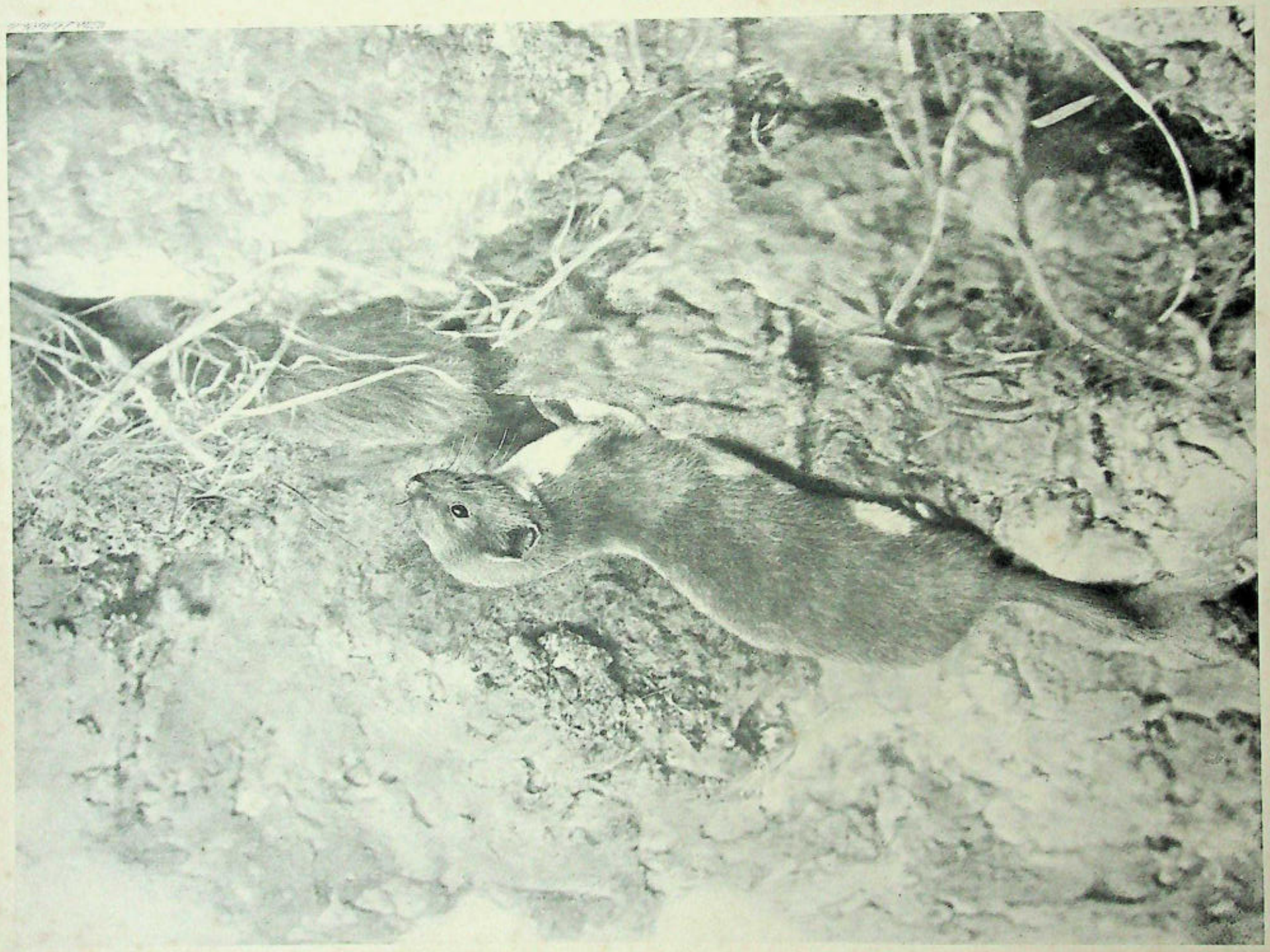
'As regards the characteristic attitudes of the Weasel, which, from a photographic standpoint, I was greatly concerned in observing, I was surprised at the rarity of the "sitting-up" position, which in the case of stoats and Weasels is a commonplace of illustration. I have never seen this position (full front with the fore paws clear of support) more than momentarily adopted by stoat, Weasel, or polecat. The Weasel has two characteristic methods of running. In one he keeps his body very low and straight, and I never succeeded in following the movements of his feet. The other is a series of bounds, and at the top of each bound his body is strongly arched, all four feet being clear of the ground. Like the marten, polecat, and stoat, he sleeps coiled head to tail, and on more than one occasion I have succeeded in confuting the proverb. In hunting he probably depends entirely on scent—my pair would often run sniffing round their cage while I held their food behind me. If the food was inserted while their back was turned they would discover it evidently more by smell than sight. Their strength, like that of stoats, is extraordinary. A stoat can easily tow a full-grown dead rabbit, and a Weasel is equally proficient with a large dead rat. In the case of living prey the Weasel fastens at the side of the throat, and to worry his victim more effectively swings and jerks like a whip-lash from side to side of its back. Once the throat-grip is secured, the victim is helpless either to bite, shake off, or scratch off his aggressor.

'I do not consider that a Weasel would be a match for a full-grown rat under anything like fair conditions, and I valued my Weasels too highly to try the experiment. I imagine the rat would corner himself, sit up, and beat down the Weasel's attack with his fore paws; but that a Weasel would cheerfully attack a full-grown rat there can be no question—he would cheerfully attack an elephant.'

The female Weasel is wonderfully brave in defence of her young, and will

A Weasel.

From a Photograph by Langhans, Cuyler, Texas.



attack any dog that threatens her progeny; but when man approaches she usually drops her offspring, but soon returns to fetch it away. Like the stoat, the Weasel will carry off a dead mate—not to eat it, but to hide it in some hole, I fancy.

White Weasels are not very rare; I am sure I have seen at least thirty in different naturalists' or private owners' hands. They seem to be prone to albinism. A few examples are given by Mr. Harting.[1]

'In the "Zoologist" for 1866[2] Mr. T. E. Gunn reported the capture of an albino Weasel in Norfolk, and in the volume for 1868[3] Mr. Cordeaux stated that "a white Weasel, probably an albino, had taken up its quarters in an oat-stack in his yard." In 1879 the late Mr. Gurney, of Northrepps Hall, Norwich, mentioned one which was killed there in November 1878, "evidently assuming a white winter coat; a circumstance which is very rare in the Weasel, though not uncommon in the stoat. The front and sides of the head were already quite white, and white hairs were appearing amongst the brown ones on all those parts of the animal which are normally brown, and especially on the flanks and tail."[4] On September 27 of the same year the late Mr. F. Bond obtained "a pure white Weasel, full grown, a true albino with pink eyes. It was killed by a dog in Soham Fen, Cambridgeshire."[5]

'In 1884 Mr. J. J. Brigg, of Kildwick, near Leeds, reported the capture, in the latter part of November of that year, of "a Weasel perfectly white, including the tail, and the eyes a dull pink";[6] and in October 1889 Mr. Corbin, of Ringwood, saw a perfectly white Weasel, which had been caught by a man cutting faggots in the New Forest. It proved to be a male, and a true albino with pink eyes.[7] In addition to these we have seen in the collection of Mr. Borrer, of Cowfold, near Horsham, a pure white Weasel which was killed at Willoughby, in Leicestershire, during the winter of 1867.'

Other examples of white or partially white Weasels are to be found in the 'Zoologist' for 1877, 1894, and 1895, and I could add many more.

[1] *Zoologist*, 1894, p. 449.
[2] P. 384.
[3] P. 1186.
[4] *Ibid.* 1879, p. 30.
[5] *Ibid.* 1879, p. 455.
[6] *Field*, January 5, 1884.
[7] *Zoologist*, 1889, p. 449.

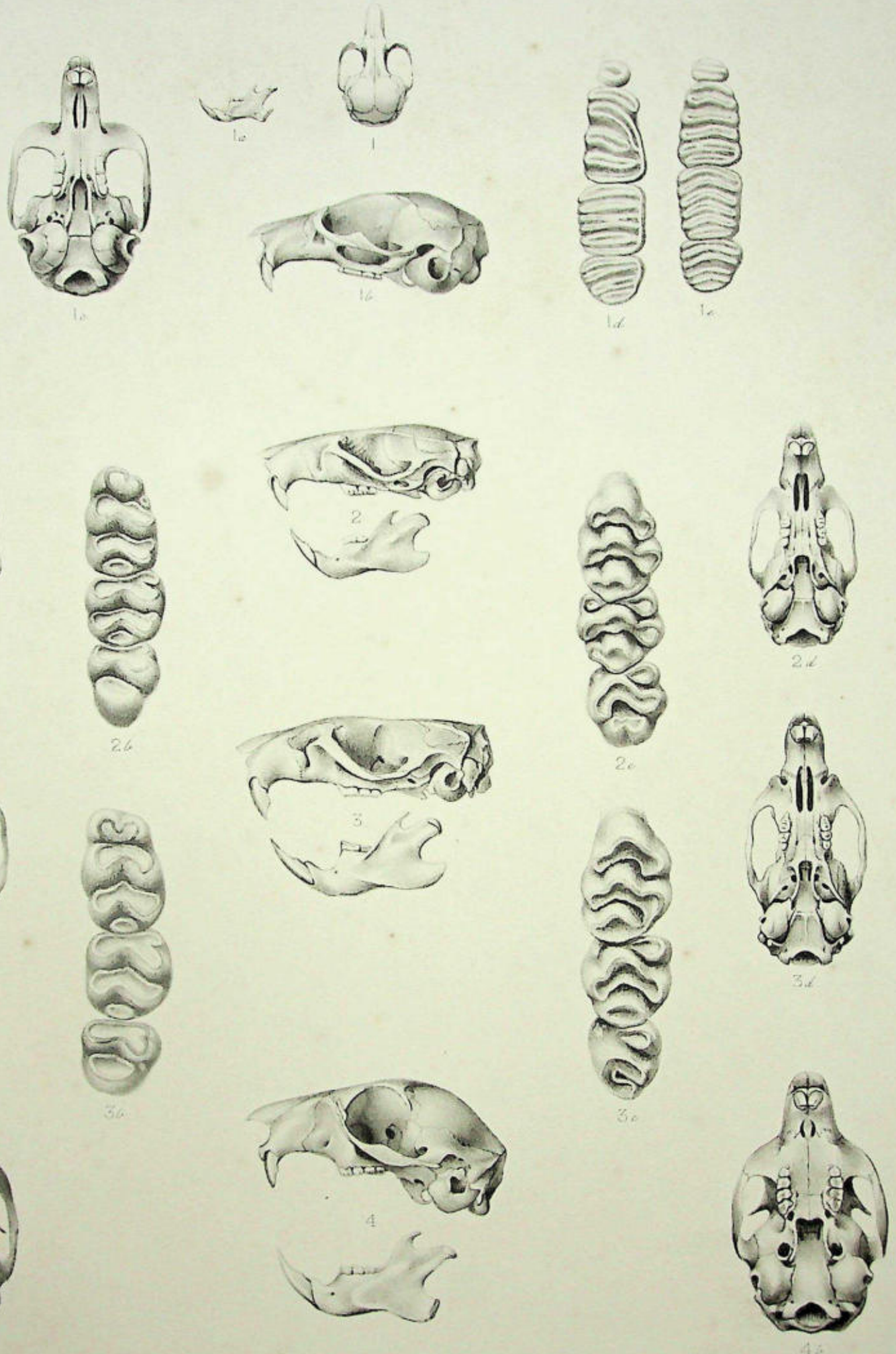
Order RODENTIA

THE RODENTS, OR GNAWING MAMMALS

THE order Rodentia comprises more species than any other mammalian order; it has, too, the widest geographical range. Rodents are found in all parts of the globe, even in the home of marsupials—Australia—and in the island of Madagascar. As a rule they are small-sized animals, though the South American capybara or capivara is about four feet in length.

The chief characteristic of the rodents is the possession, in the adult, of a single pair of long chisel-like incisors in the lower jaw, which meet a similar pair in the upper jaw; there may be one or two pairs of incisors in the upper jaw, but the second pair, if present, is small and insignificant. The incisor teeth are exceedingly long, and are more or less curved: they are deeply set in the jaws, those in the upper jaw sharply curving from the roots of the cheek teeth, those in the lower running beneath the whole series of cheek teeth. They grow continuously through life, and are constantly worn down by the action of gnawing: the front or outer surface of these teeth is coated with hard enamel, which wears more slowly than the softer ivory, so that a sharp cutting edge of enamel is retained. The colour of this enamel may be white, yellow, red, brown, or black, but in British rodents it is either reddish-yellow or white. The canine teeth are entirely absent, and the premolars are reduced in numbers or absent; a considerable and most noticeable gap is thus left in the jaws between the incisors and the cheek teeth: these usually consist of four pairs in each jaw, but the number varies considerably. The cheek teeth have flattened crowns, well adapted for grinding. 'In some cases,' says Lydekker,[1] 'these are surmounted by blunt tubercles: they are more generally interpenetrated by infolds of the enamel from the sides or summits, or both, by which in the worn state they are divided into laminæ, or have islands of enamel on the grinding surface.' The cheek teeth are sometimes provided with roots, sometimes roots are absent.

[1] *British Mammals*, p. 165.



Skulls and teeth of British Rodentia.

Fig 1a. Dormouse. life size.
- 1b. - double life size
- 1d. Right upper molars enlarged care ?
- 1c. Right lower molars enlarged care ?

Fig 2 a d. Black Rat. life size.
- 2b. Right lower molars enlarged.
- 2c. Right upper molars enlarged.

Fig 3 a d. Brown Rat. life size.
- 3 b. Right lower molars enlarged.
- 3 c. Right upper molars enlarged.
- 4 a b. Squirrel. life size.

The condyle of the lower jaw is elongated from front to back, so that the animal is able to move the jaw backwards and forwards when eating. The hairy integument of the face extends inwards into the mouth over most of the gap between the incisors and cheek teeth: it is supposed that this is useful to the animals when gnawing wood or other substances which they do not wish to swallow. The eye-socket is not surrounded by a complete ring of bone. The collar-bone is usually present, though it is sometimes only rudimentary.

The feet are plantigrade or semi-plantigrade: five toes on each foot are generally present, and these are armed with sharp claws, except in one or two genera.

The majority of the rodents are terrestrial in their habits, but some are more or less aquatic, while others are arboreal: in the flying squirrels spurious flight is attained by means of the folds of skin which extend from their sides. Nearly all are vegetable feeders only, but carnivorous and omnivorous habits are noticeable in some cases. Four families of this large order are represented in our islands at the present day, the beaver, a member of a fifth family, being now extinct.

The rodents are an ancient order: their remains are found in the Eocene deposits. The order is generally subdivided into the *Duplicidentata*, which have two or more pairs of incisors in the upper jaw, and which are represented with us by the hare and the rabbit, and the *Simplicidentata*, with only one pair. This sub-order includes the squirrel, beaver, dormouse, mice, and voles.

Mice, voles, and hares are constantly changing their coats, and do so three or four times a year. The dorsal hairs undergo curious colour changes: thus the hair on Orkney and Skomer voles is brown from the first, and its later growth is black. Mr. Drane tells me that the new fur of the hare is always black; where it is eventually brown on the animal is owing to the new black hair becoming brown at the tip In the centre it remains black, and is always white at the base.

Sub-order *SIMPLICIDENTATA*

(Rodents with one pair of incisors in the upper jaw).

Although in many particulars the members of the three groups of this sub-order—the squirrels and their allies (*Sciuromorpha*), the rats, mice, and rat-like forms (*Myomorpha*), and the porcupines (*Hystricomorpha*)—are similar, they present great differences in the number and construction of their grinding teeth, the existence or size of the cæcum, and in the development of the clavicle. The

enamel on the incisors is confined to the anterior surface. Two only of the three sections of the sub-order are represented in Great Britain and Ireland. The *Sciuromorpha* have the fibula distinct, and the malar is not supported by a long maxillary process; in the *Myomorpha* the fibula is united to the tibia, and the malar is usually supported by a long maxillary process.

Family *SCIURIDÆ*

This family, which includes the marmots and squirrels, the first purely terrestrial, the second both terrestrial and arboreal rodents, is widely distributed: members of the family occur throughout the globe, with the exception of Australia. The skull has distinct post-orbital processes; the premolars are $\frac{4}{2}$; the anterior upper premolar is small and sometimes deciduous. The molars, tubercular in the young, are rooted; the crowns when worn exhibit deep and often wavy folds of enamel.

Genus *Sciurus*

In Linnæus' genus *Sciurus* the tail is long and bushy; there are five toes on the hind feet and four and a rudimentary thumb on the fore feet. The limbs are free—not connected by any membrane or lateral folds of skin, as in their allies the flying squirrels. The infra-orbital opening is small. There are no cheek pouches. The marmots are not found in our islands, and only one species of squirrel.

THE COMMON SQUIRREL

Sciurus[1] *vulgaris*, Linnæus.

Sciurus vulgaris, Linnæus, 'Syst. Nat.' 12th ed. vol. i. p. 86 (1766); Bell, 'Brit. Quad.' 2nd ed. p. 276 (1874).

Sciurus vulgaris leucurus, Kerr, 'Linn. An. King.' p. 256 (1792).

Local Names.—*Squirrel*, *Skug*,[2] *Skuggie*, *Charlie* (Hants) (English); *Conn*,[3] *Squgg*, *Squggie* (Scotland); *Feoirag*,[4] *Earrag*, *Easag*[5] (Scotch Gaelic); *Wiwer*, *Gwiwer* (Welsh).

Characters.—The feet of the Squirrel are unusually long and pliant, as we should expect in an animal leading an arboreal life, whilst the tail is long and heavily plumed to help it in maintaining its balance. The hind feet have five toes, on the front feet there are four fingers, the thumb being a mere stump: these are all furnished with sharp well-curved claws. The teeth consist of a single pair of incisors in both jaws, which are enamelled and stained a reddish colour, one or two pairs of premolars in the upper jaw and one pair in the lower jaw, and three pairs of molars in both jaws. The crowns of the molar teeth are surmounted by tubercles. The number of teats in the female Squirrel is from two to three pairs, and these are situated on the abdomen.

MEASUREMENTS OF BRITISH SQUIRRELS.

	Head and Body.	Tail (with Hairs).	Hind Foot.	Ear.	To Tip of Tufts.	Locality.
♀	209 mm.	214 mm.	52 mm.	28 mm.	61 mm.	Sussex.
♂	220 mm.	215 mm.	52 mm.	28 mm.	58 mm.	Sussex.
♂	223 mm.	217 mm.	52 mm.	28 mm.	62 mm.	Perthshire.
♀	220 mm.	216 mm.	52 mm.	28 mm.	61 mm.	Perthshire.

The weight is usually from 10 to 14 ounces.

[1] *Sciurus* is from the Greek σκίουρος (σκιά = shade, and οὐρος = a tail; thus, shadow-tail), a name first used by Aristotle. The name *squirrel* bears an early date in writing, being used by St. Hugh (ob. 1200 A.D.). Early East Anglian *scorel* or *scerel*.

[2] From similar Greek root σκιά: in this case it is used colloquially, meaning 'to hide,' 'shelter'; hence to *skug* means to hide.

[3] A Gaelic diminutive meaning a little rabbit, from *coinean* (a rabbit). Also formerly used in Lancashire, Cumberland, and Westmorland.

[4] 'The little questioner,' a pretty name, or possibly a corruption from *Fiodharag*, which means 'the wood or tree animal.'

[5] The reader will notice that this is the same name as is applied to the stoat in Ireland. There exists the utmost confusion and inaccuracy amongst the early Erse and Gaelic speaking people in their names of common animals.

Dental Formula.—I. $\frac{2}{2}$; P. $\frac{4}{2}$; M. $\frac{6}{6}$.

The pelage of the Squirrel has been described by MacGillivray, Edward Blyth,[1] Mr. Oldfield Thomas,[2] and Mr. J. L. Bonhote.[3] Notable amongst these is the admirable paper by Mr. Oldfield Thomas, who obtained Squirrels from Dorset, at intervals of six or seven weeks, throughout a whole year. In all fifty-four skins were examined.

To summarise his notes. It appears that the upper surface of the coat is red in summer[4] and brownish grey in winter (the under parts always being white). The colour is modified in the course of the year by moults in spring and autumn, which take place respectively in May and October. In full winter dress the Squirrel, both body and tail, is greyish brown, the pelage being long and soft, whilst the ears are also ornamented with long tufts of hair. In May all the head and body hairs fall and are replaced by a shorter and coarser fur of a bright red colour, but the ear-tufts are not renewed. In the spring there is no change in the tail-hairs, which remain on through the summer, and are only renewed in the following autumn. During the summer the tail-hairs gradually bleach white, and it is not until August and September that the very dark hairs of the new tail pelage appear and replace the ragged white ones of the old pelage. Almost as soon as the tail is renewed it begins to lose colour, 'fading gradually during the winter,' says Mr. Thomas, 'through various shades of brown, pale brown, dull yellowish brown, straw colour, and finally, by June, July, and August of the following year, becoming nearly or quite white.'

In concluding his paper on the pelage of the Squirrel Mr. Oldfield Thomas gives a sort of calendar of the pelage change.

JANUARY and FEBRUARY.—Ear-tufts long brown. Body-coat long, soft, greyish rufous-brown. Limbs rufous. Tail grey-brown, like back, but bleaching, especially terminally, to whitish. Palms and soles hairy.

MARCH and APRIL.—As above, but the colour of ear-tufts, back, and tails more bleached.

MAY.—Bleached and ragged pelage of body and limbs changed for summer suit of rich rufous. Ear-tufts and tail continuing to bleach and become poorer.

JUNE and JULY.—Summer dress: rufous head, body, and limbs; white thinly haired tail; ear-tufts disappearing, white so long as they remain; palms and soles naked.

AUGUST and SEPTEMBER.—New ear-tufts and tail-hairs, both blackish brown, appearing. Body-coat still rufous, but less rich in tone.

[1] Note to his edition of White's *Selborne*, 1836, pp. 280, 281.

[2] *Zoologist*, 1896, pp. 401–407.

[3] *Ibid.* 1901, pp. 241–246.

[4] The tails of immature British Squirrels are red, but the adults in full winter pelage have brown or yellowish brown tails, never red like Continental adults, as already pointed out by Mr. Oldfield Thomas.



Litho. W. Greve, Berlin.

THE COMMON SQUIRREL.
Sciurus vulgaris.

October.—Body-coat changed for winter suit. Ear-tufts lengthening. Tail commencing to bleach.

November and December.—Winter dress: brownish grey on head and body, limbs more or less rufous; fur long, thick, and soft, inconspicuously annulated. Ear-tufts long, brown. Tail blackish or brownish, scarcely beginning to bleach. Palms and soles hairy.

Of course there are slight variations from the above in different parts of the country. For instance, it is by no means uncommon to see Squirrels with the new autumn tail almost fully developed in August, both in the South of England and in Scotland. The bushy tail of the Squirrel, and in lesser degree that of the dormouse, serves as a warm wrap in sleep whilst the nose is buried in the fur of the tail.

Distribution.—The distribution of the common Squirrel is Palearctic: it is found from Ireland to Japan. In Europe it ranges as far south as northern Italy, and northwards to Lapland. The discovery of gnawed fir-cones in the Norfolk forest-beds has been cited as evidence of the existence of this animal in England in early Pleistocene times, but this is insufficient in itself, as the gnawings may have been done by mice or voles. Recent remains, too, are very scarce, which may in part be accounted for by the arboreal nature of the animal.

Nowadays the Squirrel has few natural enemies, and is consequently abundant over the whole of England and Wales in suitable localities.[1]

There is no evidence of the existence of the Squirrel in Scotland in the Pleistocene age, and remains of this animal are likewise extremely rare in the peats of recent times. When it entered Scotland we do not know, and the inscription and carvings on the Runic scroll upon the monumental stone of Ruthwell and the representations of Squirrels on the 'Bewcastle Stone' are only mythological evidence of its early existence in the South of Scotland and the North of England. The history of the Squirrel in Scotland is admirably given in Mr. J. A. Harvie-Brown's excellent little monograph on the subject,[2] and for a complete account of the records of the animal's gradual spread from certain centres and subsequent movements, I must refer my readers to its pages: it is most complete up to 1881. In summarising his remarks on the indigenous race of Squirrels in Scotland, Mr. Harvie-Brown says:

'We have seen that the Squirrel occurred at an early date, and had a wide distribution in the pine-woods and country—perhaps all the country—north of the Firths of Forth and Clyde. . . . We have seen also that there is every reason to

[1] Squirrels existed in a wild state in Kensington Gardens, London, until 1837.

[2] *The History of the Squirrel in Great Britain*, by J. A. Harvie-Brown, 1881. *Proc. Royal Phys. Soc. Edin.* vol. vi. p. 166.

believe that it did not become absolutely extinct in Scotland, but lingered in the great old forest of Rothiemurchus until resuscitated by the new growth of suitable woods; and that it remained in Argyllshire up to an unusually late date, probably surviving up to about the year 1839 or 1840.' Subsequent reintroduction and the upgrowth of young woods combined with the destruction of vermin have given a fresh start to the Squirrel in the North, and it is now one of the commonest mammals in Scotland.

If we look at the map of the Scottish distribution of the animal, with which the book is furnished, we see that the Squirrel inhabits every part of Scotland where we should expect to find it, namely, in all the large woods. Near the coast of the east, the west, and the north, woods and plantations become small and stunted as a rule, and here the Squirrel is, as we should expect, quite absent. In this map, too, the author shows the different centres from which (approximate) areas were populated by the Squirrel. For details, however, I must refer the reader to the book itself. The first mention of the species is in the old popular Gaelic ballad 'The Lament of MacGregor of Ruaro' (*circ.* 1650), in which the poet says:

> Though nimble the squirrel
> It may be captured with patience.

Mr. Harvie-Brown thinks 'that if ever indigenous to the South of Scotland the Squirrel must have disappeared from it at a very early period, advancing northward to the shelter of the denser forests north of the Firths of Forth and Clyde.' The existing breed is supposed to have been renewed in this part of the North as well as in the Lake district of England.

Even in MacGillivray's time the Squirrel was only locally common in Scotland, but it has extended its range considerably since then, especially in the South-west. It is still unknown in all the islands adjacent to the mainland,[1] as well as in Caithness, Western Ross[2] and Inverness, and the greater part of Argyll, except the country lying immediately north and west of Loch Fyne. It is also absent from the east 'Neuk o' Fife' and the north-east of Aberdeenshire.

Mr. E. R. Alston thought that the Squirrel, with other mammals, may have found its way to Ireland at a late post-Pleistocene period by way of the South of Scotland, just prior to its final insulation. Mr. R. M. Barrington, however, disputes this theory, and does not consider that the Squirrel is indigenous to Ireland, but that it owes its present existence in that country to human agency,

[1] Squirrels were introduced into Bute about the year 1875, but none now survive.

[2] The Squirrel is found at Braemore, Ross-shire.—J. G. M., 1905.

'exercised at no very distant date.' Of its early existence in Ireland only vague traditions exist in the writing of O'Flaherty (1684), K'eogh (1739), and Rutley (1772). Thompson, too, writing[1] in 1840, says that 'the Squirrel is not now a truly native animal: it was introduced a few years since to the county of Wicklow, where it is said to be fast increasing in numbers.' Subsequent writers, also, such as Dr. Reeves, J. R. Kinahan, and Lord Rosse, all express similar views.

Squirrels were introduced about 1815 at Ashford in Wicklow, and have since extended all over the neighbouring counties where woods are suitable.

Other centres of recent introduction are Dublin; Lucan; County Carlow; Birr Castle (King's County); Garbally (Galway); Castleforbes (County Longford); Donore (Westmeath); Belfast; Ravensdale Park (Louth). Mr. Barrington, in his excellent paper 'On the Introduction of the Squirrel into Ireland'[2] gives ten centres from which the animal originated. In a letter to me (December 1904) he says: 'Since my paper was written [1880] the range of the Squirrel has greatly extended, for the animal has now spread over the greater part of Ireland.' There is no prehistoric evidence of the Squirrel in Ireland, and Giraldus Cambrensis, the first observant traveller who wrote of Ireland, does not mention it.

Habits.—The agility and grace of this charming little rodent make it a general favourite everywhere. Even the forester, whose choicest conifers have suffered from its mischievous depredations, puts up with more than a little, and hesitates to order a policy of extermination. He is a Goth, indeed, who cannot appreciate the fairy-like form and pretty ways of this little miser of the woods. It is a timid creature, and you must step lightly through the forest if you wish to observe its ways, for on the slightest sound or movement it makes for the main stem of a tree, and regards you with suspicion as it peers round from the far side of the trunk.

> Up the oak-tree, close beside him,
> Sprang the Squirrel Adjidaumo.
> In and out among the branches,
> Coughed and chattered from the oak-tree,
> Laughed, and said between his laughing,
> 'Do not shoot me, Hiawatha!'

Often after its first rush to safety it lies flat and motionless against the trunk with all four legs extended and head pressed close to the bark. If you follow it round to get a better view, it either ascends by scrambling rushes to the

[1] *Vertebrate Fauna of Ireland.*

[2] *Scientific Proc. Royal Dublin Soc.* May 19, 1880.

higher branches, or, if it considers the tree too bare, darts off along the stems to another and yet another tree, until it finds refuge high up in some dense pine or Scotch fir, where it is lost to sight. In such a position it will remain for hours without moving. When running from one tree to another it keeps its tail depressed, and it uses this appendage with great skill to aid in maintaining its balance when running along the slender twigs. Sometimes in its passage from one tree to another it is obliged to drop a considerable distance; its judgment in selecting exactly the right branch up which to run so that its course may be continuous shows a remarkably good 'eye for country.' Occasionally it miscalculates its leap and falls to the ground; but so pliant are its limbs, so light its form, and so parachute-like its loose flank-skin, that no harm results from the drop. The Squirrel can turn and hang by a single claw and yet not lose its foothold, and those who have shot one of these little animals will have noticed how long and easily it can retain its hold of a few birch buds even after death has overtaken it. A dead Squirrel may hang by a single claw: it does not fall until the limbs are completely relaxed. When climbing a tree to escape danger the Squirrel displays a considerable amount of commonsense, for it always ascends on the far side of the trunk from that on which danger threatens, just peering now and then round the corner to see how matters are progressing and what you are doing. Squirrels are very playful little creatures, and may often be seen romping and chasing each other round and round the bole of some large tree.

The gleams of red fur dart through the trees and out along the branches so swiftly that the eye can scarcely follow them. Now and again with leaps and bounds the little creatures race from bough to bough and tree to tree. In all these evolutions the tail works from side to side, now up, now down, helping the little animal to maintain its balance. Down over the forest glade and through the 'dim green heart of the woods' they scamper, happy, light, and free; only pity comes into your heart when you see the same creature whirling incessantly in its wire prison. What does freedom mean to it? Everything.

The Squirrel is one of the few really wild creatures that the general observer may notice in English woodlands. It relieves the monotony of the pheasant cover, and, with the jay and the woodpecker, gives the townsman some cherished recollection of the silvan beauties of our country. The brilliant little eyes, the ease and rapidity of its movements, and the graceful wave of its 'shadowy tail' all combine to render it an animal wholly fascinating and delightful to watch. 'Swift as a bird,' as Cowper says, 'flippant, pert, and full of play,' it ventures

forth to delight you with its vivacious gambols amid the boughs, and lightly leaps and climbs, the very embodiment of perpetual motion. Then, as it pauses,

> There whisks his brush
> And flicks his ears, and stamps, and cries aloud
> With all the prettiness of feigned alarm
> And anger insignificantly fierce.

The males in spring are very pugnacious, and drive off others of their own sex from the vicinity of their regular beat. I have seen two Squirrels fighting on the ground like a couple of rats, locked in each other's embrace, biting, scratching, and rolling over and over each other with all the zest and savagery of carnivorous animals.

Though spending the greater part of its time in the trees, the Squirrel descends to the ground in autumn and feeds on the mass of acorns, nuts, and beech mast which have either fallen naturally or been flung there by the animal itself. One often sees it on the ground in summer, running across the lawn, with tail half uplifted to avoid the dew. One June day I was stalking rabbits with a small rifle in a wood at Northlands and came on a Squirrel very busy at the base of an old oak tree that had lately been felled. On putting the telescope on it I saw that it was tearing to pieces and eating a large fungus that was growing in some holes in the stump. Doubtless Squirrels eat various kinds of fungi, and probably understand the edible qualities of the different species better than we do.

Von Tsaudi[1] noticed the predilection of Squirrels for various kinds of mushrooms, agarics, and berries, which they find by digging in the earth below trees.[2] Mr. J. Anderson has observed that some species, especially the red agarics, are rejected as food, but are carried up into the trees and placed in clefts. 'They are placed in the fork of a branch with the stalk down, like an umbrella set up to dry.'[3] Mr. R. M. Barrington, too, noticed them take up and eat both mushrooms and toadstools.[4] They have also been known to eat the parasitic fungi growing on trees.

Squirrels live chiefly on nuts of various kinds, being especially fond of chestnuts, hazel nuts, and walnuts. They also subsist largely on beech mast, acorns, and the seeds of various conifers. They will eat flowers of various kinds,

[1] *Thier. der Alpen Welt.* See also *Zoologist*, 1865, p. 9560.

[2] Harting says they eat the fungus *Boletus borinus*, and Macpherson says the mushrooms *Amanita rubescens* and *Russula heterophylla* are a favourite food.

[3] *Proc. Berw. Nat. Club*, vol. vii. Part I. p. 127.

[4] *Science Gossip*, 1865, p. 40; and 1886, p. 138.

bulbs, apples, apricots, apricot kernels, small birds, and the young and eggs of birds. Mr. Harvie-Brown says they eat the seeds of apples, burr-thistle, agrimony, horehound, haws, caraway seeds (in confinement), and such berries as blackberry, strawberry, bilberry, and the fruit of juniper and briar.

Squirrels when feeding sit up on their hind legs and hold their food in the forepaws. They are the most wasteful animals that exist; whole trees full of nuts are attacked, their fruit scattered on the ground, but only a few nuts are eaten. I have recently seen nearly every acorn under an oak tree split and broken by Squirrels, and hardly one had been eaten.

Much as one dislikes to bring charges of wanton destruction against the Squirrels—for they are persecuted too much already—it is impossible to deny the mischief that these animals do in young plantations in cutting down seedling firs and destroying shoots and eating the seeds. Scotch foresters are loud in their anathemas against them, and regard them as the greatest of all plagues that attack the conifers. Besides taking the cones they are said to peel off the bark within a few feet of the top of the main stem, and this causes the leader to die. Bark peeling, or 'ringing,' is undoubtedly their most serious offence, and is chiefly done in hot dry summers. They are especially destructive to sycamores. A forester[1] says: 'The bark is peeled off with the teeth of the Squirrels in shreds about half an inch broad, and generally from three to four inches long. The part upon the tree where the bark is peeled off frequently goes right round; in other cases a square piece is neatly peeled off, as if performed with a sharp knife. The Squirrel does not devour the bark, but peels it off that it may regale itself with the saccharine matter contained between the last-formed wood and the bark.' It usually selects trees from fifteen to twenty-five years old, and chooses the most healthy examples. Spruce is not much injured, but the larch and the common Scotch fir suffer much from their depredations; they also like the tender shoots of plane trees and birch. Squirrels did so much damage at Cawdor that no fewer than 14,123 were killed and paid for during seventeen years.[2]

The accusation that Squirrels destroy numbers of small birds as well as their eggs is too well founded to admit of contradiction. They are especially destructive to woodpigeons' eggs, and have often been seen carrying off the eggs[3] and young of birds. They will also take hens' eggs and the eggs of game-birds.

[1] *Diseases of Forest Trees*, 1865, p. 10.

[2] Harvie-Brown, *loc. cit.* p. 174.

[3] Captain S. G. Reid (*Zoologist*, 1885, p. 229) says he has known the Squirrel take the eggs of the long-eared owl and the greater spotted woodpecker.





SQUIRREL DESCENDING A BRANCH.
A YOUNG SQUIRREL.

From photographs by C. REID.

This habit is referred to in the 'Old Statistical Account of Scotland,'[1] where the animal receives reprobation on account of the damage it does amongst singing birds and for taking pheasants' eggs. Of this latter habit Colonel E. A. Butler kindly sends me the following note:

'Squirrels, though undoubtedly pretty, are most destructive animals, as the following incidents will show. When residing at Herringfleet Hall, near Lowestoft, a few years ago, the rearing field one season was selected near a plantation of Scotch firs, and when the young pheasants were about the size of partridges they began to disappear in a most mysterious manner. The hens in the coops would suddenly begin to cackle, and when the keeper went to ascertain the cause he invariably found a young bird missing, though nothing to show what had become of it. At last, after losing a number of birds, he saw a Squirrel one afternoon go up to a coop, seize a young bird, and run up a fir tree to its "drey," in which it had young ones; and as it ascended the tree he shot it with the young pheasant in its mouth. Under the tree lay the remains of several others which it had killed.

'Upon another occasion last year, hearing the sparrows mobbing something in my orchard, I went to the spot, gun in hand, and found quite a small flock of them chattering round a sparrow's nest high up in an apple tree. The nest began to heave up and down in such an extraordinary way that it was at once evident that something very unusual was taking place within. Suddenly a Squirrel with a young sparrow in its mouth appeared at the entrance, and after running a few feet along a branch sat up on its hindquarters and commenced eating it, holding the bird between its forepaws as it would have done an acorn. Shortly afterwards I shot it.

'Squirrels are also very fond of eggs, and are often caught in traps baited with these for jays and crows during the spring. Upon one occasion I found several of my wild ducks' eggs sucked, and on setting a trap baited with others taken from a nest close by I caught two Squirrels, after which the nests were not again disturbed, which showed that they were the culprits.'

Squirrels catch numbers of chaffinches, which are notoriously tame birds: they leap upon them when they are feeding on the beech mast. I think, however, that all these cases of carnivorous Squirrels are merely instances of isolated individuals, and are not characteristic of the normal taste of the species.[2]

[1] Vol. ix. 1793, p. 235.

[2] References to the carnivorous and egg-stealing propensities of Squirrels are too numerous to quote from, but many examples will be found in the pages of *Science Gossip*. See 1871, pp. 131, 189, 214, 237, 238; seen to attack a young rabbit,

Speaking of other food enjoyed by Squirrels, Mr. Coward says: 'Squirrels seem to enjoy young beech leaves; this spring we watched them pulling off and eating the leaves, and the ground below was littered with the fragments. The leaf itself did not appear to be touched, but only the fleshy stems. In winter Squirrels feed in the thorns, nibbling the haws; they seem to like isolated thorns better than hedgerows. One was noticed in an isolated thorn on the Dee Cop, quite a distance from any wood.'

Squirrels are fond of taking their food to some elevated stone or tree stump and there devouring it. It gives them a favourable position from which to look about and observe the advent of enemies, and it saves them the trouble of taking every scrap of food up the trees. Mr. L. Adams writes: 'In a fir-wood in Shelston Park, Derby, on April 2, 1897, I came upon a flat-topped stone covered with the bitten flakes of fir-cones. Was the stone used by a Squirrel for a table?' I think it was to a certain extent, but more as a place whence a look-out could be obtained during an uninterrupted dinner. I have several times seen a Squirrel carry a fir-cone to a certain broken tree in my uncle's garden in Perth and mount to his tower of observation until the food was finished and then descend to look for more.

Mr. J. L. Bonhote[1] thus describes the Squirrel's mode of eating a hazel nut:

'The method of eating them was always the same. The nut would be held by the large end, so that the long axis of the narrow portion was transverse to the mouth, when an incision would be made until there was a hole large enough for the insertion of the incisors between the shell and the kernel. Into this hole the lower incisors would be placed, and a piece of the shell broken off by a sharp twist of the head; similar actions would be repeated until the whole of the shell was broken off, and then the kernel would be devoured.'

Mr. O. V. Aplin[2] relates how Squirrels gather beech mast off the trees and take it to their winter storehouse: 'I watched for some time a pair of Squirrels, which were busy gathering beech mast and carrying it to their winter retreat in some thick spruce firs adjoining the beech trees. As the mast grows at the extreme outside of the trees, and only at the ends of the slender drooping twigs, and usually out of (Squirrel) reach of any of the thicker branches, I imagined they had

256, 257; 1869, p. 235. See also *Zoologist*, 1886, p. 24 (Squirrels stealing eggs of woodpecker); *ibid.* 1888, pp. 65, 105 (eating small birds and eggs); *Field*, July 8, 1899 (eating ants' eggs). *Zoologist*, 1885, p. 229; 1888, pp. 65, 105; 1896, p. 298; and *Field*, June 27, 1896, and February 27, 1892 (Squirrel eating small birds). Squirrels have been known to kill and eat young rabbits, and have been seen to eat the flesh of a dead jay (*Field*, May 29, 1897).

[1] *Zoologist*, July 1901, p. 245.

[2] *Ibid.* 1885, p. 479.

to content themselves with the fallen nuts. But I found that they ventured boldly out into the small twigs, and, hanging on by their hind legs, drew the mast to them with their forepaws and bit it off, when, with the exercise of the greatest agility, they twisted round, and with a quick jump regained the stronger branches. Of course a good deal of the mast fell to the ground, and *Sciurus* seemed occasionally to get quite out of temper with a refractory twig which refused to come to hand; when this happened the angry, impatient snatches made by the little animals were quite amusing. No doubt they felt their position precarious, for the breaking of a twig or the slip of a claw meant a clear twenty-foot drop, with nothing to catch at; no great matter, of course, to a Squirrel when it throws itself off a bough to drop, parachute-like, to the ground, but quite another thing when taken as an unexpected fall.'

Nearly every writer speaks of the forethought and providence of the Squirrel in creating a winter store. Thus a Latin writer says, *Provident tempestates etiam sciuri* (even Squirrels provide against the rainy day), but I think this providence is greatly exaggerated, and agree with Mr. Cornish, who cleverly remarks: 'They do this in such a jerky, inconsequent, ineffectual way that one would imagine they had been brought up in a permanent department of the War Office, which existed to provide for the remote contingency of a campaign at the North Pole.'

Squirrels make stores about October and November, generally in any odd hole and corner that presents itself, sometimes near the winter drey and sometimes far from it. They seem to possess a perfect genius for forgetting where they have put things, and consequently in mild winters they peer about looking for buried treasure. No doubt the storage of this food supply originated when the climate of our islands was severer than it is to-day, and now the force of habit and instinct is too strong for the practice to be dropped.

In such mild winters as we experience in the South of England Squirrels can hardly be said to hibernate at all. A large number of Squirrels undoubtedly remain active throughout the winter, and even in the coldest weather I have seen many running about in the woods at Murthly, Perthshire, the greatest Squirrel haunt I know of in the United Kingdom. Bell says[1] that the Squirrel 'remains during the greater part of the winter in a state of almost complete torpidity—coming abroad, however, on the occurrence of a fine day.' But this is not correct, as it may be seen abroad in keen frost and deep snow.[2] Most Squirrels sleep

[1] *British Quadrupeds*, p. 292.

[2] There is a note in *Science Gossip*, 1874, p. 143, to the effect that thirty Squirrels were found in an old oak at Cudham, Kent, on February 7 in a semi-dormant state, but this seems rather too many dreamers for one tree.

fitfully for some weeks, but there is nothing to show that their hibernation is more complete than that of the voles and mice, which take snatches of slumber whenever the temperature falls low. I have never seen one in a torpid state.

There is no doubt that our Squirrels are greatly affected by extreme cold or exposure, and that large numbers die in severe winters. This would not be the case were the animals so complete and early in their hibernation as dormice or bears. In early winters in Scotland, Squirrels suffer severely and die in numbers in exposed districts, and I once came upon one in a dazed condition sitting hopelessly under a stone in the open deer forest of Lechmeln in Ross-shire. It seemed starved with the cold and I took it back to the shelter of the Loch Broom Woods, as it seemed to have revived a bit in the warmth of my pocket. I have twice seen Squirrels right out on the open moors in Perthshire in the late autumn and think that they must perform their short journeys from forest to forest at this season and often become confused and lost on the way.[1]

Mr. Knox relates[2] an amusing instance of a Highlander, who had never seen a Squirrel before, who met one out on an open moor near Speyside. The animal at once mistook the man for a tree and mounted rapidly to the top of his head, to the great fear of the native, who believed it to be 'a thing wi' horns.'

Squirrels are fond of running along high roads and walls[3] in their passage from one wood to another, and they are capital swimmers.

> The Squirrel when she must goe seeke her food
> By making passage through the angry flood
> (And feares to be devoured by the streame),
> Thus helpes her weakness by a stratagem.
> On blocks, or chips, which on the waves doe flote,
> She nimbly leaps: and making them her boate
> (By helpe of winds, of current, and of tide)
> Is wafted over to the other side.
> Thus, that which for the body proves unfit,
> Must often be acquired by the wit.[4]

[1] Mr. Harvie-Brown gives similar instances of this, and thinks that the partial destruction of the original breed of Scotch Squirrels was due to severe winters. See pp. 53 and 63, *The Squirrel in Great Britain*. I do not think that the indigenous Squirrels of Upper Strathspey could ever have become extinct, as it would not have been possible for Squirrels to cross the watershed of the Grampians from Struan.

[2] *Autumns on the Spey*, p. 52.

[3] Squirrels sometimes climb and run along houses, and an instance is given in the *Zoologist* (1889, p. 226) of a pair making their nest and rearing their young in the church tower of Tostock in Suffolk.

[4] See also Olaus Magnus, Gesner, and Topsell for this legend. Topsell says (*History of Four-footed Beasts*, 1658): 'The admirable wit of this beast appeareth in her swimming or passing over the waters, for when hunger or some convenient

I have twice seen Squirrels enter the Tay, and swim to the other side, and riverside fishermen sometimes see them crossing the streams.[1] They swim with an unusual amount of flurry, as if fearful of the consequences, and on first entering the water leap out of it several times, as if trying to spring across the element. In the water they are very high in front and deep behind, the hind legs and tail being fully submerged. I have experimented with them and found that they can go several hundred yards without fatigue, but seem confused on landing. The old story of Squirrels passing the waters on a piece of bark with the bushy tail elevated as a sail may be a legend, but they do sail on board a wooden ship sometimes. I was fishing one day at Stobhall and a log came down the river with a Squirrel on board. The animal seemed in a desperate fright all the time, and was not sitting up complacently allowing the winds to assist its journey. When the log approached our boat the little passenger plunged into the river, and despite a heavy stream made the further shore in safety. Squirrels will always cross a river by a bridge if they can find one.

Squirrels pair as a rule very early in the year, and generally construct fresh nests in which to place their young. About the beginning of April I can usually make sure of finding half a dozen nests in St. Leonard's Forest within half a mile of my home, but one or two are always quite complete by the middle of March. I have found young Squirrels as early as the beginning of March, and remember examining a nest in the West Woods, near Marlborough, in which were three newly born young at the end of February. Bell (p. 278) says: 'The female brings forth three to four young ones in the month of June.' This seems to me far too late a date for the general breeding season, and I should say that the usual time when the female brings forth is from March 10 to April 20. A correspondent in the 'Field'[2] deposes to finding young Squirrels 'nearly as large as a rat' in the second week in February, which shows that the species sometimes breeds in January, and this is indeed striking in an animal which Bell has described as remaining the greater part of the winter in a state of 'almost complete torpidity.'[3] There is often a second litter in August.

prey of meat constraineth her to pass over a river, she seeketh out some wide or small bark of a tree, which she setteth upon the water, and then goeth into it, and holding up her tail like a sail letteth the wind drive her to the other side.'

[1] I am surprised to see that Mr. Harvie-Brown can cite only one instance of a Squirrel taking to the water naturally, as I am sure it is not of rare occurrence. In a letter to me (December 1904) he says he has seen one swim the Forth.

[2] March 6, 1886.

[3] E. W. Blagg has referred to this point in a note in the *Zoologist*, 1891, and says: 'The position of the newly born young when their mother hibernates must be a very unenviable one! Perhaps somebody will tell us that the difficulty is got over by the young ones hibernating too.'

The usual number of young is from two to three, but I have seen and heard of four several times. They are at first naked and blind, but grow very quickly. Mr. Harting[1] says: 'The old Squirrels in case of danger remove the young from the nest, or "drey," to some hole in a tree, whither they carry them one by one in the mouth, just like a cat carries her kitten. One of the prettiest sights in the world is to see an old Squirrel teaching a young one to jump.'

They are certainly very good mothers, and get fearfully excited if the young are threatened. The young closely resemble the adults except that the tails are red and thinly haired. This red colour, however, changes to brownish grey at the first moult. It is a charming sight to see the mother bringing food to the young when they first emerge from the nest. I have seen the little ones sitting in a row outside their home just like a flock of young long-tailed tits, all snug and cosy together. The mother passes the food to each with her mouth and not with her paws. She also carries them in her mouth.

The breeding 'dreys' are built by both the male and the female Squirrel, and are generally composed of moss and sticks. They are often lined with oak or hazel leaves, and sometimes a sort of platform is built out from the main stem of a large tree, and on this the nest is placed. Usually the 'drey' is situated high up in the small branches of an oak, fir, or pine, but I have seen them quite low down in hazel bushes. In general appearance it is not unlike the nest of the magpie, but is more compact, possesses more moss and leaves and fewer sticks. The opening is at the side, and it is altogether the most comfortable home built by any British mammal. The Squirrel sometimes builds the nest with thin strips of bark. Sometimes the nest of a bird is utilised, and the old nest of a crow, sparrowhawk, or woodpigeon is used on which to construct a nest.

The cry when frightened is 'Ski-wow-wow-wow,' but it makes a number of other more feeble sounds impossible to render phonetically.[2]

White and partially white Squirrels are not rare, and most good museums and collections possess examples. In this country Squirrels have few enemies except man, who to save his trees is obliged to keep their numbers within bounds. So abundant are they at Murthly, in Perthshire, that Mr. Stuart Fotheringham finds it necessary to keep one man employed all the year round in shooting them,

[1] *Zoologist*, 1891, p. 102.

[2] Squirrels have a peculiar call which may be properly imitated by squealing like a rat, and then repeatedly snapping the lips. When such a noise is made under trees where there are Squirrels without scaring them they are thrown into a state of excitement, and rush about the branches announcing the call in the same way.—Jesse, *Scenes and Occupations of a Country Life*, 1853, p. 21.



SQUIRRELS.

From photographs by D. ENGLISH, F.R.P.S.

and yet they do considerable damage. Stoats and martens kill a few, and harry the young in the nests, and formerly buzzards and goshawks used to prey largely upon them, but now these birds are so scarce that their attacks can hardly be said to count.

Most of us who live in the country have kept these charming creatures as pets, so it is superfluous to comment on their delightful little ways and mercurial dispositions. The pleasure of retaining their friendship may be much enhanced by allowing them full liberty after they are once tame: they will return at all seasons to take food from those whom they know.

They are the best of pets for children, who as a rule overfeed an animal one day and neglect it for a week. In the case of 'Squggie' he can look after himself out of doors when he is forgotten.

The Squirrel constantly figures in old folklore tales. In Germany there is supposed to be an alliance between the Squirrels, as the little people of the trees, and the fairies, who are the elves of the grass and flowers; while in Norway the Squirrel is regarded as the postman of the forest, who carries all sorts of news between the different wild animals. In Germany, too, he is a sort of Christmas patron saint like Santa Claus, and brings presents to those whom he favours.

From its red colour it is associated in Norse mythology[1] with the great god Thor, and 'in the Edda we read of the great ash tree Ygdrasil, whose branches embrace the world, on the crown of which sits an eagle: under its roots lurks the serpent Nidhogr; while between them the Squirrel, ever running up and down, seeks to sow dissension.' The whole is a fine allegory of human life. Traditions of great forests where none now exist are still kept alive in country districts by old sayings that the Squirrel could pass from tree to tree over great distances without descending. Thus we have in Cumberland various tales of this kind relating to the great woods which once existed in the North of England and in Cheshire.

> From Blaem Point to Hilbree
> Squirrels in search of food
> Might then jump straight from tree to tree,
> So thick the forest stood:

this signifies the extent of the old Wirral Forest. Mr. R. M. Barrington, too, gives other instances.

In days gone by this little animal suffered constant persecution from the

[1] The Rev. Chas. Swainson in J. A. Harvie-Brown's *Squirrel in Great Britain*, p. 31.

'Squirrel-hunters.' In the South of England, on St. Andrew's Day, men and boys assembled annually to hunt the Squirrel. The unfortunate mammal was pursued with guns, clubs, and poles,

> Whilst he from tree to tree, from spray to spray,
> Gets to the wood and hides him in his drey.

Fortunately this practice is now more or less discontinued, although some hard-hearted keepers, convinced of its general destructiveness, never fail to shoot poor 'Squggie.'

The Hon. Gerald Lascelles has[1] given an interesting account of the Squirrel-hunting in the New Forest. He says that the sticks, which were weighted with lumps of lead and hurled at the unfortunate Squirrels, were called 'squoyles,' or 'scaggers,' and that now the term 'squoyle' is used to signify slander—something cast at another.[2] The practice of hunting Squirrels in this manner is not extinct. The dead game is eaten, and those which have lived on beech mast are considered excellent food.

Their predilection for fir-cones imparts a turpentinous flavour to the flesh, so the Squirrel is not eaten in our islands, although both in Central Europe and in America it is looked upon as a delicacy.

A young Squirrel as a dish is rather similar to a young capercailzie—quite good so long as it feeds on beech mast, chestnuts, and acorns, but once it starts on the fir shoots and cones it is uneatable. I have eaten a young Squirrel, and found it as good as, and very similar to, a rabbit.

The fur of the English Squirrel is not of much account, as it never grows very thick and soft like its Continental and American relatives. Moreover, it is an exceedingly 'brittle' skin, difficult to sew, and easily affected by damp and other causes. We have many early records of the traffic in Squirrel skins. David III. of Scotland used Squirrel skins in 1328 on the occasion of his marriage: they were articles of commerce in 1377, and were probably imported largely from the Continent. In 1642 a duty of 2*l.* 5*s.* per 1,000 was charged on Squirrel skins exported from England, and these most likely, as Mr. Harvie-Brown and others have noticed, were Grey Squirrel skins which had previously been imported. White and albino Squirrels are not uncommon, and records of these varieties are too numerous to mention. A black Squirrel was taken near Watford in October 1865, and recorded by Marlborough Prior.[3]

[1] *Field*, April 6, 1901.

[2] When a schoolboy I used to use curious weapons in Savernake Forest for the pursuit of Squirrels. We called them 'squalers,' but considered them very inferior to the catapult.

[3] *Zoologist*, 1865, p. 9431.

Family *CASTORIDÆ*

THE BEAVERS

THESE large aquatic rodents differ from the *Sciuridæ* in possessing only a single pair of premolar teeth in each jaw. The cheek teeth are without roots, but have enamel on their crowns which become flat with wear. In the genus *Castor* the hind feet are webbed and the tail highly specialised, being broad and flat. The skull has no postorbital processes. The clavicle is distinct.

Genus *Castor*

In general form the Beavers are massive; the tail is very broad and hairless. The hind feet are provided with an additional rudimentary claw on the second toe; both the outer covering of hair and the inner fur are soft and dense. The incisors are very large and strong, and cut like a chisel, whilst the upper molars possess one fold of enamel on the inner and three folds on the outer sides.

Owen first pointed out the differences between the European Beaver (*Castor fiber*) and the North American or Canadian Beaver (*Castor canadensis*). This was the proportionally larger nasal bones which extend upwards beyond the anterior border of the eye-sockets in the European species. From time immemorial the Red Indians of North America, notably the Algonquins, have believed in the former existence of a giant Beaver, which is associated in their minds with the creation of the world. That a giant Beaver did exist in Europe at least was proved by Fischer,[1] who described a large rodent, very similar to the European Beaver, which he called *Trogontherium Cuvieri*, from fossil remains he discovered in the sandy borders of the Sea of Asof. Subsequently Cuvier supplied a detailed account of the specimen.[2] This was evidently a giant Beaver, differing from the largest European and American examples in its greater size and in certain dental characters.

Owen also described the *Trogontherium* as an early inhabitant of Great

[1] *Mémoires de la Société des Naturalistes de Moscou*, tom. xi. p. 250. [2] Cuvier, *Ossemens Fossiles*, tom. v. Pt. I. p. 59.

Britain, after the discovery by the Rev. Mr. Green of an incisor of the lower jaw of one of these great Beavers in the lacustrine reddish sand of Bacton. Subsequently Lyell discovered a portion of the lower jaw of this animal in the blue clay at Cromer amongst the bones of mammoth, rhinoceros, ox, horse, and deer, showing that it existed until the Pleistocene age.

In America a giant Beaver twice the size of the *C. canadensis* and belonging to the genus *Castoroides* has been discovered. Dr. A. Wallace, in his 'Geographical Distribution of Animals,'[1] says: 'Extinct species of *Castor* range back from the post-Pliocene to the Upper Miocene in Europe, and to the newer Pliocene in North America. Extinct genera in Europe are *Trogontherium*, post-Pliocene and Pliocene; *Chalicomys*, Older Pliocene; and *Steneofiber*, Upper Miocene. In North America *Castoroides* is post-Pliocene, and *Palæocastor* Upper Miocene. The family thus first appears on the same geological horizon in both Europe and North America.'

The European Beaver

Castor fiber, Linnæus.

Castor fiber, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 78 (1766).
Castor fossilis, Goldfuss, 'Nova Acta Ac. Caes. Lesp.-Car.' vol. xi. p. 488 (1823).
Castor europæus, Owen, 'Brit. Foss. Mam.' p. 190 (1846).

Local Names.—*Beaver*[2] (English); *Dobhar-chu* (water-dog), *Dovran-los lithan*[3] (broad-tailed otter), *Leas-leathan*, *Los-leathan* (broad-tail) (Scotch Gaelic); *Afangc* (avank) (river-dog), *Llostlydan* (broad-tail) (Welsh).

The *Characters* of the Beaver will be found in the description of the genus *Castor*. As the animal is now extinct in Britain it is not necessary to enter into minute details.

Distribution.—Formerly the European Beaver was distributed over the greater part of Northern and Central Europe as well as Northern Asia. It existed within historic times in England, France, Switzerland,[4] Spain, Holland, Germany,

[1] Vol. ii. p. 234.

[2] Anglo-Saxon, *befer*. The Latin *fiber* is derived from *fibrum*, denoting the edge of the water, and the generic name *Castor* is from the Greek.

[3] *Dovran* (Scotch Gaelic), *Dwfr* and *Dyfr* (Welsh), *Dover* (English) mean places or things connected with the water.

[4] 'Beavers were to be found in the Aar, the Linnet, and the Reuss, and up to the last century [eighteenth] a few still lingered on the banks of the last-named stream, on the Thiele, and the Byrse,' Troyon, *Habitations Lacustres*, and Von Tsaudi, *Das Thierleben der Alpen Welt* (Harting, *Zoologist*, p. 277, July 1886).

Austria, South Russia, Poland, and northwards through Norway, Sweden, and Lapland. Passing eastwards it was found in many parts of North Russia on the great rivers that flowed to the Arctic Ocean, both in Europe and Asia as far east as Behring Straits.

Now the Beaver may be considered a rare animal in both Europe and Asia. The last colonies existing in France[1] and Germany[2] are situated on the Rhone and the Rhine, but in both these places they are nearly extinct. A few may still linger on the Elbe and the Lower Danube, but the animal has disappeared from Poland and South Russia. There are three small colonies in Norway,[3] though the last were killed in Lapland previous to 1830. Beavers were found on the Petchora and the Dwina in Russia[4] until 1842, and possibly a few may still exist in their unfrequented tributary streams. Gone from the Yenesei and Irtish, where formerly they were common, they were reported from the Pelyn, a tributary of the Obi, in Western Siberia, until 1876, and they may still exist there. They were common in Central Livonia in the eighteenth century.

In England and Scotland semi-fossilised remains of the Beaver are common, and afford evidence of its abundance in post-Glacial times. In such superficial deposits as the Cambridge and Lincolnshire fens, the turbaries of the Lea valley in Essex, and in the peat of Berwickshire and Perthshire great numbers of remains have been unearthed, as well as in the early Pleistocene deposits of the Norfolk Forest-bed, Kent's Hole, Torquay, and the Pleistocene formations of the Thames

[1] It was common on the Gardon and the Cese in the eighteenth century, and Cuvier possessed a living example from the Gardon. Another was exhibited alive in the Jardin des Plantes, Paris, in 1874. In 1885 the Marquis de Cherville (*Les Quadrupèdes de la Chasse*, Paris, 1885, pp. 173–177) stated that a few still existed on the banks of the Rhone and its affluents, particularly the Gardon, as well as in the Marshes of Picardy.

[2] Harting says that 'at the close of the last century [eighteenth] many localities are reported to have been frequented by Beavers,' notably in Altmark, Preignitz, Middlemark, on the rivers Spree and Haxel and in the vicinities of Berlin, Potsdam, Oranienburg, Liebenwalde, Trebbin, Nauen, and Königshorst. In 1801 Bechstein says there were many Beavers on the Elbe, near Kähnert. They lived, too, near Wittenberg, Kettinghausen on the Lippe, and in the territory of Paderborn. Also they existed a little later on the rivers Nathe and Amper. Wagner in 1846 mentions Beavers as living on the Danube, Amper, Isar, Iller, Salzach, and the Oder. In North-west Germany, Harting says they formerly existed on the Moselle and the Maas; and so recently as 1878 four pairs of Beavers lived near the village of Wittenberg, and that there were other dams towards the Anhalt frontier. These animals were protected by the Crown. The Elbe colonies were still in existence in 1886. The Beaver was also not quite extinct in Bohemia at this date.

[3] Lilljeborg, Nilsson, Blasius, and Giebel all state in general terms that the Beaver was still common in Norway at the dates at which they wrote, but give no precise particulars as to its distribution. Mr. A. H. Cocks has, however, pointed out (*Zoologist*, 1880, p. 233) its present area as follows. There are at least three colonies, the exact locality of which he suppresses, and in a subsequent article (*Zoologist*, 1880, p. 501) he expresses his opinion that there were not sixty adult Beavers in the whole of Norway. In 1883 Professor Collet estimated their numbers at about a hundred, and it is satisfactory to learn that they are now protected by law. The Beaver formerly existed in Denmark.

[4] Beavers, according to Demidoff, were common in 1842 in the region towards the Caucasus.

Valley and elsewhere. Remains have also been discovered in Berkshire, Essex, Hants, Wilts, and Yorkshire, and in Dumfriesshire and Roxburghshire; there are good collections of these in the Natural History Museum, the Norwich Museum, and the University Museum at Cambridge. There is no evidence to show that the Beaver ever existed in Ireland. In England and Scotland the Beaver was long ago completely exterminated, though place-names and documentary evidence prove its existence within the historic period. These have been admirably summarised by Mr. Harting,[1] who by careful research has collected together practically all that is known of Beavers in former days.

The earliest mention of the Beaver is found in the code of Welsh laws made by Howel Dda (A.D. 940); 'it is there laid down that the King is to have the worth of Beavers, Martens, and Ermines, in whatsoever spot they shall be killed, because from them the borders of the King's garments are made.' Giraldus Cambrensis (1188), in describing his journey through Wales,[2] tells us that the Beaver was found on the Teivi in Cardiganshire, and gives an account of its habits, 'apparently derived in some part from his own observation.'[3] Later Harrison in introducing Holinshed's 'Chronicle' says: 'For to saie the truth we have not manie Beavers, but onelie in the Tiefie in Wales.' Camden too mentions the 'Beavers' Pool'[4] on the Conway to show that the Teivi was not the only river frequented at this time in Wales; and Sir Richard Hoare, in his edition of the 'Itinerary' of Giraldus Cambrensis, mentions other places as frequented by Beavers in the Principality. Thus it appears that Beavers were known in Wales in the twelfth century, whilst their skins were exported from England and Scotland until the middle of the same century.

Giraldus in the work above referred to remarks that Beavers were found in Scotland in one river, but were very scarce. Yet we know that in the reign of David I. the skins figured amongst Scotch exports in the twelfth century, although they no longer appear in accounts of export duties in the reign of James I. (1424). Yet Hector Boece, writing in 1526, states with confidence that Beavers existed in Loch Ness[5] at that date, and that their fur was in request for exportation until the end of the fifteenth century.

[1] *Extinct British Animals*, by J. E. Harting, pp. 33–60.

[2] *Itinerary through Wales*, by Giraldus Cambrensis.

[3] Harting, p. 35.

[4] There are Beaver-pools in Cardigan, Merioneth, and Carnarvonshire.

[5] All Beaver dams and lodges that I have seen in North America, Canada, and Newfoundland were invariably placed in running streams or on narrow lakes through which the water flowed, so that there is some suspicion that Boece may have been writing from hearsay.

The former existence of the Beaver in England is testified in the names of places, such as Beverley (Yorkshire), Beverage (Worcestershire), Bevercater (Nottinghamshire), Beverstone (Gloucestershire), Beversbrook (Wiltshire), and the streams Barbourne or Beaverbourne and the islands Beaver Island and Beverege (Shropshire). The Marquis of Bute introduced the Beaver into his island in 1874 with some success; Mr. Harting and Mr. J. Stuart Black give long accounts of the experiment.[1] For some time they flourished, but in 1890 one which was supposed to be the last of the colony was found dead. A similar introduction took place in Suffolk in 1870, and more recently Sir Edmund Loder has been successful in acclimatising Beavers at Leonardslea in Sussex.

[1] *British Animals extinct within Historic Times*, pp. 46–59; and *A Short Account of how the Marquis of Bute's Beavers have succeeded in the Isle of Bute.*

Section *Myomorpha*

Rat-like rodents, with tibia and fibula united, and malar supported by long maxillary process.

Family *Myoxidæ*

THE DORMICE

The Dormice, small arboreal rodents, bear a close external resemblance to the Squirrels: they possess a long bushy tail and a rudimentary thumb. From other families in the section they are distinguished by the absence of the cæcum, or blind appendage. The clavicle is well developed; the postorbital processes are absent. The premolar teeth are reduced to a single pair in each jaw; the molars are the usual three pairs in each jaw. The molars are rooted: their crowns are not tubercular, but are crossed and recrossed with transverse folds of enamel. Dormice are found in Europe, Africa, and Asia north of the Himalayas.

Genus *Muscardinus*

Although the Dormice have been grouped under several genera, the majority are usually included in Schreber's genus *Myoxus*. Kaup, however, referred the Dormouse, which occurs in our islands and in many parts of Europe, to a distinct genus, *Muscardinus*, which differs from *Myoxus* slightly in external characters, but more markedly in the structure of its stomach. In *Myoxus* the stomach is simple; in *Muscardinus* the anterior portion is distinctly complex. The tail is cylindrical.

The Common Dormouse

Muscardinus avellanarius, Linnæus.

Mus avellanarius, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 83 (1766).
Sciurus avellanarius, Erxleben, 'Syst. Reg. Anim.' p. 433 (1777).
Myoxus muscardinus, Schreber, 'Säugethiere,' vol. iv. p. 835 (1792).
Myoxus avellanarius, Desmarest, 'Mammalogie,' p. 295 (1820); Bell, 'Brit. Quad.' 2nd ed. p. 281 (1874).



Litho. W. Greve, Berlin.

THE DORMOUSE.
Muscardinus avellanarius.

Muscardinus avellanarius, Kaup, 'Nat. Syst. Europ. Thierwelt,' p. 139 (1829); Flower, Lydekker, and Sir H. Johnston.

Local Names.—*Seven Sleeper* (Devon), *Dorymouse* (Cornwall), *Glire* (Old English), *Dormouse*, *Sleeper*, *Sleeping-mouse* (English); *Dallag*, *Dallag-fheoir* (Scotch Gaelic); *Pathew*, *Llygoden goch* (Red-mouse) (Welsh).

Characters.—In general form the Dormouse is stout and round. Above it is light reddish brown in colour, fading to yellow on the flanks; the under parts are yellowish-white, the throat white. The ears are rounded, smooth inside, and covered with short hairs externally; the vibrissæ are black, sometimes a few white hairs are present. The eyes are black and prominent. The tail is long and bushy; at the tip on the upper surface it inclines to black. Head and body, 2½ to 3 in. = 63 to 70 mm.; tail generally shorter than the body and head, 2½ to 3 in. = 63 to 70 mm.; hind feet about 15 mm. Dental Formula: I. $\frac{2}{2}$; P.M. $\frac{2}{2}$; M. $\frac{6}{6}$. The young are at first brownish-grey, and remain so until the first moult. Five pairs of mammæ are present. A variety with a white tip to the tail is sometimes met with.

Distribution.—The range of the Dormouse extends over the greater part of Central Europe, from Northern Italy to the south of Sweden. Eastwards it is found in Western Russia. In Scotland[1] and Ireland[2] it is unknown, but it is found throughout England. In some counties it is rare, especially in Norfolk, Suffolk, Lincolnshire, Cambridgeshire, Northumberland, Durham, Lancashire, and Cheshire; but from the numerous records of its presence from nearly all parts of England it would appear to be very generally distributed though scarce locally. The best account of its range in England is given by Mr. G. T. Rope,[3] and from his notes and other references in works on natural history we can summarise the distribution in the different counties as follows:

In Middlesex the Dormouse is now scarce: it was formerly common.[4] In Essex it is locally common east of the Stour. It is very common in hedges and woods in Essex, Kent, Surrey, Sussex, Buckingham, Berkshire, Hertford, and Oxford. In Hampshire, the Isle of Wight, Dorset, Devon, and Cornwall it is locally common. In Suffolk, Mr. Rope found that it occurred only near Ipswich

[1] There are several suggestions that the Dormouse has occurred in Scotland. Walker included it in his *Mammalia Scotica*; Fleming described it as 'rare in Scotland'; MacGillivray had it 'reported' to him from East Lothian; and it is mentioned in the *New Statistical Account*, *Forfar*. The late E. R. Alston, however failed to find 'any confirmation of these vague statements' (Alston, *Fauna of Scotland*, p. 26).

[2] Mr. R. M. Barrington released some Dormice in co. Wicklow about twenty years ago.

[3] *Zoologist*, June 1885, pp. 201–213.

[4] See also *Field*, May 16 and 23, 1903.

and Bury St. Edmunds, and in Norfolk, though Mr. Southwell could not find it in the greater part of the county, Mr. Rope shows that it occurs in the parishes of Gillingham, Geldeston, and Stockton, in the south-east of the county. It is abundant in Worcestershire, Shropshire, and Staffordshire, occurs in Bedfordshire, and in at least one locality in Nottinghamshire, and is rare in Leicestershire. Lord Lilford found that it was not rare in Northamptonshire.[1] There are no reports from several counties—Gloucester, Lincoln, Rutland, Huntingdon, Derbyshire, Somerset, and Wilts—but as it is found in neighbouring counties to most of these, it seems probable that it has only been overlooked. It occurs in Hereford, for instance, and has been captured in Cheshire close to the Derbyshire border. In Cheshire it occurs, but is decidedly rare,[2] and there is only one record from Southern Lancashire, where Mr. I. P. Thomasson found nests on the banks of the Hodder, a stream which runs along the Yorkshire border.

In the northern counties generally it is rare. In Yorkshire, according to Mr. W. D. Roebuck, it is thinly distributed throughout the county. Messrs. Clarke and Roebuck[3] worked out its range in the county. In Durham it is scarce and local, and the only authority for its occurrence in Northumberland is Messrs. Meynell and Perkins's list. In the Lake Country the late Rev. H. A. Macpherson found it in a few places:[4] he considered it rare or absent from the eastern portions of Cumberland and Westmorland, but mentions Ulleswater and Windermere as localities. In Lakeland, Lancashire, it is local, but more abundant than in other parts of the district.

The Dormouse probably occurs in most parts of wooded Wales. In some parts of Denbighshire it is abundant. Mr. Coward found many nests at Nant Glyn, and it is also abundant at Parc-Mostyn.[5] In the 'Field' there are several reports of its occurrence in Flintshire, Radnorshire, and Montgomeryshire. It has been recorded from Merioneth, Brecon, and Carmarthen.[6] Mr. Rope adds Glamorgan, and Professor J. H. Salter Cardiganshire.[7]

Habits.—The Dormouse, very similar in its habits to the squirrel, may be said to occupy an intermediate position between that animal and the mice. Like the squirrel it builds a nest in a bush or tree: it lays up a store of provisions for use in the early spring—a habit shared by many of the mice. On the branches it is hardly so graceful as the squirrel, but it is wonderfully agile, although its bushy tail is carried in a more mouse-like manner than is that of the

[1] *Zoologist*, 1885, p. 257. [2] *Ibid.* 1895, p. 171. [3] *Vert. Fauna of Yorks*; also records in the *Field*.
[4] *Fauna of Lakeland*, p. 78. [5] *Field*, April 19, 1884. [6] *Zoologist*, 1885, p. 257. [7] *Ibid.* 1903, p. 104.

larger animal; its action amongst the twigs and branches is mouse-like also. The Dormouse is a splendid climber, and when necessary can take a wonderful leap for so small an animal. Owing to its habit of frequenting thick hedges and dense copses, as well as to its small size, it is seldom noticed save by those who search for it. Moreover, it is far more nocturnal than the squirrel, hiding in its nest during the day, and venturing forth only when the day is declining.

I have noticed a great similarity in the habitat of this animal and the nightingale. Both frequent forest 'edges,' but seem to shun the solitudes of the forest itself. They prefer the broad thickets and narrow copses of oak and hazel, or thick hedges along public roads, or meadow pastures; and though not altogether shunning the daylight like to be within sound of the 'hum of men.' In such situations the Dormouse chooses the ivy-covered stumps in the hedge bottoms or the dense foliage for its nest of grass and leaves. Here it rests for the greater part of the day. If you shake a nest the occupant looks out and takes a peep at you and then retires; this may be repeated several times; but if much frightened it rushes from the nest and runs very swiftly along the branches, or drops to the ground, and is out of sight in a moment. I once disturbed, on five successive days, a female Dormouse that had a nest, with four young ones, close to my house in Sussex, to see if she would take the hint and remove her young; but, despite my repeated disturbance, she remained (and in this showed her affinity to the mice) and reared her family in a spot that she must have known was dangerous. The Dormouse may often be seen abroad by day by those who know how to look for it, generally in spring or early autumn.

Dormice often breed in little colonies, the nests being placed close to one another in the same thicket. Bell says:[1] 'Mr. Yarrell has informed us that he has seen not less than ten or a dozen—or even more—of their nests built in the shrubs of a thicket,' and Mr. L. Adams sends me the following note: 'C. E. Wright reports that on June 15, 1900, he saw a number of Dormice nests at Oakley (in Kettering) to-day. They are built very close to the ground, but not on it. These were breeding nests, and one contained four young, another three, and another two. They are like the nests in the hedgerows, but are much larger, and are covered all over with oak leaves. They are about six inches through.' Sometimes the nest is placed in grass on the ground, and at others the deserted nest of a bird is occupied.

[1] *British Quadrupeds*, 2nd ed. p. 284.

'Mr. F. H. Birley, of East Grinstead, where he says he often finds the nests in bushes, discovered the nest of a Dormouse in a woodpecker's hole in an oak. Two Dormice came out of the nest and ran up the trunk.'[1]

'Mr. E. P. Larkin found a Dormouse nest in the nest of a blackbird in a garden at Reigate.'[2] And I have known them make use of artificial nesting-boxes placed in trees to attract birds.

I have found the nests high up in the ivy clinging to a large oak, and several times high up in a thorn tree, but always more or less concealed. In June 1903 I found two nests of the Dormouse in a bed of withies at Warnham Pond. They were placed in a very open situation, and could easily be seen by passers-by. Underneath were reeds and water, and it was altogether a curious situation for the nest of this animal. Mr. Frohawk tells me of an equally curious nesting site, namely, the top of a post amongst palings, and in full view of a high road.

The Dormouse, sitting on its haunches, feeds in the same way as the squirrel: it can suspend itself by the hind feet, and feed quite comfortably in this awkward position.

I have found them very partial to apples, grapes, and nuts of various kinds. In cool, damp weather they move about in the day time, but on hot or cold days they remain hidden in their sleeping place until the evening, when they emerge to pack themselves with food and then again quickly retire. During thunder they become sluggish and disinclined to move, and are most active and playful during the first warm days of spring.

Dormice in confinement have been known to eat aphides, nut-weevils, and various kinds of caterpillars. Of their manner of eating Barcelona nuts Mr. L. Adams writes to me:

'Dormice almost invariably begin to gnaw the nut at the edge of the rough circular patch, and then extend the hole down the side. The percentage of nuts gnawed in this way I found to be ninety-three. This is no doubt the most suitable point of commencement, as the edge of the circular patch is more fibrous and softer, thus giving a leverage which the smooth side of the nut would not afford. My Dormice refused to attempt walnuts.' They will eat cherries[3] and other fruit.

Dr. Helm[4] says he found they liked hemp-seed, nuts, and meat (especially lard), and two that I kept for a year preferred acorns, nuts, apples, and a piece of bacon fat now and again. I think their taste for flesh is just as well developed

[1] *Zoologist*, 1887, p. 69. [2] *Ibid.* 1887, p. 106. [3] *Field*, 1901, p. 39. [4] *Zoologist*, January 1888, p. 14.











Dormice.

From Photographs by D. English, A.R.P.S.

as in the case of the squirrel, and they probably take a few young birds as well as eggs.

Harting says:[1] 'In addition to hazel nuts, its food consists of fallen acorns, seeds of the hornbeam and other forest trees, grain, and fruit of different kinds, particularly grapes. In confinement a bit of apple or pear, if offered, is generally eaten with relish. The Dormouse will also suck the eggs of small birds, as a squirrel will do; and it seems to be not generally known that it is insectivorous. A tame Dormouse, when allowed a run in the garden, would eat the woolly aphis (*Aphis lanigera*) and the caterpillars of the eyed hawk-moth (*Smerinthus ocellatus*). It was very fond, too, of the grubs of the nut-weevil (*Balaninus nucum*), preferring on that account maggoty nuts to sound ones. It would also eat the small caterpillars found in apples and pears.'

The nests of the Dormouse are usually constructed of grass and moss; sometimes a few leaves, fibrous roots, or honeysuckle are added outside to hold things together. Mr. H. E. Forrest says:[2] 'Examination of a large number of nests has proved that in this neighbourhood the nests are constructed of honeysuckle bark, long coarse strips outside, fine threads inside. Occasionally dead leaves are added, but no grass. The nests are never far from where there are clumps of honeysuckle growing.' Mr. Forrest also describes[3] the formation of the nest as follows:

'Many birds weave their materials skilfully together, using the beak like a bodkin. The Dormouse has no such tool, and does not weave the grass at all. Apparently he puts together a bundle of grass-stalks and then dives in the middle, taking in other pieces one by one, always working from the centre.'

The last of the 'summer' nests are found in October or the beginning of November, and it is at this season many are captured by the dealers in animals. But with the approaching cold the Dormouse makes its 'winter' nest. This is generally situated amongst the decaying vegetation about the roots of brambles and thorns. Dormice are very fond of placing their hibernacula amongst the fibrous roots of rhododendrons. Whilst some old shrubs of this kind were being removed in the winter of 1904 at Warnham Court, Sussex, no fewer than forty nests were discovered; in one instance we found twelve close together. On rare occasions they will hibernate in 'bird' boxes—the deserted nests of birds which they have patched up—and sometimes they even build an exposed nest of moss and leaves. My son found two at Braishfield, in Hampshire, in the early spring of 1905, and

[1] *Vermin of the Farm.* [2] *Zoologist*, January 1902, p. 23. [3] *Ibid.* February 1901, p. 68.

Mr. Frohawk says he has known one placed in an exposed alder bush in midwinter. It has been suggested that female Dormice go to sleep earlier than the males, but at present I am not convinced as to this point.

The female produces from two to four young in the spring. The young are born blind, but soon open their eyes and grow very rapidly. In first pelage they are mouse-grey in colour except on the head and flanks, which are reddish-brown; the full colour is not attained until they are fifteen months old. This species occasionally has a second litter in the autumn—a fact already noticed by Bell and Lydekker. Mr. Forrest reports finding a nest with newly born young at Betton, near Shrewsbury, on September 29, 1901, and he says that 'at the present time [early October] there are several other nests near here containing young.'[1] In fact, so frequent are autumnal litters that country people think that the fall of the year is their regular breeding season. They will breed very freely in confinement.

It seems to be a wonderful piece of good luck or provision of Nature that the food most relished by the Dormouse should be most abundant in autumn, when the little animal can become fat and collect its winter store prior to hibernation. The adult Dormouse retires to its nest about the middle of October, but the young ones are active for some weeks later. Here it sleeps in a torpid state, with few interruptions, until spring comes round again. Now and again in mild weather it wakes up and attacks its store of provisions, but soon lapses again into profound slumber. The attitude of the Dormouse in hibernation is very curious. Coiling itself in a round ball it wraps its long tail round head and body, and thus keeps most of the heat in the inside.

A long and careful account of the hibernation of the Dormouse appeared in the 'Zoologist,'[2] and to this I must refer my readers who are especially interested in the minute details of the animal's torpidity and its awakening.[3] Mr. Lionel Adams tells me that the Dormouse can defæcate during hibernation—a very curious fact. Everyone who has kept Dormice in confinement will have noticed the number of deaths which occur shortly after waking from the winter sleep. This is doubtless due to the artificial conditions to which they have been subjected in the matter of food. Irritation of the digestive organs is created by an absence of variety in diet, but those who feed their pets carefully prior to hibernation seldom lose them.

[1] *Zoologist*, 1901, p. 423.

[2] May 1882, p. 16.

[3] Another excellent account of the hibernating of the closely allied *Myoxus glis*, a common Dormouse of the South of Europe, is also given in the *Zoologist*, August 1887, pp. 281–283.

An early writer of the time of Shakespeare gives a pleasant picture of the Dormouse:

'Glires be little beasts, as it were great mice, and have that name for sleep makes them fat. They love their fellows that they know, and strive and fight against other. And they love their father and mother with great mildness and pity, and feed and serve them in their age'

It would appear that in the Middle Ages the Dormouse was considered almost as poisonous a beast as the shrew. Thus Topsell, also a contemporary of Shakespeare, in his 'Four-footed Beasts' mentions this very curious belief:

'If the viper find their nest, because she cannot eat all the young ones at one time, at the first she filleth herself with one or two, and putteth out the eyes of all the residue, and afterwards bringeth them meat and nourisheth them, being blind, until the time that the stomach serveth her to eat them every one. But if it happen that in the meantime any man chance to light upon these *viper-nourished*, *blind* Dormice, and to kill and eat them, they poison themselves through the venom which the viper hath left in them. Dormice are bigger in quantity than a squirrel. It is a biting and angry beast.'

So too Dr. Helm:[1] 'This species of Dormouse exists not uncommonly in the woods of the "Upper Vogtland" (Saxony), which consist almost entirely of pine and fir. It is known everywhere as "*the* Dormouse," and disliked; for it is believed by the country people that if a cow is breathed upon by a Dormouse its udder will become diseased, and that everything touched by its urine will immediately decay. Moreover the Dormouse is supposed to be as venomous at least as the Viper, *Vipera berus*, which is also common there.'

Dormice make charming pets, but are most variable in their dispositions. Some are very tame and others never get over the habit of biting, and will not permit themselves to be petted and stroked. A correspondent in the 'Field' says he has known them live for four years in confinement.

Bellamy, in his 'Nat. Hist. of South Devon,' says: 'In the unique collection of G. Leach, Esq., comprising a nearly perfect cabinet of British mammals, there is a white variety of the Dormouse taken in Devon.'

A hybrid between the Dormouse and the house mouse has been reared by Mr. C. W. Browning.

[1] *Zoologist*, 1888, p. 16.

Family *MURIDÆ*

RATS, MICE, AND VOLES

THE *Muridæ* differ from the rodents previously referred to in the number of the cheek teeth: there are the usual three pairs of molars present in each jaw, but the premolars are absent. The cheek teeth in this family are variable in structure: they may be rooted or rootless. In some cases they are surmounted by tubercles, and in others the grinding surface is flattened and divided into prisms or compartments, which may be—as in the Bank Vole—connected by hollow channels or —as in the Field Vole—separated by narrow walls of enamel. The skull is without postorbital processes, and the infraorbital opening is large; the malar short and slender. The first toe on the forefoot is rudimentary, in some species only a small claw. The tail is generally naked and scaly, but sometimes is clothed with fine hair. The ears are round and large, the collar-bone complete.

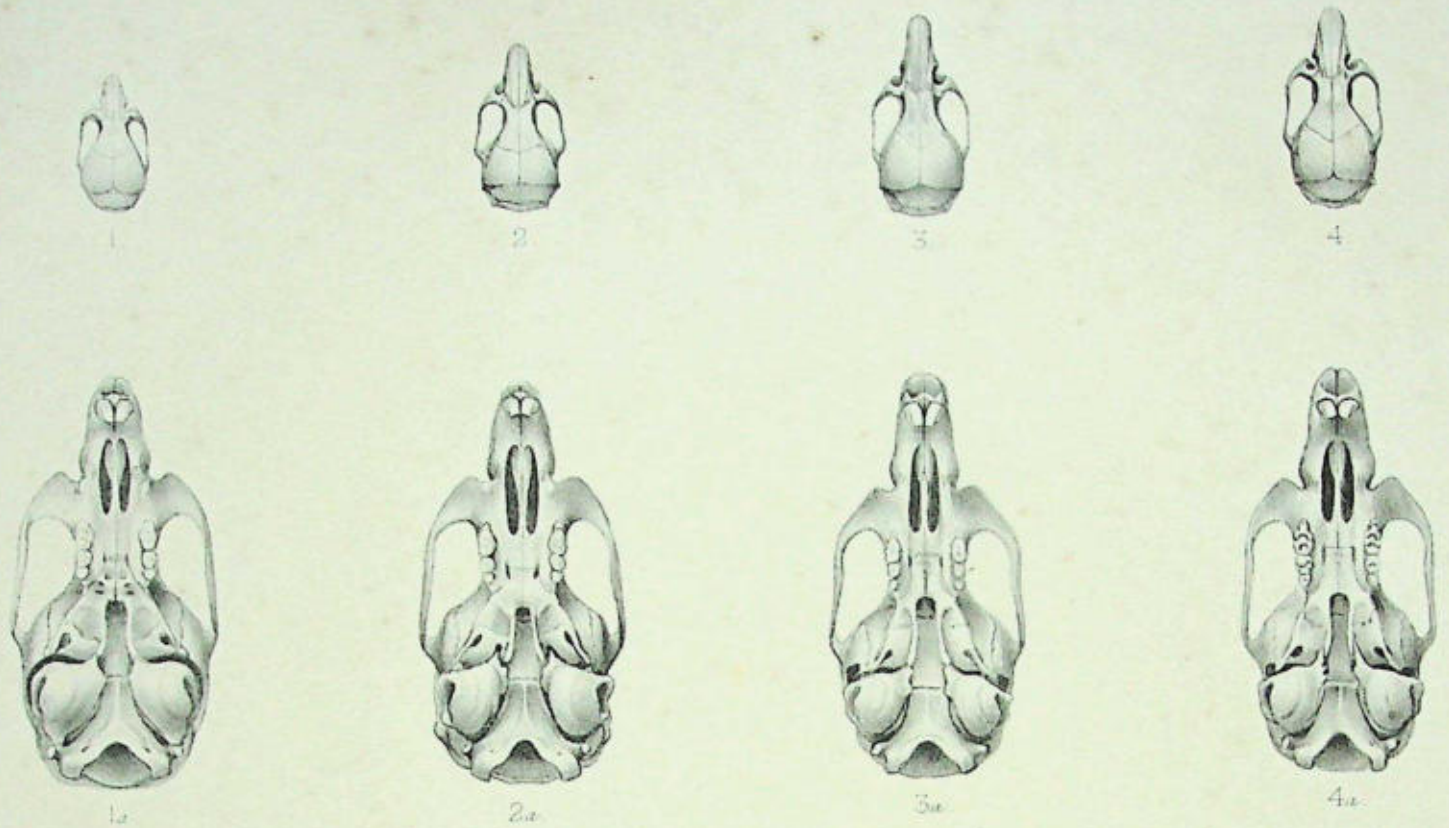
The family is subdivided, but only representatives of two sub-families are found in our islands—the *Murinæ*, or Rats and Mice, and the *Microtinæ*, or Voles.

Sub-family *MURINÆ*

Genus *Mus*

MICE AND RATS

There are more species in Linnæus' genus *Mus* than in any other mammalian genus, and even in the recognised species there is great tendency to insular and even local variation. Rats and Mice are found throughout the globe, with the exception of Madagascar, for in Australia we have the allied genus *Hydromys*. In their general form the term 'rat-like' is sufficiently descriptive—small-sized animals with pointed muzzles, long scaly tails, large ears, dark prominent eyes, soft dense fur, and abundant vibrissæ. The incisor teeth—a single pair in each jaw—are strong, smooth (not grooved), and narrow; on the external surface they



Skulls & teeth of British Muridæ.

Fig 1. Harvest Mouse. life size
. 1 a b . . enlarged
. 1 d. Right upper molars enlarged
. 1 e. Right lower molars enlarged

Fig 2. House Mouse. life size
. 2 a b . . enlarged
. 2 d. Right upper molars enlarged
. 2 e. Right lower molars enlarged.

Fig 3. Wood Mouse. life size
. 3 a b . . enlarged
. 3 d. Right upper molars enlarged
. 3 e. Right lower molars enlarged

Fig 4. British yellow necked Mouse. life size.
. 4 a b . . . . enlarged.
. 4 d. Right upper molars slightly worn / enlarged
. 4 e. Right lower molars slightly worn / enlarged

are covered with yellowish-red enamel. The molars are rooted, and in the young are crowned with tubercles, which in the upper jaw are arranged in three longitudinal rows, and in the lower jaw in two rows; when the teeth become worn they are crossed with folded transverse laminæ.

Dental Formula.—I. $\frac{2}{2}$; C. $\frac{0}{0}$; P.M. $\frac{0}{0}$; M. $\frac{6}{6}$.

Most of the members of the genus frequent underground galleries and holes which they excavate in the earth, and are more or less nocturnal in their habits. The Harvest Mouse is an exception, for it makes its nest in shrubs and growing vegetation, whilst the Wood Mouse sometimes places its nest below ground and sometimes on the surface.

THE HARVEST MOUSE

Mus minutus, Pallas.

Mus minutus, Pallas, 'Reise,' vol. i., Append., p. 454 (1778); Bell, Lydekker, Sir H. Johnston.
Mus minimus, White, 'Nat. Hist. Selborne,' p. 33 (1789).
Mus messorius, Kerr, 'Animal Kingdom,' p. 230 (1792); Shaw, 'Gen. Zool.' vol. ii. p. 62 (1801).
Mus minutus minimus, sub-species, Barrett-Hamilton, 'Ann. Mag. Nat. Hist.' ser. vii. vol. v. p. 528 (1900).

Local Names.—*The Harvest Mouse* (England); *Llygoden yr ŷd* (Welsh); *Luch-fheoir*[1] (Scotch Gaelic).

Characters.—Next to the Lesser Shrew this is the smallest British mammal. The head is narrow and the nose somewhat larger and blunter, comparatively speaking, than in the other British mice. The tail, which is covered with short hairs, and the ears are also relatively short. The general colour of the upper parts is a yellow-red or orange-brown, being almost orange across the thighs, where the colour is brightest. The under parts are pure white. Mr. J. E. Harting, in describing the pelage of this mouse, says:[2] 'The bright sandy yellow or orange-fawn of the upper part was purest and brightest towards the tail; being focussed (so to speak) on the hindquarters just at the root of the tail, and extending underneath as far as the vent. This bright but delicate tint shades off gradually, above, into the light yellowish or orange-brown, which is the prevailing colour of the upper parts, the latter hue becoming again brighter and lighter as it extends downwards to meet the white of the under parts. The fur of the cheeks and that surrounding the ears is also bright sandy or orange; the hairs are nearly always of that colour, varying, however, in intensity in different individuals.' The feet are naked on the soles and covered above with fine yellowish hairs. The young are brownish-grey and not unlike young common mice, and two individuals lately in my possession did not begin to assume the colour of the adults until January.

[1] This name and *Luchag-fheoir* are indiscriminately applied to any small rodent frequenting the grass, either on the mainland or in the Hebrides, so that it must be taken more as a general term than one actually applied to this species.

[2] *Zoologist*, November 1895, p. 420.



THE HARVEST MOUSE.
Mus minutus.

Litho. W. Greve, Berlin

Gilbert White in the first description of this little animal as a British species gives the measurements as 2¼ inches, tail 2 inches; whilst Mr. Rope[1] gives the average measurements of seven adults, irrespective of sex, as: length of head and body 2 inches 7½ lines; tail 2 inches 1 line; total length 4 inches 8½ lines, which I find very correct. Gilbert White also states that two Harvest Mice just weighed down a halfpenny piece, *i.e.* about one-eighth of an ounce. The cranial measurements of this species are given in the plate.

Distribution.—Ranging over the greater part of Europe, except the extreme north, and as far to the east as Western Asia, the Harvest Mouse is generally considered to be a scarce and local resident in all countries in which it is found. Doubtless it exists in many parts where it is still unknown, as its small size and retiring habits cause it to escape the notice of all except expert observers. This at any rate is the case in England and Scotland, where alone it is known in our islands; but on the whole it may be regarded as generally but locally distributed south of Aberdeenshire, though in Scotland it is much scarcer than in England.

Montagu was the first to notice[2] this species in England (Wiltshire); but for the first description we are indebted to Gilbert White, who communicated[3] his discovery to Pennant, who in turn published his notes in his 'British Quadrupeds' (2nd edition). The Harvest Mouse has been noticed in the following counties, the list being compiled from my own notes and those kindly lent to me by Mr. Harting:

Lancashire (Byerley, Coward[4]), Cheshire (Coward and Newstead), and Shropshire (Murdoch),[5] Staffordshire (Garner and Masefield), Leicester (Horley and Widdowson), Norfolk (Lubbock and Gurney), Suffolk (Rope and Moor), Cambridgeshire (Jenyns), Warwickshire (Tomes), Worcestershire (Hastings), Hertfordshire (Bond), Essex (Laver), Kent (Collingwood), Sussex (Harting), Hampshire (Gilbert White), Isle of Wight, Shanklin (A. G. More),[6] Wiltshire (Montagu), Gloucestershire (Knapp, Witchell), Devonshire (Montagu, Rowe, Bellamy, Parfitt), and Cornwall (Couch and Rodd). With regard to its absence from Northamptonshire, Mr. Lionel Adams writes to me: 'A week before his death the late Lord Lilford informed me that he remembered the Harvest Mouse in Northants, which is a valuable record of what I believe to be an extinct animal in this county.'

[1] *Zoologist* February 1884, p. 59. [2] *Trans. Linn. Soc.* vol. vii. p. 274. [3] *Nat. Hist. Selborne*, Letter xiii.
[4] Mr. Coward says it occurs only sparingly in Lancashire and Cheshire, *Zoologist*, January 1896; *ibid.* 1895, p. 175.
[5] *Zoologist*, December 1895, p. 447. [6] A very doubtful record.

Messrs. Clarke and Roebuck say that it is very irregularly and thinly distributed throughout Yorkshire, and subsequent writers have confirmed this. In the Lake district the late Rev. H. A. Macpherson says it is extremely rare, and can cite only two instances of its occurrence. It is also mentioned as having been recorded from a few localities in Northumberland and Durham by Messrs. Mennell and Perkins.[1]

The species may be said to be common in West Kent, East Sussex, Essex, and Hampshire. In the Weald of Sussex it was very abundant about fifty years ago, but with the introduction of the closer-cutting reaping machines it has almost disappeared.

MacGillivray says that the Harvest Mouse has been met with in Aberdeenshire,[2] Fifeshire, and Midlothian in Scotland. In the last-named county Mr. William Evans considers it very local and nowhere numerous, and in a recent letter to me he doubts its present existence there. He has himself found the nest near Aberlady, in East Lothian, and there is reason to suppose that a small colony existed in 1870 at Morton Hall, near Edinburgh. The late Mr. Small, the Edinburgh taxidermist, received two from Banffshire,[3] a county from which Thomas Edward had already recorded it.[4] I believe that it may occur in the Carse of Gowrie, in Perthshire, but have never been able to obtain specimens, although farmers say they have noticed the animals and their nests.

The Harvest Mouse, with its size and weight correctly stated, is included in the list of animals of Alloa.[5] Mr. R. Gray informed the late E. R. Alston that he had caught one in Kincardineshire in 1869.[6]

Mr. Robert Service[7] says that it has not been seen in Solway for twenty-five years. In the Paisley Museum there is a nest from Kilbarchan, Renfrew, taken in 1895; and Mr. J. M. B. Taylor says that he has seen other nests in the county.[8]

From the south-west of Scotland we should expect to hear of this species, but few records are forthcoming; yet Harvest Mice were common in the Mauchline district of Ayrshire about the year 1855 (Murdoch). From the West and in the North the species seems totally absent. It is not known to occur in

[1] *Cat. Mam. Northumberland and Durham; Trans. Tyneside Nat. Field Club*, vol. vi. p. 171 (1864).
[2] Mr. Stewart Burnett found one at Kenmay in 1889 (*Ann. Scot. Nat. Hist.* 1898, p. 46).
[3] *Mammalian Fauna of the Edinburgh District*, 1892, p. 79.
[4] This record was doubted by Mr. W. Taylor (*Ann. Scot. Nat. Hist.* 1897, p. 249).
[5] *New Stat. Acc. Clackmannan*, p. 9.
[6] *Fauna of Scotland*; Alston, *Mammalia*, p. 10.
[7] *Ann. Scot. Nat. Hist.* 1896, p. 205.
[8] *Ibid.* 1898, p. 112.

Wales or Ireland.[1] On the whole the Harvest Mouse must be considered a rare animal in Scotland.[2]

Habits.—During the spring and summer the Harvest Mouse lives chiefly in the rank vegetation of ditches and hedgerows bordering on cultivation. It frequently selects a hedgerow next to a wheat, oat, or barley field, and on the ripe grain of these cereals it feeds, and occasionally builds its nest amongst the growing stalks. Whether the Harvest Mouse has actually learnt anything from the annual destruction of one of its main haunts, or whether it has merely taken to living and breeding more commonly in hedgerows and shrubs than formerly, the fact remains that the nests of Harvest Mice are now seldom found in standing corn, whereas this used to be their favourite resort. Since the species breeds several times during the season, its first nests are probably placed amongst wild vegetation, another amongst the corn, and a third or even a fourth in corn-stacks, where it generally spends the winter until threshing time, when it either re-enters the straw stacks or is forced to seek shelter in the banks or to build fresh winter nests.

Writing of the winter nest Mr. A. G. Rope says:[3] 'On November 30 I obtained a nest of the Harvest Mouse from Leiston. It was built about three feet from the ground, among some straggling blackthorn bushes growing by the side of a ditch. Some years ago I found a nest of these little animals built in a plant of the common broom. These tiny creatures are fond of frequenting the tall rank herbage growing by the sides of ditches.'

The summer nest is a small round compact ball of grass, corn blades, or the split leaves of reeds, and is about the size of an orange. It is suspended to and interwoven amongst shrubs or growing herbage at a slight elevation above the ground. It is usually lined with finely bitten pieces of grass or reed.

The following notes, kindly sent to me by Mr. Douglas English, refer to the nests of Harvest Mice built in standing oats: 'In this part of Kent the labourers confidently assert the preference of the little red 'un for oat-stacks, and I am inclined to agree with them. Probably the time of sowing has something to do with the matter, as Harvest Mice are quite indifferent as to what kind of grain they eat.

[1] Thompson thought that it could not with certainty be added to the Irish fauna, but Bell includes it in error on the authority of Dr. Kinahan.

[2] Mr. Harvie-Brown thinks the many records should be dispensed with (see *Ann. Scot. Nat. Hist.* 1898, pp. 46, 47), and he himself has never met with this species, nor have I seen one in the flesh in Scotland.

[3] *Zoologist*, 1880, p. 57.

'The nests are normally spherical, though their surroundings may considerably modify their shape. Taking the average of half a dozen: they are built a foot above the surface and composed entirely of the *leaves* of the corn with the stalks as scaffolding. Occasionally a complete spike is found interwoven in the walls, but this is so rare that it may be regarded as accidental. In the scaffolding full advantage is taken of the growing leaves. These are left attached to their stalks and pulled upwards, downwards, and sideways into the nest, so as to form a stiffening palisade. At the base of the nest there are usually three or four entire leaves. The body of the nest is composed of short lengths split longitudinally by the mouse's teeth, but not entirely picked to pieces: these naturally contract into spirals and complicate themselves. The end of any stalk which hangs down conveniently is treated in the same way. There were two hundred and fifty split up but more or less coherent lengths in one nest which I unravelled, and, allowing for miscalculations, I should reckon that at least a hundred complete leaves had been utilised. I have twice discovered the litter, and in both cases the number was seven. They seemed to enjoy as much proportional space as a house mouse of the same age would have been allowed.'

It is not very long since that Professor Schlegel discovered that these mice built winter nests near Leyden. A translation of his interesting account is thus given by Mr. Harting:[1]

'Close observation showed that these reeds actually contained about fifty nests of this little mouse. During the breeding season these were of the usual globular form, of the average size of a man's fist, and showing near the top a small circular opening for the entrance of the little animal. But the winter nests were quite different. These were composed of various mosses, and were attached to and between several stems of reeds, exactly like the nests of the reed warblers, but more fusiform, of from six inches to a foot in height, and from three to four inches in diameter. They showed no inlet, and were placed at the height of a foot over the water's level. The animal when entering had to remove the upper part of the covering, which was less densely interwoven, and was concealed between the moss. It appears evident that the building of these nests was a just calculation of being safe against the danger of drowning, in the same way that swans and moorhens have been observed to build their nests in time of flood above the reach of the rising water. Some of the mice in the case above noticed went a

[1] *Zoologist*, November 1895, p. 423.



Harvest Mice

From Photographs by D. English, F.R.P.S.

step further, and adapted to their own requirements the deserted nests of aquatic warblers, which they covered with a cap of grass.'

In summer the nests are often built in standing wheat or barley and sometimes in oats. Mr. E. C. Moor (quoted by Mr. Harting[1]), writing from Woodbridge, Suffolk, says: 'During the summer of 1883, especially at harvest time, several nests of the Harvest Mouse were taken by me, mostly from barley fields, being placed upon the laid barley. Almost all contained young ones, numbering from six to eight; and it was surprising to see how eight fair-sized mice could possibly live in a nest hardly as large as an orange.'

The gestation is supposed to be the same as in the wood mouse, *i.e.* three weeks, and the number of young, which are born blind and naked, is from five to eight. Mr. Rope has found the nest placed in a blackthorn and a common broom bush, as previously noticed. Gilbert White (p. 43) describes one placed in a wheat field in the head of a thistle. Mr. Southwell has recorded a nest found on the beach at Herringswell, Suffolk,[2] and MacGillivray found one in Fife in the midst of a tuft of *Aira cæspitosa*; whilst Dr. Laver, of Colchester, says he finds these mice more generally in corn stacked in the fields than in the sheaves which have been carted. The only nest I ever found was at Marlborough in Wilts. It was placed in a thorn bush, and interwoven with honeysuckle which grew up the bush. I kept the owner alive in my school desk for four months, until, indeed, it escaped.

The food of the Harvest Mouse consists of a variety of seeds, shoots, and the tender leaves of various plants. I have found that it prefers wheat to barley or oats, but seems to enjoy all cereals. It does not care for bread, of which voles are very fond. Mr. Gurney[3] says these mice like canary seed and hazel twigs, with leaf buds and the partially expanded leaves.

Vegetable food does not satisfy the Harvest Mouse: it devours numbers of insects, and for these it will burrow into moss and earth. The carnivorous habits of the species have long been known, and when in captivity it is not guiltless of cannibalism. Mr. Gurney suggests that 'a mutton-bone prevented his captives from devouring one another.'

Its manner of disposing of a grain of wheat is accurately described by Mr. Rope[4] as follows: 'Sitting up and holding the grain in a horizontal position between the forepaws (one being placed at each end), the little animal begins

[1] *Zoologist*, November 1895, p. 421.
[2] *Mammalia and Reptilia of Norfolk.*
[3] *Zoologist*, March 1884, p. 112.
[4] *Ibid.* February 1884, p. 56.

dexterously and rapidly turning it round like a wheel on its axle, a time applying to it the edge of his sharp incisors, and by their means the outer skin or bran and letting it fall like the shavings from the woodturner at his lathe, to whose operations the whole process bears resemblance; nor does he begin eating till he has reduced the grain to white and almost cylindrical body. On placing a Harvest Mouse minutes in a vessel containing broom-seed, I was surprised to see it afte about among the seeds pick up one and devour it.'

The Rev. W. Bingley gives an interesting account[1] of its in propensities and its mode of catching and eating flies and bluebottles, every writer who has kept these charming little animals in confir observed the habit and their predilection for this food. Thus Mr. has written excellent notes on the species, says:[2] 'On a fly being pu cage the mouse, instead of rushing about after the insect, appears at f no notice whatever of it; but when the latter, in buzzing about approaches within its reach, in the twinkling of an eye he has it firm in his paws, and it is devoured almost before one can realise the being caught; the wings and legs are generally rejected. These probably devour many other insects, and I have seen wood-lice eaten Even a cockroach, large as it is, fares no better, although there i amount of hesitation in seizing this more formidable-looking prey.

The two examples figured in Mr. Thorburn's plate were observ and eating flies by the artist, and when they returned to me after sitti portraits they seemed to relish all the flies and bluebottles I could cate There is little doubt that when deprived of animal or insect foo cannibals, and will, like all other mice and voles, kill and eat one anc

They lap milk and water with relish; in fact liquid is neces existence of all mice and voles.

I made the following observations of the movements and hal Harvest Mice which I received from Kent, sent by Mr. Douglas En spring of 1904.

Harvest Mice are particularly active in their movements. They swiftly, and climb or run up a stalk with ease but deliberation. Th graceful than rapid; consequently they are easily captured. In climbi up a twig or stalk of corn, and whenever they stop take a hitch w

[1] *Memoirs of British Quadrupeds.*

[2] *Zoologist*, 1884, p



HARVEST MICE.

From photographs by Douglas English, F.R.P.S.

third of the tail, which is to a certain extent prehensile. As they run upwards the tail is held out from the body at an angle of 25°. They like to run to the top of a twig, and then sit up, look about, and descend again, the head in this case being held outwards. When passing from twig to twig I have never seen them leap, for at all times they seem afraid to jump, however short the distance. They come down the branch till they meet the angle of another where it diverges, and then step across, at the same time taking a secure hold with the tail of the upper twig they are about to leave. Sometimes they will drop from the lowest branch to the ground, and before doing so they hang suspended by the tail for a few seconds. They seem incapable of holding on by the tail for any length of time, or of swinging by it. I have several times seen one mouse wrap his tail round the neck of the other and, using this as a back support, pass to another twig or stalk.

Whilst on the subject of the tail in mice, it is interesting to compare the use which different species make of it in climbing. The dormouse, although arboreal in its habits, never uses the tail in a prehensile manner, but simply as a guider or balancer in its quick leap from bough to bough. All the other true mice climb to a considerable extent. Most of us have seen white mice running up poles in the London streets, and they certainly use their tails in climbing. I watched a brown rat one day ascend to the very top of a spruce fir, whose branches he was evidently exploring for the eggs of small birds. In climbing, his tail hung 'free,' but in descending he certainly received some support from it, for as he left each branch in turn he allowed it to wrap over, and did not proceed until a half-hitch was taken, then on getting a foothold on the next branch with his fore-paws, he drew his caudal appendage after him.

Mr. Rope says Harvest Mice bite savagely when handled, but I did not find this to be the case with those which I kept. Doubtless my specimens found it useless to bite, as I wore a glove when first handling them.

'The Harvest Mouse,' says Mr. English, 'is a gymnast of remarkable ability, and I have always provided my captives with a natural gymnasium of corn-stalks; and, quite frequently, I have observed four or five of them exercising simultaneously within the space of about six cubic inches (for in this, as in all else, they are sociable), some performing vertical revolutions like squirrels, some horizontal revolutions like nothing else I have ever seen, some revolutions at an angle, never hitting each other, never missing their foot- and tail-hold, never varying the order of their going.

'It is a unique performance, and encouraged by the sunshine—even by artificial light, for turning up the gas is an immediate signal for one or the other to leave the common shelter and initiate a gymkhana.

'The Harvest Mouse assuredly takes a joy in living. The best receptacle for four or five is a large bell-shaped aquarium glass uncovered. The height to which it is safe to allow them to exercise can easily be determined by trial. For mice they are indifferent jumpers.

'In such confinement they grow accustomed to humanity very quickly, and their daily round, miniature meals, miniature toilets, miniature gymnastics, and miniature quarrels can be easily watched. In the latter there is the usual mouse procedure, plus the tail-grip—not of the adversary, but of some convenient base. Battle is conducted with the forefeet, partly in aggression, partly in parry. In play two tails will often be accidentally entangled (the tail instinctively grasps whatever it touches), and on the first movement there is a mutual loss of balance. Toilet is in the ordinary mouse fashion, though the tail, as might be anticipated, forms part of that regular mouse routine which commences with the whiskers.

'I can confirm the statement that the Harvest Mouse kills flies, but I do not regard them as a normal addition to his diet. The mouse's action in killing a fly (they snap at them on the wing) is remarkably like a similar action in the dog. It is either a sporting instinct or the outcome of annoyance.

'I have never been fortunate enough to induce the Harvest Mouse to breed in captivity, but I have seen them splitting corn leaves longitudinally (the preliminary of nest-building), and have noticed the ubiquity of their tails on such occasions. One naturally surmises that the tail, as well as the teeth and claws, plays its part in nest-formation.'

Owls and weasels must account for a good many of these little creatures.

All mice and voles sleep fitfully during the winter, hardly ever moving if the temperature falls below freezing-point, becoming active again in search of food when milder weather returns. To this rule the Harvest Mouse is no exception. Mr. Thorburn caught one running in a hedgerow close to his house at Hascombe, Surrey, in December 1904.

THE WOOD MOUSE

Mus sylvaticus, Linnæus.

Mus sylvaticus, Linn. 'Syst. Nat.' 12th ed., vol. i. p. 84 (1766); Bell and Lydekker.

Local Names.—*The Long-tailed Field Mouse, Wood Mouse* (England and Scotland); *Hill Mouse* (Shetland); *Luch-fheoir* (Scotch Gaelic) (Irish Gaelic); *Lugh-varghey, Lugh-sliean* (Manx); *Llygoden ganolig, Llygoden y maes* (Welsh).

Captain G. E. H. Barrett-Hamilton recognises[1] no fewer than nineteen different varieties or sub-species of *Mus sylvaticus*, five of which are found in our islands. He further shows that *Mus sylvaticus*, Linnæus, which he calls *M. s. typicus*, differs from the forms found in the British Islands, and that its range is confined to Northern Europe. Melchior's *Mus flavicollis*[2] is, he considers, referable to the type, so that *M. flavicollis* becomes a synonym of *M. sylvaticus typicus*, but this is not the variety described by Mr. de Winton as the 'Yellow-necked Mouse' which occurs in Britain. After giving the subject the most careful consideration and examining a very large series of British examples I think that, for the most part, his conclusions are sound. In the case of *M. s. intermedius*, the common Wood Mouse of England and Scotland, there is such great variety both in size and coloration, particularly about the lower parts, that it would be easily possible to foist on long-suffering naturalists yet other three varieties, did I not consider their patience in the matter of subdivision had been strained to the utmost limit.[3]

[1] *Proc. Zool. Soc.* 1900, pp. 387–428.

[2] *Den danske Stats og Norge Pattedyr*, 1834, p. 99.

[3] In adopting the above nomenclature I must rank myself with the trinominalists, and this not without hesitation, for by nature I am opposed to the endless subdivision of species. At one time it seemed to me that the system of names suggested by my friend Mr. J. A. Harvie-Brown was in itself sufficient, namely, that any local variety of one species should simply bear the locality in brackets after the name of the animal. This is certainly one way out of a difficult situation; but, on the other hand, we must not consider ourselves alone, but the great body of naturalists all over the world who do not understand English and who do understand Latin, and so the extra title in Latin makes things universally intelligible.

The following sub-species are recognised as inhabiting Great Britain and Ireland:

SUB-SPECIES 1

The British Wood Mouse

Mus sylvaticus intermedius,[1] Bellamy.

Characters.—In adults the upper parts are sandy-reddish brown, the lower parts pure white. The basal two-thirds of the hair, which is hidden, slatey grey. Many of the dorsal hairs, especially in the middle of the back, are tipped with black; these black hairs are most profuse in winter, but in this respect there is considerable individual variation. In many examples there is a sandy-coloured breast spot which often extends along the median ventral surface in either a thin or broad line. In some few examples the under parts are greyish. Females nursing young often become bare or have the white under surface stained. In immature specimens the general colour of the upper parts is greyish brown, and the animal somewhat resembles the house mouse. These grey immatures may be caught as late as December, since this sub-species breeds until late in September.

There is considerable variation in size. Bell gives: Length of head and body 3 inches 8 lines; head 1 inch 1 line; ears 7 lines; tail 3 inches 8 lines. Mr. Rope gives:[2] Average length of head and body 3 inches 9½ lines; tail 3 inches 5 lines. The largest female measured by Mr. Rope was 8 inches 2 lines in total length, of which the head and body were 4 inches 6 lines and the tail 3 inches 8 lines. Average length of skull 25 mm., and rarely exceeding 26 mm.

Examples from the North of Scotland seem to be slightly smaller and greyer than those from the South of England.

Distribution.—This sub-species inhabits England, Scotland, Ireland, the Inner Hebrides, Shetland, and the Channel Islands. On the Continent it is found in Holland, Belgium, Brittany and North-west France, South-western France, and Switzerland; but Captain Barrett-Hamilton states that its actual range is not known with certainty. In February 1905 I received from Mr. Lewis Garroway of Scalloway two living specimens of *M. s. intermedius* from West Shetland. As this

[1] The synonym *intermedius* was given by C. J. Bellamy, who gives a woodcut of the animal in his *Natural History of South Devon*, 1839, pp. 195, 329, 330. Captain Barrett-Hamilton regards this sub-species as synonymous with *M. campestris* of Holandre (*Faune de la Moselle*, 1836, p. 24), but not *M. campestris* of Desmarest, which was referable to the harvest mouse, and *M. s. fossilis* of Gervais (*Zool. et Pal. Fr.* 1859, p. 43).

[2] *Zoologist*, 1887, p. 202.



Litho. W. Greve, Berlin.

THE BRITISH YELLOW NECKED MOUSE.
Mus sylvaticus wintoni.

THE BRITISH WOOD MOUSE.
Mus sylvaticus intermedius.

form was unknown in Shetland I thought that it would prove to be a new sub-species; but on examining additional specimens I came to the conclusion that this northern race, although undoubtedly large, especially about the head and ears, had not sufficient characteristics of its own to warrant sub-specific rank. The figure of this animal next to those of English *M. s. intermedius* as drawn by Mr. G. Lodge in the photogravure plate will at once show such differences as exist.

SUB-SPECIES II

The Irish Wood Mouse

Mus sylvaticus celticus, G. E. H. Barrett-Hamilton.

Characters.—Smaller than the typical *sylvaticus*, this sub-species is characterised by the darkness of the upper parts, due to a large number of blackish hairs on the dorsal region. The under side is white. Captain Barrett-Hamilton says that 'the dimensions of ear and hind foot seem to show that these are slightly larger in proportion to the general body-size than is the case with Irish examples of *M. s. intermedius*.'

The general measurements are very similar to those of the common British Wood Mouse; the length of skull is the same.

Distribution.—Southern and Western Ireland, the Hebrides and Skye, are given as the home of this sub-species. I obtained a male which appears to belong to this form at the north end of North Maven, Shetlands, in August 1901 (figured). It is also believed to exist in Portugal. So long ago as 1841 the Rev. Leonard Jenyns (Blomefield) received Wood Mice from county Kerry and noticed[1] that they differed considerably from the typical form, being smaller and darker. In closing his remarks[2] on this sub-species Captain Barret-Hamilton says: 'A remarkable fact is the occurrence of this mouse on the same island (Lewis) as the very distinct *M. s. hebridensis*, which is one of the larger forms of Field Mice. I am informed by Mr. de Winton that the latter keeps to its own part of the island, and that probably the two do not intermingle. It is curious that while a big and a little form of *Mus sylvaticus* occur here side by side, each finds a different method of fitting itself for the damp, dull climate of the west.' I am not at all sure, however, that these two forms do not intermingle.

[1] *Ann. and Mag. Nat. Hist.* 1841, vol. vii. p. 268.

[2] *Proc. Zool. Soc.* 1900, p. 403.

SUB-SPECIES III

The Hebridean Wood Mouse

Mus sylvaticus hebridensis, W. E. de Winton.

Characters.—In general form and colour this sub-species resembles *M. s. intermedius*, but it is larger and has proportionately smaller ears, larger hind feet (especially in males), a shorter and thicker tail, and a generally stouter build. The colour of the upper parts is more uniform and less bright than in *M. s. intermedius*. The under parts, according to Mr. de Winton, are generally dusky or sandy, and have no distinct line between the two surfaces, whilst the tail is of uniform brownish grey. Total length of skull 27 mm.

Captain Barrett-Hamilton has made[1] the following interesting observations on the pelage of immature examples: 'The young males appear to lose the dull hues of immaturity of the upper side, and to don the reddish colour of maturity, at an earlier age than do the females, so that young males and females of the same age are actually distinguishable by their colour alone.'

Distribution.—This form of *Mus sylvaticus* was first obtained by Mr. J. Steele Elliot and afterwards described by Mr. de Winton.[2] It seems to be found only in the islands of Lewis (North Harris) and Barra, in the Outer Hebrides.

SUB-SPECIES IV

The St. Kilda Wood Mouse

Mus sylvaticus hirtensis, G. E. H. Barrett-Hamilton.[3]

Characters.—This Wood Mouse is closely allied to the *M. s. hebridensis*, from which it differs in its 'slightly larger size and also in the greater amount of buff or yellowish-brown coloration on the under side. Like *M. s. hebridensis*, it differs from *M. s. intermedius*, apart from its greater size, in the more uniform coloration of the upper surface of the body, in the absence of the clearly defined white under side, and in the longer feet and shorter ears.' The skull is unusually large,

[1] *Proc. Zool. Soc.* 1900, p. 404.

[2] *Mus hebridensis*, W. E. de Winton, *Zoologist*, October 1895, p. 369; *Mus sylvaticus hebridensis*, W. E. de Winton, *ibid.* November 1895, p. 426.

[3] *Mus hirtensis*, Barrett-Hamilton, *Proc. Zool. Soc.* 1899, p. 81; *Mus sylvaticus hirtensis*, Barrett-Hamilton, *ibid.* 1900, p. 404.



Varieties and sub-species of British Wood Mice

1 Varieties of M. s. intermedius with chestnut breast spot and ventral line of chestnut. *2 Shetland variety of M. s. intermedius.*

3 M. s. hebridensis. *4 M. s. celticus.* *5 M. s. hirtensis.*

reaching 29 mm.—which is the measurement in the largest specimens of *M. s. wintoni*.

Distribution.—The first example of this mouse was obtained by Mr. J. Steele Elliot, and specimens were subsequently sent by Mr. Henry Evans to Captain Barrett-Hamilton in 1898, and were described. Through the kindness of The Macleod of Macleod I obtained examples in June 1904, but they were more or less destroyed by being sent in whisky. The island of St. Kilda is the only known habitat of this sub-species.

SUB-SPECIES V

The British Yellow-necked Wood Mouse

Mus sylvaticus wintoni, G. E. H. Barrett-Hamilton.[1]

Characters.—This fine type of Wood Mouse, first recognised as British by Mr. W. E. de Winton, is both larger and more richly coloured than *M. s. intermedius*. The tail is longer, and is said to possess thirty vertebræ, as against twenty-seven in *M. s. intermedius*. All the colours are very bright, and examples of all ages generally possess a well-marked breast-spot of sandy brown. This characteristic mark is described by Mr. de Winton as follows: 'About 8 mm. broad, passing along the chest, immediately in front of the forelegs, with a cross or longitudinal stripe in the centre, extending forward about 5 mm., and back along the sternum about 10 mm., where it is entirely lost, unlike the slight dash of colour so frequently found on the chest of *Mus sylvaticus* (*intermedius*), and which varies from the smallest spot on the breast to a decided yellow-brown tinge extending over the whole belly.' Specimens from the West of England are generally considered the finest, but I have seen individuals from Sussex and Surrey quite as richly marked. The skull is generally about 27 mm. in length, and occasionally reaches 29 mm.

Distribution.—On the Continent this sub-species is found in Central and Eastern Germany, Bohemia, Silesia and Western Hungary, Switzerland, and in many other localities; but in Roumania it is replaced by *M. s. princeps*, the handsomest of all the Wood Mice.

[1] *Mus flavicollis*, de Winton, *Zoologist*, 1894, pp. 441–445. Captain Barrett-Hamilton considers that this sub-species differs in a marked degree from *Mus flavicollis*, Melchior, to which form it was originally referred. Melchior's yellow-necked Mouse agrees with Linnæus' type.

In England *M. s. wintoni* seems to be very generally but locally dis and is common in the southern and western counties. It has not been north of Northumberland. It has been noticed as occurring in the f counties: Middlesex,[1] Surrey, Sussex, Kent, Northamptonshire, Worcester, H shire, Suffolk, and Northumberland.

Mr. de Winton thinks that this sub-species does not interbreed wit *intermedius*.

The following table of measurements in millimetres is taken from G. E. H. Barrett-Hamilton's paper on '*Mus sylvaticus* and its allies':

Mus sylvaticus intermedius. (Averages of from 30 to 60 specimens.)

		Head and Body	Tail	Hind Foot	Ear	Ex
Males	Maximum	111 mm.	103 mm.	24·5 mm.	17·5 mm.	
	Mean	92·6 mm.	88·2 mm.	22·6 mm.	15·4 mm.	
	Minimum	83 mm.	67 mm.	20 mm.	14 mm.	
Females	Maximum	110 mm.	98 mm.	24 mm.	17·5 mm.	
	Mean	92 mm.	84·5 mm.	22·5 mm.	16 mm.	
	Minimum	78 mm.	70 mm.	20 mm.	14 mm.	

Mus sylvaticus celticus. (2 males and 4 females.)

Maximum	90 mm.	84 mm.	25 mm.	15 mm.
Mean	85·3 mm.	80·8 mm.	22·3 mm.	14·6 mm.
Minimum	80 mm.	75 mm.	20 mm.	14 mm.

Mus sylvaticus hebridensis. (3 males and 1 female.)

Maximum	112 mm.	100 mm.	25 mm.	16 mm.
Mean	108 mm.	97·5 mm.	24·25mm.	15·75mm.
Minimum	106 mm.	95 mm.	23·5 mm.	15 mm.

Mus sylvaticus hirtensis.

Male	107 mm.	91 mm.	24·5 mm.	17 mm.
Female	110 mm.	94 mm.	24 mm.	15 mm.

Mus sylvaticus wintoni. (3 males and 1 female.)

Maximum	108 mm.	108 mm.	23 mm.	18 mm.
Mean	110·75mm.	111·75mm.	23·75mm.	18 mm.
Minimum	115 mm.	112 mm.	24 mm.	18 mm.

[1] Mr. de Winton tells me he has seen it on the flower-borders in the Zoological Society's Gardens at Rege

Mus sylvaticus may be, in all its forms, generally recognised or distinguished from *Mus musculus*, apart from its coloration, by its longer tail—as long as the head and body as a rule—its large white hind feet, its longer ears—more than half the length of the head—and its remarkably prominent eyes. The skull shows several marked differences, which can be most readily appreciated by comparing the plates. There are but six mammæ, whereas in *musculus* there are ten.

The general distribution of *Mus sylvaticus* in all its forms embraces the whole of Europe except the extreme north, temperate and Central Asia as far north as Lake Baikal, Asia Minor, Palestine and North Africa, the Balearics and Iceland. It does not seem to have reached Japan.

In the Norfolk Forest-bed remains of *Mus sylvaticus* have been found, showing that it has been an inhabitant of England since early Pleistocene days.

Habits.—The habits of all our sub-species of Wood Mouse seem to be similar, so that in describing them there is no use in particularising localities, although it is scarcely necessary to say that in the Hebrides or Shetlands they do not climb trees. The Wood Mouse frequents our woodlands and hedgerows, and even the coarse marram grass of the sea beaches, as well as the desolate peat hags of the storm-swept Hebrides and Shetlands. I have found it in residence on some lonely hills in Sutherland, and have seen it playing in the flower-beds of Regent's Park amongst the busy haunts of men. In fact it is everywhere, and far exceeds in actual numbers, not even excepting man, any other British mammal. I have even seen one in a house,[1] but never in a corn-stack, which is curious, considering its omnivorous tastes.

This Mouse is more strictly nocturnal than the harvest mouse, and this fact is indicated by the large and very prominent eyes. I have often seen them abroad in winter, when shooting in the woods; and one sometimes comes across the little fellows sitting up in hedge-banks washing their faces. On these occasions they are sometimes exceedingly tame, and will permit close approach. Thus Mr. Lionel Adams writes:

'I remember many years ago coming upon a Long-tailed Field Mouse in a lane at Maidenhead. It was sitting up washing its face with its paws. I approached

[1] Thompson records an instance of a Wood Mouse being found in an inhabited house near Belfast, and in the neighbourhood of St. Petersburg there is a form of *Mus sylvaticus* which was named *Mus cellarius* by J. F. Fischer on account of its habit of haunting cellars. On two different occasions Mr. Coward has received examples which were captured in the bedrooms (first story) of a dwelling-house. No doubt they had climbed up by the ivy which covered the front of the house.

it quietly and it took no notice. I even scratched its head with my stick without alarming it. When I withdrew my stick it quietly trotted off.'

Besides frequenting the woodlands at all seasons, these Mice swarm in the hedgerows and country gardens; in the spring they are the detestation of the gardener, and in the autumn of the farmer. The Wood Mouse is mainly a vegetable feeder: corn, seeds, nuts,[1] bulbs, pulse, roots, haws, and several wild fruits are its favourite diet, but it is also insectivorous and carnivorous when it gets the chance. Anyone who has tried to make a nice show of crocuses in his garden will have had cause to anathematise this little rascal as well as the common sparrow. The sparrow tears the flowers to pieces in wanton mischief, but the Mouse is after the bulb, which is a very favourite food. Mr. Heatley Noble tells me that so fond of crocus bulbs are they that whole colonies of these Mice move in the spring to the vicinity of his crocus borders at Henley-on-Thames, and that he has trapped as many as 300 in a fortnight in one small border which he showed to me. I have found that they are most destructive to lily bulbs, especially to the common white lily and Turk's-cap, and have lost several by their depredations. They drill a single hole straight down to the roots just as the lily is beginning to grow in March. Strange as it may appear, their destructive habit of attacking bulbs has resulted in benefit to the Dutch growers of hyacinths. The following extract from a gardening paper is somewhat remarkable. It shows how hyacinths may be increased.

The Dutch growers were helped out of the difficulty of rapid reproduction, like the captive lion of fabled history, by a mouse. It was observed that certain hyacinths here and there, instead of blossoming in the ordinary course, made innumerable bulblets—hundreds, indeed—and in a few years these hundreds came to perfection and blossomed with the best. This led to an examination of the bulbs as soon as it was noticed that they were not by way of flowering. The inspection disclosed the fact that the bulbs had been gnawed to the heart by mice. So now, the way to increase a valuable hyacinth is to take a knife and slash into its very heart with innumerable cross-cuts, and plant it in the ordinary way.

Mr. R. M. Barrington in his excellent account of the species in captivity[2] says the leaves, as well as the roots of plants, are eaten.

[1] They will eat walnuts, so Mr. L. Adams informs me. A lot of walnuts picked up at Barnwell Castle show that the gnawing is commenced at the rounded end of the nut, at the crack, never at the other end, which is thicker and harder. Unlike monkeys, mice do not appear able to reject bad nuts, but gnaw to the kernel before they discover that their trouble is in vain.

[2] *Zoologist*, April 1882, p. 121.

'The leaves of clover,' he says, 'and especially dandelion, were greatly relished, and for an unexpanded flower of dandelion nearly everything else would be deserted.' They also ate arbutus berries, gooseberries, apples, and grapes, but did not care for almonds. I have found them very destructive to young peas and beans, and they will eat the leaves of sweet peas with as much enjoyment as the sparrows do. Mr. Rope says they eat the berries of butcher's-broom and like carrots, which I can endorse. Those that I have kept in confinement were particularly fond of them, and voles prefer them to any other food. The bark of many shrubs and trees is eaten by these Mice, and Mr. Coward says that green holly twigs are often stripped by this acrobatic little climber.

Fatio[1] first mentions insects as forming part of their diet. Mr. Chas. Oldham and Mr. T. A. Coward have both written on the subject.[2] Mr. Coward says:

'The Wood Mouse is not solely a vegetable feeder; insects and molluscs are devoured, and in some cases the animal is practically insectivorous. In some old copper workings in the New Red Sandstone the sandy floors of the tunnels are covered with tracks left by their wee feet. For some time it puzzled my friend and me to tell what species inhabited these caves, but a little bread and aniseed settled the question, for few Mice can resist aniseed. We trapped a number of Wood Mice and dissected them at once. Apparently the Mice do not leave the tunnels, at any rate in winter, for in none of their stomachs did we find any trace of vegetable matter; instead they were crammed with the remains of a dipterous fly which swarms in the workings. This fly appears a dry and uninviting meal, but possibly the security of the caves is attractive to the Mice: here they are safe from owls and hawks, and weasels do not seem to have found them out, for we never came across the footmarks of the little mouse-killer. The Wood Mouse is nocturnal in its habits, so that the darkness of the caves would be no drawback.' And Mr. Oldham gives the names of the moths and flies on which the Wood Mice feed in the disused copper mines on Alderley Edge (November 1898): 'Besides two moths, *Gonoptera libatrix* and *Scotosia dubitata*, which are fairly abundant, a gnat (*Culex*), two flies (*Blepharoptera serrata* and *Borborus niger*), and possibly other insects hibernate in countless numbers on the roofs and walls of the tunnels. That the Mice frequent the place in order to feed upon the insects was clear from an examination of the stomachs of several which I trapped. Wings and empty skins of the gnat and flies, as well as legs of the moths, were easily identified in their half-digested contents.

[1] *Faune des Vertébrés de la Suisse.* [2] Oldham, *Zoologist*, September 1900, p. 421; Coward, *Scotsman*, June 24, 1902.

In some cases vegetable matter was present in addition, and, as the footprints were present from end to end of the tunnels, it appears that the Mice obtain part of their food in the woods; whilst the burrows in the tunnels themselves seem to indicate that they actually live in their recesses for the time being, and do not merely visit them to prey upon the insects they find there. Even in June there are flies in thousands on the walls of the tunnels; but during the summer months I have failed to trap any Mice, nor are there then any fresh tracks to be seen in the sand.'

The late Mr. Edwin Birchall has described[1] the number and variety of moths eaten by the Long-tailed Field Mouse. These consist of twenty different species. '*Xylophasia polyodon* (a few), *Charæas graminis* (a few), *Luperina testacea* (a few), *Agrotis suffusa* and *A. segetum* (abundantly), *Triphæna orbona* (abundantly), *Noctua glareosa* (abundantly), *N. festiva* and *N. xanthographa* (a few), *Orthosia macilenta* (in profusion), *Anchocelis rufina* and *A. litura* (several), *Cerastis vaccinii* (abundantly), *Xanthia ferruginea* (abundantly), *Miselia oxycanthæ* (one only), *Agriopis aprilina* (abundantly), *Phlogophora meticulosa* (a few), *Hadena glauca* (one only), *Plusia gamma* (in hundreds), and *Amphipyra tragopogonis* (one only).'

Wood Mice are said occasionally to catch young birds, and undoubtedly prey on their own species. It is a common thing to find the half-eaten remains of a Wood Mouse in a trap, and one suffering from the slightest injury is pretty sure to be devoured by its own kind.

In the winter months Wood Mice climb a good deal and attack the haws and hips,[2] the fruit of the wild rose, which they nip off and carry to the nearest thrush's or blackbird's nest; and this they use both as a refectory and a storehouse. I have seen a deserted blackbird's nest crammed full of hips and roofed over with moss, either carried up or taken from the outside of the nest itself. On this point Mr. Coward kindly sends me the following interesting note:

'In winter when the hedges were bare we have found scores of these nests crammed full of a mass of empty seeds and chewed red pulp discarded by the Mice. On this platform the Mouse devours its food, constantly adding to the pile of refuse, until at times the mass rises high above the edge of the nest. An old nest of a thrush or blackbird is most frequently selected, probably on account of its

[1] *Zoologist*, 1866, pp. 8, 9.

[2] Dormice, short-tailed field voles, bank voles, water voles, and brown rats will all eat hips and haws. See also Oldham, *Zoologist*, 1899, p. 27; and Coward, *ibid.* 1901, p. 221.













Wood. Mice.

From Photographs by Douglas English. 1846

roominess, but sometimes a hedge sparrow's, greenfinch's, or even whitethroat's deserted domicile is utilised. The hip is conveyed to the nest and the Mouse extracts the seeds, and then chisels off the end of each seed to get at the kernel. In order to ascertain what species was using these nests my friend Mr. C. Oldham placed traps in a large number, and succeeded in capturing several Wood Mice, but no other kind of mouse or vole was taken. One of the Mice was trapped in a greenfinch's nest seven feet above the ground. The stomachs of these Mice were full of a whitish mass of kernel, and only one contained fragments of the red pulp of the fruit. I have found husks and half-nibbled acorns in the nests, showing that the Mice carry food up from the ground; probably the nests make a safe dining-table. The weasel will not trouble to climb the hedge, and within the shelter of whitethorn, brier, and bramble the Mouse is secure from the sudden dash of a predatory bird. In these nests we have also found haws, the fruit of the whitethorn, the seeds of blackberry and holly, and the stones of the sloe or blackthorn, all with the kernel extracted through a neat hole chiselled by the Mouse's sharp incisors.' Little as this habit is known, Mary Howitt, in a poem on the Wood Mouse published in 1834, says:

In the hedge-sparrow's nest he sits,
When its summer brood is fled,
And picks the berries from the bough
Of the hawthorn overhead.

Mr. C. Oldham, in writing to Mr. L. Adams, says that it does not eat the pulp of the fruit of the wild rose, but the seeds which it contains: each tiny seed is nibbled through, about one-third of the length from one end, and the kernel extracted. The empty seeds may be seen among the red pulp in the nests. Wood Mice generally make their winter stores underground in their holes,[1] at the end of the tunnels, and I have found them in old tree-stumps as well as in deserted birds' nests. They will also frequent barns, outhouses, and stacks of manure, doubtless attracted by the warmth. Nests are made in such situations for use during winter, but large numbers of the Mice are abroad at all seasons and in all temperatures. The species does not hibernate. In summer they do not always place their nests underground, but often in a hedgebank only partially concealed. Sometimes they are placed high in old nests of birds, and Mr. Harting has one which was taken from the foundation of an old rook's nest in an elm tree of considerable elevation. A Lancashire observer

[1] These runs and holes in old hedgerows are sometimes, but not always, made by Wood Mice, for they are used indiscriminately by other mammals, such as common shrews and bank voles.

states that the nests of Field Mice are a great nuisance, for they get into the knives of the mowing machines and choke them.

The Wood Mouse is the most prolific of rodents. Females will breed at five months old, and where food is plentiful they will have two litters in thirty days. Experiments in breeding Wood Mice conducted by Mr. R. M. Barrington showed that one female Wood Mouse had no fewer than five litters between the beginning of March and the month of July. The interval between each family was on an average twenty-five days. He found that the gestation was generally about three weeks, and that the average number of young in the litter was four, five being the largest number. Fatio gives the number of young as four to six, and Bell says seven to ten—rather too high a computation, since there are but six mammæ. It would seem that more than one female and the successive families sometimes occupy the same hole, for Buffon gives an example where twenty-two were found in a single hole—two adult females and twenty young ones.

Gilbert White, Mr. Barrington, and Mr. Rope have all commented on the remarkable way in which the young, even when blind and naked, cling to the mother if she be suddenly surprised. The last-named writer says:

'The singular tenacity with which the young Mice cling to their dam when she is surprised and put to flight was, as far as I am aware, first observed—or at any rate recorded—by the Rev. Gilbert White, the instance on which his attention was drawn to this circumstance occurring during the removal of the lining of a hot-bed. He says: "From out of the side of this bed leaped an animal with great agility, that made a most grotesque figure; nor was it without great difficulty that it could be taken, when it proved to be a large white-bellied Field Mouse, with three or four young clinging to her teats by their mouths and feet. It was amazing that the desultory and rapid motions of this dam should not oblige her litter to quit their hold, especially when it appeared that they were so young as to be both naked and blind!" Fatio witnessed a similar occurrence. A female was ploughed out of the ground with young ones clinging to her, but not, as in the instance given by White, *to the teats*, but "accrochés par les pieds antérieurs et par les dents à sa queue et à ses poils."' As regards the manner of attachment Mr. Barrington's observations are in accordance with those of the author of the 'Natural History of Selborne'; for, after remarking that the mother seemed to have hardly any cessation of suckling, he says:[1]

'During April we had twelve to twenty Mice, young and old, in the nest:

[1] *Zoologist*, 1882, p. 122.

they all slept together, and it was certainly a curious sight to see fathers, mothers, and children of all ages and sizes in the nest, the young of different ages suckling the same mother at the same time, and the mothers appearing to suckle each other's young indiscriminately. They also seemed to have no cessation of suckling; but on this point I will not speak confidently. So fast did the young attach themselves that the females could scarcely move without pulling two or three after them.' The mothers carried their young by the side of the belly, but the well-grown young ones were dragged along. Mr. Barrington says that his pets were very timid and easily frightened, and those that I have kept possessed all the shyness and timidity of nocturnal animals: the slightest noise or movement is sufficient to send them scurrying to cover. *À propos* of their storing propensities, Mr. Barrington concludes his interesting notes by saying: 'Every corner of the cage was a storehouse; a grain of wheat or other food would be covered up with the nose after the manner of a dog burying a bone, and sometimes the hind legs would be used in scraping the floor of the cage backward to assist in heaping materials to hide it.'

This species swims very well. Two which I released in a lake 200 yards broad reached the shore without apparent fatigue.

The voice in anger is somewhat high-pitched,[1] but they make other sounds of a quiet, chuckling nature.

The mode of progression of Wood Mice is somewhat peculiar. When frightened they may be said to advance in a series of erratic bounds, the body being propelled by the hind legs. When in confinement one often sees them make a funny little series of short hops like a miniature kangaroo or jerboa; but their more leisurely movements are conducted on all fours by means of quick little runs from side to side or forward, punctuated with short stops. They are very busy, cheerful little creatures. Wood Mice make nice pets, being far more attractive than the white mice of the fancier's shop, which always seem to me to be detestable creatures owing to their offensive smell. They are very easy to keep and still easier to trap—in fact the easiest animal to trap with which I am acquainted.[2] Almost any bait will attract them. Bread, cheese, aniseed, and rabbit-liver are equally effective; and a Wood Mouse just caught is often eaten by its companions or by bank voles.

[1] *Zoologist*, June 1887, pp. 205, 206.

[2] 'To destroy Wood Mice search out their holes and put hemlock seed in them,' says G. Markham, *Farewell to Husbandry*, 1638, p. 93.

Wood Mice have many enemies, and it is fortunate for gardeners and agriculturists that this is so, or we should speedily have all our gardens[1] and crops devastated. The senseless slaughter of weasels is largely responsible for the great increase of Wood Mice in certain areas, for this Mouse is a favourite prey of the little mouse-hunter. Dogs, foxes, and stoats kill a certain number, and Mr. Lydekker says their nests are dug up by rooks and crows, whilst Mr. Trevor-Battye says that black-headed gulls kill them by dropping them on the ground from a height.[2] Domestic cats kill large numbers, and probably bank voles attack the young and clear off weaklings, for a bank vole captured in an open rat-cage with two Wood Mice quickly slew both his companions in misfortune and partially ate one of them. Perhaps the greatest enemy of the Wood Mouse in England is the white owl. In the analyses of a number of owls' pellets kindly sent to me by Mr. Lionel Adams remains of the Wood Mouse preponderate over all other species. Tawny and long-eared owls also kill large numbers. Take, for instance, the following:

'On April 23, 1892, at Huntley Wood, Cheadle, Staffs, Masefield and I gathered forty-four pellets of the tawny and long-eared owls, and the following is the analysis thereof:

Number of pellets	44
Mus sylvaticus	30
Evotomys glareolus	14
Microtus agrestis	1
Mus decumanus	3
Birds of finch tribe	3
Pellets of rabbits' fur	2
Sorex vulgaris	1

[1] Miss Jekyll, in her charming book *On Gardening*, 1899, p. 260, says: 'Field Mice are very troublesome. Some years they will nibble off the buds of the Lent hellebores, and have a curious way of collecting them and laying them in heaps. . . . They once stole all my auricula seed in the same way. The umbel-shaped heads were cut off at the top of the stalk and taken away whole. I found them under the bank at the back of the border piled in heaps as if stored for food.' The same writer testifies to their destructive attacks on newly sown peas and outdoor grapes. During the spring and summer of 1905 Wood Mice were very numerous and destructive in Sussex gardens. To give a list of the rock plants and flowers which they attacked would fill several pages, but it may be noted that the large sub-species *M. s. Wintoni* bit off large numbers of fresh shoots of the Crimson Rambler roses and destroyed two fig trees at Muntham, whilst in another garden (Sedgewick) no fewer than 1,300 were destroyed in six months.

[2] That the gulls drop them on the ground from a height I can well believe; but that they kill them in this manner I doubt. It is the practice of the black-headed gull to pick up young birds of other species and to mount into the air with them. Then it gives them a nip which fractures the skull and *afterwards* drops them. So too with mice. It is likely that the thrush kills a few Wood Mice, as I once saw one of these birds carrying a dead mouse to its young.

The stone curlew catches and devours numbers of these mice as well as of the common shrew. Moles and vipers also probably account for a few.

Considering the great abundance of the species, variations and albinos are extremely rare, and I have seen only two in private or public collections. Lord Clermont[1] says varieties of white, brown, and dull yellow occur, but that the belly is always white. An albino caught at Highwood, Middlesex, is recorded in the 'Field'[2] by H. F. de F. Cox, and another pure albino by A. H. Cocks in the 'Zoologist,'[3] which was found dead at Great Marlow, Bucks. Mr. Harting tells me that in May 1877 Mr. Borrer of Cowfold showed him a Mouse of this species which was perfectly black. I have been unable to trace this specimen. It was not to be found in the late Mr. Borrer's collection when it was recently dispersed. Mr. J. Whitaker informs me that he possesses a cream-coloured specimen.

[1] *Quadrupeds and Reptiles of Europe.* [2] January 18, 1873. [3] June 1884, p. 226.

THE COMMON MOUSE

Mus musculus, Linnæus.

Linn. 'Syst. Nat.' 12th ed. vol. i. p. 83 (1766); Bell, 'Brit. Quad.' 2nd ed. p. 297 (1874); Lydekker, 'Brit. Mam.' p. 188 (1895); Sir H. Johnston, 'Brit. Mam.' p. 242 (1903).

Local Names.—*Mouse*, *House Mouse* (England and Scotland); *Luch*, *Luchag* (Scotch Gaelic); *Llygoden fach* (Welsh).

Characters.—The House Mouse is slightly smaller than the wood mouse. The general colour above is greyish brown, whilst the under parts are pale brownish grey or pale grey. The average length of both males and females is: Head and body 80 to 90 mm.; tail 75 to 85 mm. The eyes and ears are considerably smaller than in the Wood Mouse, and the vibrissæ not quite so abundant; the tail is scaly and interspersed with fine hairs; the size and shape of the skull will be found in the photogravure plate. In nearly every large house frequented by the Common Mouse varieties of black, yellow, and white are found to occur sooner or later. I have in my own house at Horsham trapped two jet-black, one brown-and-black, one fawn-coloured, and one pure white example.

The Common Mouse possesses ten mammæ.

Considering the usual proneness towards variation in animals we should expect to find numerous sub-species of House Mouse inhabiting the isolated islands off the coasts of Wales, Scotland, and Ireland; but only one such sub-species has been described, namely *Mus musculus muralis* of St. Kilda, although the sandy-coloured House Mice, described by Mr. H. Lyster Jameson,[1] are, I think, almost entitled to sub-specific rank. Mr. W. Eagle Clarke calls them an incipient sub-species, or a sub-species in course of transition.

[1] *Jour. Linn. Soc. Zool.* xxvi. 1897, pp. 465–473.

SUB-SPECIES

The St. Kilda House Mouse

Mus musculus muralis,[1] G. E. H. Barrett-Hamilton.

The St. Kilda House Mouse resembles the common species in shape, but is more robust and larger in size. The upper surface is sepia-brown with a grizzled appearance, which is due to a large number of the hairs being tipped with rufous and not smoky brown, as in the common species. The colour of the under surface is buff, and this part is separated by a clearly defined line of demarcation. The skull is characterised by the exaggerated narrowness of the posterior opening of the nostrils.

In 1895 Mr. H. Lyster Jameson discovered a colony of Mice inhabiting the North Bull, a tract of sand dunes in Dublin Bay, isolated at high water. These Mice had begun to harmonise with their sandy surroundings. Thirty-six specimens were procured, and a large proportion were found to be only pale examples of *Mus musculus*. Others showed every gradation between these and the lightest type, which had yellowish white ventral and pale dorsal surface. In the majority of the specimens the ventral surface was pale buff or yellowish-white. These mice are of special interest, as they show how a sub-species is created. It seems that less than a century has elapsed since the variation has been evolved, for the sand-bank is of recent origin.

Mr. W. E. Clarke has recently described the House Mouse of the Faroe Islands as a new sub-species, *Mus musculus færoensis*. It is robust in form and intermediate in colour between the St. Kilda Mouse and the Common House Mouse.

Distribution.—Palæontologists are uncertain as to the original home of the House Mouse, for, although it has now an almost cosmopolitan range, with the exception of the Arctic and Antarctic regions,[2] the part of the globe from which it emerged is still doubtful.

Its earliest remains in this country have been assigned to the Pleistocene age from remains found in caves and in the Thames Valley deposits; but, as Mr. Lydekker has noted, the identification is doubtful. Without doubt this Mouse

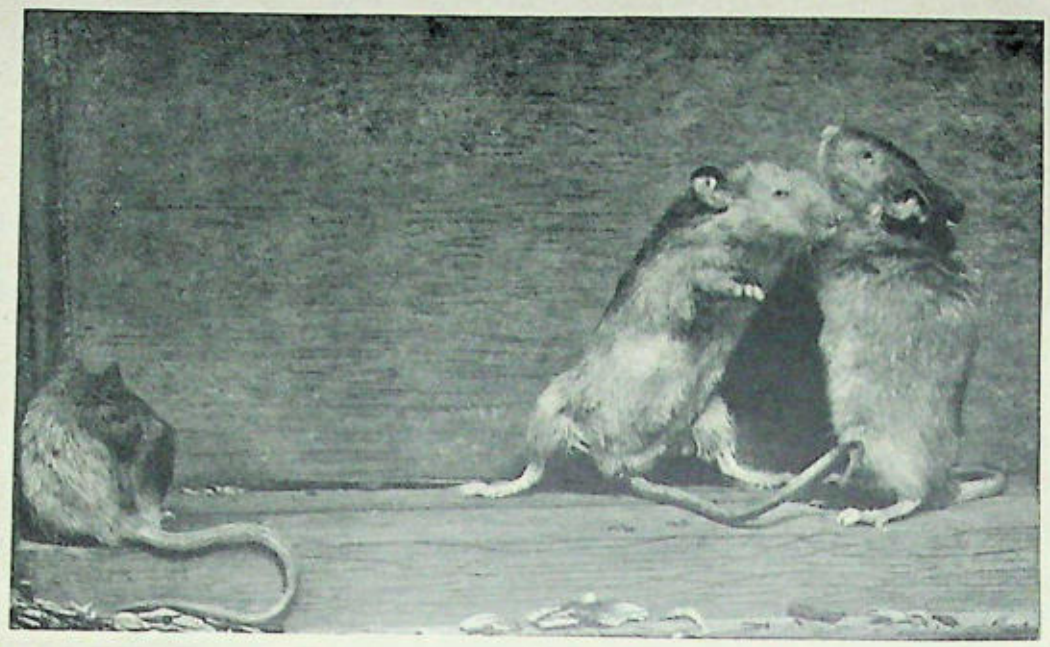
[1] 'Sub-species of the Genus *Mus* inhabiting St. Kilda,' *Proc. Zool. Soc.* 1899, pp. 77–88.

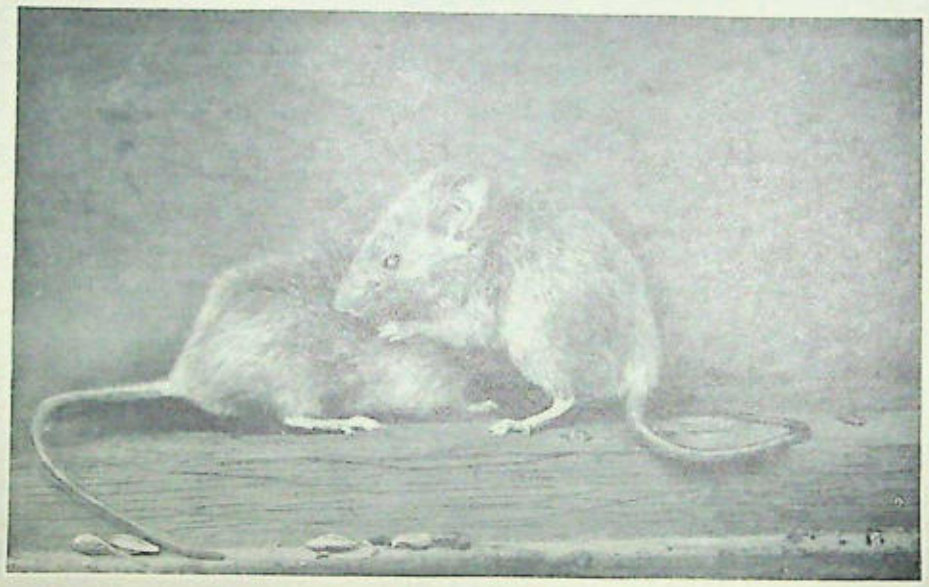
[2] The Common Mouse has not yet established itself in Iceland, although it has done so at the Cape and Tierra del Fuego, and a number of the Polynesian islands. It is also absent from the African forest regions, the Sahara Desert, and the north-western provinces of India.

follows man wherever he goes and takes up his abode, and so its distribution has been accomplished coincidently with the human race.

Habits.—It would be a work of supererogation to say more than a few words as to the habits of this well-known animal. Its principal habitat is of course houses, but at certain seasons it repairs to the fields, notably to the corn-fields in autumn, and later to the stacks. I have noticed this to be especially the case in the outer islands of Scotland—in Shetland and Orkney in particular, where the House Mouse seems to emigrate to the oats and bere at harvest time. Though not of much interest to the general observer, many a wretched convict or dweller in the slums has derived infinite enjoyment from the friendly visits of these little creatures, and looked forward to their coming with as much pleasure as the more fortunate dweller in the country does to seeing the larger mammals. For their general habits I must in this case fall back on a stock quotation, MacGillivray's excellent description of the species:

'It is pleasant to sit quietly at midnight watching one which has ventured from its retreat and stolen to the hearth in quest of crumbs. It glides along now slowly, now by sudden starts, and on finding some fragment of food sits on its haunches, lays hold of it in its forefeet, and, raising it up, nibbles it, or, if apprehensive of danger, runs off with it to its hole. Although extremely timid Mice sometimes exhibit considerable boldness, and venture quite close to a person who does not molest them. Their agility is astonishing, and to escape when pursued they perform extraordinary feats. I have seen one leap from the top of a staircase upon a table, a distance of twelve feet, apparently without receiving any injury. If seized in the hand they bite severely, but if caught by the tail and thus suspended are unable to turn upon their persecutor. Although when in small numbers they are scarcely injurious to a house, yet, owing to their fecundity they soon become very destructive, devouring meal, flour, bread, cheese, butter, tallow, in short, almost every article of food that comes in their way, and often gnawing clothes, leather, and furniture. Their great enemy, the cat, is not always able to extirpate them, so that the additional aid of traps and poison is required. The ravages of this species are not confined to houses, for it often betakes itself to the fields and nestles in the corn-stacks, which are found towards the base traversed by its tortuous runs. The ground beneath is also filled with them, and on removing a stack numbers almost incredible are often met with. Besides man and his allies the cat, the dog, and the ferret, the Mouse has many powerful enemies, all of which, however, are unable to extirpate it, for it litters many







HOUSE MICE.

From photographs by D. English, F.R.P.S.

times in the year, producing from five to seven at a birth, and thus in favourable localities soon increases to a great extent.'

The nest is composed of any soft material gnawed into very fine fragments. Wool, linen, straw, hay, or paper is utilised, and one pair of Mice showed such an appreciation of the manuscript of 'A Breath from the Veldt' that they made a very comfortable nest out of the second chapter. Almost any place and material may be chosen. I have seen a nest made in a box of choice Havana cigars out of its contents, the yellow ribbons being carefully utilised to hold the fabric together.[1] Female Mice breed before they are one year old, and have four or five litters in the course of twelve months. If food is plentiful they will, like rats, breed all the year round. The gestation is similar to that of the Wood Mouse, namely, three weeks.

The House Mouse is omnivorous:[2] nothing seems to come amiss to it. It will nibble at gummed paper, and showed a fondness for the old red postage stamps, which, many of us will remember, were provided with a good thick layer of gum. It will experiment on woodwork, but not necessarily to obtain food, for all rodents delight to gnaw something. A writer in the 'Field' for August 22, 1896, pointed out that it will eat moths, and Mr. T. A. Coward tells me of his experiences of Mice and moths. He had noticed that when sitting in the summer evening with the window open many moths scorched themselves in the light of the lamp or gas, and fell to the floor, but that next morning only the wings of these corpses remained. One night he decided to watch, and also set traps. He had not been seated in his chair long before a trap, not twelve inches away, was sprung, and he afterwards captured several others. The Mice came for the moths, devoured the bodies, and left the wings.

The Common Mouse utters a variety of squeaks, and Mr. Lydekker says that 'Singing Mice' can run up an octave and end with a decided attempt at a trill. I have never heard of Mice in a wild state attempting such ambitious music, but these 'Singing Mice' are well known, and Sir Harry Johnston[3] says: 'The singing of these Mice resembled the chirping, quavering notes of a young cock canary who is beginning to experiment with his voice.' There are, too, the phenomenal 'Waltzing Mice,' which will run for hours in a

[1] The nest has been found in a loaf of bread and in a tin of gunpowder (*Field*, June 16, 1894).

[2] Mice are fond of entering beehives in the winter. Here, if once established, they do much mischief by devouring the pollen which the bees have stored as the chief food of the larvæ. They will also eat honey and the bees themselves.

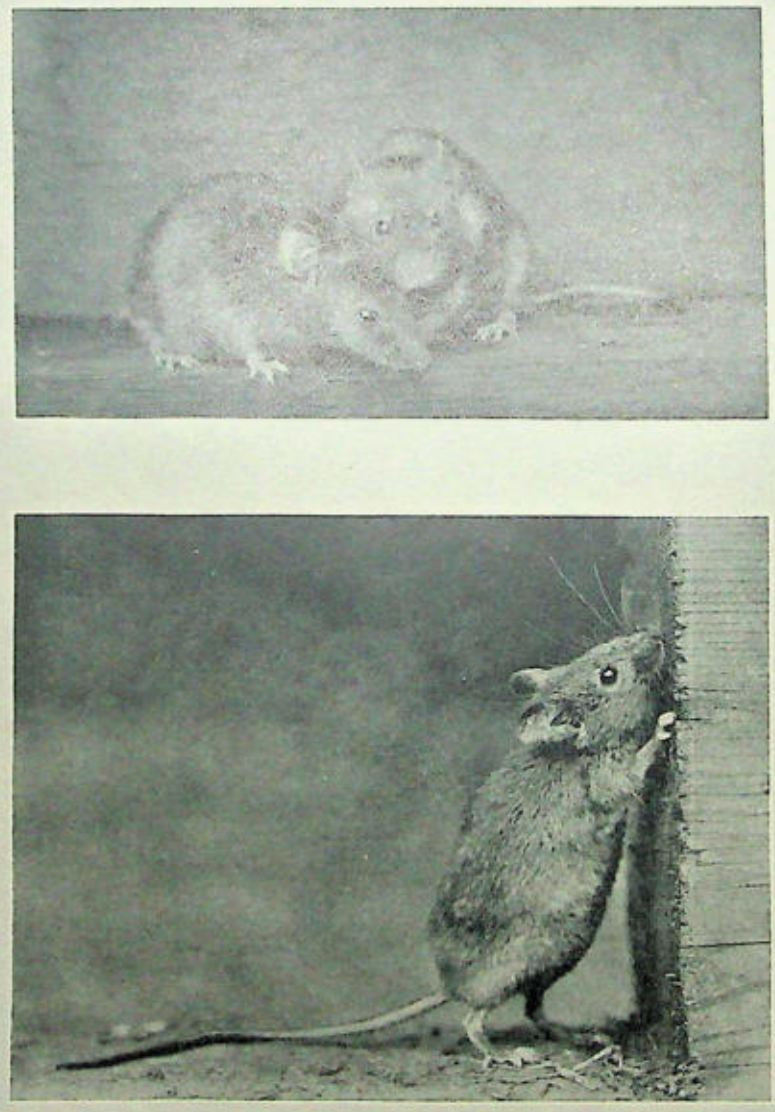
[3] *British Mammals*, p. 243.

circle.[1] Hairless varieties of the Common Mouse have several times been reported.

As a result of Mr. Darbishire's experiments at Oxford on the breeding of domesticated Mice, it was found that in mating an ordinary coloured Mouse with one of the albino race, the result was grey or white offspring, whilst two white Mice bred true. Mr. Bateson, in lecturing before the Zoological Society, May 26, 1903, said he could not account for the varied coloration of fancy Mice, such as the black, yellow, fawn, or pale blue-grey forms, and was inclined to think that a strain of Field Mouse had been introduced. This view is, however, obviously incorrect, and shows how useless experiments are which only go superficially into the matter. Melanism in the Common Mouse in a wild state is very common, and Mr. Bateson must have been unaware of the North Bull yellow Mice which occur in the wild state, and show no cranial affinities to *Mus sylvaticus*. The St. Kilda House Mouse, too, has a buff under surface, and yellow House Mice are common.

[1] The habit is doubtless due to a cerebral affection which can be perpetuated.





HOUSE MICE IN MOVEMENT.

From photographs by D. ENGLISH, F.R.P.S.

THE BLACK RAT

Mus rattus, Linnæus.

Mus rattus, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 83 (1766); Bell, 'Brit. Quad.' 2nd ed. p. 302 (1874); Blanford, 'Mam. Brit. India,' p. 406 (1891); Lydekker, 'Brit. Mam.' p. 191 (1895); Sir H. Johnston, 'Brit. Mam.' p. 241 (1903); Thomas, 'Zool.' 4th ser. vol. ii. p. 100 (1898).
Mus alexandrinus, Geoffroy, 'Descr. de l'Egypte,' vol. ii. p. 753 (1812); Thomas, 'Proc. Zool. Soc.' p. 533 (1881).
Mus rufescens, Gray, 'Mag. Nat. Hist.' vol. i. p. 585 (1837).
Mus nitidus, Gray, 'Ann. Mag. Nat. Hist.' vol. xv. p. 267 (1845).
Mus rattus alexandrinus, Millais, 'Zool.' 4th ser. vol. ix. June 1905, pp. 201–207.
Mus rattus rattus, Millais, 'Zool.' 4th ser. vol. ix. June 1905, pp. 201–207.
Mus rattus ater, Millais, 'Zool.' 4th ser. vol. ix. June 1905, pp. 201–207.

Local Names.—*Black Rat, Old English Black Rat, Alexandrine Rat* (English); *Black Ratton, Blue Rat* (Scottish); *Rodan-dubh, Radan-dubh* (Scotch Gaelic); *Llygoden ffreinig or Llygoden ffrengig* ('French' Mouse) (Welsh).

Characters.—The 'Black' Rat is not so stoutly built as the Brown Rat, and it has a proportionally longer tail and larger ears. The tail is generally, but not always, longer than the head and body, and the ears are about half the length of the head. Mammæ ten or twelve.

Three well-marked races of the so-called 'Black' Rat exist in our islands, and the fact that all interbreed freely[1] has led to some confusion among naturalists, who, perhaps, have only had the opportunity of handling a few specimens. I have examined a very large series of the species taken in different localities within the past fifty years, and consider that there are three distinct races, namely, the Alexandrine Rat, the Northern Alexandrine Rat, *i.e.* the misnamed Old English 'Black' Rat, and the Black Alexandrine Rat. The first named is undoubtedly the true species of which the two last named are sub-specific races.

[1] M. de l'Isle made experiments with interbreeding, and concluded that *M. rattus* and *M. alexandrinus* were geographical races of the same species, and that *M. alexandrinus* was the older and parent form (*Ann. Sci. Nat.* 1865, pp. 173–222).

Owing to the general confusion which has long existed in zoological nomenclature, the necessity for adopting some fixed rule for future guidance has gradually been forced upon us, and now I think that by far the greater majority of working naturalists are agreed that we must follow the law of priority. Whether a species is well or badly named, it is best to adopt such a system for the purpose of eventual uniformity; and though it is easy to find faults—and there are many glaring ones in this method—the general acclamation of the method would more than counterbalance its evident weaknesses in minor details. A recent report (1905) of a committee appointed by the Zoological Congress (1895) to inquire into the desirability of its adoption unanimously voted in its favour, and all zoologists who wish to be in accord with their fellow workers will do well to accept this dictum.

Of course there are dissentients—there always will be to every innovation. They will point to the case of the South African eland of the Kalahari, a stripeless animal, which is evidently a local race that by living under different surroundings has lost the stripes that belong to the parent forms of the north. Yet this southern eland was the first described, and must stand as the type, of which more recent discoveries are only sub-species. Other such instances of errors which we must accept by the adoption of the priority system could easily be noticed, and none, to my mind, is more glaring than that of *Mus rattus*.

The present case, that of retaining Linnæus' specific name for what is undoubtedly only a sub-species, is one of those errors which make a writer feel that he is only perpetuating a clerical error by using it. In self-defence it is therefore necessary to explain one's position. A name—a scientific name—should be descriptive, or, if the animal be a local form, it should be designated by the name of the locality in Latin. But how often is this the case?

Mus alexandrinus of Geoffroy is the Eastern and, according to the best evidence, the parent form of a Rat which reached Scandinavia from the East at a remote period. Here it became locally altered in colour, and Linnæus, having only this altered form or sub-species available, described it[1] prior to the time when Geoffroy wrote his description of *Mus alexandrinus*.[2] We are therefore bound to adopt the name of *Mus rattus*, as given by Linnæus, for the whole species. But we are not necessarily bound to adopt this name for the parent form, which practically ranks as a species.

[1] *Syst. Nat.* 12th ed. vol. i. p. 83 (1766).

[2] *Descr. de l'Egypte*, vol. ii. p. 753 (1812).



Litho. W. Greve, Berlin

THE NORTHERN ALEXANDRINE RAT.
Mus rattus rattus

THE ALEXANDRINE RAT.
Mus rattus alexandrinus.

SUB-SPECIES I

The Alexandrine Rat

Mus rattus alexandrinus.

The colour on the upper surface of this race is very similar to that of *Mus decumanus* (the Brown Rat), yellowish brown, intermixed with black hairs. The black hairs predominate, and are longest over the thighs and rump. The ventral surface, breast, throat, lower lip, and edges of the limbs are yellowish white. The upper part of the fore legs and along the line of demarcation between the two surfaces is pure grey. Compared with *Mus rattus ater*, the coat seems somewhat sparse. Tail long and furnished with rings of scales and covered with short black lines. Ears large, naked, and well rounded; vibrissæ long and black. Soles naked and yellowish.

Measurements of an adult male from Yarmouth: Head and body 9 in.; tail 7½ in. (generally thicker at the base, and shorter than in the other sub-species); hind foot 35 mm.

This is apparently a recent arrival in England; the true type as described above appears to have reached both Scotland and Ireland. It is most commonly found inhabiting the coast ports on the east and south of England, and is very numerous on board ships trading in Southern Europe. Of its original home we are uncertain, but the supposition that it is an Eastern form is probably well founded.

SUB-SPECIES II

The Northern Alexandrine Rat

Mus rattus rattus

This, the most common type, has always been known as the 'Old English' Black Rat. Early in the last century it was abundant nearly all over the United Kingdom, but is now becoming scarce and very local. It has been erroneously called the indigenous type, but there is little doubt that it arrived from the East, probably from Western or Central Asia (possibly Western Mongolia) by way of Russia and Germany, or on board ships from the Black Sea ports.

In colour the name 'Black' Rat is a misnomer for this northern race, as it is not properly speaking black.[1] The upper surface is greyish black, interspersed (behind the shoulders) with glossy white hairs, and the whole upper and lower parts have a blue-grey or purple in them when viewed in the light. The under fur, which is sparse, is pure grey. The ventral surface and limbs are slaty grey.

[1] Linnæus did not call it black: he speaks of it as 'corpore fusco,' and otherwise refers to its dusky colour. Pennant probably gave the superficial name of 'Black,' which has remained ever since. 'Blue' would have been more appropriate.

These slate-coloured hairs become thin on the upper surface of the feet and toes; the soles are naked and yellowish; the toes small and bone-coloured. The tail is ornamented with scales which form rings from root to end, and is covered with short black hairs; the ears are large, naked, and well rounded; the eyes black and prominent; the vibrissæ fairly numerous, long, and black in colour. Average length of head and body 7 in. A very large male from Yarmouth now before me measures 8½ in.; tail 9 in.; hind foot 35 mm.

SUB-SPECIES III

THE BLACK ALEXANDRINE RAT, sub-sp. n.

Mus rattus ater.

This well-marked race, which is a very recent arrival on our shores, deserves some such title as has been suggested by Mr. O. Thomas, for it is now a well-marked race, and occurs by itself in several places where the *M. r. alexandrinus* and true *M. r. rattus* are apparently unknown.

The whole of the upper parts of this variety are glossy black, which in bright light has a curious green sheen, and the pelage deeper and richer than in the two other races; the minor and terminal portion of these hairs is jet black, and the major or hidden portion is white or grey; the lower parts dusky grey. Ears, vibrissæ, feet, and measurements identical with those of the last-named sub-species. Tail not so thick at the base as in *M. r. alexandrinus*, and slightly longer.

The Black Alexandrine Rat is a native of the Black Sea ports, although its original home is like that of the other races unknown. Its habits are similar, and it is a great traveller on board the grain ships, and has doubtless reached many out-of-the-way places of which at present we are ignorant. I saw what I believe to be a Rat of this sub-species lying dead in a Kaffir village about fifty miles north of Pretoria, and was informed that they were common there, and that the 'Blue' variety was not known. These Rats had doubtless worked their way up from Johannesburg *via* Delagoa Bay. It is, I believe, also found in several of the North African seaports. I first heard of this race as an inhabitant of London in 1900, but it was not until 1904 that I obtained two fine specimens from Messrs. Courage & Co.'s brewery, Horselydown, London, S.E., where they have been found in company with both *M. r. alexandrinus* and *M. r. rattus*. Mr. Douglas English, whose excellent photographs of the animal accompany this article, has also known them for some time, and has kept several in captivity, which he has kindly sent me for examination. These, too, were taken in London, and so far I have not



Litho. W. Greve, Berlin.

THE BLACK ALEXANDRINE RAT

Mus rattus ater.

These slate-coloured hairs become thin on the upper surface of the feet and toes; the soles are naked and yellowish; the toes small and bone-coloured. The tail is ornamented with scales which form rings from root to end, and is covered with short black hairs; the ears are large, naked, and well rounded; the eyes black and prominent; the vibrissæ fairly numerous, long, and black in colour. Average length of head and body 7 in. A very large male from Yarmouth now before me measures 8½ in.; tail 9 in.; hind foot 35 mm.

SUB-SPECIES III

THE BLACK ALEXANDRINE RAT, sub-sp. n.

Mus rattus ater.

This well-marked race, which is a very recent arrival on our shores, deserves some such title as has been suggested by Mr. O. Thomas, for it is now a well-marked race, and occurs by itself in several places where the *M. r. alexandrinus* and true *M. r. rattus* are apparently unknown.

The whole of the upper parts of this variety are glossy black, which in bright light has a curious green sheen, and the pelage deeper and richer than in the two other races; the minor and terminal portion of these hairs is jet black, and the major or hidden portion is white or grey; the lower parts dusky grey. Ears, vibrissæ, feet, and measurements identical with those of the last-named sub-species. Tail not so thick at the base as in *M. r. alexandrinus*, and slightly longer.

The Black Alexandrine Rat is a native of the Black Sea ports, although its original home is like that of the other races unknown. Its habits are similar, and it is a great traveller on board the grain ships, and has doubtless reached many out-of-the-way places of which at present we are ignorant. I saw what I believe to be a Rat of this sub-species lying dead in a Kaffir village about fifty miles north of Pretoria, and was informed that they were common there, and that the 'Blue' variety was not known. These Rats had doubtless worked their way up from Johannesburg *via* Delagoa Bay. It is, I believe, also found in several of the North African seaports. I first heard of this race as an inhabitant of London in 1900, but it was not until 1904 that I obtained two fine specimens from Messrs. Courage & Co.'s brewery, Horselydown, London, S.E., where they have been found in company with both *M. r. alexandrinus* and *M. r. rattus*. Mr. Douglas English, whose excellent photographs of the animal accompany this article, has also known them for some time, and has kept several in captivity, which he has kindly sent me for examination. These, too, were taken in London, and so far I have not

heard of it in any other British seaport. After examining over one hundred specimens of 'Old English Black' Rats—that is, old examples that have been killed in inland places during the past fifty years, and were undoubtedly examples of the race that is now nearly extinct—I have not found one that was black like the present sub-species, and have only found hybrids between the two in London, where the black race exists.

All the three above-mentioned races are sometimes found frequenting the same town, and, as previously stated, will breed freely with one another, and prove their original identity. Thus we often see in a collection of specimens Rats of this species presenting every intermixed condition of fur which may occur between the very black form and the pale white-bellied one. Black Rats with white chests, paws, and sometimes whitish whiskers are common, as well as yellowish-brown examples with blue-grey under surfaces. This is most noticeable in London, where the docks are constantly receiving fresh supplies of the different sub-species from the East, which make their homes about the Docks, Ratcliffe Highway, and Thames Street. I have examined every type from this one district of our metropolis.

I think that this species may very occasionally interbreed with *M. decumanus*, but I have never seen an example, nor has Mr. Douglas English, who has long kept both species, succeeded in obtaining a cross. Melanic varieties of *M. decumanus* and variations of the present species are constantly described as such hybrids.

The scientific reader may question the necessity of describing the foregoing as new sub-species without according similar sub-specific rank to the partially melanic variety of *Mus decumanus*, for some time known as *M. hibernicus*. The answer to this is that the dark form of the last named is not constant, nor has it developed into a sufficiently extensive race, inhabiting a certain area, of which we can take notice. After all, the difference between a variety and a sub-species is a most difficult one to describe. All sub-species have their commencement in a slight variation from the normal type, which is altered and developed according to circumstances and local environment. When that variation is small and sporadic in distribution it is called a variety, but if a variation becomes well marked and constant, and its members dominate a district, island, or area of land, as in the various races of *Mus rattus*, I think we are entitled to name its members as belonging to a sub-species.

Possessing such a very wide geographical range we are not surprised to find various well-marked local races in different parts of the world. Thus *alexandrinus*

is found all over the seaports of Southern Europe and North Africa, Egypt, Palestine, Asia Minor, and Gilgit. A smaller variety known as the Tree Rat (*Mus rufescens*) inhabits India, Ceylon, and Burma. The black variety (*M. r. niger*) is known in the Black Sea ports, the Crimea, Asia Minor, North, South, Central, and East Africa, but not in the forest regions. I have seen it in the Transvaal, where it is the only variety.

In Sikkim and Nepaul there is a short-tailed form known as the Hill Rat (*Mus nitidus*), and in the Andaman Islands there is a curious variety with spines in the fur (*Mus andamanensis*) which Mr. O. Thomas considers specifically identical with *M. rattus*.

The following measurements, in inches, of the three races have been taken (in the flesh) by Mr. Lionel Adams and myself:

Sub-specific Race	Sex	Head and Body	Tail	Ear	Vibrissæ	Back Hairs	Weight in oz.	Locality
1. *M. r. alexandrinus*	♂	9	7½	1	2¾	1½	—	Yarmouth.
2. ,,	♂	6¾	—	—	2	1½	4	Woolwich.
3. ,,	♂	7	—	1	2¾	1¾	5	,,
4. ,,	♂	8½	7½	¾	2½	1½	8	,,
5. ,,	♀	8	7¾	¾	1¾	1	6¼	,,
6. ,,	♀	6⅝	7⅝	⅞	2	1⅛	3½	,,
7. ,,	♀	7⅝	8½	⅞	2⅝	1	5½	,,
8. ,,	♀	—	8⅛	—	2	1¼	5	,,
9. *M. r. rattus* . .	♂	7½	8½	1	2	1¼	4¾	,,
10. ,,	♂	7½	7¾	1	2	1¼	3¾	,,
11. ,,	♀	—	8⅛	—	2	1¼	5	,,
12. ,,	♀	7½	9	1	2½	1	5¼	,,
13. *M. r. ater* (type) .	♂	9¼	9¼	1	2¾	1¾	—	London, S.E.
14. ,,	♂	7¾	8¾	1	2	1¾	—	,,
15. ,,	♂	8½	8¾	1	2	1¾	—	,,
16. ,,	♀	7¾	8¾	1	2	1¾	—	,,
17. ,,	♀	8¾	broken	1	2¾	1¾	—	,,

The hind foot is generally 1½ in. The skulls and teeth are similar, and have been described too often to require explanation.

Distribution.—The typical variety of the 'Old English' Black Rat is found over the greater part of Europe as far south as Northern Italy, in the southern part of which the Alexandrine form takes its place. In Sweden it is now scarce, and does not occur in Lapland or Iceland. On the Continent it is generally distributed, but is scarce and local in France, Germany, and Thuringia, as well as in the Caucasus, Georgia, and the Caspian provinces. It is also found in Spain, Portugal, and the Azores. It has been taken by ships to the Cape, India, the Philippines, and New Zealand, and is said to have been introduced into the New World about 1554, where it is found both in North and South America, as well as the West Indies.

In North Africa it is well known, as well as in the Nile Valley. It frequents the Isle of Bourbon, where it is said to have been introduced by the Buccaneers in 1548. Mr. E. L. Layard has recorded it from the island of Ascension.

Some authorities think that the Black Rat was introduced into England as early as the time of the Norman Conquest, but there is no mention of it in English literature previous to the fourteenth century,[1] and the actual date of its arrival is veiled in obscurity. Its remains are unknown either in Pleistocene or recent deposits, so that it must be, comparatively speaking, a late arrival in this country.

There has been constant confusion between *Mus hibernicus* and *Mus rattus*, so that we must look with suspicion upon all records where the specimens were not examined by a competent authority. It has not been possible to trace all the recorded specimens, for many of them are non-existent; but the majority of the following occurrences are founded on a reliable basis. It is of course just as likely that many brown Black Rats have been neglected as that black Brown Rats have been recorded as *Mus rattus*.

The British distribution of this mammal has been well worked out by Mr. Harting, who summarised all that was known up to date (1883);[2] a good many fresh localities have been added since his essay was written, and the Black Rat,

[1] In the *Vision of Piers Plowman*, written by William Langland, *circa* 1362, we have several references to 'ratouns.' He speaks of 'route of ratones and smale mys mo than a thousande,' and refers in other places to 'ratounes.' These, however, may not have been *M. rattus*. But there are even earlier references to Rats, for we cannot think that any other animal is meant, in the writings of Giraldus Cambrensis (twelfth century). He records how, in the sixth century, St. Yvorus cursed the Rats and expelled them from a province of Leinster, probably because they had gnawed his books, and, to quote from Sir Richard Colt Hoare's translation, 'none were afterwards bred there, or could exist if they were introduced.' Elsewhere he tells of a man in Wales who was persecuted by Rats, 'the larger species of mice, commonly called Rats.'

[2] *Essays on Sport and Natural History*, pp. 156, 170.

whilst it has become extinct in many of its old haunts, has found refuge in a few new ones.

From all the interior parts of Great Britain it has practically vanished, but it may be said still to exist, in sporadic instances, in the coast towns and northern islands, owing its reintroduction to the arrival of foreign ships, which either replenish the vanishing stock or add new localities to its habitat. The decrease of this species, which seems directly due to the attacks of the Brown Rat, was noticed soon after the advent of the stronger animal.

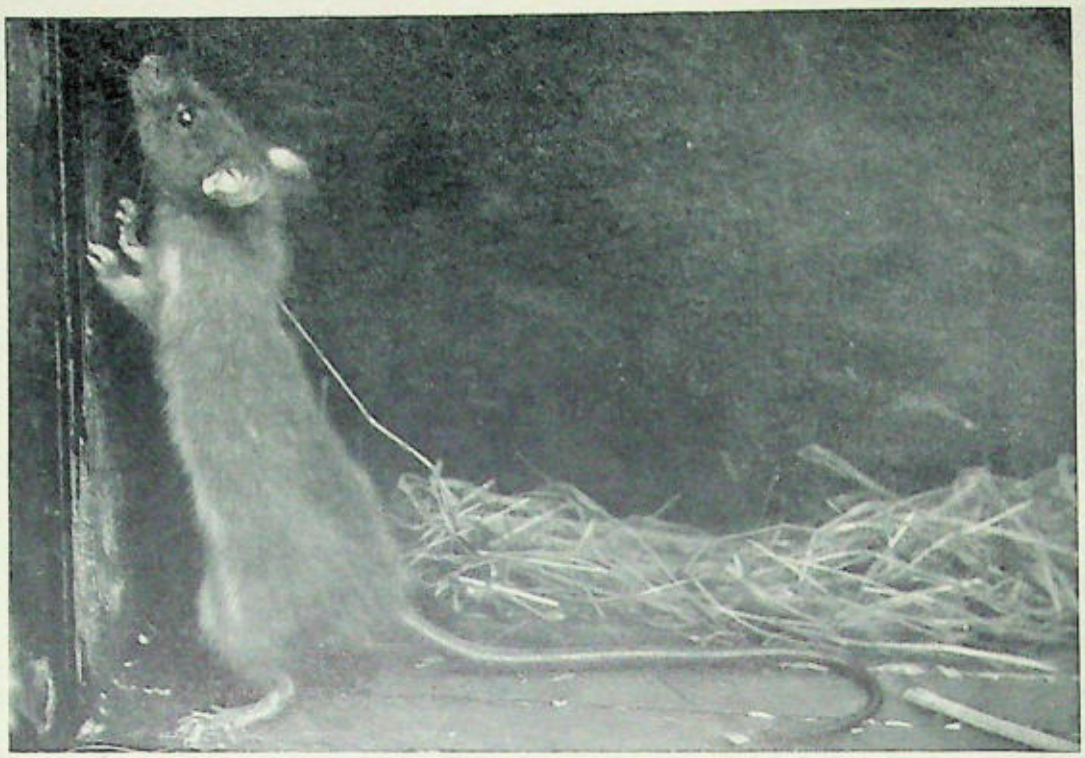
An interesting notice of Black Rats is given in 'The Universal Directory for taking alive and destroying Rats &c.' by Robert Smith, Rat-catcher to the Princess Amelia[1] (1768). In this the royal Rat-catcher of that time relates the animosity displayed by the Brown Rat to his weaker cousin. 'The black ones,' he says, 'do not burrow, and run into shores, as the others do, but chiefly lie in the ceilings and wainscots in behind the rafters, and run about the side-plates; but their numbers are greatly diminished to what they were formerly, not many of them being left, for the Norway Rats always drive them out and kill them whenever they can come at them; as a proof of which I was once exercising my employment at a gentleman's house, and when the night came that I appointed to catch, I set all my traps going as usual, and in the lower part of the house in the cellars I caught the Norway Rats, but in the upper part of the house I took nothing but Black Rats. I then put them together into a great cage to keep them alive till the morning, that the gentleman might see them, when the Norway Rats killed the Black Rats immediately, and devoured them in my presence.'[2]

Bell thinks it probable that from the proximity of the two countries the Black Rat was introduced into England from France, and some support to this statement may be found in the Welsh name for the animal, *Llygoden ffreinig* or *Llygoden ffrengig*, which means the 'French Mouse.'

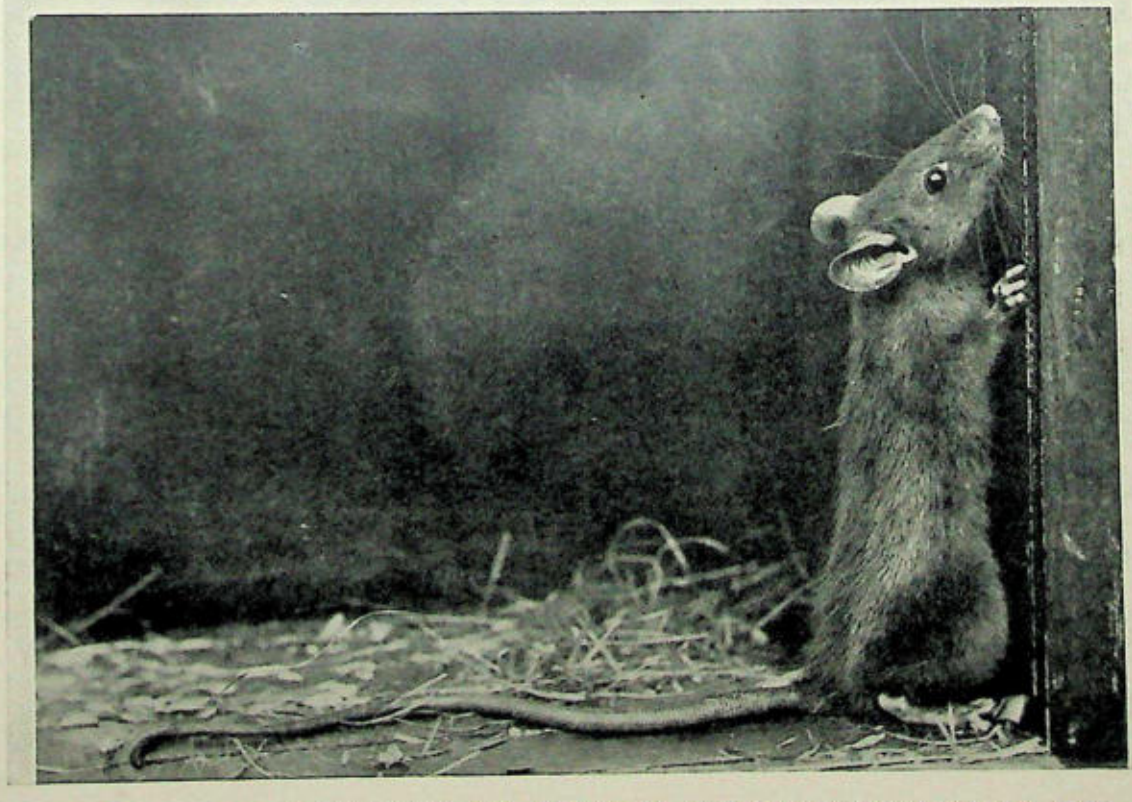
Over the whole of the interior of England the 'Old English' Black Rat may be said to be extinct in the broad sense of the word. Here and there a poor

[1] Pennant in his *British Zoology* (1812) gives the following description of the dress of the Royal Rat-catcher (vol. i. p. 142): 'Among other officers, his British Majesty has a Rat-catcher, distinguished by a particular dress, scarlet, embroidered with yellow worsted, on which are figures of mice destroying wheat sheaves.'

[2] Instances of Brown and Black Rats living in the same house or ship are almost too numerous to mention, though we may cite the recorded examples of H.M.S. *Valorous* at Devonport, August 1879, which was found to be infested with both species; H.M.S. *Victor Emanuel*, in 1874; H.M.S. *Valiant*, in 1878. It is possible that the variety of Brown Rat which generally infests ships, and is altogether a smaller and less aggressive animal than its land relative, may not be sufficiently strong to overcome and destroy the Black Rat.







THE NORTHERN ALEXANDRINE RAT, KNOWN AS THE OLD ENGLISH 'BLACK' RAT.
THE ALEXANDRINE RAT (UNDER PARTS WHITE).
THE NORTHERN ALEXANDRINE RAT.

From photographs by D. ENGLISH, F.R.P.S.

straggler is killed in some barn or house from which the species has long since been supposed to have vanished, and Mr. Harting[1] and others writing in natural history papers have the melancholy satisfaction of recording 'last instances.'

In Sussex the late Mr. Borrer never succeeded in securing an example from the county, although he possessed specimens from Portsmouth and Cambridge. Mr. R. M. Christy, however, reports 'having found a Black Rat lying dead on the mud at Shoreham Harbour in April 1880, and two months later another under similar circumstances nearer to Brighton.'[2] Examples of the form known as *M. alexandrinus* are sometimes caught about Shoreham. Two were captured in 1898, and are in the possession of Mr. Daniel Francis. These doubtless came recently on ships. In Somerset the Rev. Murray Matthew records an example[3] killed in 1877 at Bishop's Lydeard; in that county and in Devon Mr. Brooking Rowe[4] says that it is 'found occasionally,' and has heard of both the Brown and the Black Rat under one roof at Plymouth. Mr. Harting says 'half a dozen were caught in Mr. Slade's warehouse at Torquay in 1879,' and according to Mr. D'Urban the species was still to be met with near Exeter in 1875. There are two recent records[5] from Cornwall.

The Black Rat is numerous in Jersey, Guernsey, and Sark. In Sark, says Mr. Harting, 'both Black and Brown Rats coexist in the same territory, though not quite the same haunts, the latter preferring old buildings; while in the little island called Ile des Marchands, separated from the larger island of Sark by a deep though narrow strait about a hundred and fifty yards in width, the Black Rat lives undisturbed.'

In London the two species of Rats have always frequented the Zoological Gardens in Regent's Park, and I have myself seen the 'Black' Rat twice in the antelope house. Mr. de Winton tells me they are always there, and one day in 1903 when trying to procure a specimen for me, he saw a 'Black' Rat *chasing a Brown one*, and shot the less interesting animal of the two.[6]

The Docks, St. George's East, and the streets of this neighbourhood in the East of London have always been a favourite resort of the Black Rat, and I have recently received all three varieties of the species from this district. The very black race figured by Mr. Thorburn were captured at Messrs. Courage

[1] *Essays on Sport and Natural History*, by J. E. Harting, pp. 156, 170.
[2] *Essays on Sport and Natural History*, p. 161.
[3] *Zoologist*, September 1877.
[4] *Catalogue of the Mammals of Devon.*
[5] *Zoologist*, 1878, p. 388; *ibid.* 1889, p. 434.
[6] Mr. Bartlett was of opinion that the Black Rats were introduced in the bundles of bananas which were obtained as food for many of the animals. In this way they were recently introduced to Covent Garden market (*Field*, July 4, 1896).

& Co.'s brewery, Horselydown, S.E., in 1904, and after they had sat for their portraits I presented them to the Zoological Society's Gardens. Mr. E. Bidwell, to whom I applied for some of these Rats, writes (May 11, 1903): 'The rebuilding of these premises some sixteen years ago put a stop to my Black Rat catching in Upper Thames Street. About a week before I received your letter I saw the mangled remains of a freshly caught specimen by the side of the Welsh Church in Upper Thames Street, and I passed by on the other side, unlike Mr. Bond (a well-known naturalist) who saw one in Finch Lane, and wrapping it up in a newspaper, put it in his pocket, to the amazement of the people in the street. Recently I gave Mr. Lydekker a fine specimen caught here twenty years ago.'

The Black Rat was found in nearly all the midland counties, as well as in Cambridge and Essex, so recently as 1880. Writing in 1871, Mr. Southwell considered[1] the species extinct in Norfolk. Since that date, however, Mr. Southwell, Mr. Patterson, and others have recorded several occurrences.[2] The Rev. Richard Lubbock, writing in 1845,[3] observed that it was still found at that date in the city of Norwich. 'This species still remains here' (Yarmouth), says Mr. A. Patterson,[4] 'though its numbers are gradually decreasing; it is now seldom found, except in the ceilings and upper stories of old buildings.'

Mr. Patterson writes from Yarmouth, 1905: 'Than at the present moment the Black Rat was never more numerous at Yarmouth. I have known it from boyhood, and in succeeding years have frequently met with examples, generally dead and mutilated, in the Rows, thrown out from malt and other warehouses. In 1895 it again forced itself into notice by the apparent increase, although, peculiarly enough, it seemed to flourish in the south-western corner of the town, Regent Street forming a margin to its northward distribution. Putting a premium on every specimen brought to me, I received over a hundred examples within a few months. In summer the Black Rats become troublesome in private houses, warehouses, and stores, and in sail-lofts are keen upon the Russian tallow used there. From one loft I received a whole family of half-grown *rattus* with a white spot in the centre of the chest. As the malting season returns they seem again to concentrate their forces in the maltings. In 1895, having heard of certain smacks being infested with them, I made arrangements with the "watchers," who "smoked" each vessel as it came into port, to secure specimens. After a day and a night's burning of pepper in the vessel, all apertures being closed by boards and mud, the hatches

[1] *Trans. Norf. and Nor. Nat. Soc.* 1883–84, p. 674.
[2] *Zoologist*, 1889, p. 321; 1891, p. 299; 1901, p. 153.
[3] *Fauna of Norfolk.*
[4] *Zoologist*, 1898, pp. 305–6.

were taken off. I have seen them lying in all conceivable places, the largest generally being near to the stove. From one I had the pick of forty Rats. Amongst them were two or three *M. alexandrinus*.'

The specimen of the 'Old English' Black Rat, the hybrid and the Alexandrine variety, figured in the coloured plate, were both taken at Yarmouth in 1898 and kindly lent to me by Mr. Ruskin Butterfield.

Isaac Byerley[1] reported it as common on shipboard in 1854, when he wrote, and stated that stragglers were sometimes taken ashore. It is still to be met with in the docks, both on the Liverpool and Birkenhead sides.[2] In Cheshire it was also known, not many years ago, at Aldersey, and remains of the animals were found at Frodsham during some alterations to an old building.[3] Mr. J. Steele Elliot reports it for Bedfordshire,[4] and it has been recorded from Hereford.[5] In Northamptonshire it may now be considered extinct; Mr. Charles Wright, of Kettering, sent for my inspection the 'last' killed in that county, but one was taken later at Woodford Mill in 1901.

Waterton never met with the Black Rat in Yorkshire, but Mr. Harting[6] supplies a few recent records, and Mr. Boulton notes one which was killed at Beverley in 1864.[7] In 1883 Mr. H. G. Faber, of Stockton-on-Tees, reported it as not uncommon there, but there are no recent occurrences noticed from Northumberland. In the Lake Country—Cumberland, Westmorland, and Lancashire beyond the Sands—it is now probably extinct; the late Rev. H. A. Macpherson gives a few records,[8] however, some of which may be said to be recent. A colony existed near Cockermouth in 1876, and according to Mr. J. Goodchild it was not uncommon in Westmorland in certain out-of-the-way places so recently as 1883.[9] A female and young were obtained at Barrow in 1879,[10] and in the Furness ports it may still occur as in other seaport towns.

From Wales we have little information, the most recent records being from Aberffraw in Anglesey,[11] and from a warehouse on the river Usk, Monmouth.[12]

Mr. Charles Tracey tells me that when at school at King William's College, about the year 1883, he witnessed the wreck of an Austrian barque near Port St. Mary, Isle of Man. As the wreckage came ashore it was seen to be crowded with jet-black Rats and brown ones with white chests and bellies. One crate was

1 *Fauna of Liverpool*, 1854, p. 7.
2 *Zoologist*, 1894, p. 186.
3 *Ibid.* 1895, p. 175.
4 *Ibid.* 1897, p. 328.
5 *Field*, October 24, 1896.
6 *Essays on Sport and Nat. Hist.* p. 159.
7 *Zoologist*, 1864, pp. 8872, 9016.
8 *Vert. Fauna of Lakeland*, p. 80.
9 *Trans. Cum. and West. Ass.* vol. viii. p. 218.
10 Durnford, *Zoologist*, 1879, p. 234.
11 *Field*, November 8, 1879.
12 *Ibid.* July 26, 1902.

entirely covered with these Rats, and as soon as it came ashore men and boys attacked the Rats and killed great numbers, although a few escaped into the island.

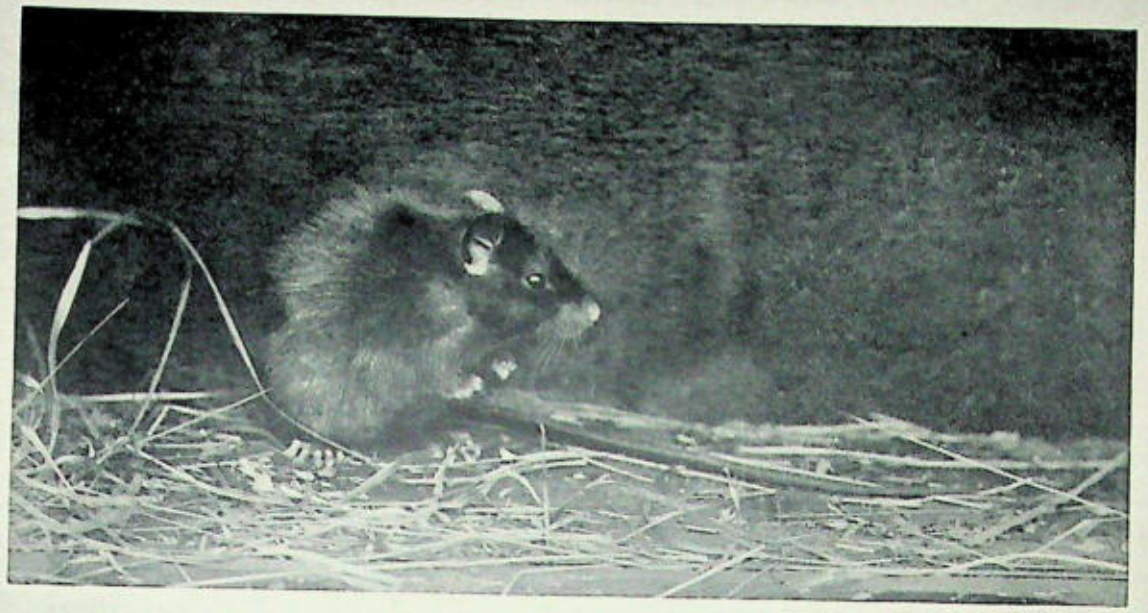
In Scotland, says Mr. W. Evans,[1] 'the Black Rat was, of course, well known to Sibbald, Walker, and other early writers. Neill includes it in his Habbie's Howe and Tweeddale lists (1808 and 1815), and Stark ("Picture of Edinburgh," 1834) tells us that it "still inhabits the garrets of the high houses in the old city." Two years later Rhind dismisses it with the remark, "now rare" ("Excursions," p. 132); and in 1838 MacGillivray ("British Quadrupeds," p. 238) wrote thus: "In Edinburgh it appears to be completely extirpated, as I have not seen a specimen obtained there within these fifteen years."

'In his list of Forfarshire animals (1813) Don says the Black Rat "is the only species I have seen in the town of Forfar, and it is not rare in all the inland parts of Angusshire" (Headrick's "Agriculture" of Forfar, App., p. 38).'

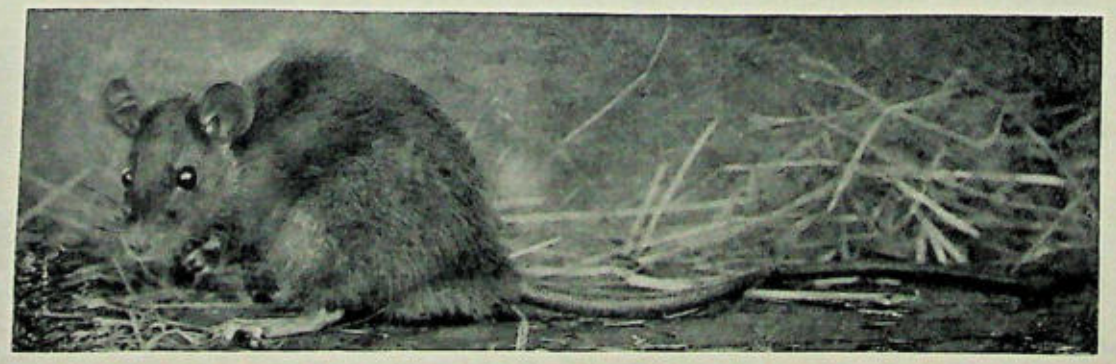
The Black Rat was common in Aberdeenshire until 1830, when it seems to have rapidly disappeared. In Perthshire Colonel Drummond Hay informed Bell of the existence of a small colony at Pitlochry in 1860, and they were considered then as great rarities. I can, however, record a much later date of their existence in this county. In 1879 a small colony was discovered in Messrs. Anderson's fishing-tackle shop in Dunkeld, where I saw two undoubted Black Rats which had just been captured. I think Mr. Roderick Anderson, who now lives in Edinburgh, still possesses the specimens. Mr. Harting[2] says: 'In some of the old houses in Edinburgh Black Rats are occasionally captured. Mr. Hugh Stewart, of Tonderghie, Wigtonshire,[3] had a Black Rat brought to him for identification in August 1879, which had been picked up dead on a farm near the coast. The Black Rat is now probably quite extinct in the inland counties of Scotland.'

Mr. Harvie-Brown in a letter to me (December 13, 1904) says: 'With regard to Alexandrine and Black Rats I have had the former always from on board ship. The Black Rat I have only once got on British soil. But I have an immense number of notes on supposed occurrences, and generally consider that scarcely one record is trustworthy.' Captain Macfarlane, R.N., recently took Alexandrine Rats on board the 'Devastation' when she lay in Queensferry, and forwarded specimens to Mr. Harvie-Brown. Mr. A. H. Baring has recorded [4] an example he found dead on the Forfarshire side of the river North Esk in 1900.

[1] *Mammalia of the Edinburgh District*, p. 75.
[2] *Loc. cit.* p. 158.
[3] *Zoologist*, November 1900.
[4] *Ibid.* p. 517.







1, 2. HYBRIDS BETWEEN THE NORTHERN ALEXANDRINE RAT AND THE BLACK ALEXANDRINE RAT.
3. THE NORTHERN ALEXANDRINE RAT.

From photographs by D. ENGLISH, F.R.P.S.

With regard to the distribution of the Black Rat in the Western Isles, Messrs. Harvie-Brown and Buckley[1] state: 'Mr. Alexander Carmichael informs us that this species still exists in Benbecula. He says, "I saw them about our house at Creagorry several times, and also at Gramsdail, on the opposite side of Benbecula."'

In the Orkneys it is said still to exist in South Ronaldshay, where it is known as the 'Blue Rat.' Low in 1813 records it from this island in his 'Fauna Orcadensis'; and Messrs. Baikie and Heddle in 1848 state that it was still there, but decreasing fast. The old 'Statistical Account'[2] for 1793 says that the 'Black Muscovy Rat, which is the only one now to be met with [in Orkney], has destroyed the Grey or Brown Rat.' A curious statement indeed.[3]

Messrs. Buckley and Evans make no mention of the Black Rat in Shetland, yet I believe it is frequently killed in Lerwick. During a stay in the island of Whalsey in August 1904 I noticed three rats of this species lying dead on the wharf in front of Mr. Nicholson's store. They were of the variety produced by the interbreeding of the Alexandrine and the Old English types—brown above with grey bellies. Mr. Nicholson informs me that about twenty years ago these long-tailed Rats were common but died out. In 1900 they suddenly appeared again, being brought by a German vessel, and are now exceedingly numerous about his storehouses, and a great pest.

There is evidence to show that the Black Rat was very numerous in Ireland. Thompson mentions localities in Cork, Kerry, Armagh, Dublin, and Antrim where it was resident in his time; and Dr. Harvey[4] says it is rare in the northern parts of the city of Cork. Bell, informed by Dr. Kinahan, says that the Black Rat used to be found in Dublin, and the species had been recorded from county Down,[5] whilst Captain Barrett-Hamilton says that it is not infrequent in the neighbourhood of New Ross (Wexford). The same writer has met with it at Kilmannock, 'where it can hardly be called very rare,' and has heard of it at Duncannon (Waterford).[6] Writing in the seventies in his list of Irish mammals, Mr. R. M. Barrington considered it rare and local; and Mr. Harting says that a litter appeared at Levitson, county Kildare, in 1876. It may be said that the Black Rat is now very rare in Ireland.

Habits.—The general habits of this species are very similar to those of the more common Brown Rat, whose ways are unfortunately only too well known to

[1] *A Fauna of the Outer Hebrides*, p. 36.
[2] Vol. vii. p. 546.
[3] Mr. T. E. Buckley records the Black Rat from Orkney in 1892 (*Ann. Scot. Nat. Hist.* 1892, p. 267).
[4] *Fauna of Cork*, p. 2.
[5] *Field*, March 28, 1874.
[6] *Zoologist*, 1887, p. 425; 1888, p. 141.

most of us. On the whole the Black Rat is a less offensive animal and not nearly so bold or so carnivorous in its tastes. I kept two for a short time, and found them active and sprightly in all their movements, but very shy. They were remarkably cleanly in their persons, constantly washing their faces and polishing up their glossy coats. They darted about with greater agility than the Brown Rat, and although quarrelsome and constantly chasing each other, they seemed to spar more in fun than in anger. MacGillivray's description of their attitudes when feeding is very correct. 'This species,' he says, 'holds its object, if small, between the forefeet, sits on its haunches with body bent forward and the back arched, whilst its tail is curved along the ground.' This position is well shown in one of Mr. English's excellent photographs. As it now hardly maintains a footing in agricultural districts its ravages on granaries and provisions of all sorts may be said to be a thing of the past; but in seaport towns and storehouses situated on our large rivers it frequents breweries, houses by the docks, and any old buildings where grain is stored.

Like all the Rats it is a most voracious feeder, and for its size eats and destroys great quantities of provisions. MacGillivray says that 'in affectionate concern for its young it is not surpassed by any other animal, and were it not an unwelcome guest in our dwellings and stores, but confined itself to the woods and pastures, we should place it among the most interesting of our native quadrupeds.'

Great numbers of these Rats were until recently destroyed in the London docks, and professional Rat-catchers were kept busy at all seasons reducing their numbers. Now on the arrival of the Russian grain ships a clever invention is employed which sucks the corn out of the hold, and the Rats are either suffocated as they are drawn up into the funnel or left in a mass in the empty hold, where they are quickly destroyed when all the grain is exhausted. A friend who witnessed one of these grain elevators at work said it was interesting to watch dozens of Black Rats trying to run up the sides of the corn, which was ever falling towards the 'sucker.' Their numbers increased until finally, when the corn was almost extracted, the whole place presented a view of struggling Rats.

Speaking of the familiarity of the Alexandrine Rats on board ship, Mr. Lionel Adams writes:

'This form infested a certain tramp steamer, the "George Fisher," in which I sailed from Cardiff to Bunorah in 1882.

'This ship was full of them, and the captain said they had come on board in a cargo of rice from Akyab on the previous voyage. They used to run all over







THE BLACK ALEXANDRINE RAT.

From photographs by D. ENGLISH, F.R.P.S.

us at night when we were asleep on deck, performing their toilets, fighting and playing with perfect freedom on our prostrate bodies. We used to catch them alive in traps and heave them overboard to the sharks. They had particularly soft fur, and resembled long-tailed field mice in colour of the back, and also in the line of demarcation between the dark of the back and the white of the belly. I skinned one or two for preservation, but their brethren and the cockroaches devoured them.'

Speaking of a Rat of this species which he kept in confinement in 1898, Mr. Adams says: 'After a month in a cage the Black Rat has begun to get tame, although still wild. It is far more active than any Brown Rat I ever saw, springing and jumping about with exceeding quickness. It often climbs all over the wire dome of its cage. Though no change of bedding or sawdust has taken place for a month, it had not the least offensive smell, like *decumanus*.' A second specimen of the Alexandrine variety never became tame, nor a third received in February 1899 from the same place (Woolwich Arsenal). Mr. Adams thus describes the meeting of two female Black Rats: 'I put the newcomer into the cage of the other black doe. The stranger had not been long in the outer cage when she found the entrance to the sleeping den, where her black sister was, and into it she timidly poked her nose. This familiarity was at once resented by curious little sharp grunts and twitters (such as I never heard from *Mus decumanus*), and presently out flew the occupant. Chaos at once prevailed, the newcomer flying in terror. The original owner then retreated to the den, but shortly emerged, and another pandemonium ensued. This occurred three or four times in half an hour. An Alexandrine buck in another trap close by took not the slightest notice of the fracas.'

Previous to the introduction of the Brown Rat this species was common everywhere, but the original race is not extinct yet. It breeds several times in the course of the year, and the female brings up from seven to nine young ones. Most people dislike and fear Rats, but those who become acquainted with this species soon learn to regard it with tolerance[1] and even affection. When quite tame it is an interesting and amiable creature, possessing few of the devilish qualities of its stronger cousin, and none of its repulsive smell or shabby appearance. Consequently there are many Rat fanciers in the country who take great interest in the breed, for it is scarcely necessary to say that all the Rats sold in the fanciers' shops are domesticated varieties of *Mus rattus*. Although there was a

[1] The dissemination of plague has recently been traced to this species.

National Mouse Club in the nineteenth century, it was not until the twentieth century that classes for fancy Rats came into notice at the shows.

With respect to superstitions attaching to this species, Mr. Harting has the following interesting note in his 'Essays on Sport and Natural History':[1] 'In bygone times it was a prevalent notion that Rats might be extirpated by a persevering course of anathematising in rhyme. Reginald Scott, in his "Discoverie of Witchcraft" (1584), says the Irish thought they could rhyme any beast to death, but the notion was in general restricted to the Rat. It is with reference to this belief or practice that Shakespeare in "As You Like It" (Act iii. scene 2) makes Rosalind say, "I never was so berhymed since Pythagoras' time that I was an *Irish Rat*, which I can hardly remember!"'

Mr. Whitaker possesses a white variety of this species.

[1] P. 164.



Litho. W. Greve, Berlin

THE BROWN RAT.
Mus decumanus.

THE BROWN RAT

Mus decumanus, Pallas.

Mus decumanus, Pallas, 'Glires,' p. 91 (1779); Bell, 'Brit. Quad.' 2nd ed. p. 318 (1874); Lydekker, 'Brit. Mam.' p. 195 (1895).

Mus hibernicus, Thompson, 'Proc. Zool. Soc.' p. 52 (1837); Harvie-Brown and Buckley, 'Fauna of the Outer Hebrides,' p. 36*a* (1889); Eagle Clarke and Barrett-Hamilton, 'Zool.' 3rd ser. vol. xv. p. 8 (1891).

Local Names.—*Rat*, *Norway Rat*,[1] *Hanoverian Rat*, *Ratton* (Yorks) (English); *Ratton*, *Rattan*, *Rottan*, *Rotten* (Scotch); *Radan* (Gaelic); *Irish Rat* (dark var.) (Irish); *Luch franncach* (Irish Gaelic); *Llygoden fawr* (Welsh); *Roddan* (Manx).

Characters.—More strongly built than the Black Rat, the Brown Rat is easily distinguished from that animal by its shorter and more arched skull, obtuse muzzle, smaller ears, and shorter and thicker tail, which is shorter than the head and body. The general colour above is a greyish brown. In old males many black hairs intersperse the dorsal pelage. The fur is coarse and hard in contrast with the soft pelage of the Black Rat. The lower parts are greyish white and the hair on the lower parts of the limbs is white when the animal is in full winter coat. The vibrissæ are not so long nor so abundant as in the Black Rat, and the tail is more 'fleshy' and scaly.

The average adult measures about 8 to 9 inches in length, the tail about 7½ inches. The hind foot measures from 38 to 42 mm. The species, however, varies greatly in length and weight. On December 26, 1904, I received one from Cambridge, evidently an old male, which measured only 7 inches in head and body, and 5½ inches in the tail. On the other hand very large Rats are sometimes found. On June 12, 1903, I killed a Rat 18½ inches in length (including tail) which weighed 22 oz. And on December 20, 1904, a very large male which measured 19 inches (including tail) and weighed 2¼ lb.[2] During the Rat plague in Sussex

[1] In Pennant's time the Brown Rat was generally known by this name. This, however, as well as 'the Hanoverian Rat,' was a misnomer, for at that time it was unknown in Scandinavia.

[2] This Rat lived in the banks of a pond in my garden, and defied me for two years; at length a flood came and I got him in the open one evening. He accounted for many fantail pigeons, and even slew an old male shoveller duck single-handed.

in June 1899 George Taylor, the Warnham keeper, called my attention to an immense Rat he had killed on the previous day. It measured 19½ inches in total length, but unfortunately I had no means of weighing the specimen, which was too far gone to preserve. This was the largest Brown Rat I have seen. It is a large Rat that exceeds 17½ inches, but Mr. Oxley Grabham mentions killing an old buck, at Claxton Hall, Yorks, which measured 20 inches in total length and weighed 2¾ lb.[1] The largest Brown Rat that has yet been recorded was killed in August 1881 at Malton. It measured 23 inches, and weighed 2¾ lb. There are ten to twelve mammæ.

In 1837 Thompson, the Irish naturalist, described a Rat with black upper parts and with a white patch on the chest, under the title of *Mus hibernicus*. Moreover he regarded it as nearly allied to the Black Rat: an opinion which was disputed by Bell, following Blasius, who considered it to be merely a dark variety of *M. decumanus*. Little attention was fixed on this Irish Rat until the appearance of Messrs. Harvie-Brown and Buckley's 'Fauna of the Outer Hebrides' in 1889, when *Mus hibernicus* was restored to the British list owing to the discovery of certain white-chested Black Rats, which had been found in those islands. In this work Mr. Eagle Clarke carefully set forth the respective measurements of *rattus*, *decumanus*, *alexandrinus*, and *hibernicus*. These measurements, however, did not seem to prove anything except that the so-called *hibernicus* of the Outer Hebrides was a smaller form of *decumanus*. Later Mr. Southwell suggested[2] that from specimens he had obtained at Norwich in 1882 which were similar to the Irish Rat, the examples were hybrids between *rattus* and *decumanus*. Subsequently Messrs. Eagle Clarke and Barrett-Hamilton by the examination of a number of specimens proved[3] that *Mus hibernicus* was only a melanistic form of *Mus decumanus*, showing that Blasius' original view[4] was the correct one. This dark variety occurs in Ireland, where it is common, and has been found in at least twenty counties, in the Outer Hebrides, where it is local, and in a few places in England. It has been recorded from Surrey, Norfolk, Suffolk, Cambridge, and Lundy Island[5] and I have lately (March 1905) received specimens from Exebridge, Devonshire. The small size of the Hebrides specimens is doubtless due to long

[1] *Field*, January 9, 1897. [2] *Zoologist*, 1889, pp. 321, 323. [3] *Zoologist*, 1891, pp. 1–9.

[4] *Fauna der Wirbelthiere Deutschlands; Säugethiere*, 1857, p. 815. So also De L'Isle in *Ann. Sci. Nat.* iv.; *Zoologie*, 1865, p. 189.

[5] Surrey, *Zoologist*, 1893, p. 103; Norfolk, *Zoologist*, 1889, p. 321; Suffolk, *Field*, January 24, 1891; Cambridge, *Irish Nat.* April 1895; Lundy Island, *Irish Nat.* September 1892. It is now known to occur in North Uist (*Ann. Scott. Nat. Hist.* 1892, p. 134).

isolation, for Irish and English ones are often as large as full-grown Brown Rats, although they never seem to possess the white chest-patch. Sandy, white, and pied varieties are also not very rare. Col. E. A. Butler tells me he captured recently a curious coloured Rat which was cinnamon-brown above, with the lower parts of the usual colour.

In the island of Tiree a race of sandy-coloured Brown Rats lives on the seashore. This assimilation to surroundings is an exact parallel to the sandy-coloured house mice which frequent the North Bull in Dublin Bay.

Distribution.—Nowadays a complete cosmopolitan, the introduction of the Brown Rat into Europe and America is of comparatively recent date. Pennant suggested that the ancient home of the species was India; but this has been shown to be erroneous by Blanford, who thinks that they originated in Western Mongolia. Pallas tells us that a great western movement of the Brown Rat was noticeable in 1727, and that they succeeded in crossing the Volga in that year. After this their conquest of Russia and Continental Europe was only a matter of a short time, for they reached Paris in 1750. Erxleben and Professor Boyd Dawkins say that the Brown Rat reached England a little before 1730, whilst Waterton gives an earlier date and says they came from Hanover in a ship soon after the year 1688. A middle date, that given by Pennant, who said that it appeared in England about forty years before he wrote, *i.e.* about 200 years ago, is probably somewhere about the correct time.[1] In this country the Brown Rat is found everywhere in town and country where food is to be obtained. When supplies fail or become scarce Rats show wonderful intelligence in changing their ground in time to avoid starvation. They migrate in bodies by land or water. Thus many of the islands off the northern and western coasts of Britain are sometimes deserted, while at other times they swarm with Rats.

Habits.—So great are the resource and persistence of this animal that it may be said to be able to gain a living right under the very guns of the enemy, and consequently owing to its mischievous habits it enjoys the distinction of being the best-hated animal in Europe. You meet men who loathe it, but nevertheless almost fear it for its courage, which is of the 'three o'clock in the morning' variety, and positively compels admiration.

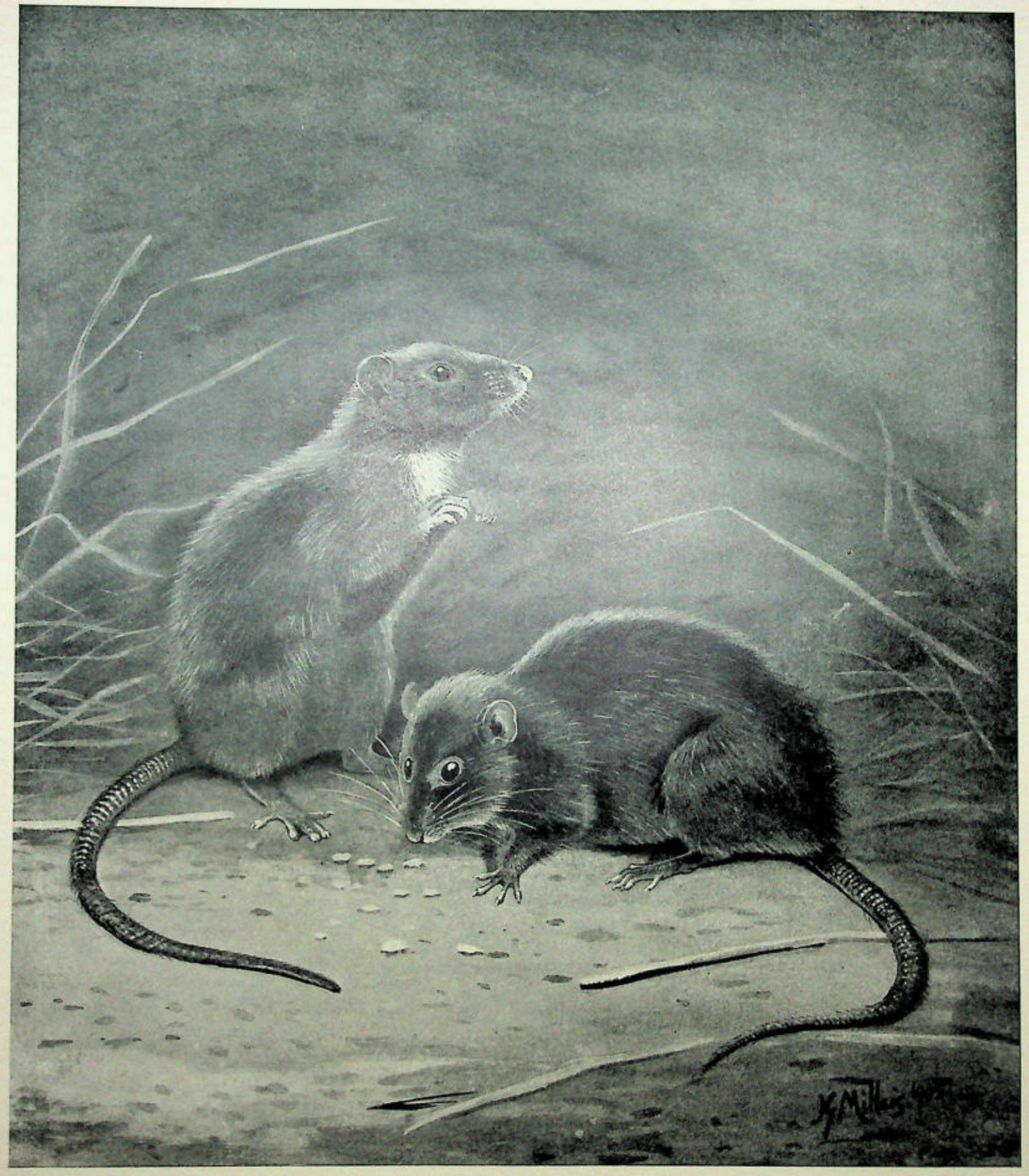
MacGillivray says that 'in cities it frequently inhabits in great numbers the drains and sewers, whence it makes its way into the houses. In maritime towns it often takes up its abodes in the quays, among piles of wood, in

[1] The late E. R. Alston thought that they penetrated to Scotland between the years 1770 and 1777.

buildings along the shores, or wherever it finds a secure retreat. But it is not confined to cities and villages, but establishes colonies in farmsteadings, on the banks of canals and rivers, and even in islands at a considerable distance from the mainland, or upon large islands to which it has been introduced by shipping.'[1] This gives a good general idea of the usual places where Rats make their homes; but of late years thousands of Rats all over England have taken to a purely country life and live in vast numbers in the hedgerows, where they turn out the bank voles and rabbits, and convert all the smaller runs to suit their own purposes. This is especially the case in Surrey, Sussex, and the Eastern Counties. In Cambridge a small farmer told me that at Babraham, during the past three years he had killed over 1,000 Rats per season by simply walking along the hedge sides after dark with his wire-haired terrier. The dog could see fairly well at night and intercepted the Rats which at this time are all out feeding in the grass and stubbles. Seventy or eighty Rats in a single night was no unusual bag, and the plague seemed in no way to decrease. My informant was an intelligent man, and rightly attributed the great increase of 'field' Rats to the senseless killing of so-called vermin, such as owls, kestrels, and weasels. Speaking of this plague of field Rats, Mr. Bristow Noble says:[2] 'The field Rat undoubtedly is the most troublesome and numerous pest of the country-side to-day. It is in every hedgerow, every corn-rick, every coppice, and every covert —a scourge to both the agriculturist and the gamekeeper. I have found it breeding in all seasons of the year. When snow has been on the ground and the severest of frosts have been prevailing at nights, I have dug young field Rats out of the burrows in the hedgerows—mere hairless, pink-skinned little creatures with their eyes still closed. The litters vary in number. In some we find as many as seventeen, whilst the smallest litter contains no less than eleven; but thirteen may be put down as the number in the average litter. Strange to say, in every family there are always more males than females. Thus a litter of thirteen is invariably found to contain seven males and six females. The field Rat "casts" about every six weeks, and a young doe has often been found with a family when it has been estimated she has not been more than three months old. Consequently, if we

[1] The occupation of Puffin Island by shipwrecked Rats and the destruction worked by them amongst the rabbits and puffins is described in the second edition of Bell's *Quadrupeds*, but an even more recent invasion of an island—Ailsa Craig—has been noticed. It seems that until 1889, when one was killed, Rats had not been known on the rock; but by the close of that year they were plentiful, having apparently come from the lighters which brought stores. The following year they became a nuisance, and between October and December 1900 (ten years later) over 900 were slain (*Ann. Scot. Nat. Hist.* 1892, p. 132).

[2] *Field*, November 26, 1904.



MELANIC BROWN RATS.

For some time known as *Mus hibernicus*.

take for granted the field Rat has a litter eight times a year; that she gives birth to her first litter of the year on January 1; that each litter is composed of thirteen Rats, seven males and six females; that each female born within the year has a litter when she is three months old, and subsequently a litter at the end of every six weeks, by the end of December we find that one Rat will have been responsible for the birth of the enormous total of 35,044 Rats, which number on the very next day, namely, January 1 of the next year, by the writer's method of calculating, will have been increased enormously. What wonder the country is overrun with the pests, though, to be sure, they do not increase at the above astounding rate. I have frequently been present at the threshing of corn-ricks in the southern counties, out of which 500 and sometimes more Rats have been driven and killed. The ricks had seldom been standing for more than four months. Surely it is time steps were taken to put a toll upon the field Rat in England. A penny per tail might be the amount of the toll, and even that would be a mean price.'

In the East and South of England the plague of field Rats seems to be becoming chronic. Not long ago a professional rat-catcher lived in every village, but now, as he cannot wander at will with dogs and ferrets, the local rat-catcher is nearly extinct, and the professionals, which are few and far between, are only called in when houses are overrun to an unbearable extent. Nowadays Rats are not content to wait till the corn is ripe or stored, but will even attack grain recently sown. Thus we read:[1] 'In some parts of Suffolk Rats have by their abundance become a great nuisance this autumn. When shooting last week we passed through a field lately sown with wheat which was completely overrun with the diggings of some animal after the sown grain. The bailiff informed us this was done by Rats, and on further examination it looked as if this was true. He also told us that he and his men had destroyed 4,000 since harvest, and could hardly notice any sign of diminution in the number, and that other farms adjoining were even worse off, one having killed 6,000 since harvest a month ago.'

Rats are said to thrive most in a wet season, as water is very necessary to their well-being.

Recent demolitions in the Strand have aroused Londoners to the fact that tens of thousands of Rats are living in the midst of London and daily creating destruction to property. But it is a case of the heart not grieving at what the eye does not see, for underground London seethes at night with a restless sea of Rats which do some good by scavenging, but are constantly undermining and

[1] W. R. Raillem, *Field*, January 9, 1904.

tunnelling into buildings. The recent improvements undertaken by the London County Council revealed the fact that armies of Rats infested Catherine Street, Drury Lane, Blackmore Street, White Hart Street, and Clare Market, lying on the northern side of the Strand, and it was found that the vermin had done damage to the extent of 5,000*l.* Many of the rooms of the Gaiety Restaurant had to be closed to the public. Behind the wainscot of the bandstand the remains of 1,728 serviettes were found gnawed to pieces, and thirty to forty wine and beer bottles were removed and stacked so as to form comfortable sleeping places. One of their principal achievements was gnawing a hole through a 28-lb. cask of macaroni, and a rat-catcher, when first employed, killed on an average 300 per night. The London docks, too, suffer from a chronic Rat plague, the numbers being constantly augmented by arrivals from foreign ships. During two months in the year 1904, 9,770 Rats were killed in and about the docks. A recent writer in a daily paper says:

'The London docks have always been a favourite haunt of the rodents. Over 5,000 have been killed in a month by the official rat-catcher. Formerly these Rats were taken out alive and sold to dog owners for sporting purposes. Happily this has now been stopped.

'The carcasses of these Rats[1] have been found to contain germs of bubonic plague. A penalty of 2*l.* hangs over the head of any person who takes away a live Rat.

'The carcasses are collected every morning and cremated on the quayside in the presence of an official.

'The sewers of London were once swarming with the rodents, and the sewermen were in the habit of making large incomes by catching the rats and selling them for sporting purposes at 3*s.* a dozen. Many a grim encounter did these men have in blind underground passages when several Rats were brought to bay, and it required no small amount of pluck to seize the savage vermin.

'When driven to extremity there is scarcely a fiercer animal existing than the Brown Rat. He is also a serious danger, for a bite from the garbage-poisoned teeth of a Rat has often meant death within a few hours. A desperate Rat will sometimes daunt the stoutest bull-terrier, and many a splendid dog has died from a Rat bite.'

During big fires in houses and on board ships Rats have often been seen to leave the threatened spot in large bodies. The following example is taken from the 'Zoologist,' September 1895:

'A most remarkable sight was witnessed during the burning of the large

[1] The spread of bubonic plague from India has been traced to Black Rats.

grain warehouse near Blackfriars Bridge on August 31 last. When the fire was at its height a great stir was noticed in the waters of the Thames, which for some time could not be accounted for. Before long, however, the spectators on the Embankment discovered that it was caused by immense numbers of Rats which had been driven by the heat from the burning building. They appear to have left the place *en masse*, for they were all gathered together, and made their way across the water in one crowd. Unfortunately for the Rats, but fortunately for the dwellers on the opposite side of the river, they could find no landing-place, and most of them found a watery grave. Rats, although essentially land animals, are not without the power to swim, but, like all other animals which take to the water by force of circumstances and not from choice, they are not long before they become exhausted. It is probable, therefore, that those which swam across the river and could find no landing-stage on the Embankment were too exhausted to return to the Surrey side, and so perished.'

Their manner of leaving ships is proverbial, and 'an old Indian officer' was so imbued with the courage and resource of the Rat that he used to tell the following story: 'A Rat was thrown overboard in the Indian Ocean, and the passengers assembled with pleasurable feelings to see it drown. Did it meet its fate with equanimity? Far from it. A gull settled on the sea close to the drowning rodent with joyful anticipation. But the Rat at once seized it, killed it, and hoisting one wing of the defunct gull as a sail waved a paw in farewell to the astonished passengers and sailed for the nearest coast.' Unfortunately the story is untrue, but our respect for the Rat is so great that we almost wish it were veracious.

In 1899 there was a large migration of Rats into West Sussex. They came from the North—some said from London, but I do not think that this was correct —and arrived in such battalions that every hedge between Kingsfold (Surrey) and West Grinstead was a mass of their runs. Walking one frosty evening in December 1900 from Rusper, I am sure that more than five thousand ran out of my way before I reached home: they allowed approach within six yards or so on the public road and then ran for the hedges. Gradually the plague has abated, but they are still here in great numbers, and constant warfare is necessary to save the chickens and young ducks. In the summer evenings these Rats come out in full light to feed on the grass roots, and in one field I shot over 100 with a small rifle. Rats do not see or observe the approach of man if he glides quietly along until he is within ten yards or so, and then they suddenly stop the feeding and

dart for the hedgerow, without ever raising the head as other rodents do. Their persistence in frequenting one spot when food is abundant is wonderful. You may kill and kill, but new Rats take the place of the slaughtered with never-varying regularity. There is a hedgerow at the back of my museum where the refuse of the kitchen is thrown. This is within view and easy shot of a certain spot in my garden, and throughout the year I kill about 150 Rats with my rifle. The occupiers of the immediate vicinity always consist of about the same number: an old male, two females, and their broods. As soon as the parents are shot two or three adults come to take their place, but I never see more than one old buck in evidence at one time. He drives off all other bucks and his own male offspring when they begin to grow large. On two occasions I have shot half-grown Rats, and the mother has rushed out of the hole and borne away her dead offspring. Whether the other Rats eat them or not I cannot say, but it is likely they do so.

In fact, unless food is scattered over a large area, buck Rats are constantly fighting and chasing each other about. They will even attack so large and strong an animal as the hedgehog. Mr. L. Adams sends me the following note of such an incident:

'When I was a small boy,' he writes, 'in London we used to keep a hedgehog to eat the cockroaches in the kitchen. One morning I distinctly remember seeing marks of blood on the floor and walls, and a dead Rat of large size was presently found. The hedgehog was also badly wounded, and died a day or two afterwards.'

Rats are very fond of frequenting pheasant-covers, and it is a common sight to see Rats, rabbits, and pheasants all on the same ride in a wood. Their favourite retreats here are under the rhododendron bushes, where they burrow and make little towns.

In spite of the fact that the Brown Rat frequents such filthy surroundings it is on the whole remarkably clean in its person. It is most particular about its toilet. It sits up and licks its paws, and works them quickly across and down its face. Then it polishes up its whiskers, and attends to its back and sides by twisting its body to reach the more inaccessible parts. In the winter and spring its coat is almost smart, as may be seen from Mr. Thorburn's beautiful drawing, which was taken from a particularly fine specimen.

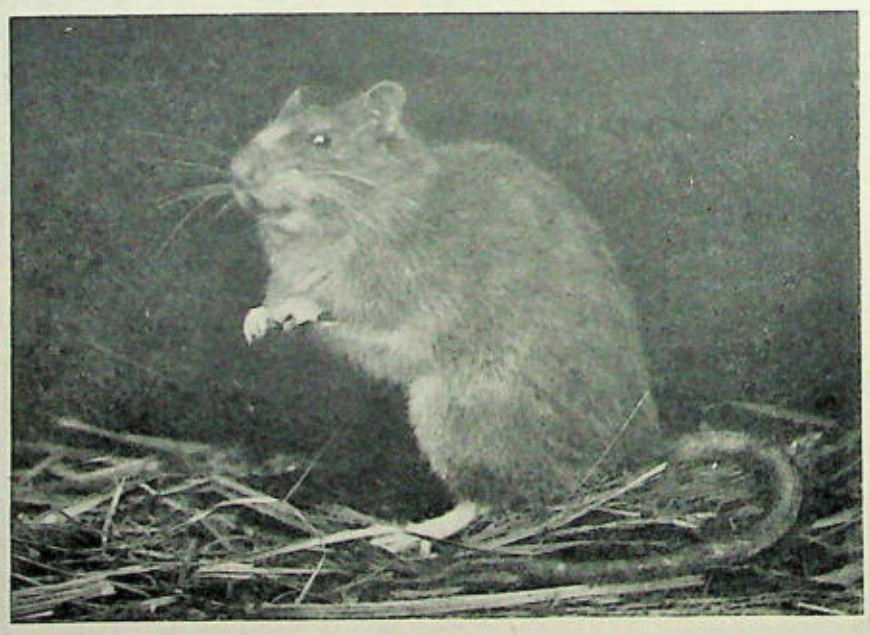
The Brown Rat devours all things, animal and vegetable. It is the beast's wonderful adaptation to circumstances, and the fact that few things come amiss to it, that enable it to survive where other creatures would starve. In towns it is a most efficient scavenger, although it destroys so much valuable property.

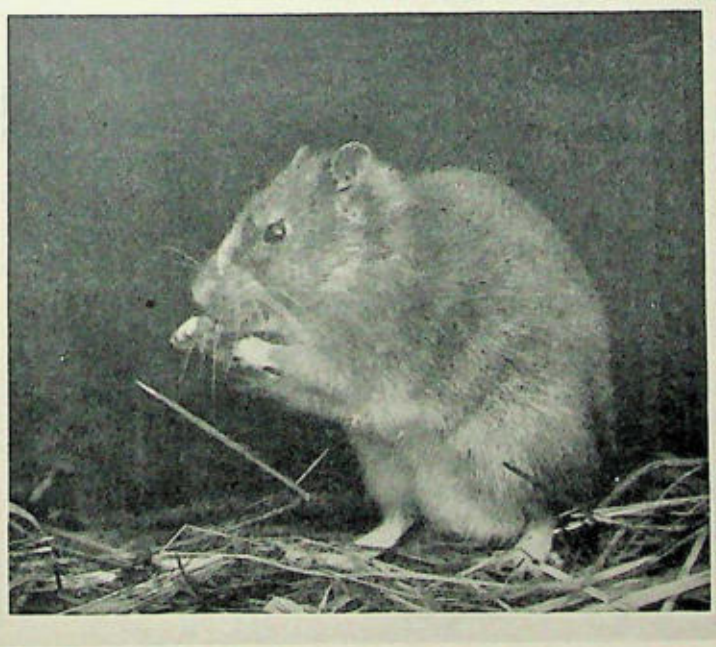












BROWN RATS.

From photographs by D. ENGLISH, F.R.P.S.

Recently I heard of Rats breaking through the floor of a seedsman's shop in Perth and carrying off no less than 280*l.* worth of tulip and hyacinth bulbs. These were all removed one by one through a single hole and borne away underground, where they were carefully stored for future consumption. In arriving at their object Rats use their chisel-like teeth with great effect, and I have seen a two-inch-thick lead pipe gnawed through by them.

Besides field and town Rats there is another great race of these rodents which lives exclusively by the sea and on the islands off our coasts, frequenting rocks above high-water mark and creating havoc amongst the eggs and young birds of various species. They also catch prawns and shrimps in the pools left by the tide. Their favourite food, however, in some localities is shell-fish, sand-hoppers, crustacea, dead fish, and the flotsam and jetsam of the sea. Mr. Dorrien-Smith tells me that his family often kill as many as fifty or sixty in an afternoon on the Scilly Islands by turning over the rocks and using terriers. I have seen great numbers on the west coast of North Uist. They doubtless swim considerable distances to reach islands, and whenever food becomes scarce they emigrate in a body, if the distance to the mainland or next islet is not too great, otherwise they perish, or wait for the next ship. In Shetland they even take the eggs of the lesser black-backed gulls, but must commit such depredations at night. Rats often kill full-grown ducks and poultry, and are agile enough to catch a sparrow occasionally. The following instance of this is interesting, as it also exhibits the animal's courage:

'A few days ago some ladies were feeding the sparrows in Kensington Gardens. The birds were, as usual, very tame, and one or two of them were even bold enough to take crumbs from off a lady's boot. Whilst they were picking up the food several Rats made their appearance in the border of the shrubbery, and one of these suddenly made a rush at a group of sparrows, seized one in its jaws, and disappeared with it in the plantation.'[1]

Mr. L. Adams says that they catch toads near ponds, and that he has seen scores of these batrachians mangled by Rats near a pond at Snelston in Northamptonshire. They will even chase hares and rabbits.[2] *À propos* of the manner in which Rats and rabbits destroy turnips Mr. R. M. Barrington writes:[3]

'If a turnip is growing, and a portion of the bulb is still in the ground, a

[1] E. J. C., *Field*, July 2, 1904.

[2] Mr. H. Godman tells me that one evening at Muntham, Sussex, whilst waiting for Rats near a pond he saw a full-grown Rat emerge from a hole and pounce upon something in the grass. He then shot the Rat, which held in its mouth a field vole whose back it had broken in two places.

[3] *Zoologist*, 1878, p. 178.

Recently I heard of Rats breaking through the floor of a seedsman's shop in Perth and carrying off no less than 280*l.* worth of tulip and hyacinth bulbs. These were all removed one by one through a single hole and borne away underground, where they were carefully stored for future consumption. In arriving at their object Rats use their chisel-like teeth with great effect, and I have seen a two-inch-thick lead pipe gnawed through by them.

Besides field and town Rats there is another great race of these rodents which lives exclusively by the sea and on the islands off our coasts, frequenting rocks above high-water mark and creating havoc amongst the eggs and young birds of various species. They also catch prawns and shrimps in the pools left by the tide. Their favourite food, however, in some localities is shell-fish, sand-hoppers, crustacea, dead fish, and the flotsam and jetsam of the sea. Mr. Dorrien-Smith tells me that his family often kill as many as fifty or sixty in an afternoon on the Scilly Islands by turning over the rocks and using terriers. I have seen great numbers on the west coast of North Uist. They doubtless swim considerable distances to reach islands, and whenever food becomes scarce they emigrate in a body, if the distance to the mainland or next islet is not too great, otherwise they perish, or wait for the next ship. In Shetland they even take the eggs of the lesser black-backed gulls, but must commit such depredations at night. Rats often kill full-grown ducks and poultry, and are agile enough to catch a sparrow occasionally. The following instance of this is interesting, as it also exhibits the animal's courage:

'A few days ago some ladies were feeding the sparrows in Kensington Gardens. The birds were, as usual, very tame, and one or two of them were even bold enough to take crumbs from off a lady's boot. Whilst they were picking up the food several Rats made their appearance in the border of the shrubbery, and one of these suddenly made a rush at a group of sparrows, seized one in its jaws, and disappeared with it in the plantation.'[1]

Mr. L. Adams says that they catch toads near ponds, and that he has seen scores of these batrachians mangled by Rats near a pond at Snelston in Northamptonshire. They will even chase hares and rabbits.[2] *À propos* of the manner in which Rats and rabbits destroy turnips Mr. R. M. Barrington writes:[3]

'If a turnip is growing, and a portion of the bulb is still in the ground, a

[1] E. J. C., *Field*, July 2, 1904.

[2] Mr. H. Godman tells me that one evening at Muntham, Sussex, whilst waiting for Rats near a pond he saw a full-grown Rat emerge from a hole and pounce upon something in the grass. He then shot the Rat, which held in its mouth a field vole whose back it had broken in two places.

[3] *Zoologist*, 1878, p. 178.

Rat generally eats all round the turnip and leaves the centre to the last; whereas a rabbit begins at the side and works right across to the other side. A Rat bites off the skin or rind and leaves it in little pellets around the bulb; a rabbit eats skin and all.'

Meal, dog-biscuits, carrots, truffles, the bark of fruit trees, fruit, eggs, chickens, young rabbits, moles, and especially young ducks are favourite items in the bill of fare. An interesting example of the Rat's cleverness is related by Mr. Harting,[1] who thus quotes Mr. T. W. Kirk, of the Colonial Museum, Wellington, New Zealand:

'I was standing in a doorway of a large shed, the further end of which had been partitioned off with bars to form a fowl-house, when I was attracted by a gnawing and scraping noise. Turning round I saw a Rat run from a large dog-biscuit which was lying on the floor and pass through the bars. Being curious to watch if he would return, I kept quiet, and presently saw a well-grown specimen of the common Brown Rat (*Mus decumanus*) come cautiously forward, and after nibbling for a short time at the biscuit drag it towards the bars, which are only two inches apart, and would not allow the biscuit to pass. After several unsuccessful attempts he left it, and in about five minutes returned with another Rat, rather smaller than himself. He then came through the bars, and, pushing his nose under the biscuit, gradually tipped it on edge, Rat number two pulling vigorously from the other side: by this means they finally succeeded in getting a four-inch biscuit through a two-inch aperture. . . . I think the conduct of these animals showed a wonderful amount of intelligence. It was evident that the first Rat saw that to get the biscuit through the bars it was necessary that it should be on its edge, and not being able to tip it and pull at the same time he gained the assistance of a friend.'

Edward Jesse in his 'Gleanings in Natural History' tells how Rats attacked a pear tree at Hampton Court. They descended from the projecting eaves of the building on to the branches of the tree and fed on its leaves and tender shoots. They are also able to carry and remove eggs, and do so in the same manner as the stoat, by pushing them along between the fore legs. Rats may often be seen swimming and diving in still waters, and in winter they are sometimes caught in the rapidly forming ice.[2] They eat numbers of freshwater snails, and even catch fish. Mr. James Hardy, of Gateshead-on-Tyne, thus describes one catching an eel in a mill-race at Swalwell: 'Curious to know what

[1] *Vermin of the Farm*, p. 3.

[2] *Zoologist*, 1861, p. 7376.

it [a Brown Rat] could be doing there, we watched its progress downwards, until it reached the outlet of a drain, into which it had just turned; then it gave a sudden plunge, and as quickly reappeared in the stream with a middling-sized eel in its mouth. It made for the edge, where it soon regained its footing; and this, from the steepness of the bank, was a matter of difficulty, which was much increased by the eel, which it had seized a little above the tail, and which was struggling vigorously to get free.' Eventually the Rat had to drop his prey.

Nothing that has flesh and moves on the face of the earth is free from the attacks of Rats. Some years ago the elephants in the Zoological Gardens were noticed to be very restless and appeared to be tender about the feet. The late Frank Buckland traced the circumstance to Rats. At night when all slept the Rats came from their hole and nibbled and tore the huge feet. The 'quicks' had been eaten off the nails and the flesh beneath 'tunnelled.' Similar attacks had taken place on the hippopotamus, for several times crushed Rats were found beneath the monster, which had killed his minute enemies as he turned in his sleep.

The instances of Rats attacking and killing children are too numerous to mention, but the following story, which was told by a clergyman who worked in the East End, seems to touch the utmost pathos of poverty: A man, his wife, and a family of starving children were observed to keep a well-fed cur. On being asked why the dog was sleek and well fed when the children were mere skeletons, the eldest boy replied, 'Father gave sixpence for the dawg, and we wants it. The Rats was so many and strong they used to eat our toes at night, but now the dawg keeps them off.'[1]

The boldness of Rats could hardly go further than the following instance:[2] 'I have a fox terrier acting foster mother to three cocker spaniel puppies now three weeks old. Two nights ago the smallest of the puppies was carried off by rats, and the remaining two were gnawed about the head. There were no signs of the missing puppy. What makes it more remarkable still is the fact that the terrier is a first-rate ratter and a splendid mother. I took the remaining two puppies away, and the following night set a trap inside the nest where they were, and caught by the head one of the largest Rats I have ever seen.'

[1] The dangers arising from rodents were terribly demonstrated at Lewisham in November 1904, when a six-weeks-old child was gnawed to death. The infant was left in bed by its parents in charge of a brother aged ten years. When the mother returned she found the child dead, the left side of the scalp and the upper part of the cheek having been eaten away. Tramps lying by the roadsides and sleeping in rickyards have been killed by Rats. Mr. Patterson informs me that a 'Black' Rat has been known to attack a child at Yarmouth (1905).

[2] Ambrose Boyson (*Field*, November 28, 1903).

It is also on record that Rats have eaten their way through a live fat pig.

Rats will eat snails, and the method by which they carry them is described by Mr. Harting,[1] 'the Rats in question belonging to a colony which had taken up their quarters in some new houses while in course of erection, where there were no larders to visit. They were observed to climb the hollyhocks in the garden, clear off several snails, bring them down in one paw, like an armful, and run with them on three legs to their holes.'

Rats kill and eat their own species, and a recent successful method of destroying these animals on board ship is to keep and feed several large and powerful Rats exclusively on their own kind. These individuals are then turned loose, and quickly destroy the majority of their own relatives.

The nest is composed of any soft material,[2] and the female Rat brings forth usually from six to sixteen young. Mr. C. E. Wright tells me of an extraordinary litter which he discovered on June 1, 1903, at Oakley, Northamptonshire: 'In investigating a mole's fortress I found a Brown Rat's nest containing twenty young ones, and after further digging discovered a mole's nest with seven young.'

A most remarkable site for a Rat's nest is given in the 'Field':[3] 'On January 19 I was making my weekly inspection of the beef-house at Devonport when the butcher drew my attention to four squirming little Rats lying on one of the lockers. It appears that on going to unhook a hindquarter of beef he noticed a piece of netting sticking out of the suet on the inside of the carcass. He opened it out a little more to see where the netting came from, and was considerably startled when a large Rat jumped out and made off at once. A closer examination showed that the beast had stuffed three potato-nets into the cavity between the suet and the bone, and had there made a nest for its offspring.'

It would be possible to write a book on the mischief caused by the Rat, and its power of destruction has often caused the loss of many thousands of pounds to individuals. Recently an elderly couple had invested their entire fortune, amounting to 5,000*l.*, in bearer shares in various companies. These they unwisely stored in a dilapidated old hat-box, so shabby that the most experienced burglar might easily have ignored it. Periodically either the husband or the wife counted their treasure, and when they went in November 1904 they found nothing but a little heap of dust. As usual Rats were the culprits.

[1] *Zoologist*, 1887, p. 190.

[2] Audubon, the American naturalist, once lost the contents of a large portfolio of drawings by a pair of Rats which had made their nest of his pictures. In a few days the labour of years was destroyed.

[3] Henry de C. Ward, Devonport (*Field*, January 30, 1904).

There are many ways of destroying Rats, most of them too well known to need description.[1] Where they are in large numbers in farm buildings and hedgerows the most efficient way is to feed with soaked grain for a week or ten days in one spot, and then when the Rats are quite accustomed to the nightly banquet to put down strychnined wheat. This is illegal, but I have known as many as three hundred killed in one spot in a single night. A chemist has recently invented a poison which so completely dries up the dead bodies that no smell is noticeable in dead Rats that have been poisoned by it. Those who are nervous about destroying Rats in a house would do better to employ a professional rat-catcher, and to take the risk of his possible dishonesty by leaving a few to furnish a future job. This trick of leaving Rats or even turning them down is a common one, as the Plague Commissioners in Bombay recently ascertained. Rats are certainly a danger to health, and it is well known that they disseminate the microbes of various diseases. A very effective method of destroying Rats is practised in the great sewers of Paris. A naked electric wire is run through their haunts, suspended about six inches above the ground, and on this pieces of horseflesh are firmly fixed at intervals of twelve inches. This wire is attached to the electric main and a power current runs through it. The Rats in reaching for the flesh place their paws on the wire and are instantly electrocuted.

The late Duke of Beaufort used to say that the two best sports in the world were fox-hunting and ratting, and that ratting was a very good second. Certainly there is some sport in witnessing the respective courage and quickness of the highly trained terriers doing their deadly work upon the small though none the less gallant Rats. One sportsman, who makes a speciality of this form of hunting, places a terrier at each end of a corn-stack, turns in his ferrets, and then goes away for an hour and smokes his pipe. On his return he will find his dogs each with a pile of dead Rats carefully arranged for his inspection.

The most remarkable statistics of Rat killing are given by Lord Gifford, who lives at Old Park, Chichester: 'I have resided here nearly five years, and found this estate of about 2,000 acres infested with Rats. My men and self set to work

[1] A very useful book on destroying Rats is that by Ike Matthews, a professional Rat-catcher of great experience. It is called *The Revelations of a Rat-catcher*. A Rat caught in a gin frequently gnaws off its own leg, and so gets free. Less intelligent animals submit quietly to their fate. For various methods of destroying Rats see the *Vermin of the Farm*, by J. E. Harting, pp. 6–9. Colonel Hanger in 1814 minutely described the use of box or hutch traps, and they are still a most excellent method of destroying vermin. *The Universal Directory*, by Robert Smith, is another good book on the subject, but the most recent publications are the *Revelations of a Professional Rat-catcher*, by Ike Matthews (1898); *Studies in the Art of Rat-catching*, by H. C. Barkley; and *The Rat: its History and Destructive Character*, by James Rodwell.

with traps, ferrets, and poison. I kept a careful record of what we actually killed, and the total is 31,981, not including what the tenants and labourers killed when threshing &c.'[1] The great abundance of Rats on this estate is due to the defective drainage of the town of Chichester.

A great Rat hunt took place at the dust-heap near Sugar Loaf Hill, Folkestone, in July 1904. The dogs killed 783 on the first day, 508 on the second, and 354 on the third. Total, 1,645 Rats.

The 'fancy' exhibit Brown Rats with pride at the various shows, but most of us prefer less unsavoury and prettier pets. Pure white varieties in a wild state are rare, but pied Brown Rats are not uncommon.

I returned home one evening in May 1904 to find my wife standing with blanched face, and the cook, the parlourmaid, and the nurse gathered together for mutual protection, and holding their skirts instinctively. Something unusual had happened. 'Do you know,' said my wife, 'that I've seen the most awful-looking beast I ever set eyes on? He's in the potting-shed now, and I've shut him in. You must get your gun at once.' Now potting-sheds are not good places for practising with a twelve-bore; so I took a candle instead and went to investigate. Yes, there he was, certainly. A perfectly bald Rat with a transparent yellow skin, through which one could see the whole of his pink entrails working—I think about the most uncanny beast I ever saw. The only hair about him was his whiskers, which stood out black and fierce, and some fine whitish hair about the belly and limbs. The eyes, having no hirsute setting, seemed to be dropping out of his wicked-looking head. I kept him alive for one day, and then my little son managed successfully to suffocate him through excessive kindness.

These hairless Rats are very rare, and most people will say it is a good thing. On December 1, 1903, at the meeting of the Zoological Society, Mr. F. E. Beddard exhibited a hairless Rat which had been obtained at Leyton, Essex. It was quite hairless, with the skin corrugated in narrow folds. Mice obtained at Maidenhead, and presenting identical characters, were described in 1856 in the Society's 'Proceedings.' These bald varieties are sometimes known as 'rhinoceros' Rats and mice.

[1] *Field*, September 27, 1902.

Sub-family *MICROTINÆ*

THE VOLES

THE members of this sub-family of murine rodents are divided into two super-generic groups: the *Lemmi* (the Lemmings), including three genera, *Synaptomys*, *Lemmus*, and *Dicrostonyx*; and the *Microti*, embracing the genera *Phenacomys*, *Evotomys*, *Microtus*, and *Fiber*. With the Lemmings we are not greatly concerned, for only two species—the Norwegian Lemming (*Lemmus lemmus*) and the Banded Lemming (*Dicrostonyx torquatus*)—appear to have inhabited England during the Pleistocene period. Their remains have been found in the southern and eastern counties. Although both species still exist in Northern Europe, they appear to have become extinct in England about the time of the second great cataclysm, surviving, however, until a more recent date in the South of Europe.

We have five representatives of the second group—the *Microti*—in our islands: two of these voles are referable to the genus *Evotomys* and three to *Microtus*.

The Voles are, as a rule, short, thick-set mammals possessing dense fur, rounded heads, and short tails. Their cranial and dental characters vary considerably in different species. So far as the British species are concerned reference to the plates will be useful in studying the distinctions. The molar teeth—three pairs in each jaw—are either rootless or imperfectly rooted. The grinding surface is divided into cement spaces bordered by enamel ridges. Although there is a certain amount of variation in the pattern of these spaces in each species, Mr. Gerrit S. Miller says: 'In about 75 per cent. of the specimens of a given species the enamel pattern conforms to a type which may be considered normal.'[1]

The *Microtinæ* are distributed throughout the temperate and cold regions of Europe, Asia, and North America. In the North some species are found at the northern limit of mammalian life, whilst others reach the tropics. Five distinct genera and four sub-genera have a circumpolar distribution.

Voles, which are generally numerous in the regions they occupy, are found in a variety of situations, from sea beaches to the tops of high mountains, and alike

[1] *North American Fauna* (*Genera and Sub-genera of Voles and Lemmings*), No. 12, 1896, p. 25.

in open plains and dense forests. They can live wherever vegetable matter is to be found. The majority are terrestrial, passing much of their time on the surface of the ground, but retiring into burrows or underground runs. Their presence is to be detected by the trails, tracks, runs, or burrows in or on the surface of the ground and through the herbage. A few species are almost entirely subterranean in their mode of life, some are amphibious, and one at least—*Phenacomys longicauda* (True)—lives for the most part in the branches of the Douglas pine; it is practically arboreal.

The following craniometrical measurements of four of the five species of Vole were taken by Professor O. Charnock Bradley:[1]

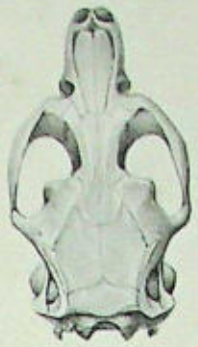
—	*M. orcadensis*	*M. amphibius*	*M. agrestis*	*E. glareolus*
CRANIUM.				
Length	19	26	19	17
Breadth	14	19	12	11
Cephalic index	73·68	73·07	63·15	64·70
Height. (1) Oblique	11·5	16	11·5	9·5
,, (2) Vertical	7	10·5	6	6
Oblique altitudinal index	60·52	61·53	60·52	55·88
Vertical ,, ,,	36·84	40·38	31·57	35·29
Bistephanic diameter	2	6·5	4·5	6
Frontal length	9·5	15	9	8
Stephanic index	21·05	42·33	50·00	75·00
Fronto-parietal length	14	20	13·5	12
FACE.				
Length	11	15	9	8
Breadth	6	7·5	5	5
Facial index	54·54	50·00	55·55	62·50
PALATE.				
Length	14·5	22	12	11
Breadth	3	4	3	3
Palatine index	20·68	18·18	25·00	27·27
Cranio-facial length	27	38·5	25	22
Upper cranio-facial index	127·27	133·33	150·00	150·00
Lower ,, ,,	40·74	38·96	36·00	36·36

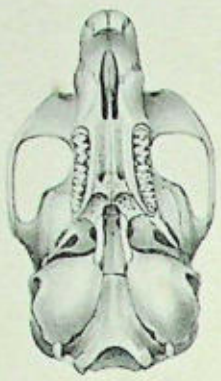
[1] W. Eagle Clarke, *On the Vole and Shrew of the Orkney Islands*, with Report by Professor O. Charnock Bradley, M.B. (*Ann. Scot. Nat. Hist.* 1905, pp. 1–8).

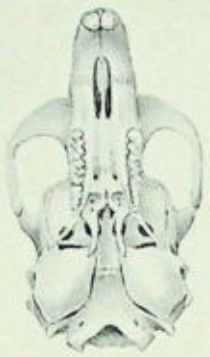

1

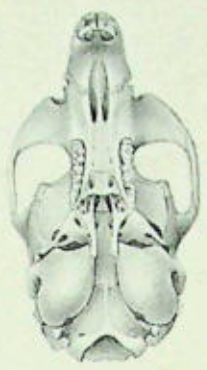

2

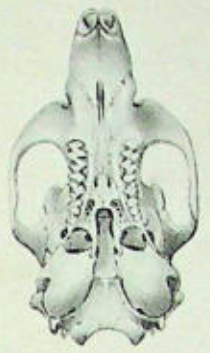

3

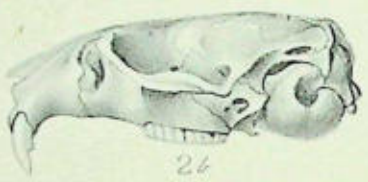

4


1a

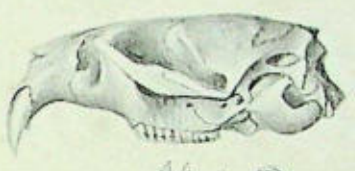

2a

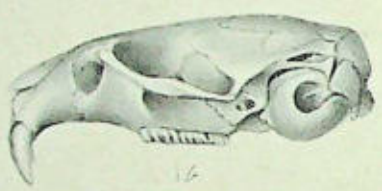

3a


4a


2b


3b


4b

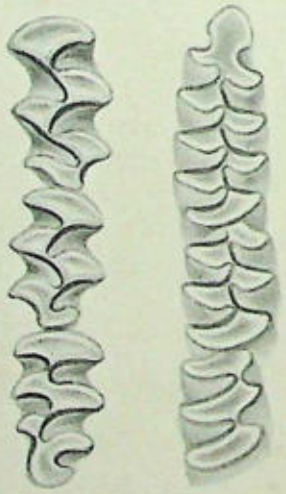

1b


1c

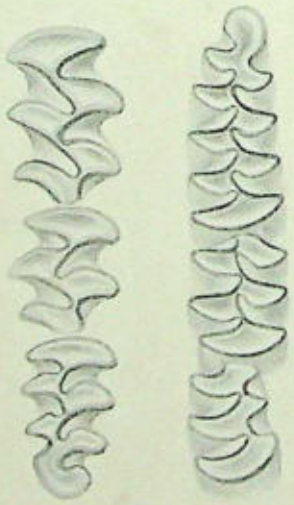

2c


3c

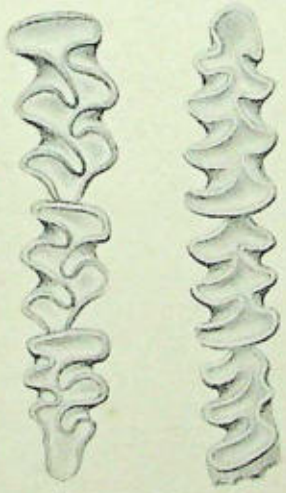

4c


1d

1e


2d

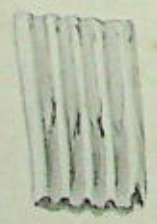
2e

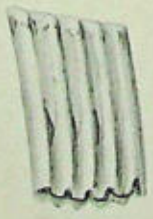

3d

3e

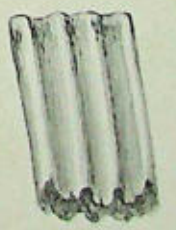

4d


4e


1f


2f


3f


4f

Skulls & teeth of British Microtina.

Fig 1. Field Vole. life size
- 1a. - - enlarged
- 1d. Right upper molars enlarged
- 1e. Right lower molars enlarged
- 1f. Left lower anterior molar enlarged

Fig 2. Orkney Vole. life size
- 2a. - - enlarged
- 2d. Right upper molars enlarged
- 2e. Right lower molars enlarged
- 2f. Left lower anterior molar enlarged

Fig 3. Bank Vole. life size
- 3a. - - enlarged
- 3d. Right upper molars enlarged
- 3e. Right lower molars enlarged
- 3f. Left lower anterior molar enlarged

Fig 4. a. Water Vole. life size
- 4 d. Right upper molars enlarged
- 4 e. Right lower molars enlarged
- 4 f. Left lower anterior molar enlarged

I have made a list of the following dental characters of Voles, and these are important aids in the identification of the British species:

—	Prismatic Spaces of the Upper Jaw			Prismatic Spaces of the Lower Jaw			Remarks on the Skull
	1st Molar	2nd Molar	3rd Molar	1st Molar	2nd Molar	3rd Molar	
Common Field Vole	5	5	6	7	5	3	
Orkney Vole . .	5	4	5[1]	7[2]	5	3	Skull more round and smoother than in the Common Field Vole. Incisors large.
Water Vole . .	5	4	4	7[3]	5	3	
Bank Vole . .	5	4	5	7	3	3	The zygomata are much slighter in *Evotomys* than in *Microtus*.
Skomer Vole . .	5	4	5	5[4] 6 7	3	3	Skull similar to Bank Vole, but rather more massive.

Roots of Molars.—In the Common Field Vole the roots of the molars are simple, and form one complete block as shown in the figure. In the Bank Vole and Skomer Vole the molars have two large roots to each tooth, but in juvenile examples the roots are simple. In both the Orkney and the Water Vole the molars are rootless.

Grinding surfaces.—The cemental spaces or triangles are in all these species caused by the folding of the enamel. This folding in some cases is not so pronounced as in others, and consequently what are separate spaces in some (as in *agrestis*) are continuous areas in others (as in *glareolus* and *orcadensis*).

Genus *Evotomys*, Coves.[5]

The characters of this genus are principally to be found in the teeth. The upper incisors are without grooves, and the lower possess roots on the outer sides of the molars. The molars are rooted in adults, and simple at the base in the case of young animals. Their enamel pattern is characterised by the approximate equality of re-entrant angles (Miller). The grinding surfaces of these teeth are described in the foregoing table. The feet and fur are not especially modified,

[1] The second of these spaces is generally imperfectly separated from the third.
[2] The first space is formed of three compartments which lead into one another.
[3] The first three of these spaces are generally imperfectly separated.
[4] Spaces sometimes perfectly and sometimes imperfectly separated.
[5] *Proc. Acad. Nat. Sci. Phila.* 1874, p. 186.

and the tail is longer than the hind foot. Mr. G. S. Miller considers[1] that the peculiar form of the bony palate—terminating 'in a thin-edged shelf, continuous between the alveoli of the posterior incisors'—is one of the best characters of the genus. Members of this genus are found in Europe, Asia, and North America. The distribution of the numerous species and sub-species has not been fully worked out, and it is probable that many new sub-specific forms might be added to those already known. *E. rutilus* (Pallas) is the type.

In his 'Preliminary Revision of the European Red-backed Mice,'[2] Mr. Gerrit S. Miller, jun., thinks that *E. rutilus*, *E. rufocanus*, and *E. glareolus* do not sufficiently embrace all the forms of *Evotomys* found in Europe, and suggests that there are known at present about ten good species and sub-species, whilst others still remain to be discovered.[3]

We are always loath to alter a title which has been in existence for some time, and is in itself a good one, so that when Mr. Miller takes away the good old name of *Evotomys glareolus* from our Bank Vole and relegates that animal to the comparatively insignificant position of an island sub-species under the name of *Evotomys hercynicus britannicus*, we feel almost inclined to dispute with him. On the other hand, to argue and fight with insular prejudice for what we know in our heart of hearts is a contention that cannot be upheld is both narrow-minded and ridiculous, for in the long run we shall be proved to be wrong. It is only by the examination of a very large series of the members of one genus that a zoologist is able to form a definite opinion. And Mr. Miller has done that with the greatest care. He has spent more time in examining the true position of Voles than any other zoologist, so that at present I feel disposed to accept his views.

If his explanation of our Bank Vole is correct then *E. skomerensis* also will have to be a sub-species, *Evotomys hercynicus skomerensis*, and in consequence I have given it this name.

[1] *North American Fauna* (*Genera and Sub-genera of Voles and Lemmings*), by Gerrit S. Miller, jun., Washington, 1896.

[2] *Proc. Wash. Acad. Sci.* vol. ii. July 1900, pp. 83–109.

[3] Since Mr. Miller's paper was written Captain Barrett-Hamilton has described as new a species of *Evotomys* inhabiting the island of Skomer. This will make the existing species and sub-species eleven.

THE BANK VOLE

Evotomys glareolus, Schreber.

[*Evotomys hercynicus*, Mehlis, sub-spec. *britannicus*, Miller]

Mus glareolus, Schreber, 'Säugethiere,' iv. p. 680 (1774).
Arvicola fulvus, Millet, 'Faune de Maine-et-Loire,' ii. p. 40 (1828); not of Geoffroy and Desmarest.
Hypudæus hercynicus, Mehlis, 'Isis,' p. 876 (1831).
Arvicola riparius, Yarrell, 'Proc. Zool. Soc.' p. 109 (1832); not of Ord (1825).
Lemmus rubidus, Baillon, 'Mém. Soc. Emul. Abbeville' (1834).
Hypudæus glareolus, Melchior, 'Den danske Stats og Norge Patt.' p. 116 (1834).
Arvicola rufescens, De Selys-Longchamps, 'Essai Monog. sur les Camps. des Envs. de Liège,' p. 13 (1836).
Arvicola pratensis, Cuvier, 'Hist. Nat. des Mam.' vii. (1842); Bell, 'Brit. Quad.' p. 230 (1837).
Arvicola glareolus, Blasius, 'Faun. der Wirb. Deutsch. i. Säugeth.' p. 337 (1857); Bell, 'Brit. Quad.' 2nd ed. p. 327 (1874).
Hypudæus glareolus, Fatio, 'Les Camp. du Bassin du Léman,' p. 28 (1867).
Arvicola (*Evotomys*) *glareola*, Newton, 'Geol. Mag.' dec. ii., viii. p. 258 (1881).
Microtus glareolus, Lataste, 'Act. Soc. Linn. Bordeaux,' xxxviii. p. 36 (1884).
Evotomys glareolus, Thomas, 'Zool.' 4th ser. ii. p. 101 (1898); not of Schreber.
Evotomys hercynicus britannicus, Miller, 'Proc. Wash. Ac. Sci.' ii. p. 103 (1900).

Local Names.—*Bank Vole*, *Red Vole*, *Red Field Vole* (English); *Hill Mouse* (Scottish); *Llygoden gwtta'r maes* (Welsh).

Mr. Gerrit S. Miller, in the able paper on the 'European Red-backed Mice' already referred to, demonstrates why he considers that *hercynicus* is the first tenable name for this species. Fatio's *Myodes bicolor*, and to a certain extent his *Hypudæus glareolus*, he considers are synonyms of *Evotomys nageri*, Schinz, to which on account of cranial distinctions he gives full specific rank. In the same way he gives specific rank to the Norwegian forest form *Microtus glareolus*, Collett, under the name *E. norvegicus*, Miller, and the Pyrenean form, *E. vasconiæ*, Miller. Millet's *Arvicola fulvus* he describes as 'a mere mis-identification of the *Lemmus fulvus* of Geoffroy, and *Arvicola fulvus* of Desmarest, a species of *Microtus*.' Schreber's *Mus glareolus*, the name hitherto adopted, he thinks was probably an example of *Microtus agrestis*. Melchior, in 1834, was

really the first to apply this name, with any certainty, to our Bank Vole, so that in any case it is antedated by the *H. hercynicus* of Mehlis. Yarrell's name *riparius* was the first which was actually applied to our British form, but this, again, is antedated by Ord's name for the Meadow Mouse of the United States, *Microtus pennsylvanicus*.

As Mr. Miller considers his work only as a 'Preliminary Revision,' I shall, though agreeing with his conclusions, retain the name given by Schreber, and recognised in 1898 by Mr. Oldfield Thomas, until the matter is fought out to a finish. I have therefore added Mehlis' specific and Miller's sub-specific name in brackets only.

Characters.—This species[1] is the most mouse-like of our Voles, both in form and general habits. In size it resembles the Field Vole, but it is not so blunt about the head or so short in the tail; the ears are longer and stand up above the fur. The body, too, is more elongated. The summer and the winter pelage of this species vary greatly in colour. In winter the upper parts are brown, with a slight reddish tinge; the whole interspersed with black hairs. In summer the upper pelage is reddish chestnut, with very fine black hairs. The under parts at both seasons are a sandy yellowish-white: sometimes they are white, and sometimes fawn-coloured, or may be silvery grey. Lips pink. Upper surface of feet white, upper surface of tail dark brown; white on the lower surface. All the hidden portions of the hairs are dull grey. In many examples captured in winter there is a tendency to grey on the back and flanks, and this is more noticeable in high latitudes. Scotch examples are at all times much less rufous than English ones; in winter they are grey brown above and greyish white below. They are also larger, as a rule, than those from further south.

The teeth of this species are fully described in the introduction to *Evotomys* and *Microtus*, so that I need only point out that the Bank Vole may be easily distinguished by the fact that the angles of the cemental spaces of the molars are rounded, and that their roots are 'forked,' whilst in the Field Vole the enamel walls of these spaces form sharp prismatic angles, and the teeth themselves have simple roots. In immature Bank Voles the roots of the molars are simple, as in *M. agrestis*.

Nine adults were obtained by Mr. Rope in Suffolk, near Blaxhall; the average dimensions were: Head and body, 3 in. 8 lines; tail, 1 in. 9 lines. One example, a female, measured as much as 4 in. in head and body, the tail being 1 in. 9 lines.

[1] In natural histories this species is sometimes placed after the Field Vole, but I think it should come first amongst the list of Voles, as it seems to form a connecting link with the mice.



THE BANK VOLE.
Evotomys Glareolus.

Litho. W. Greve, Berlin.

The following are the measurements of British specimens:

Sex	Locality	Head and Body	Tail	Hind Foot	Remarks
♂	Clifton, Gloucester	160 mm.	47 mm.	—	L. Adams
♂	Horsham, Sussex	110 mm.	45 mm.	17 mm.	April 1904
♂	Cambridge	100 mm.	41 mm.	17 mm.	April 1904
♀	Horsham, Sussex	100 mm.	40 mm.	17 mm.	April 1904

The following measurements of twenty-six specimens of *Evotomys hercynicus britannicus* are given by Mr. G. Miller:[1]

Locality	Number	Sex	Total Length	Tail Vertebræ	Hind Foot	Hind Foot
England: New Forest . .	2968	♂	138	43	18	—
,, ,, . .	2969	♂	138	42	17	—
,, Eversley . . .	2970	♂	146	44	18	—
,, ,, . . .	2971	♂	148	45	18	—
,, ,, . . .	2972	♂	146	46·6	18	16·5
,, ,, . . .	2973	♂	148	51	17·8	17
,, Basingstoke . .	2974	♂	147	48	18	—
,, ,, . .	2975	♂	139	46	17·8	—
,, ,, . .	2976	♂	139	41	18	17
,, ,, . .	2977	♂	139	44	18	17
,, Eversley . . .	2979	♂	137	43	17·4	16·6
,, New Forest . .	2937	♀	134	41	18	16·6
,, Eversley . . .	2938	♀	145	47	17	—
,, ,, . . .	2940	♀	140	46	17	16
,, Basingstoke . .	2941	♀	141	46·8	17·8	—
,, ,, . .	2942	♀	158	52	19	—
,, ,, . .	2943	♀	140	47·6	18·4	17
,, ,, . .	2944	♀	156	51	17·4	16·6
,, ,, . .	2945	♀	159	52	17	—
,, ,, . .	2946	♀	160	54	18	—
,, ,, . .	2947	♀	147	44	18	17
,, ,, . .	2949	♀	158	51	18	—
,, ,, . .	2950	♀	161	54	18	—
,, ,, . .	2951	♀	137	42	18	17
,, ,, . .	2952	♀	137	43	18	17
,, Eversley . . .	2956	♀	150	51	18·8	17

[1] *Proc. Washington Acad. Sci.* July 1900.

Distribution.—The Bank Vole has a very wide distribution in the northern hemisphere, as it is found from England and France throughout temperate Europe, and onwards to the East, north of the Himalayas, to China. In America the closely allied *M. gapperi* takes its place. Remains of the Bank Vole found in the Norfolk forest-bed, as well as in several of the English caverns, prove it to have been an inhabitant of England in the early Pleistocene age.

Not so very long ago local naturalists thought it necessary to record the discovery of this species from counties where it is abundant, but now it would be a work of supererogation to do more than summarise briefly all these records and to take notice of such districts in which the Bank Vole is said to be rare. Even so recently as 1887, Mr. Harting published a good paper on the Bank Vole,[1] in which he summarised the records of its distribution in England and Scotland up to date. A perusal of these records, however, shows rather the 'poverty of the land' in the matter of observers than a correct summary of the actual distribution of the animal. In many counties it is reported as rare where we now know it to be extremely common, for from Cumberland to Sussex, and Yorkshire to Anglesey, I have met with the Bank Vole wherever I have taken traps or made close inquiries. It is, in fact, one of the commonest mammals in England. Wherever there are old ivy-covered hedgebanks there are sure to be Bank Voles. This animal was first described as a British mammal by Yarrell (1832) from specimens he received from Birchanger in Essex.[2]

In Scotland it is necessary to become more precise, as the Bank Vole undoubtedly becomes scarcer the further north we look for it. In Wigtownshire and the Border counties, Dumfries, Linlithgow (from which county it was first noticed by MacGillivray)[3] and Lanarkshire (where I have found it very numerous on the Cadzow estate, near Hamilton), and the Lothians it is generally distributed and common locally, as well as in all the arable lands of Stirling and Perthshire.

Near the heads of the main valleys, and when we enter the mountain and wood regions north of the Tay and the Clyde, the Bank Vole becomes very rare, if not absent altogether. Messrs. Harvie-Brown and Buckley did not mention the Bank Vole as occurring in Argyllshire, when their account of the 'Fauna' of that county appeared, but recently Mr. Harvie-Brown wrote to me that he has, since 1892, received specimens from Loch Aweside, where Mr. C.

[1] *Zoologist*, 1887, pp. 361–371.

[2] *Proc. Zool. Soc.* 1832, p. 109; also in *Mag. of Nat. Hist.* v. 599.

[3] *Nat. Lib. Brit. Quad.* vol. vii. p. 272.

Alston has recently reported it as common, and several other localities. Specimens have recently been sent to Mr. Eagle Clarke, of the Edinburgh Museum, from both Forfarshire and Kincardineshire, so it is probably fairly numerous in the lower grounds of these counties. From Banff Edward recorded it under the name of *Arvicola pratensis*, and I have found it very common wherever I have looked for it in Elgin, Moray, and Nairn.[1] Mr. George Sim, curiously enough, omits this species from Aberdeenshire in his 'Fauna of Dee,' but I feel certain that it is common in that county.[2] I have several times seen Bank Voles crossing the road close to the town of Inverness, but further west and north than this I have never come across the species.

Until recently Inverness might be described as its known northern limit, but in 1894 Messrs. Eagle Clarke and Hinxman recorded it from Braemore in Ross-shire, an isolated valley surrounded by high mountains and wild moorlands—a locality to which we should not have imagined the little animal could have penetrated. I expect that it will shortly be reported from East Sutherland. The country about Dunrobin is entirely suitable to it, and it may occur on the low grounds of Caithness.

The species is plentiful in North Wales, and is probably found all over the Principality in suitable localities. In Anglesey it is common. Many trapped in the island by Messrs. Oldham and Coward had very 'smoky' bellies, and this peculiarity is not uncommon amongst Scotch specimens.

Habits.—The description of the habitat of this little mouse-like Vole given by Mr. Rope is good; and over nearly the whole of England where such places exist, Bank Voles will be found. He says: 'Their favourite haunts here [Suffolk] are old, rough, ivy-covered hedge-banks, especially those from which the soil has been washed away in places, leaving the roots bare, and thus forming hollows behind them. Banks adjoining woods and plantations seem particularly attractive to them. In spots like this, pleasingly varied by a sprinkling of old mossy stubs, brambles, and bushes, with the roots of overhanging trees backed by deep cavernous recesses, the Bank Vole makes its burrow, and forms runs in all directions, partly above and partly below the surface, probably also making use of that of the mole.'

[1] Whenever I set traps for small mammals at Fort George I caught more of this species than any other.

[2] A letter to Mr. Sim elicited the following reply (April 1905): 'You are quite right in supposing that the Bank Vole occurs in "Dee." Within the past nine months I have received specimens from several districts in Aberdeenshire; so that there is no longer any doubt it is fairly abundant.'

The last sentence proves that Mr. Rope is not only an accurate observer 'on the surface of things,' but that he has gone underground to probe deeper into the matter. And I think his suggestion that Bank Voles use the runs of moles is more than a theory.[1] I have taken a spade and cut down an entire bank to trace the workings of various species of small mammals. In most cases I believe that the mole is the original engineer of these bank-galleries. Field rats may follow in due course, and if they do they scare away all smaller mammals except moles; but on the other hand, when the moles have worked out one of these banks, in which, by the way, they often place their fortress, the common shrews and Bank Voles take possession and live in amity together. The main galleries still afford the general highway, and are used indiscriminately by moles, passing rats, common shrews, lesser shrews, and Bank Voles; but when shrews and Bank Voles 'take up' a certain part of a hedgerow as their actual home, they drill subsidiary galleries and passages through the surrounding herbage, which are usually smaller in diameter than the main-travelled routes. Into these rats and moles do not penetrate, and so young Voles and shrews are comparatively safe.

My garden abuts on the old Forest of St. Leonard's, and to all the copses and bordering hedgerows come the Bank Voles in the spring. At night they swarm over herbaceous borders, tulip-beds, and rough places, leaving traces in the morning of their midnight forays, for the Bank Vole is much more nocturnal in its habits than any of the other species of Voles. Yet it must not be inferred from this that the animal moves only at night. In spring it is often active throughout the day, and may constantly be seen rushing from its hole to secure some delicacy, which it sits up and eats, and then runs back again in great haste. On warm afternoons small parties of the Vole may often be observed sitting at the entrance of their houses and enjoying the sunshine. The slightest movement on the part of an observer causes an immediate retreat, but they soon reappear to enjoy the sun-bath or to arrange their toilet. If undisturbed they will soon become extremely bold. A large colony lives at the back of one of my herbaceous borders in which a hard nut of the anemone order grows very freely. These I dig up in spring and arrange in piles with other weeds, and so fond of them are the Bank Voles that they will rush out and carry them off almost under my nose. One day I had constructed a little heap of about thirty of these ground nuts, which I left for about ten minutes, and on my return not one remained. It is

[1] In March 1905 I caught two Bank Voles in a mole-run situated in an open lawn.











Bank Voles

From Photographs by D. English. 1934

fond of drilling experimental holes in the flower beds. These are made in a single night, and are only 'try holes,' as the burrower is never 'at home' when we dig them up next day. The Voles just go down to examine a root, and in nine cases out of ten do not touch it. In the tenth case you have to lament the loss of some choice lily or other bulbiferous plant. In confinement I have found them wonderfully smart, active, and bright little creatures. They are full of resources and mischief. Two which I confined in a cage which I considered unbreakable, and in which I had kept Orkney and Field Voles for months, escaped in ten minutes, and I had to catch more specimens. Like mice and unlike the majority of Voles, they will bite on the smallest provocation. If caught in a trap with the Field Vole, the latter has no chance: it is killed and eaten without ceremony. With a second lot of Bank Voles taken in my garden in the spring of 1904 I was more successful, and kept them for two months, when I allowed them to escape. I used to keep them under a glass shade on my table, and it amused me to watch their pretty little ways as I wrote or painted. These became very tame, but never took food from my hand as Orkney and Field Voles would do. They were always fighting and chasing one another about, sitting up polishing their glossy coats, eating quantities of food and wasting an equal amount, playing games of hide-and-seek in and out of the grass, hopping about like the restless hedgesparrow, climbing nimbly about their miniature bushes, and behaving with the delightful inconsequence of a thoroughly happy and volatile disposition.

Mr. Douglas English sends me some delightful notes of his pets and their habits.

'*Post mortem*,' he says, 'the main difference between Bank and Field Voles lies in their dentition; living it lies in their character. In ways, attitudes, and build the Bank Vole forms a connecting link between the Voles and the mice.

'Large ears, large eyes, pointed muzzle, and estimable tail incline one naturally to expect mouse attitudes, and, so far as general agility is concerned, one's expectations are justified.

'The Bank Vole lacks the *élan* of the wood mouse; yet he will *jump* for preference on the flat, whereas the Field Vole never under normal conditions leaves the ground. An open-topped glass tank with seven-inch walls is sufficient confinement for the latter. The Bank Vole thinks little of such a prison. His fourth or fifth leap lands him on its parapet. I have known one escape from a square biscuit tin (sides 9¼ in.), which argues no small skill as a gymnast.

'He will gnaw his way through wood as quickly as a mouse—the Field Vole's gnawing of wood is laborious—so it is not surprising to find that he is a nut-cracker.

'In the spring of 1902 I excavated in an orchard two small rodent communities. One consisted of wood mice, the other of Bank Voles. They were situate within fifteen yards of each other and seemed to be conducted on identical lines. In both cases there were, as far as I could determine in the intricacy of roots, three entrances. In both cases these entrances terminated in a double compartment (sleeping room and store) some eighteen inches below the surface. In both cases the community consisted of five adults, and in both cases the store consisted entirely of cob nuts. The mice had ninety-eight, the Voles ninety-three, so tightly packed that it was difficult to dislodge them with the fingers. The nuts were intact, and I failed to discover any empty shells either in the burrows or their vicinity. It looked as if the stores had not been drawn upon; but, to satisfy myself in the case of the Voles, I fed the three I had captured solely on nuts, placing them at such a distance from their cover that I could assure myself of the way in which they handled them.

'Like rats, they use at least three methods of transport. Sometimes they take the pointed end of the nut between their teeth and jump with their heads held high; sometimes they wedge it between their chin and fore legs; sometimes they roll it before them.

'When feeding they sit back on their haunches and twist the nut from side to side, as they gnaw its pointed end, squirrel fashion. The speed with which they effect an entrance is astonishing. It averages a minute. Another minute and the shell is empty. Sometimes the hole which is round and symmetrical seems smaller than any possible diameter of the kernel.

'They are indeed as skilful with their cleft lips and teeth as mice. In the management of nest-material they seem even more skilful. I tested their abilities with hay. The thin, flexible grasses were left untouched, the thicker stems were cut in lengths of an inch or less. Either in the cutting or naturally these lengths split longitudinally, and the hollow of the entwined nest-sphere was lined with the resulting short thin strips.

'I have bred the Bank Vole in captivity, a litter of five. They were blind and hairless at birth. On the fifth day their eyes were open: they were covered with a blackish down, and their whiskers were visible. On the seventh day they were brownish (the red-brown is characteristic of the adult), and in an attempt at

transposing them to better quarters my observations were unfortunately ended. I removed the young safely, in the course of which operation the mother deliberately attacked me. I caught her with some difficulty, but without the slightest violence, and was genuinely distressed to find her die in my hand.

'From previous experience of infant harvest mice and infant dormice I had hopes of being able to rear the bereaved family, but was unsuccessful.

'Audacity in defence of the young is of course characteristic of the mouse family: it is not generally recognised in the case of the Voles. Yet the Bank Vole is easy to trap, and to be trapped argues a certain initial audacity.'

Mr. Rope thus describes their movements in fighting: 'When angry these little creatures make a great fuss, grinding their teeth and using their voice very freely, which may be described as a short grunting squeak, neither so sharp nor so prolonged as that of *Mus sylvaticus* or *musculus*. In quarrelling their actions are ludicrous in the extreme: they dodge round each other in a perfectly upright attitude, hopping on their hind legs, and now and then nearly throwing themselves over backwards in endeavouring to avoid each other's attacks, the fore paws being held stretched out before the face for protection. There is a great deal of fuss, and much squeaking and grinding of teeth, but very little comes of it all, and in general they are peaceable and gentle in their ways.'

In captivity they will eat many vegetable substances, but prefer fruit and nuts and cereals. They are particularly fond of apples, hemp-seed, and nuts. Mr. Rope says they like haws,[1] peas, sunflower seeds, holly berries, and only eat the middle of a piece of maize, wasting the rest. Curiously enough, they do not care for carrots, of which other Voles are so fond, but like Brussels sprouts. The same writer says: 'During the winter Bank Voles often visit and even take up their abode in outbuildings where roots, bulbs,[2] vegetable seeds, &c. are stored; yet those I have kept in cages would not touch carrots, parsnips, or crocus bulbs.'

In a wild state they eat quantities of grass, roots, dandelion leaves, sheep's parsley, plantains, hogweed, wild anemone roots, acorns, and nuts of various kinds. The stomach usually contains a mass of undigested seeds yellow in colour.

Mr. de Winton says:[3] 'Its principal food at all seasons consists of seeds, bark, and shoots, and it is this species which does the damage in the woods. I have opened the bodies of many, and have invariably found the stomach filled

[1] The same writer says he has seen a Bank Vole climbing about a whitethorn hedge, doubtless in search of haws.

[2] They certainly destroy numbers of tulips, taking the bud shortly before flowering, and Mr. Heatley Noble tells me they are almost as destructive to crocuses as *M. sylvaticus*.

[3] Lydekker, *Brit. Mam.* p. 207.

with a yellow substance like pease pudding, while the stomach of the Field Vole contains chewed grass.'

Mr. John Lowe says that it eats the carpels of *Ranunculus repens*.[1] Victor Fatio[2] states that during the winter this species lives on bark and roots, and also that it devours worms, and is in the habit of robbing the nests of small birds building on or near the ground. This last remark is open to question, for the robber may have been some other species, such as dormouse or squirrel. Nevertheless there is little doubt that the Bank Vole is not entirely a vegetable feeder. It probably eats various kinds of insects and pupæ, and so good an observer as Mr. Lionel Adams sends me the following note, which seems to prove that these Voles will eat land-snails:

'In some ditches at Rockingham,' he says, 'C. Wright and I found in September 1895 numbers of *H. nemoralis*, and one *H. aspersa* broken in at the sides (and not smashed in at the top as by thrushes). This must be put down to "mice," for no birds could get among the tangled grass at the bottom of the ditch. C. Wright says he has caught *E. glareolus* in the act—too far from buildings to be *M. decumanus*, and too far from water to be *M. amphibius*.'

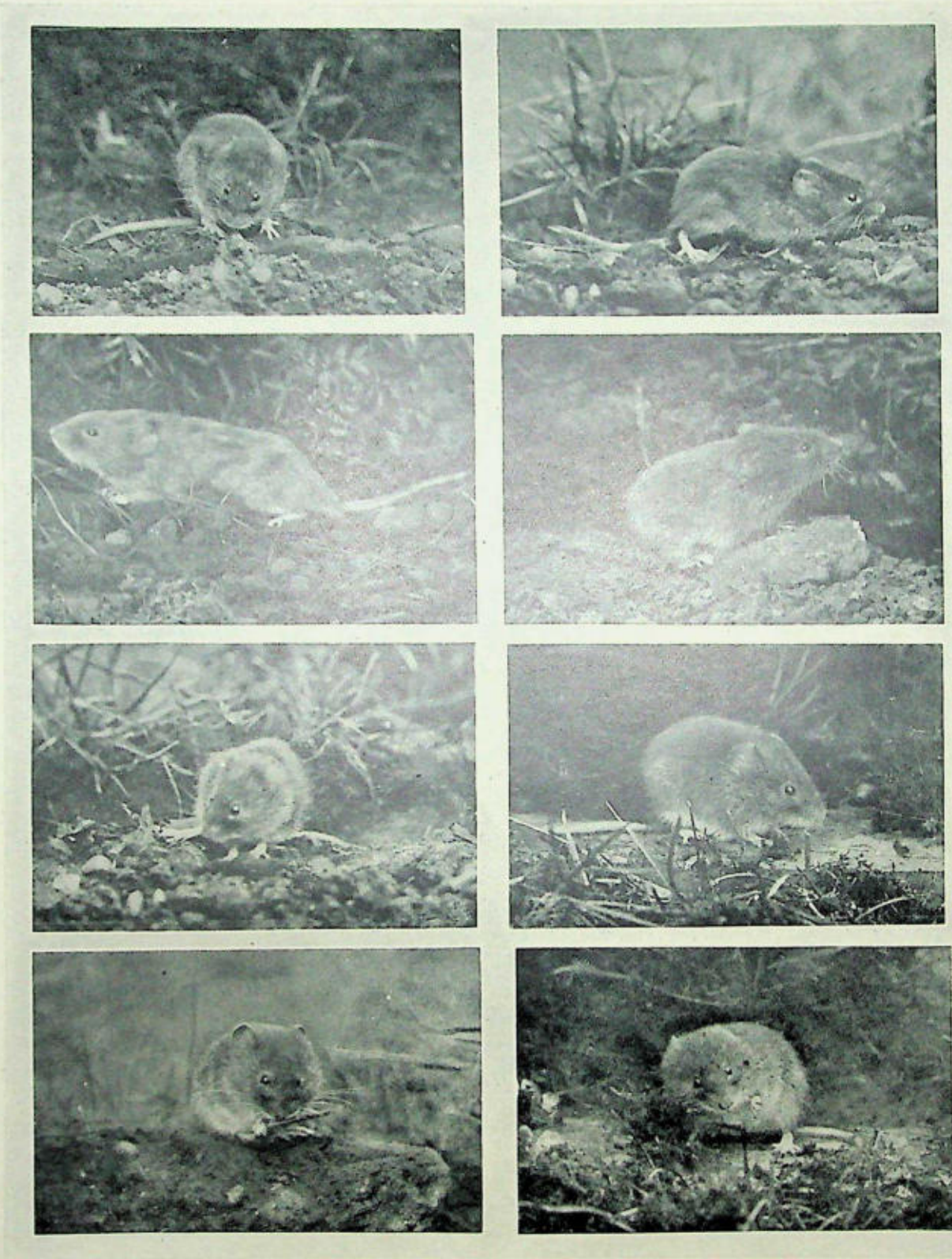
In the winter, before cold weather sets in, the Bank Vole makes a winter store, and in another compartment close by several will sleep for days without venturing abroad. The late Rev. H. A. Macpherson says[3] that in Lakeland the species lives, generally in parties of five, in heaps of turnips. He thinks that where numerous they must do a great deal of damage to root crops.

Like the Field Vole this species breeds early in the year and generally has several litters during the spring and summer months, Fatio says from two to four. The normal number of young is from four to eight. I have found nests made of grass and moss, all the interior being bitten into small pieces.

The period of gestation is twenty-eight days. Some Bank Voles were kept in confinement by Mr. Drane, of Cardiff. A doe was found to have produced two young, and was at once isolated with them in a separate hutch, where she shortly produced three others. In twenty-eight days from that time she had another litter, showing that she had been impregnated before removal from the common hutch in which she had produced the first two young ones.

Young Bank Voles are much darker in colour than the adults. They do not get the bright chestnut colour till the following spring. Mr. Harting says they change their fur with great rapidity.

[1] *Zoologist*, June 1895. [2] *Faune des Vertèbres de la Suisse.* [3] *Zoologist*, April 1894.



BANK VOLES.

From photographs by D. English, F.R.P.S.

Sometimes in spring and winter Bank Voles do much destruction by stripping apple, larch, fir, and birch trees of their bark. This is especially the case in years when this species has bred in such numbers as to constitute a plague. One of the worst outbreaks in England was in 1813–14, when hordes of Bank Voles appeared in the Forest of Dean in Gloucestershire.

'Great numbers of hollies and of five-year-old oaks and chestnuts were barked near the ground, while the Voles gnawed the bark at 3 ft. to 4 ft. up, and active measures had to be taken to exterminate the pests. Cats were first of all employed, but proved next to useless as an exterminative measure. Then an endeavour was made to clear away the furze, fern, rough grass, &c.; but this was soon abandoned as too expensive. Poisons were next tried, without proving very effectual; while traps of various sorts worked well, but were also expensive. Finally holes or trenches were dug, 18 in. to 20 in. wide at bottom, 2 ft. long, 1½ ft. deep, and 9 in. wide at the top, up the inward sloping sides of which the mice and Voles could not climb out again after once they had fallen into the pits. Where the mice were numerous the lines of trenches were dug about twenty yards apart; otherwise they were thirty yards apart. About 30,000 were thus caught during the course of one autumn, and it was calculated that during the three or four months of their visitation upwards of 200,000 were killed.'[1]

In Scotland they have sometimes threatened to become a plague, especially about Dumfries and the Border counties, where they are numerous in the small plantations. In 1893 the species was very abundant all over England. Bank Voles are very easily caught with any of the ordinary traps now in use. If they are required for study, the common wooden mouse-trap will catch them alive; but if the animals are a nuisance, and it is desired to rid the garden of them, the little 'nipper' is the best of all. A piece of bread or cheese is an excellent bait, and Mr. Rope says that a few hempseeds scattered about the entrance of the trap serve as a useful ground bait. If a Bank Vole finds other small mammals in a trap, or even a weaker member of his own species, he soon kills the less active animal, and after eating will turn the skin inside out like a glove. The favourite point of attack of all small mammals, including stoats and weasels, is a spot just behind the ear.

On the trapping of small mammals the following excellent note by Mr. R. I. Pocock not only bears out my own experience of the general abundance of Bank Voles, but also touches on an important point, namely, that the abundance or

[1] J. Nisbet in the *Field*.

scarcity of a certain species is by no means proved by the steadfast setting of traps which will catch with certainty, say, two or three common species. To catch what are called the 'rarer' kinds is only a matter of procuring the proper cage and using exactly the right bait. This point most naturalists do not understand as yet.

'It by no means follows,' says Mr. Pocock,[1] 'that a species of mammal is scarce because it is hard to trap or rarely seen. Take, for example, the case of our two small Voles, *Microtus agrestis* and *M. glareolus*. A few years back it was the custom to publish the capture of every specimen of the latter, and record it as "new to the county." Yet nothing, I take it, is more certain than that the species is, and always has been—at least since historic times—abundant everywhere throughout Great Britain. I myself have caught it night after night in numbers in the counties of Glamorgan, Gloucester, Somerset, Devon, and Dorset. It even outdoes *Mus sylvaticus* in obtrusiveness. But with the Field Vole it is far otherwise. I have trapped it, it is true, but only at rare intervals, and so to speak by chance; that is to say, the specimens were found in the traps, either snapped by the hindquarters or lying in some other position, showing equally clearly that their capture was due to pure bad luck, like an accidental dart into the trap, and not to any eagerness after the bait. In fact, at a rough estimate I should compute that in the case of these two species the percentage of *agrestis* captured had not been higher than five; yet this is not attributable to any scarcity on the part of *agrestis*, nor to trapping in unfavourable localities. Traps have been set in their runs in the green fields, and even close to the nest containing young, but without success. Nevertheless the species is probably abundant everywhere in meadows and hayfields, not to mention hedges and banks, where I have myself seen it. The same may be the case with the pigmy shrew. It may be as abundant as *S. araneus*, but harder to trap. The small amount of experience I have had of the species lends some support to this supposition, for in at least two cases I clearly recollect that the specimens were caught in the way mentioned above as characteristic of *A. agrestis*; that is to say, with their heads nowhere near the bait. In conclusion, it may be added that in my opinion the difference with respect to being trapped observable between *agrestis* and *glareolus* is partly, at all events, explicable in connection with an habitual difference of diet between the two species. At the time when I had the best opportunities of trapping *agrestis* I was not aware that baits like bread, cheese, boiled potato, and the

[1] *Zoologist*, 1897, p. 507.

like, which seem to be so attractive to *glareolus*, have no charm for the other species.'

White varieties of this species are very rare. An albino, with pink eyes and a slight sandy tint in the back, was taken at Chelmsford in August 1885,[1] and Mr. F. Bond records a light cream-coloured Bank Vole which was captured some years previously in Huntingdonshire.[2] Mr. Whitaker also has a cream-coloured specimen.

The enemies of the Bank Vole are very similar to those of the Field Vole.

[1] *Zoologist*, 1885, p. 432.

[2] *Ibid.* 1887, p. 425.

THE SKOMER VOLE

Evotomys hercynicus skomerensis, sub-spec. nov.

Evotomys skomerensis, Barrett-Hamilton, 'Proc. Roy. Irish Acad.' vol. xxiv., sect. B, art. 4, pp. 315–319 (1903).

Characters.—I cannot do better than quote Captain Barrett-Hamilton's description of this animal, which he regards as a species but which I consider a sub-species: 'Size large; skull of adults about 25 mm. in greatest length; total length averaging about 165 mm.; hind foot averaging 18 mm.; ratio of tail vertebræ to total length 33; skulls strong (for *Evotomys*), angular, and ridged for muscular attachment; the zygomata rather heavy. Colour deep and moderately bright. Skull of the same type as that of *E. nageri*, with which it agrees in size, angular appearance, and general massiveness, but is, on the average, slightly smaller.'

The skull of an adult male presents the following dimensions (in mm.): Greatest length 25; basilar length 22·5; palatal length 12; length of palatal foramina 4·5; zygomatic breadth 14; breadth of brain-case above zygomata 11·75; length of molar series (both upper and lower) 6; length of nasals along middle line 8.

Colour.—Above between bright 'cinnamon-rufous' and 'madder-brown,' the general appearance being due to the sub-terminal bands of the hairs, about 2 mm. in breadth. The hidden (and major) portion of these hairs is 'slate-black' and the tips black, face, sides of head, and flanks becoming gradually deficient in rufous, and running through light 'hazel' or 'vinaceous-cinnamon' to a dull greyish buff. Rump and upper side of the sharply bi-coloured tail 'mummy-brown.' Under side of body and tail, with the legs and feet, white (the hidden portions of the hairs again were 'slate-black'), usually with a very perceptible yellowish wash. The line of demarcation between the colours of the upper and under surfaces moderately defined. Ears nearly naked externally, internally covered with light 'cinnamon-rufous' hairs. The dimensions of twelve specimens the writer gives as follows:



THE SKOMER VOLE.

	Head and Body	Tail	Hind Foot	Ear
Maximum of seven males and five females . .	114	61	19	15
Mean „ „ „ about .	110	55·5	18	13·5
Minimum „ „ „ „ .	105	50	17	12

The Skomer Vole, besides exceeding the Bank Vole by an average of 18 mm. in the length of the body, and also in the dimensions of its other parts, differs from the typical species in the proportionate length of the tail vertebræ, 33 per cent. of the whole in the Skomer Vole as compared with 31·5 in the Bank Vole. Two adult females in the flesh, sent to me by Dr. Mills, of Haverfordwest, and obtained on Skomer on April 26, 1905, bear out these measurements. One of these specimens had an orange tinge over the whole of the under parts, a variation we often notice in the Bank Vole.

It is more than likely that Mr. Gerrit Miller in his 'Preliminary Revision of the European Red-backed Mice' (1900) would have described this animal as a sub-species of *Evotomys hercynicus*, but Captain Barrett-Hamilton considers that it is entitled to full specific rank, and includes it as a fourth member of the group and closely related to *Evotomys norvegicus* (Miller) of Norway, *E. nageri* (Schinz) of the Alps, and *E. vasconiæ* (Miller) of the Pyrenees. But with this decision I cannot agree, as the Skomer Vole is an 'improved' Bank Vole.

The credit of discovering this Vole is due to Mr. Drane, of Cardiff, who in 1897, on a visit to the island of Skomer, off the coast of Wales, caught several specimens and partially described them in a paper which he read before the Cardiff Naturalists' Society, and which was published in their 'Transactions,'[1] from which the following is a quotation:

'We caught many Voles which, as far as I understand, do not agree with either of the two possible ones found in this country. Of these two it cannot be the common Field Vole, with which everybody is familiar, and from which it differs widely in appearance, colour, and size. It is very like the remaining one, the Bank Vole (*Microtus glareolus*), but it is much larger, and I cannot make its teeth agree with the description of Lydekker, "British Mammals," page 213 (1895), who gives the length of this species head and body 4 in., tail $1\frac{1}{3}$ in. $= 5\frac{1}{3}$ in. These Voles measured respectively 6 in., $6\frac{1}{2}$ in., and 7 in., the tail being 2 in. to $2\frac{1}{4}$ in., so that the smallest is larger than Lydekker's largest.'

In June 1898 Mr. Drane again visited Skomer, and after securing more specimens then wrote in the 'Transactions' of the Cardiff Naturalists' Society:[2]

[1] Vol. xxxi. 1898, 1899, p. 47.

[2] Vol. xxxiii. 1900, 1901, p. 63.

'One thing I set myself to do this time at Skomer was to capture some of the Voles which I found there on a former visit, and which I am inclined to regard as a hitherto unnoticed variety, for I cannot make them agree with any given by Lydekker in his "British Mammals," published in 1895. An authority at the British Museum, South Kensington, says that these Skomer Voles are a "local variety" of the Bank Vole. Well, I am not convinced, but will just refer to them now because I have some living ones here to show you. Of one of these Voles I will give you a fact or two, and then leave the scientific consideration of species for some future paper, when I shall have come to some definite opinion; but when, perhaps, I may not be able to present the living ones.'

Subsequently Mr. Drane sent specimens to the Linnean Society and the British Museum, but could obtain no recognition of his new species beyond the statement that it was a local variety. When Captain Barrett-Hamilton described the animal six years afterwards, the Cardiff Naturalists' Society protested[1] that Mr. Drane had been unfairly treated. Mr. Oldfield Thomas,[2] however, very sensibly pointed out that the discovery of new species and sub-species should not appear in purely local publications, but in zoological journals of high standing, to which all may have reference; and that, moreover, the more recent methods of studying local races, as exemplified in Mr. Miller's papers, had enabled Captain Barrett-Hamilton to describe the Skomer Vole, which would not have been possible six years previously.

Habits.—The general habits of this species seem to be similar in most respects to those of the common Bank Vole. One characteristic, that of frequenting stacks of turnips stored for the winter, is common to both species; but the habit of the Skomer Vole of living in and about the vicinity of farm buildings is somewhat peculiar. Thus Mr. Drane writes: 'The Skomer and the Bank Vole are very much alike in disposition and habits. Both affect the vicinity of homesteads, but the Skomer Vole much more so than the Bank Vole. The Skomer Vole may be taken in any number near and within a farmstead and *not at all five hundred yards from it*. The completely mature Orkney or Skomer Vole is really quite different in size and appearance from the great majority of those taken in the ordinary way, and a good large specimen does not occur once amongst fifty individuals. The gestation seems to be similar to that of the Bank Vole. In every respect these two sub-species of *E. hercynicus* seem to be very closely allied.'

The discovery of the Skomer and Orkney Voles as well as certain local races

[1] T. W. Proger, *Field*, February 20, 1904.

[2] *Field*, March 12, 1904.

of *Mus sylvaticus* and *M. muralis* is a curious and little-understood zoological question. In the case of the larger mammals the effect on a robust Continental form of isolation in a comparatively small wind-swept island is considerable deterioration, as instanced in the reindeer of Iceland and the red deer of the Lews. But all the above-mentioned forms are distinctly of a more robust type than their mainland allies. It is difficult to account for this local superiority when we consider the cramped habitat, damper climate, and small variation in diet. This is explained by Captain Barrett-Hamilton's concluding remarks[1] on this animal:

'It cannot, however, be without meaning or importance that we have here on this small, treeless, wind-swept islet, almost facing the home of *Lepus timidus hibernicus*, an animal which belongs to the same type of fauna as that boreal mammal. It may be that we may yet find amongst the Welsh mountains further colonies of these boreal Voles, and the possibility should at least be a stimulus to British field naturalists in their collecting expeditions. Meanwhile we may note the parallel between the occurrence of a boreal Vole at sea-level on Skomer Island and the similar downward extension of the range of the variable hare in Ireland, accompanied as it is in the West by the frequent descent to the plains of certain Alpine plants.'

No one can question the writer's views on the subject of the variable hare, which is without doubt a boreal species, but his contentions that the Skomer Vole belongs to the Arctic races I am inclined to dispute, just as the Orkney Vole may be and probably is closely allied to *Microtus arvalis* of the southern continent; in fact, all the cranial characters point to this; so *E. skomerensis* is probably a similar offshoot from the group of which *E. hercynicus* is the type. Captain Barrett-Hamilton has himself shown that *Mus sylvaticus hebridensis*, *M. s.. hirtensis*, and *M. muralis*, animals superior in size to the parent forms, and living under isolated conditions, are only local races of southern forms which have gradually moved north and become isolated.

In his paper on this species Captain Barrett-Hamilton makes no mention of the teeth, perhaps the most important point in the determination of the Voles. On examination of four skulls under microscope I find that, beyond being more robust than those of the Bank Vole, they are so similar that separation is impossible. A frequent variation occurs in the walls inclosing the spaces of the first lower molar, which in some specimens are well formed, and in others so imperfect that some of the spaces may be said to run one into the other.

[1] *Proc. Roy. Irish Acad.* vol. xxiv. Sect. B, Part IV., p. 319.

Genus *Microtus*, Schrank.

The general characters of this genus are to be found in the skulls and teeth, which differ considerably from those of *Evotomys*. The molars are large with sharp salient angles, and are rootless throughout life. The skull is strong and angular. Mr. Miller has pointed out that the middle portion of zygoma is distinctly expanded, whilst in *Evotomys* it is scarcely expanded at all. The posterior border of the bone palate is extremely variable. The upper incisors are without grooves, and the lower possess roots on the outer side of the molars. The tail is generally longer than the hind foot. The thumb is furnished with a small pointed nail. This genus is found in large numbers, consisting of several species in both hemispheres from the northern limit of mammalian life to the borders of the tropics.

There are eight mammæ. The soles of the feet are moderately hairy in *agrestis* and *orcadensis*, but sparsely haired in *amphibius*; in *agrestis* there are six tubercles, but in *amphibius* only five. The claws on the hind feet are longer than on the fore feet. The fur is moderately full and soft.

The genus *Microtus* is found throughout Europe, Northern Asia, and North America. In England and Scotland and on some of the islands off the coast three species are found, the Field Vole, Orkney Vole, and the Water Vole. According to Miller the first species belongs to the sub-genus *Microtus*, and the Water Vole to the sub-genus *Arvicola*.

I have been unable to find who originated the term 'Vole.' In this country Bell in his first edition seems to have been the first to use it, for Bingley, White, and Pennant refer only to water rats and meadow mice. The etymology is doubtful. One writer derives it from 'wold,' hence 'wold-mouse.' It may come, through the French *voler*, from the Latin *involare*, owing to the stealthy, sneaking habits of the animal. Thus Dr. Wendell Holmes in his classical skit 'Æstivation' writes:

'Oh! might I *vole* to some umbrageous clump.'

THE COMMON FIELD VOLE

Microtus agrestis, Linnæus.

Mus agrestis, Linn. 'Fauna Suecica,' 2nd ed. p. 11 (1761).
Mus gregarius, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 84 (1766).
Arvicola agrestis, Fleming, 'Brit. Animals,' p. 23 (1828); Bell, 'Brit. Quad.' 2nd ed. p. 323 (1874).
Arvicola neglectus, Jenyns, 'Ann. Nat. Hist.' vii. p. 270 (1841).
Arvicola britannicus, De Selys Longchamps, 'Rev. Zool.' p. 305 (1847).
Microtus agrestis, Lataste, 'Le Naturaliste,' 1883, p. 349; *id.* 'Act. Soc. Linn. Bordeaux,' vol. xxxviii. p. 36 (1884); Lydekker, 'Brit. Mam.' p. 202 (1895).

Local Names.—*Field Vole*, *Short-tailed Field Vole*, *Field Mouse*, *Short-tailed Mouse*, *Meadow Mouse* (English); *Hill Mouse*, *Meadow Mouse*, *Grass Mouse* (Scottish); *Luch-fheior*[1] (Scotch Gaelic); *Magh-luch*, *Luch-fheir*, *Luch-mhachaire* (Irish Gaelic); *Llygoden gwtta'r maes* (Welsh).

Characters.—The Field Vole has a short, rounded muzzle: its small ears are almost buried in fur; its tail is short, rather less than one third the length of the head and body. The rootless molar teeth may be distinguished from the molars of the Bank Vole by their much sharper angles. The colour of the upper parts varies from greyish brown to rich reddish-brown, the pelage being russet in midsummer. On comparing a large series of Field Voles from all parts of England and Scotland I find the lightest-coloured examples come from the low grass lands of Southern England and South-west Scotland. In hilly districts where Field Voles are found amongst heather and peaty surroundings the animals exhibit a natural assimilation to their environment and, to meet the colder condition, a denser fur. English Field Voles vary very little in colour, but immediately we cross the Border there are two very distinct types found: one frequenting the low ground, very russet along the back; and the other, which lives in the hills, much greyer and longer-haired. This variation is first noticeable in

[1] Also applied to the harvest mouse.

Wigtonshire[1] and the Cheviots, and as we move north the two types become larger, the colouring darker, and the density of coat, of the hill Voles especially, still more pronounced. I have taken this species in the north of Sutherlandshire, and have found it so grey and long-haired as almost to constitute a sub-species; but the succession of intermediate varieties is so continuous and so well connected that it is impossible to create a dividing line. Nevertheless the Sutherland and Sussex Field Voles present the two extremes of the British Field Vole, which in the course of its gradual northward journey has shown an interesting adaptation to its surroundings. In nearly all examples the under parts are greyish white or dull smoky grey, but I have seen two with pure white bellies. A line of very dark brown hair extends along the upper surface of the tail, the hairs of the under side being pale grey. The short hairs on the upper surface of the limbs are also grey. The soles of the feet are naked.

The following are some measurements of British examples, the first two being average examples:

Locality	Sex	Length of Head and Body	Tail	Hind Foot
Horsham, Sussex . . .	♂	95 mm.	30 mm.	16 mm.
,, ,, . . .	♀	105 mm.	26 mm.	17 mm.
Longendale, Cheshire . .	♂	123 mm.	33 mm.	17 mm.[2]
Herefordshire	—	120 mm.	33 mm.	18 mm.[2]
Cheshire	—	118 mm.	33 mm.	17 mm.

The dorsal hairs, which are dark grey in two thirds of their hidden length, are in length about 10 mm. in Sussex specimens and 13 mm. in Sutherland ones.

Distribution.—The common Field Vole is found inhabiting most of the arable lands of Europe. Its range extends from Northern Italy to Finland, and from Spain to North Russia, whilst in Norway and Sweden another closely allied form takes its place in the forest regions. In Great Britain it is found all over England and Scotland, from Cornwall to Caithness. It is absent from Lewis,

[1] I received an adult male from Netherby in Cumberland in April 1905, which was exactly similar to richly coloured southern Scotch examples. The coat was far denser than that of any English specimen I have seen.

[2] Capt. Barrett-Hamilton, *Proc. Zool. Soc.* May 19, 1896. Unusually large examples such as these sometimes occur. Mr. Tegetmeier mentions (*Field*, August 5, 1903) having received one from Masham, Yorkshire, which measured 6½ inches (including the tail).



THE COMMON FIELD-VOLE.
Microtus agrestis.

Litho. W. Greve, Berlin.

but abundant in Skye, Mull, North and South Uist, and probably in Rum, Muck, and Eigg.

In North and South Uist it is particularly abundant in the grass lands of the east and west coasts, but in the Orkneys *M. orcadensis* takes its place.

The Field Vole is unknown in Ireland.

The species has been an inhabitant of England since the Pleistocene age, its remains having been found in the brick earths of the Thames Valley, Kirkdale Cave, Yorkshire, and in Kent's Cavern, Torquay. Mr. Lydekker tells us[1] that the jaws of *M. arvalis*, the Continental Field Vole, have been discovered in the Norfolk forest bed, and also in a fissure near Frome in Somersetshire.

Habits.—This species is very gregarious, living for the most part in rough grass lands which are undisturbed by the farmer. The animal is found inhabiting the rough 'machar' or marram grass of the sea-levels and the peat hags of the mountains. I have seen numbers on the saltings of the east coast of England and the grassy shores of the Hebrides, and have found their workings on a hill 2,000 feet above sea-level in Sutherland. Dr. Buchanan White found traces of them on Ben-na-Mhuic-dhu at nearly 4,000 feet, and picked up a dead one on another hill at 2,700 feet.[2] It will therefore be seen how widely different is the habitat in our islands.

Their favourite haunts are low-lying and moist grass lands and, in Scotland, damp plantations. In such places they form small communities and make runs in every direction, but without any apparent system. These runs, beaten flat by the constant passage of their small bodies, lead to the entrance hole of their retreat. Each separate pair has its own dwelling, where they rear their young and place a small store of winter food. The burrows are very clean and devoid of smell, as their droppings are deposited in small heaps outside, generally on a slight elevation close at hand.

I have devoted about a fifth part of an acre in my garden to a small colony of Field Voles, and find they increase somewhat rapidly and do little damage, as they seem to live exclusively on the coarse grass about their immediate surroundings. Round the entrance hole itself the grass is completely eaten or worn away, and the burrow goes straight down into the earth for about two feet, ending in a small cavity in which the nest is placed. If the grass is cut

[1] *British Mammals*, p. 213.

[2] It is not uncommon on the summit of Ben Nevis, according to Mr. W. J. Bruce (*Ann. Scot. Nat. Hist.* 1896, p. 187).

anywhere about their runs or holes they at once leave the spot, but take their revenge by drilling holes in the carefully mown lawns.[1]

Field Voles are both nocturnal and diurnal in their habits, and may often be seen abroad by day, especially in spring, and after heavy rains which flood them out of their holes.[2] I remember one summer evening walking through Warnham Park just before the hay was cut, and noticing the passage of Field Voles in many directions. Their snake-like progress was easy to observe in heavily soaked grass, so I ran and caught several in my hands and let them go again. Unlike wood mice, this species seldom bites when taken in the hand. I have never known the Field Vole or the Orkney Vole bite except when handled very roughly or when mistaking one's fingers for food. On the other hand the Bank Vole will often bite, and is altogether a more cantankerous and aggressive little animal.

Field Voles soon become tame if undisturbed, and may often be seen running and chasing one another along their tortuous paths; but any sudden movement on the observer's part at once drives them to their holes. They soon get over their fears, however, and will come very close and watch you with their beady little eyes. If handled they soon become tame, and are of a most amiable disposition.

Those which I kept in confinement drank frequently; a neglect to supply them with water causes death in the course of three or four days. They do not hibernate in the strict sense of the word, for I have trapped them in frost; but in cold weather they often sleep for several days without touching food, waking up and moving about again immediately a thaw comes. They are exceedingly voracious, and the amount of food this species and the Orkney Vole will consume is astonishing. They are said to eat almost anything in the way of fruit, nuts, grain, young leaves, seeds, and grass, and I have found that they enjoy almost any vegetable substance[3] when hungry, but prefer sweet grass, clover, and carrots to all other food.

Sir Walter Elliott says[4]: 'During the summer months they range over the

[1] Here in Sussex Field Voles evicted from their natural home—the rough grass fields—live in the hedgerows. Their holes may easily be recognised from those of Bank Voles by the perpendicular shaft.

[2] At one time I thought of giving illustrations of the runs and galleries and retreats of the four species of Voles, but after making many sketches I found that the workings of each species are so irregular and dissimilar that pictures of these would be of little help to the student for the purpose of identification.

[3] Professor Bell and others have observed their partiality for insects, and Dr. Sharp has noticed that where Voles abound beetles are scarce.

[4] *Some Account of the Plague of Field Mice in the Border Farms in* 1876–7 &c., p. 451.

whole hillside within their limits, cropping the tender shoots of the heather and browsing on the *moss*, *ling*, *deer's-hair* (*Scirpus cæspitosus*), and other favourite grasses on which they thrive and become fat. As winter approaches and vegetation slackens the *bents* and stronger hill-grasses become dry and sapless, and the sheep betake themselves to the *lay* or *lea* grasses, which under the general name of "spret" (*Juncus*) flourish on the land lower down,' and to this ground the Voles also move.

They will undoubtedly bark trees, but not to the same extent as the Bank Vole, who is the chief sinner in this respect. Reports on the Scottish Vole plagues proved that this species would bark heather, growing larch, birch, and firs of various kinds. They gnaw the roots and bark the trees two or three inches from the ground; but as they are poor climbers cannot do further damage, although this is often sufficient to kill young trees.[1] During the 1892 Vole plague entire plantations were destroyed, but I should consider this an abnormal taste on the part of the animal owing to scarcity of food and similar to the depredations of rabbits during severe frosts. Thus a Lincolnshire forester writes:[2] 'When last week, for the second time this season, the woodmen were cutting weeds among young trees—3 ft. to 6 ft. high and planted three years ago—it was discovered that where the nettles (second growth) were densest many of the ash, sycamore, beech, oak, and birch, Italian poplar, &c. were completely barked round from close to the surface of the ground to a height varying from 3 in. to 6 in. It had not been done by rabbits, as the ground—about four acres, and a second crop—is inclosed by 1½-inch mesh netting 3½ ft. high, and not a rabbit was seen inside. But the place was positively swarming with mice of the brown short-tailed variety, and from the appearance of the wounds there can be no doubt that the damage has been done by them. A curious feature of the case is that the damaged trees are confined to those parts where the nettles and other broad-leaved rank-growing weeds cover the ground. On other parts covered with grass, rushes, brushwood, &c. no damage has been done. Owls and foxes, which feed largely on mice, are preserved on the estate, and are very plentiful, and I can only account for the damage being amongst the nettles and similar weeds and not in other places by the probability that owls (and kestrels) were unable to see the mice on account of the dense covering of weeds. Now that the weeds are cut and the ground

[1] A nurseryman giving evidence before the Vole Plague Committee, 1892, stated that he had experienced serious losses on account of their ravages. Voles, he stated, would take the bark off young trees eight and ten inches up the stem.

[2] *Field*, September 26, 1903.

exposed the nuisance may be abated, but many of the damaged trees will have to be cut off at the ground level in the hope that new shoots will spring from the roots. During a long experience as a forester this is the first time that I have known mice attack young trees during the summer months, and, in fact, only once before in the winter.'

This mischief may have been caused by Bank Voles; it is a pity that specimens were not sent for identification.

A very interesting and accurate article from the pen of Mr. J. Nisbet appeared in the 'Field,' and certain passages relating the different ways in which various rodents injure trees are worth quoting:

'Of these the chief offenders are rabbits, squirrels, mice, and Voles. Sometimes it is difficult to determine, on first inspection, to which class of rodents the damage done may be due, unless the offenders have actually been seen at work. The three main points for consideration in this respect are (1) the season of the year, (2) the position of the injury, and (3) the appearance of the damage done.

'All of these three classes of rodents may do more or less damage to woodland trees, young plantations, and nurseries during the winter months. But th e injuries inflicted by squirrels at this season of the year are entirely different in their specific character from those done during the summer months, when the sap of the trees is in full flow, because in the former case they consist mainly in biting off the topmost twigs in order to eat the buds, while in the latter they take the form of peeling and ringing poles and trees for the sake of the sappy cambium during hot, dry summers. If large trees are barked near their base one may be almost certain that it is the work of rabbits—or of hares if the latter be at all plentiful, in which case the marks of the incisors are much larger than when rabbits have been at work. But hares are not now so plentiful as they once were, and they soon shun places where rabbits abound. Where, however, the damage has been committed in young plantations up to about fifteen or twenty years of age, in which the bark on the young trees is still fairly soft and tender, injuries done at and near the base of the stems may be due either to rabbits or to mice and Voles. Here, again, as with hares and rabbits, the difference in the size of the marks left by the incisors gives a fairly good clue as to whether the damage has been done by rabbits or by mice or Voles. Apart from the difference in the actual size of the marks, those made by the rabbits are not only fewer in number, but are also more generally horizontal than the far closer and smaller marks left by mice and Voles. But while the long-tailed field mouse (*Mus sylvaticus*)

gnaws only at the roots and within two or three inches above the ground, and while the damage done by rabbits is confined to within the 12 in. or 15 in. they can reach up to by standing on their hind legs, the Voles (the genus *Microtus*, characterised by their short tail and legs, broad head, and small ears hidden in fur) gnaw both near the ground and, except the water rat (*M. amphibius*), for a very considerable way up the tree, owing to their being endowed with the power of climbing.[1]

'Of the three species of these climbing land Voles the true field mouse (*M. arvalis*) is a poor climber, while the common Field Vole (*M. agrestis*) climbs better, but the Bank Vole (*M. glareolus*) is by far the best climber of the three. Hence, when the Voles swarm in woods during the winter, the two first-named do more damage by devouring seed and mast, and by gnawing the rind of saplings and poles near the ground, and taking the bark off the foot of the young trees as far up the stem as 8 in. or 10 in., while the Bank Vole oftens climbs to a considerable height in order to reach the soft bark. Consequently, when injuries have been done to plantations at about 11 ft. to 12 ft. above the ground, they may have been caused either by Bank Voles or by squirrels, the Voles climbing by means of the little branches. But the Voles carry on their work of destruction during the winter, whereas the peeling and ringing of trees by squirrels takes place in the summer season. Here again, however, the incisor marks left by the squirrels (though often very indefinite until the specimens have become old and dry) are much larger and wider apart, and are more regularly perpendicular than those made by the Bank Vole. And they generally extend from about 6 in. to 8 in. or 10 in. above some horizontal branch, where the squirrel seats himself conveniently and proceeds to clean away the soft bark and the cambium either nearly or else entirely around the stem, in which latter case, of course, the top of the tree dies off above the peeled ring. . . .

'At Rannoch, in Perthshire, early in the winter of 1863-64 mice attacked about 140 acres of mixed plantations of eight and fifteen years of age, consisting of Scots pine and larch intermixed with oak, ash, sycamore, elm, beech, and sweet chestnut; but on this occasion only the Scots pine suffered. Sir Robert Menzies thus described the attacks and the means of suppressing them: "Early in the winter of 1863-64 the mice attacked the Scotch firs in both plantations simultaneously, eating away the bark, and sometimes the wood all round, as high as they could reach, which, assisted by the heather and long grass, was from

[1] This, however, would only apply to the Bank Vole.

6 in. to a foot. The Scotch firs only were attacked, and it was difficult to distinguish those that were injured from those that had escaped in the long grass, which concealed the gnawed places, in this respect showing distinctly the difference between the work of mice and that of rabbits, the latter being visible at once." They were got rid of in spring by poisoning them with phosphorous paste added to oatmeal laid in drain tiles scattered throughout the plantations. As food became scarce the mice ate the bodies of the poisoned ones, and were in their turn also poisoned.

'From 1864 to 1867 Voles did a good deal of damage in the Drumlanrig plantations (chiefly oak and ash) on the Buccleuch estate, but they were finally got rid of by means of digging pits. There were subsequent attacks in 1875, 1876, and 1891–92, which were remedied in the same way. So long, however, as mice and Voles can get their proper natural food, such as grass and herbage, they are not likely to attack trees. Thus, in 1877, Sir Robert Menzies wrote concerning mice: "I have a plantation at present in Ardlarich, in Rannoch, planted in 1871, that is swarming with them quite as numerously as the former ones (attacked in 1863-64), and not a tree has yet been touched (1877), because the grass is still plentiful; but should that fail the tiles are all ready for them."'

From the account given by Brehm, the habits of the Continental Field Vole, *M. arvalis*, are somewhat different from those of our species, and signify a bolder and even more destructive animal. Though the British Field Vole does repair to cornfields in the autumn and eat the fallen grain, I have never heard of its biting the stalks until they fall over, and dragging the ears to its burrow. On the Continent Gmelin says that they follow the reapers from field to field and then find their way to the stackyard, where they do immense damage. Although an occasional Field Vole may be found frequenting a stack, it is very unusual to see one in such a situation in Britain.

Field Voles commence to breed very early in the year—the young may often be found as early as April. From three to six appears to be the usual number of young,[1] and the female generally has from three to four litters in the season. The number of young at a birth is said to be as many as nine or even ten. Sir Walter Elliott says:[2] 'As a general rule the Vole has three or four litters in

[1] Mr. Robert Service says that it is rare to find more than four or five in a nest, but he has found as many as ten in one nest (*Report of the Committee on Field Voles*, p. 44).

[2] *Proc. Berwick Naturalists' Club*, viii. 1878.



FIELD VOLES.

From photographs by D. ENGLISH, F.R.P.S.

the year, and produces from four to eight, but usually five or six, at a birth. Several farmers and shepherds, however, in the hill districts believe that in mild seasons they are still more prolific, breeding five or six times and rearing eight or nine young. In proof of this they state that in such abnormal years the young mice are seen from February to November. Now as the period of gestation of the rodents is only from three to six weeks,[1] and that of the Vole is probably among the shortest,[2] there is nothing improbable in the popular idea. And so with regard to the greater number of young produced and brought to maturity, the female being furnished with eight mammæ, and even occasionally more, she may easily rear the larger number under exceptional circumstances.'

Putting aside these abnormal conditions, I think that on the whole the Field Vole is not usually a very prolific animal: it cannot compare in this respect with the wood mouse, the common mouse, and the brown rat, which all exceed it in rapidity of reproduction and size of litter. The nest is formed of dried grass and other herbage, and when taken from the hole seems to possess no visible entrance.

My wife and I were working on our herbaceous border one morning in March 1905 when we observed two Field Voles rushing from the long grass in the orchard and out on to a cinder path where a quantity of the weed known as 'shepherd's purse' was growing. They proved to be a pair engaged in nest building. Work was conducted at the gallop; each Vole emerged from its retreat and seized a plant, which it tore up with ease, and holding high the head galloped back again. In the course of two minutes they had completely weeded an area of a square yard. I never saw anything done so quickly or so well—a perfect lesson in construction and activity. When I dug out the nest or food supply a few minutes afterwards it was already partially interwoven and nearly complete.

Young Field Voles, which are somewhat greyer than the adults, grow quickly, and doubtless breed when they are three or four months old. Females suckling young are often found in a pregnant state. During the 1892 Vole plague Mr. R. Service says that the nests were placed in any rough vegetation on the surface of the ground. When the grass had all been eaten off, the Voles placed their nests rather deeper—to a distance of a foot or more—in the centres of little 'foggy knowes,' that is, in little raised tufts. This he attributed to a natural law of protection on the part of the animals to save their young from the rooks, which

[1] See Victor Fatio, *Descr. de la Faune de Vertèbres de la Suisse*, 1869, i. p. 152; also Bell, *British Quadrupeds*, 1874, pp. 290, 314, 325, 335, 354, &c.

[2] Mr. Service thinks the gestation is twenty-four days.

tore out all exposed nests. Nests above ground are common even when there is not a Vole plague.

I have had the Field Vole in confinement, but cannot state definitely the period of gestation. The young are very clumsy and slow in their movements until the age of three weeks, and I do not think that they go abroad and forage for themselves until they are five weeks old.

In ancient times the agriculturists of Southern Europe had many difficulties to contend with, and not the least of them was the constantly recurring plague of Field Voles. The classics are full of references to destruction caused by 'field mice,' and offer suggestions to abate the nuisance. For instance, there is Aristotle's account,[1] written more than 2,000 years ago:

'There is a doubt respecting the reproduction and destruction of the Mice which live on the ground; for such an inexpressible number of Field Mice have sometimes made their appearance that very little food remained. Their power of destruction also is so great that some small farmers, having on one day observed that their corn was ready for harvest, when they went the following day to cut their corn found it all eaten. The manner of their disappearance also is unaccountable; for in a few days they all vanish, although beforehand they could not be exterminated by smoking and digging them out, nor by hunting them and turning swine among them to root up their runs. Foxes also hunt them out, and wild weasels are very ready to destroy them; but they cannot prevail over their numbers and the rapidity of their increase, nor indeed can anything prevail over them but rain, and when this comes they disappear very soon.'

The accuracy of Aristotle's statement is, curiously enough, confirmed by the official reports of the Greek Government on the Thessalian Vole plague, as quoted by Professor Loeffler: 'One evening a field was visited which was to be mowed the following day, but when the labourers came to the field next morning they found nothing left to reap. The Voles had destroyed the entire crop in a single night.'

[1] Bohn's ed. and translation (p. 178) of the *Historia Animalium*, lib. vi. cap. 37. Many other references to the damage caused by Field Mice are supplied by Mr. Harting, notably, Diodorus, lib. iii. cap. 30; Ælian, *De Natura Animalium*, lib. ix. cap. 41 and lib. xvii. cap. 41; Rutilius, *Itin.* v. 285; Æschylus; *Geoponicorum sive de re rustica*, lib. xiii. cap. 5; not forgetting Theophrastus, and the more familiar Pliny. Ælian relates how a visitation and plague of Field Mice drove certain peoples in Italy out from their native land, and made them wanderers on the face of the earth, destroying not only the leaves of the plants as a drought would, or extreme frost, or other inclemency of the season, but eating up the very roots. Rutilius also relates (*l.c.*) how a similar experience befell the people of Cosa. Then there is the account given by Herodotus (*Euterpe*, ii. 141) of the defeat of the army of Sennacherib in consequence of the destruction by Field Mice, during the night, of their quivers, arrows, and bowstrings, which were rendered useless by gnawing.

Greek scholars are familiar with the worship of Apollo Smintheus,[1] or Apollo the Mouse-god, as he is sometimes called. Apollo was regarded as the author and averter of the various plagues of field mice from which Greece suffered, and we can still understand the reverence in which his powers were held.

Sir Walter Elliott mentions various early references, the earliest being found in 1 Sam. v. 6, when the Philistines, having carried off the Ark of the Covenant, were stricken with disease, and their fields overrun with swarms of mice. England, Scotland, France, Germany, Hungary, Thessaly, Asia Minor, and La Plata have all suffered from Vole plagues in their turn.

The origin of the various and frequent plagues of Field Voles has never yet been properly explained. For several years these small rodents seem to exist in their usual numbers, and then one season they suddenly come upon the earth as if 'by magic,' says Blasius, in their tens of thousands. A mild winter and an unusual abundance of good grass may perhaps account for it, and then the unfortunate farmers in some district are exposed to all the inconveniences and loss that are entailed by a 'Vole-year.'

'Under favourable circumstances,' says Blasius, 'the Field Vole multiplies in an incredible manner. Many instances are known in which a great part of the harvest has been destroyed over large tracts of country by their inordinate increase, and more than a thousand acres of young birch trees have been destroyed by their gnawing the bark. Those who have never experienced such a Vole-year can hardly form a conception of the almost incredible swarms of Voles in the fields and plantations.'

Brehm thus describes the Vole plagues that visited the Lower Rhine at the beginning of the nineteenth century: 'The fields were so undermined in places that you could scarcely set foot on the ground without touching a Vole-hole, and innumerable paths were deeply trodden between these openings. On fine days it swarmed with Voles, which ran about openly and fearlessly. If they were approached, from six to ten rushed to the same hole to creep in, and unwillingly impeded one another's progress by crowding together. It was not difficult in the

[1] Σμινθεύς is derived from Σμίνθη, a town in Troas, according to Aristarchus; but Apion says it comes from σμίνθος, a *mouse*; hence σμινθεύς, the *mouse-killer*. 'P.,' writing in the *Stonyhurst Magazine*, December 1892, and referring to the worship of the Mouse-god, says: 'Finally there is another aspect in which we may regard the mouse, and one in which it is even more closely connected with the religious ideas of the ancients, namely, as a harbinger of good or evil tidings from the gods; that is to say, the announcer of their satisfaction or displeasure. The mouse in fact seems to have been a creature of omen from the earliest times, though there appears to have been some scepticism about the matter, as may be seen from the anecdote related by St. Augustine. A person had his boots gnawed by mice, and asked Cato how the portent should be explained. Cato replied that it would have been more of a portent if the boots had gnawed the mice.'

crush to kill half-a-dozen with one blow from a stick. All seemed to be strong and healthy, but mostly rather small, and for the greater part were probably young ones. Three weeks after I revisited the place. The number of Voles had actually increased, but the animals were apparently in a sickly state. Many had mangy places or sores over the whole body, and even in those which appeared sound the skin was so loose and delicate that it could not be roughly handled without destroying it. When I visited the place for the third time, four weeks later, every trace of them had disappeared; but the empty burrows and passages awakened a much more dismal feeling than when they swarmed with life. People said that the whole race had suddenly disappeared from the earth as if by magic. Many may have perished from a devastating pestilence, and many have been devoured by their fellows, as happens in captivity; but people also spoke of the innumerable hosts that had swum across the Rhine at several places in the open day. No extraordinary increase was noticed anywhere over a wide area; but they seemed to have disappeared everywhere at the same time without reappearing elsewhere. Nature must have put a stop to their inordinate multiplication at the same period. It was fine autumn weather, apparently favourable to them to the last moment.

'In order to give some idea of the hordes of Voles which sometimes appear in certain districts, it may be mentioned that in 1822, in the district of Zabern, 1,570,000 Voles were caught in fourteen days; in the district of Nidda, 590,427; and in that of Putzbach, 271,941.

'In the autumn of 1856, says Lenz, there were so many Voles in one district of four leagues in circumference between Erfurt and Gotha that about 12,000 acres of land had to be reploughed. The sowing of each acre at current wages cost 6*s*., and the ploughing up was estimated at 1*s*. 6*d*.; so that the loss amounted to from 2,000*l*. to 4,500*l*., and probably much more. On a single large estate near Breslau 200,000 were caught in seven weeks and delivered to the Breslau manure factory, which then paid a pfennig (half a farthing) per dozen for them. Some of the Vole catchers were able to supply the factory with 1,400 or 1,500 per day. In the summer of 1861 409,523 Voles and 4,707 hamsters were caught and counted in the district of Alsheim in Rhenish Hesse. The local authorities paid 2,523 gulden (about 164*l*.) for them.

'In the years 1872 and 1873 it was just the same, and local complaints arose in all parts of the country about the Vole plague. It might be compared to one of the plagues of Egypt. Even in the day, on the sandy plains of the Mark of Brandenburg, thousands of Voles were counted in particular fields, and in the

rich cornlands of Lower Saxony, Thuringia, and Hesse they abounded to a fearful extent. Half the harvest was destroyed, hundred of thousands of acres were left untilled, and thousands of pounds were spent on their destruction. Agricultural Societies and Governments were implored to seek ways and means of staying the plague.'

In the year 1892 Thessaly was devastated by a plague of Field Voles,[1] or 'Arourai' (*M. arvalis*), which affected Delihanis, Kalinga, and the plain of Phersala. In this case some good effects resulted from squirting carbon bisulphide into the holes, and many were killed by this means. Professor Loeffler was employed to try his method of extermination, but the results were not sufficiently convincing to warrant its employment in more recent cases. M. Pasteur threw doubts on the contagious nature of the virus.

A still more serious outbreak took place in France in April 1904 in the district lying between the Loire and the Gironde.

'The district affected by the Vole plague at the present time is that lying between the Loire and the Gironde, comprising the Départements of Charente, Charente Inférieure, Vienne, les Deux-Sèvres, and La Vendée. In the northern part of Charente, where the plague is most serious, the damage done by the Voles is said to be enormous. The surface of the ground is riddled with holes like a sieve (about 10,000 to the acre), and the substratum is furrowed with innumerable galleries. It is estimated that about 100,000 acres (50,000 hectares) are affected, and the farmers are in despair at the prospective damage to crops. Not only will it be impossible to feed the stock on the farms, but the farmers themselves will be deprived of their ordinary food supply. In this unfortunate state of affairs the Minister of Agriculture has appointed a committee of scientists to consider the best means of destroying the Voles in the arrondissement of Ruffec (Charente), and it is stated that the result of experiments which have been made with a virus prepared by M. Danysz, of the Pasteur Institute, has proved satisfactory. These experiments have been carried out on a single farm of about 2,000 acres in the cantons of Aigre and Rouillac on the borders of Charente and Deux-Sèvres, under the direction of M. de Lapparent, the Inspector General of Agriculture, and M. Danysz himself, and, for reasons presently to be stated, are of considerable importance, not merely to those whose crops are so seriously affected at the present time, but to all who are in any way interested in the question of animal plagues and their scientific counteraction.

[1] For an account of this see Appendix iv. *Report of the Committee on Field Voles, Scotland*, 1892, p. 86.

'It will be remembered that at the time when a great part of Eastern Thessaly was visited by a plague of Field Voles a German scientist, Professor Loeffler, of Greifswald, claimed to have discovered a remedy by inoculating the mice with a bacillus of typhus (*Bacillus typhi murium*). The method adopted was to liberate the bacilli, after cultivation on gelatin, in an infusion of hay, and to steep bread and biscuit in the liquid until the virus was absorbed, and then to scatter this prepared bait in the runs of the mice. Those that swallowed it died, and in this way great numbers were destroyed. But the weak point in the experiment was that the disease thus produced was not contagious, only those animals died which actually swallowed the bait, so that it was not more efficacious than any mineral poison. Another objection was the cost of the application. It worked out at about half a crown per acre, and for these, amongst other reasons, the committee of the Board of Agriculture were unable to recommend its adoption on the sheep farms of Scotland, carrying an average rental of only one shilling per acre. Bearing this in mind, it is of special interest to note the development of the experiments which are being made in the present crisis. The principle adopted by M. Danysz is practically that of Professor Loeffler, and he states that the bacillus, when absorbed with the food, is very effective with all kinds of field mice known in France, but has no appreciable effect on rodents of larger size, nor on ducks, fowls, pigeons, dogs, cats, or farm stock. He further asserts from personal experience, and that of others who have similarly tested it, that the culture of this bacillus, even when absorbed in large doses, is in no way dangerous to man. The virus prepared at the Pasteur Institute is forwarded in bottles hermetically sealed, and the liquid on being poured into earthenware vessels is still further diluted with water (in the proportion of one litre to four of water) to which are added five teaspoonfuls of kitchen salt to arrest fermentation. The bread has to be steeped the day it is to be used, especially if the weather is warm, in order to prevent any change in the liquid from too long exposure to the air. It has been found from the experiments at Aigre that one litre of virus and ten kilos of bread or grain will suffice for one hectare (two acres), and that one man can deal with four acres a day. The cost is estimated at 5 fr. per hectare, or, roughly speaking, about 2*s*. per acre, exclusive of the cost of spreading the prepared bait. In other words the expenditure is approximately that entailed by the adoption of Professor Loeffler's plan.'[1]

The value of M. Danysz's experiments depended entirely on whether the

[1] *Field*, April 23, 1904.

rich cornlands of Lower Saxony, Thuringia, and Hesse they abounded to a fearful extent. Half the harvest was destroyed, hundred of thousands of acres were left untilled, and thousands of pounds were spent on their destruction. Agricultural Societies and Governments were implored to seek ways and means of staying the plague.'

In the year 1892 Thessaly was devastated by a plague of Field Voles,[1] or 'Arourai' (*M. arvalis*), which affected Delihanis, Kalinga, and the plain of Phersala. In this case some good effects resulted from squirting carbon bisulphide into the holes, and many were killed by this means. Professor Loeffler was employed to try his method of extermination, but the results were not sufficiently convincing to warrant its employment in more recent cases. M. Pasteur threw doubts on the contagious nature of the virus.

A still more serious outbreak took place in France in April 1904 in the district lying between the Loire and the Gironde.

'The district affected by the Vole plague at the present time is that lying between the Loire and the Gironde, comprising the Départements of Charente, Charente Inférieure, Vienne, les Deux-Sèvres, and La Vendée. In the northern part of Charente, where the plague is most serious, the damage done by the Voles is said to be enormous. The surface of the ground is riddled with holes like a sieve (about 10,000 to the acre), and the substratum is furrowed with innumerable galleries. It is estimated that about 100,000 acres (50,000 hectares) are affected, and the farmers are in despair at the prospective damage to crops. Not only will it be impossible to feed the stock on the farms, but the farmers themselves will be deprived of their ordinary food supply. In this unfortunate state of affairs the Minister of Agriculture has appointed a committee of scientists to consider the best means of destroying the Voles in the arrondissement of Ruffec (Charente), and it is stated that the result of experiments which have been made with a virus prepared by M. Danysz, of the Pasteur Institute, has proved satisfactory. These experiments have been carried out on a single farm of about 2,000 acres in the cantons of Aigre and Rouillac on the borders of Charente and Deux-Sèvres, under the direction of M. de Lapparent, the Inspector General of Agriculture, and M. Danysz himself, and, for reasons presently to be stated, are of considerable importance, not merely to those whose crops are so seriously affected at the present time, but to all who are in any way interested in the question of animal plagues and their scientific counteraction.

[1] For an account of this see Appendix iv. *Report of the Committee on Field Voles, Scotland*, 1892, p. 86.

'It will be remembered that at the time when a great part of Eastern Thessaly was visited by a plague of Field Voles a German scientist, Professor Loeffler, of Greifswald, claimed to have discovered a remedy by inoculating the mice with a bacillus of typhus (*Bacillus typhi murium*). The method adopted was to liberate the bacilli, after cultivation on gelatin, in an infusion of hay, and to steep bread and biscuit in the liquid until the virus was absorbed, and then to scatter this prepared bait in the runs of the mice. Those that swallowed it died, and in this way great numbers were destroyed. But the weak point in the experiment was that the disease thus produced was not contagious, only those animals died which actually swallowed the bait, so that it was not more efficacious than any mineral poison. Another objection was the cost of the application. It worked out at about half a crown per acre, and for these, amongst other reasons, the committee of the Board of Agriculture were unable to recommend its adoption on the sheep farms of Scotland, carrying an average rental of only one shilling per acre. Bearing this in mind, it is of special interest to note the development of the experiments which are being made in the present crisis. The principle adopted by M. Danysz is practically that of Professor Loeffler, and he states that the bacillus, when absorbed with the food, is very effective with all kinds of field mice known in France, but has no appreciable effect on rodents of larger size, nor on ducks, fowls, pigeons, dogs, cats, or farm stock. He further asserts from personal experience, and that of others who have similarly tested it, that the culture of this bacillus, even when absorbed in large doses, is in no way dangerous to man. The virus prepared at the Pasteur Institute is forwarded in bottles hermetically sealed, and the liquid on being poured into earthenware vessels is still further diluted with water (in the proportion of one litre to four of water) to which are added five teaspoonfuls of kitchen salt to arrest fermentation. The bread has to be steeped the day it is to be used, especially if the weather is warm, in order to prevent any change in the liquid from too long exposure to the air. It has been found from the experiments at Aigre that one litre of virus and ten kilos of bread or grain will suffice for one hectare (two acres), and that one man can deal with four acres a day. The cost is estimated at 5 fr. per hectare, or, roughly speaking, about 2*s.* per acre, exclusive of the cost of spreading the prepared bait. In other words the expenditure is approximately that entailed by the adoption of Professor Loeffler's plan.'[1]

The value of M. Danysz's experiments depended entirely on whether the

[1] *Field*, April 23, 1904.

disease, once introduced, was contagious or not. We read that thousands of Voles were killed, but there seemed nothing to show that they had died from other effects than the poison itself. Professor Cassez considered that contagion was established owing to the discovery of dead Voles partly devoured by their companions. But this seems to establish no new fact, for the habit of eating their dead comrades is a constant practice amongst the Voles. So we still await the arrival of that genius who will discover some really effective and inexpensive cure for the plague of Field Voles.

England and Scotland have at various times suffered from similar visitations. The earliest recorded took place in 1580 in the hundred of Danesey in Essex, and Holinshed in his 'Chronicle' thus refers to the plague:

'About Hallowtide last past (1581) in the marshes of Danesey Hundred, in a place called South Minster, in the county of Essex . . there sodainlie appeared an infinite number of mice, which overwhelming the whole earth in the said marshes did sheare and gnaw the grass by the rootes, spoyling and tainting the same with their venimous teeth, in such sort that the cattell which grazed thereon were smitten with a murraine and died thereof; which vermine by policie of men could not be destroyed, till at the last there flocked together such a number of owles as all the shire was not able to yield, whereby the marshholders were shortly delivered from the vexation of the said mice.'

Stowe (1615) says a similar plague occurred in Kent in 1615, and Childrey in 'Britannia Baconica' (1660) mentions another outbreak in Essex in 1648, and Lilley yet another in the same county in 1660, of which Fuller, writing in 1662, says:

'An army of mice, resting in the anthills as conies in burrows, shaved off the grass at the bare roots which, withering to dung, was infectious to cattle. In March following numberless flocks of owls from all parts flew thither and destroyed them, which otherwise had ruined the country if continuing another year.'

A similar occurrence took place at Market Downham, in Norfolk, in 1754, and Montagu mentions in his 'Ornithological Dictionary' (1813) that a plague of mice appeared at Bridgwater a few years previously.

In 1814 a Vole plague existed in the Forest of Dean in Gloucestershire and in the New Forest in Hampshire. In the case of the Forest of Dean Lord Glenbervie tells us that ninety-eight per cent. of the Voles were of the present species,[1] the other two per cent. being wood mice. The New Forest visitation is

[1] This is very doubtful. They were probably Bank Voles.

said to have been composed of Bank Voles, and 11,500 were destroyed in that year. Another mouse plague (probably Bank Voles) was experienced in the Forest of Dean in 1836.

Destructive visitations of Voles took place in 1825 in the oak coppices of Cameron, Dumbartonshire; and in 1864–67 in the woods of Drumlanrig, Dumfriesshire, when the oak, holly, and ash suffered severely, but the fir and mountain ash were spared. On the other hand in 1863, on the estate of Rannoch, Perthshire, Sir Robert Menzies stated that much damage was done to his woods, but that the Scotch firs only were attacked.

A still more serious one in Wensley Dale and the Border farms in 1874 lasted for two years. Reporting on this scourge, Sir Walter Elliott says that the districts most affected were the farms at the head of Borthwick Water, the parish of Roberton in the Buccleuch property, and the parishes of Teviothead, estate of Tushielaw, and the farms of Langshawburn, Eskdalemuir, Ettrick-head and Tema Water, whilst in Nithsdale and Western Dumfries the parishes of Tynron, Penport, and Durisdeer suffered most.

'For two or three years previous to 1876,' says this writer, 'the Voles had been observed to be on the increase. In the spring of 1875 the ground, which had been covered with snow since December, was found to be riddled with holes under the wreath-drifts, and denuded of herbage, by the Voles that had found shelter there. Great numbers were seen throughout the summer when cutting the bog hay. The shepherd at Craikhope described the children as "amusing themselves by hunting them from morning to night, as long as they could find nothing better to do, so that each day," he believes, "they destroyed hundreds, and the dogs devoured them till they made themselves sick!" In the autumn of the same year they continued plentiful. The farmer of Howpasley, when cutting a four-acre field of corn, observed numbers to be driven inwards by the reaping machine, so that when only a spot in the centre of about twenty feet by five remained, he made one of the men take a scythe and cut it slowly, a woman lifting behind. The others surrounded them, and killed the mice as they came out; and somewhere between eighty and a hundred were thus destroyed, most of which were eaten by six dogs present. "I used to kill scores of them," he adds, "with a stick while walking over the hills."

'The same thing was observed in a greater or less degree wherever the conditions of the ground were favourable to them. A correspondent to a county paper relates that when "removing a two years' crop of hay in the autumn of 1875 from a meadow

sloping down to the Bowmont, on the farm of Sourhope, near Yetholm, two to four nests were found under every rick, each with six to nine young ones, the nest lying in a cavity, from which runs diverged in every direction. Great numbers were killed by the boys assisting. One little fellow got seventy-nine full-grown ones for his share, and his straw hat was brimful of young ones."

'Their numbers, already redundant, were augmented by the mild winter of 1875-6, and in the succeeding spring they made their presence felt in the doomed farms. During the three months from February to April they completely destroyed the pasturage of the bog-land in Borthwick Water, and were then driven to the bents. Notwithstanding the means used for their destruction—which, however, were not very skilful—the swarms showed little diminution. The public journals suggested a trial of the plan which had been so efficacious in the New Forest, where holes were dug into which they fell; but the hint came too late. More efficient auxiliaries appeared in the shape of hawks, foxes, weasels, &c. attracted by the abundant prey. Buzzards, which have long been strangers to the district, again made their appearance. A shepherd in Eskdalemuir saw seven of the rough-legged species (*Archibuteo lagopus*) on the wing at the same time, and the short and long eared owls were observed in still larger numbers. By the middle of April the herbage was so much impaired that the Voles themselves began to feel the want of food, and the occurrence of severe frost, with a sprinkling of snow, about the middle of the month, completed their discomfiture. Many died of starvation, and by the end of May they had mostly disappeared.

'When the Committee of the Farmers' Club made their inspection they found that fully one third of the pasture in the places visited had been destroyed. The true bog-grass especially, on which the sheep mainly depend in April and May, had been eaten down to the roots. The ground was strewed with dried stalks and blades, mixed with tufts of fur, limbs, and other remains of the depredators. The sheep were in a deplorable case; several had died, and the emaciated ewes, too weak to make good nurses, suckled their lambs with difficulty.'

The most alarming plague of recent years commenced in 1891 and lasted till 1893. It affected the northern boundary of Dumfriesshire and the north-west of Roxburghshire, where between 80,000 and 90,000 acres were overrun by these little pests. The Border districts too, in the south of Selkirk, Peebles, and Lanark, and the north of the Stewardry of Kirkcudbright also suffered in less degree. A Government Committee under the presidency of Sir Herbert Maxwell, with Mr. Harting as secretary, was appointed in May 1892 to inquire and report

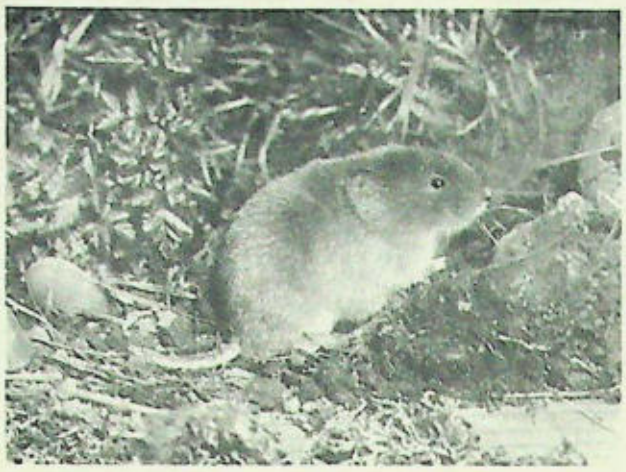
upon the circumstances attending this plague of Voles in the South of Scotland, and the report now before me goes fully into the whole matter, both in relation to the natural history of the Field Vole and the reasons of the plague, and the best means to combat it. Voluminous evidence was taken which went far to prove that the enormous increase of the 'Field Mice' was in a great measure due to the destruction of their natural enemies in the shape of owls, hawks, weasels, and stoats.[1] The general remarks of farmers, shepherds, land agents, naturalists, and even gamekeepers, all tended to show that through the destruction of raptorial birds and small carnivora the balance of nature had been upset. In dealing with the nature and origin of the plague, the report says:

'The present outbreak may be traced back to the year 1888, when the Voles were observed to be increasing on the farm of Glenkerry and others in Selkirkshire. In the summer of 1889 the low-lying pastures near Closeburn, in Dumfriesshire, were observed to be infested by enormous numbers of Voles, which remained there during 1890 and disappeared in 1891, probably moving up to the hill pastures, where at the time of your Committee's visit they were swarming. On some of the hill farms this excessive increase was observed as early as the autumn of 1890; elsewhere, however, they attracted no attention till the spring of 1891. The districts principally affected are the hill pastures in the north-west of Roxburghshire, the south of the counties of Selkirk, Peebles, and Lanark, and the northern part of Dumfries from Eskdalemuir by Moffat to Thornhill. The Voles have also appeared in great numbers in the parishes of Dalry and Carsphairn, in the Stewardry of Kirkcudbright.

'Your local inspector, Mr. R. F. Dudgeon, has already informed you that, at the date of his report, he estimated that in Roxburghshire 30,000 to 40,000 acres had been affected, of which he considered 12,000 to 15,000 acres had been rendered useless; in Dumfriesshire 40,000 to 50,000 acres, and in the Stewardry of Kirkcudbright 10,000 to 12,000 acres were described by him as infested by Voles.

'Your Committee received no estimate of the area affected in the counties of Selkirk, Peebles, and Lanark, nor had they the means of verifying Mr. Dudgeon's calculation in respect to the other counties affected; but a reference to the map

[1] Mr. Harting, writing in the *Field*, May 1904, says: 'Nothing was more abundantly proved in the Scottish inquiry than the fact that the greatest check on the undue increase of Field Voles was removed by the indiscriminate destruction of so-called vermin. Hawks, owls, stoats, weasels, foxes, rooks, and even adders, all prey largely on field mice, and on the farms where these creatures were systematically trapped the ground was overrun with Voles, to the great destruction of grass and starvation of sheep. Rooks were found to be particularly useful in digging out the Voles' nests and devouring the young ones.'













Field Voles

The middle right hand figure is a Bank Vole

From Photographs by J. English A.R.P.S.

accompanying this report will show that an area not less than sixty miles in length and from twelve to twenty miles in breadth has been overrun.'

The causes of the outbreak are attributed as follows:

'The rapid increase in the number of Voles to the dimensions of a plague was attributed by all the witnesses examined to one of two causes, or to a combination of both. The first of these consists in the character of the seasons. Mr. Service called attention to the occurrence of a series of dry springs in 1890, 1891, and 1892, adducing figures to show that the rainfall in these seasons was very much below the average, and therefore favourable, in his opinion, to the breeding of small mammals. The autumn of 1890 was unusually wet, producing great luxuriance of grass on the hill pastures which afforded abundant shelter for the Voles. The winter which followed, though very severe in England, was a mild one in Scotland. It will be observed that Sir Walter Elliott has traced the cause of the outbreak of Voles which took place in 1876 to the unusual mildness of the four or five winters preceding that year.

'The second cause assigned by witnesses is the destruction of hawks, buzzards, owls, stoats, and weasels by persons interested in the preservation of game. Major Craigie had previously stated to your Board that "a preponderance of opinion amongst farmers is reported, tracing the cause of the present outbreak to the scarcity of owls, kestrels, hawks, weasels, and other vermin." Of the prevalence of this opinion your Committee were made fully aware, nearly every witness who was examined giving it as his belief that the outbreak was due to the destruction of the "natural enemies" of the Voles. A similar view was expressed by the witnesses before the Committee of the "Teviotdale Farmers' Club" appointed to inquire into the cause of the outbreak in 1876; but Sir Walter Elliott states that much weight was not attached to this "popular opinion . . . because no more hawks, owls, weasels, &c. had been destroyed than usual." They had in fact (to use Sir Walter Elliott's own words) "been well nigh extirpated long before the outbreak took place."'

The effect of this plague on pasture and stock was naturally disastrous. Remedies seem to have come too late, as the plague existed till the end of 1893, and then seemed to die away. Thousands were, however, destroyed by driving them out of bog and heather lands by burning. Poison met with very partial success, and pitfalls were only useful in clearing small plantations, but most were killed by men with dogs. In this manner the tenant of West Buccleuch in Selkirkshire killed 13,000 in three months on 3,000 acres; another tenant of Glenkerry

employed one man who killed 15,000 in one month. The Committee could come to no satisfactory conclusion favourable to the adoption of Professor Loeffler's method of destroying Voles by means of bread saturated in a preparation of mouse typhus, and other poisonous methods were considered too expensive. It seems, therefore, that with all his scientific knowledge man is more or less powerless to check these animal hordes when once they have gained a footing.

The abnormal increase of this species will doubtless occur again and again in the great grazing lands of Southern Scotland, for so late as 1903 we hear of constant complaints of small local plagues in the Border counties. If the Voles remain there, a succession of mild winters will be sure to produce yet another plague.

A curious circumstance was related to me by a friend who was anxious to witness the destruction caused by the mice in 1892 on a farm in Roxburgh. He was told to repair to a certain open hillside above a lake which he had seen on the previous day, and after walking for some time in what he supposed to be the right direction he was mystified by not being able to find the lake in question. After rambling about for some hours he discovered in front of him a great plain of dried grass, and so perfectly flat that his curiosity was excited. Proceeding to view the phenomenon, he suddenly found himself plunged into two feet of water. He had in fact walked straight into the lake without knowing it. During the night a wind had arisen and blown the whole of the grass cut by the Voles from the hillside above, and this mass of yellow material floating on the surface of the pool had completely hidden the waters.

The Field Vole has many natural enemies, and the ruthless and indiscriminate slaughter of these is no doubt largely responsible for the alarming dimensions which Vole plagues now assume. Weasels, stoats, and foxes are their mammalian enemies,[1] whilst in this country the white, tawny, long-eared and short-eared owls are all known to prey on Voles. Rooks and crows also destroy numbers of young ones as well as adults, and the kestrel feeds principally on Voles and mice. Buzzards and kites are now so scarce that their attacks can hardly be said to count.

The weasel is a great Vole hunter. I could hardly have credited it had I not myself seen a full-grown weasel go down a Vole shaft in my garden with as much ease as a ferret enters a rabbit-hole. His lithe body must have been able to turn

[1] The Swiss naturalist Fatio includes the hedgehog amongst the enemies of the Vole, and certain observers have also mentioned the mole as an occasional aggressor, but there is no proof that this is true.

at the bottom of the hole, for he soon reappeared and dived into another one, which he also drew blank. I had always considered that weasels killed Field Voles by scenting and taking them in the runs on the surface of the ground, so the fact that they can also enter and attack them in their homes was something new to me. Weasels constantly hunt the tunnels of Bank Voles, but the galleries are much wider than those made by Field Voles. Weasels will kill far more than they can devour, apparently out of sheer lust of blood.

A question asking him if he had ever seen a weasel kill a Vole was addressed to David Glendinning, a shepherd, during the session of the Committee which inquired into the Vole plague in Scotland in 1892, eliciting the following reply: 'Yes, about three weeks ago I came upon a small brown weasel which had killed five in one of the sheep-drains. I followed it up and found it killing its sixth. A week past, on Sunday morning, I came down a drain for 250 yards or so. A weasel had been before me, and there were twenty-two dead Voles in the bottom. I secured a specimen last night in order to show you the way a weasel destroys a Vole. The blood is entirely drawn from behind the left ear. There is not a bit of the Vole marked otherwise, except by the tooth-marks on the head. All those I have seen were killed in the same way.'

Stoats undoubtedly kill a few Voles, but I think that their attacks on them have been somewhat exaggerated, and doubt if they do any real good in thinning the numbers. A stoat will always go for larger game when he can get it. Foxes will kill large numbers and carry a mouthful at a time to their young ones, whilst the most inveterate foe of the Field Vole in Scotland is the collie dog. I have seen a collie stuff himself so full of Voles that he was sick, and then start hunting and eating again as if nothing had happened. In the island of North Uist I have seen collies hunting Field Voles all day long when not actually engaged in work.

Amongst birds the short-eared owl makes the Field Vole its favourite prey. In North Uist I have seen two or three pairs of these birds beating about the whole day catching Voles, and as I never molested them they would often come and hunt close to me when I was shooting snipe. In the same island the hen-harrier also preys largely on Voles. After every big irruption of Voles in Scotland, and formerly in England, numbers of short-eared owls have appeared and fed for weeks on the Voles: these birds should be strictly protected by law at all seasons. The barn owl is also a most useful destroyer of Voles, as the examination of owl pellets has shown to us; and tawny and long-eared owls doubtless kill a good many in the vicinity of the woods which they frequent.

The kestrel, amongst hawks, may be seen at all times hovering in pursuit of Voles, and there is no British bird which is more shamefully treated or more deserving of protection, if for the very reason alone that it preys largely on Voles and mice. Both the lesser and the greater black-backed gull destroy numbers of Voles, and I attribute the great scarcity of these small mammals in Shetland to their depredations. On the northern isles these two birds swarm and sit about on the moors at all times when not at sea, and it is a careful and swift Vole that can escape their sharp eyes.

The carnivorous habits of rooks are now well known, and there is no doubt that during the past twenty years there has been a marked increase in the numbers of individual rooks which at certain seasons prey exclusively on eggs, young birds, and Field Voles. Although they now do much mischief from the game preserver's point of view, yet in the Vole plague of 1892 the greatest service was rendered by the rooks, which tore out the nests and destroyed thousands of young Voles. Mr. Tom Speedy in his evidence before the Committee said (p. 20): 'At this time of the year, in former years, if you had gone up the Ettrick you would have found numbers of rooks over all the fields of Philliphaugh. This year there is not one to be seen. They are all hunting for mice [Field Voles] on the higher ground. Almost every carcass we found on the high ground was torn to pieces by the rooks. I shot half a dozen rooks and found their gizzards packed with mice. The young mice had been swallowed whole, and parts of the adult mice were also found.' Again Mr. Robert Service in his evidence (p. 45) says: 'By far the most effective among the bird and animal enemies of the Voles is the common rook or corncrow, as the shepherds call it, and it is possible that one of the principal among the lesser causes of the Vole plague (if you admit certain meteorological conditions to be the main cause) is the destruction of rooks during the past seven or eight years.' Mr. Service then went on to deplore the destruction of rooks owing to their carnivorous habits in attacking game and poultry. There had been a great and serious diminution of the birds in the Border counties, and consequently a great increase in the Voles.[1]

Adders feed on Voles, but as they cannot kill many their attacks can only be regarded as insignificant. An adder will perhaps take one Vole per week in summer.

Considering the immense number of Field Voles that have been slaughtered, it is remarkable how few variations in colour have been noticed. Mr. Robert

[1] An interesting account of rooks hunting Voles (*M. arvalis*) is to be found in the *Zoologist*, October 1894.

Service says that occasionally pied varieties occur, and records[1] a white one that came into his possession. I have seen a buff-white one in the collection of the late Mr. Borrer at Cowfold. It was captured near Horsham. An albino[2] was caught at East Bergholt, near Colchester, in November 1872. Mr. G. T. Rope records[3] a black variety which was killed at Blaxhall, Suffolk, on June 25, 1886, and Mr. Southwell another black example.[4] A black-and-white one was found near Harrogate July 21, 1886,[5] and a pied specimen was caught at Long Cross, Chertsey, in July 1866.[6] In Mr. J. Whitaker's collection there are two white and one cream-coloured example.

[1] *Zoologist*, July 1893, p. 266. [2] *Ibid.* 1885, p. 229. Two other albinos are mentioned in the *Zoologist*, 1887, p. 152.
[3] *Ibid.* August 1886, p. 332. [4] *Ibid.* 1890, p. 216. [5] *Ibid.* 1886, p. 485. [6] *Field*, July 27, 1866.

THE ORKNEY VOLE

Microtus orcadensis, Millais.

Microtus orcadensis, J. G. Millais, 'Zool.' July 1904, pp. 241–244.

Local Names.—*The Cuttick*, *Puttick* (Orkneys); *The Hill Mouse* (Shetlands).

Characters.—In full winter pelage the general colour of the upper parts is dull sandy brown. This effect is produced by the upper and minor portion of the hairs being pale yellowish brown, with the long protruding hairs black. The major and hidden portion is slaty grey. The back hairs are very dense and long, measuring as much as 15 mm. Hair on cheeks and flanks having fewer black hairs, more sandy brown, inclining to russet, whilst the throat is again paler, and the whole of the under parts sandy rufous. Hair on the legs and feet pale sandy yellow. Demarcation between the upper and lower parts is only slightly defined. The ears are heavily haired on the inner ridge. This gradually ceases towards the top, whilst the inner surface of the ear itself is thinly covered with small sandy hairs. Tail well haired with yellowish hair possessing grey under parts. Both in adults and immatures a dark line is sometimes seen extending from the root to tip of the tail on the upper surface. The above describes the full winter pelage. In summer the coat of hair is not so dense, and rather more cinnamon-rufous all over. The immatures resemble the adults, except that the hair on the upper surface of the toes is often white. The eyes are black and very prominent.

Dimensions in Millimetres.

Adults (Female and Male)	Head and Body	Tail	Hind Foot	Ear
Maximum .	140	30	20	12
Mean . .	120	26	18	11
Minimum .	115	22	16	10

Size, in very large males, nearly double that of the Common Field Vole; skull of adults about 26 mm., very strong, with large incisors; tail 30 mm., short and well haired; zygomata heavy. The long hair on the forehead stands up prominently in life. Ears large and well haired. The general appearance is massive,



Litho. W. Greve, Berlin.

THE ORKNEY VOLE.
Microtus Orcadensis.

the muzzle being particularly blunt, with the strong incisors prominent. Skull of the adult male in millimetres: Greatest length above 26; base length 24; palatal length 15; zygomatic breadth 17; brain-case 12; length of molars 6·5; length of nasals 9. And the same may be said of the skulls of females.

Measurements in Millimetres of Eight Specimens presented to the British Museum.

Sex	Head and Body	Tail	Hind Foot	Ear	Length of Skull	Breadth of Skull at Zygomata
1. Male . . .	140	25	20	12	broken	17
2. Female . .	135	25	16	12	broken	15
3. Male . . .	130	30	17	11	broken	—
4. Female . .	130	26	16	11	broken	18
5. Male (type)[1] .	120	25	20	11	27	17
6. Male . . .	110	24	16	11	26	17
7. Immature male, 3½ months .	105	23	17	10	25	17
8. Immature female, 3½ months .	90	20	18	9	26	15

I have noticed that both the Orkney and the Water Voles often possess a white tip to the end of the tail. This is never seen in the Field Vole.

Professor O. Charnock Bradley has furnished a very full report of the dental and cranial characters in a paper which Mr. W. Eagle Clarke contributes to the 'Annals of Scottish Natural History,'[2] and to this I must refer my scientific readers for details of comparison.

Mr. Eagle Clarke considers that the Orkney Vole occupies an intermediate position between the Water Vole and the Field Vole, and is more nearly allied to the former;[3] but this view is, I think, misleading, for all its characters seem to point to a close affinity with *M. agrestis*, which, according to Mr. Miller, is a member of the sub-genus *Microtus*, and not to the Water Vole, whose characters in the sub-genus *Arvicola* are quite distinct, and which the Orkney Vole does not possess.

In this view I receive the support of Mr. C. J. Forsyth-Major, one of our best authorities on Voles, who thus refers[4] to Mr. Eagle Clarke and Professor Charnock Bradley's views:

[1] British Museum, No. 4. 6. 21. 1.

[2] January 1905, pp. 1–8.

[3] 'In considering all the features of the skull together,' says Mr. Eagle Clarke (*Ann. Scot. Nat. Hist.* January 1905, p. 6), 'it is clear that, except in regard to the teeth, *M. orcadensis* is more closely allied to *M. amphibius* than to any other British species.' The same writer points out that marked distinctions in the skull of *M. orcadensis* are the degree of development of the temporal fossa, and the great sagittal diameter of the interparietal bone.

[4] *Ann. and Mag. Nat. Hist.* ser. 7, vol. xv. March 1905.

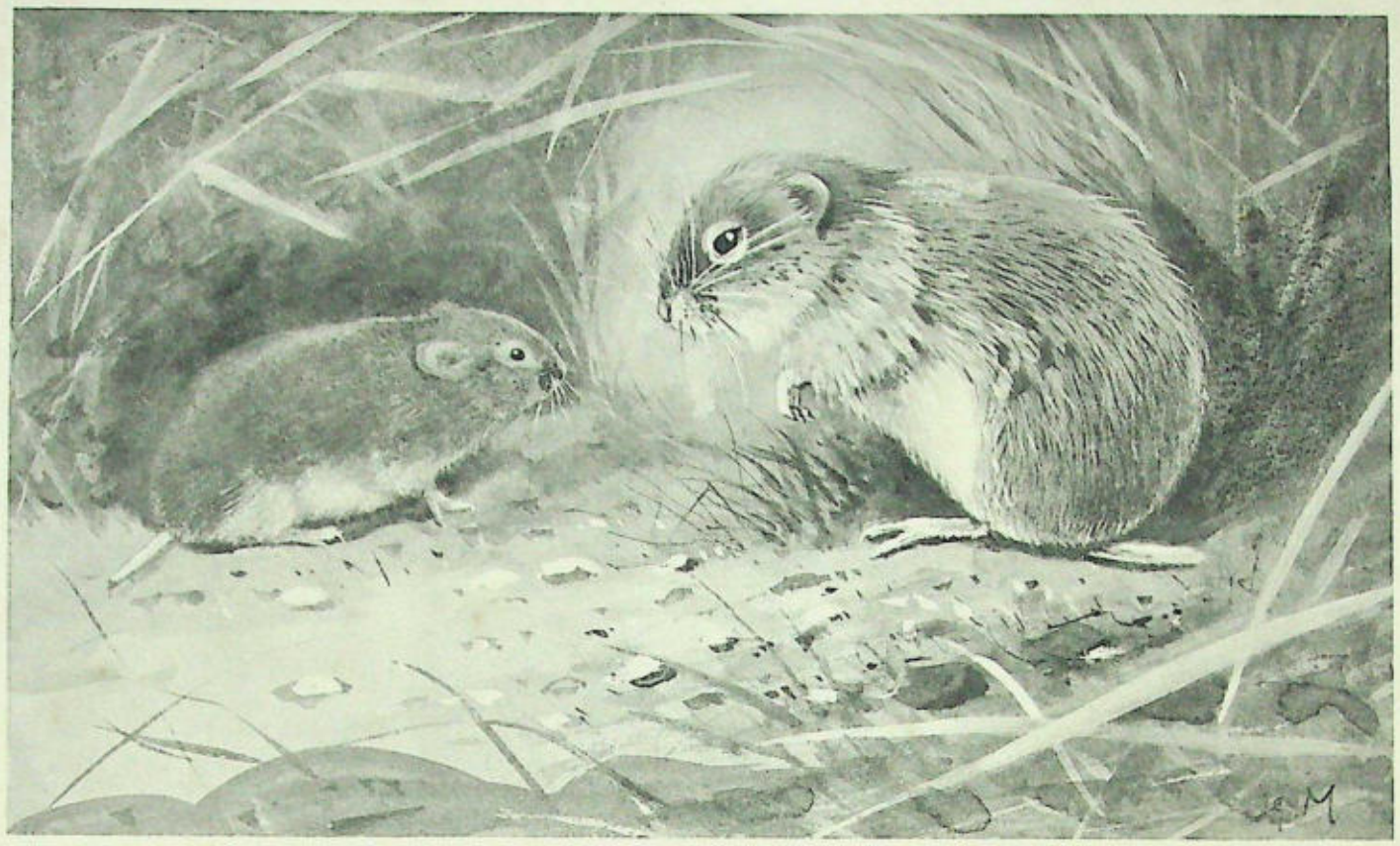
'The two British species just mentioned, the Orkney and the Water Vole, are so widely apart from each other that they have been placed into two distinct sections (sub-genera) of the genus *Microtus*. Now the Orkney Vole, by its external characters (number of footpads on the hind sole, absence of abdominal musk-glands), as well as by the character of its teeth, is clearly a member of the same sub-genus as the Field Vole, and therefore much nearer related to the latter than to the Water Vole. The peculiarities of its skull by no means contradict this statement. Great width of the skull, relative shortness of the brain-case, and elongation of the rostrum are not peculiarities proper to the Water Vole alone: they occur in other sub-genera also. Within the sub-genus to which our common Field Vole (*M. agrestis*) belongs it is the *M. arvalis* and its allies, one of the Field Voles of Continental Europe and Northern Asia, which the Orkney Vole approaches most in the characters of the skull. The teeth of the last-mentioned being, moreover, indistinguishable from those of the *M. arvalis* group, I would assign it a place within the latter, of which it is a large-sized and otherwise remarkable form, well deserving of a specific name of its own.

'One form (possibly more) of a Vole with teeth of the *M. arvalis* type is represented by jaws in some of our caves and river-deposits. Not having as yet come upon fairly complete skulls, I do not venture to assert that the species *M. arvalis* was represented in Great Britain during Pleistocene times; but the *M. arvalis* group certainly was. This last circumstance will in due time presumably help to explain satisfactorily the present existence of a member of the *M. arvalis* group in the Orkney and Shetland Islands.'

The Sanday Vole

Microtus orcadensis sandayensis, sub-sp. nov.

This smaller race of the Orkney Vole, which inhabits the island of Sanday, bears very much the same comparison to the large form found in the island of Pomona that *M. s. celticus* does to *M. s. intermedius*, the wood mouse of England. It is considerably smaller and greyer than the larger race, and the under parts never possess the rich sandy-brown tint. These are grey, sometimes with a slight yellow tint and sometimes greyish-white, like *M. agrestis*. The dark line along the upper surface of the tail is not so strongly marked, whilst in some specimens it is scarcely noticeable. In all other respects it resembles the Orkney Vole, skull and teeth being identical, although smaller.





The Sandy Vole

The Black Variety of the Orkney Vole

Centuries of isolation in a restricted area, where the grass is not so rich and conditions of life are altogether less favourable, have caused the Sanday Vole to deteriorate into a smaller race than the parent form. The island of Sanday lies about thirty miles north-east of Pomona, and contains about 12,000 acres of land. It is twelve miles long from north-east to south-west. On the east side the soil is sandy and covered with bent grass, in which Voles are fairly plentiful. I have visited it in winter and found the climate very mild—more so than in Pomona.

I am indebted to my friend Mr. George Sim, of Aberdeen, for the first specimens of this sub-species, and have little doubt that it also inhabits the island of North Ronaldshay, but at the time of going to press I have not received specimens from that island.

Distribution.—So far the Orkney Vole, which was first described by myself as a new species in 1904, seems to be confined to the Orkney Islands. It is abundant on the main island of Pomona, and on all the other islands of the group which are of any size, except Hoy. In Hoy it may yet be found, but the general character of the island is too rocky and peaty to afford a suitable habitat.

I have been at considerable labour to obtain this species in Shetland, where I believe it may occur, or did occur until quite recently, but so far without success. In 1901 I spent some time in examining the country about Scalloway, as well as in North Maven and Yell, and questioning the natives, but without seeing a single 'run,' or obtaining any information that was satisfactory. In 1904 I made a very complete survey of the eastern side of the principal island, from North Rooe to Lerwick.[1] Here I met the recent tenant of Bressay, who assured me that a short-tailed Vole occurred in that island. A visit to Bressay, however, convinced me it was not there; but wandering on the hills one day I met a simple shepherd who, on my showing him a drawing of the Orkney Vole, said: 'I ken yon beast fine. It is not here, but lives in Whalsey, where I come from. I have several times seen and caught it when I was a lad, "runnin' the night."'[2] I was in high spirits, and made haste back to Lerwick, where I caught the first steamer to Whalsey.

Whalsey is a wild island off the east of Shetland, where I had great difficulty in finding a place in which to lay my head. I wandered in the rain for six

[1] I did not work the south-west of the main island, for did the Vole exist there, Mr. Henderson of Dunrowness would certainly have obtained it.

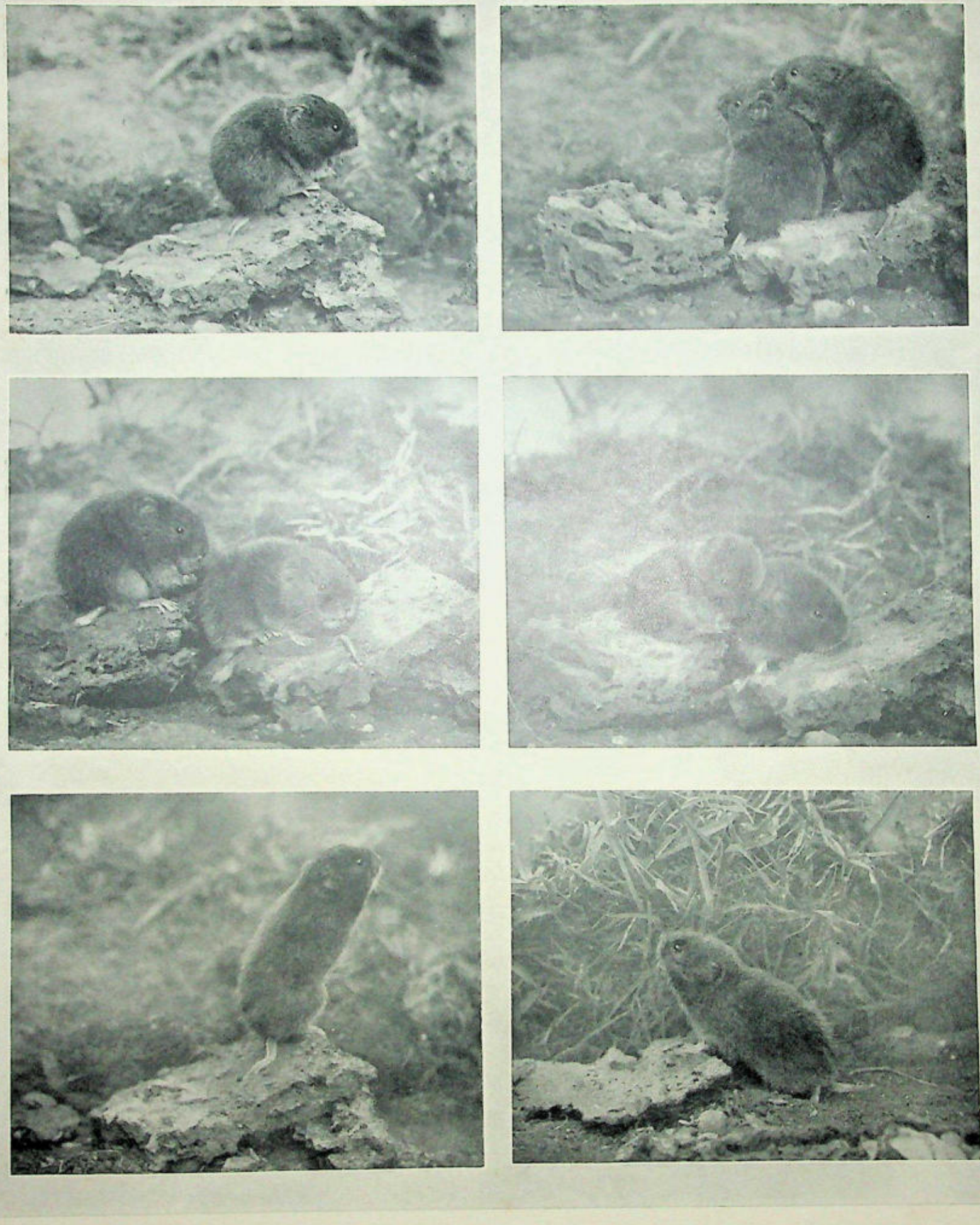
[2] 'Running the night,' a curious old Shetland custom. A youth who desires to court his sweetheart goes at night and creeps into the house of his *innamorata*, where he stays till daybreak, when by etiquette he is obliged to depart before the household awakes. It corresponds to the Dutch *Oppsitting*.

hours, being refused hospitality by the crofters, who are ever suspicious of entertaining a stranger. At last I discovered the local schoolmaster, Mr. White, who gave me a cheering welcome, and with him I spent a most enjoyable week. We searched the whole island, and though I found no Voles, nearly everyone I met seemed to recognise the picture of the little beast, with its short tail and blunt head, and they all knew the long-tailed wood mouse.

Until recently there were many 'weasels' (stoats) in the island, and these with the black-backed gull, whose name is legion, have probably nearly exterminated the Voles which existed in Whalsey. Yet one or two may come to light, as two were said to have been killed in 1904. The united efforts of Mr. White and the entire juvenile population of Whalsey may yet produce a specimen. My only consolation was the discovery of a colony of *Mus rattus*, animals new to Shetland.

Habits.—Returning one evening from fishing in the Loch of Stennis, Pomona, Orkneys, in the month of August 1886 I noticed what looked like a Water Vole running swiftly along the sheep-track in front of me. The fact that the animal seemed to be quite black at once made me pause, for the distance from the lake was considerable, and I had never observed the black form of the Water Vole in the Orkneys. The little beast presently darted into what I found on examination to be a large series of runs and tunnels intersecting the heather, grass, and small rocks, such as we are accustomed to find in the northern colonies of the Common Field Vole. I saw at once that it must be a black variety of some Vole, and its size, which appeared to be twice that of the common species, led me to think that all the Orcadian Field Voles might be melanic, and might also be a distinct species of the genus.

After sitting and waiting for an hour, I saw another of these Voles—a still larger specimen—also black; but, having no traps with me, and an engagement in the south, I was unable to capture a specimen that year. In the following August, however, a friend sent me two specimens in the flesh, one of which was russet-brown, and the other brownish-black all over. I then saw that this Vole differed in many respects from *M. agrestis*. Now, too, I know that it differs from the smaller British species in more marked degree than the recently discovered *E. skomerensis* of Skomer does from the Common Bank Vole (*E. glareolus*) of Britain. Owing to the carelessness of a local taxidermist in Perth both these specimens were destroyed, but I had fortunately made a careful drawing of the black variety in the flesh, and I have since obtained and



ORKNEY VOLES.
From photographs by D. ENGLISH, F.R.P.S.

examined a large series of this Orcadian Vole. Mr. P. D. Malloch collected five adults for me in September 1898, and Mr. Cursiter, of Kirkwall, has sent me specimens, living and dead, as I have required them. Most of these have been obtained from a large colony in the parish of Sandwick, Pomona, where they are especially numerous in the grass fields.

Pomona, the main island of the Orkneys and the principal habitat of this species, is a large wind-swept island of some twenty-six miles in length, and fourteen at its greatest breadth. The general aspect of the land consists, for the most part, of low rolling hills covered with rocks and heather; whilst the lower slopes and lands adjacent to the sea have been reclaimed for the purpose of agriculture, and consist chiefly of rushy fields, grass, and clover. For the greater part of the year the Orkney Vole inhabits these rough fields, and even the part-grass, part-heather uplands, where sheep feed, until the summer and autumn, when they repair to the rich grass and clover fields which are under cultivation, doing here and there considerable damage to crops.

In the neighbourhood of the Loch of Stennis it is fairly numerous, and especially so in the parish of Sandwich. I have seen the runs of these Voles quite near Kirkwall, and on the promontory of the mainland facing the island of Damsay, and in several other places where the ground is suitable.

The Orkney Vole is especially partial to damp localities. Here its runs may be seen passing in and out of the herbage, at times hidden and at others conspicuous. Many of these surface galleries, which extend for a considerable distance from the holes, are placed in the open, where the animals may often be seen running in broad daylight, for it is quite as diurnal in its habits as the Water Vole. Like that animal it takes the water freely, and will for preference swim a pool in its flight rather than go round it by land. One released in a pond dived when I tried to catch it.

The first litters are produced as early as April, and I have seen half-grown young as late as the end of September.

In September 1903 Mr. Cursiter sent me five of these Voles alive, and I kept them until the 15th of the following December, when a spaniel, who was accustomed to collect small mammals and bring them to me, finding business dull, upset the cage and released or swallowed four of them. At any rate, I found only one (a male) remaining when my faithful hound had finished his work. This specimen I kept until February 10, when I killed it for the sake of its pelage. Amongst these five was one big male, which measured 5½ inches from

nose to the root of the tail; tail 1¼ inch—the largest and handsomest specimen I have seen. This loss was particularly distressful, not only on account of his remarkable size, but because he was so amiable a little beast. He never attempted to bite, and would sit up in my hand and eat a piece of carrot without fear whilst strangers observed him. In confinement all these Voles were at first very shy and retiring, sometimes biting if roughly handled; but the males soon became tame, and I could then handle all three without fear of being bitten. The females were always much shyer and more pugnacious. Their high squeak could constantly be heard when others jostled them, or fresh food was put into the cage. They also make a low chuckling noise. The Voles devoured large quantities of grass when fresh and green. They seemed, too, to like brown bread, and an occasional nibble at a turnip; but next to grass their favourite food was carrots. The unconsumed blades of grass, though rejected as food as soon as they commenced to dry, were taken to one corner of the cage, and carefully interwoven into a large comfortable nest. In the centre of this the Voles would cuddle and sleep the greater part of the day, their usual attitude being three tucked closely together, whilst a fourth lay across the top, forming a warm fur coverlet.

On December 2 the temperature sank to 35°, and I noticed that the Voles did not touch the food placed for them. This cold snap lasted a few days, during which they neither fed nor moved; but on a rise of temperature they again appeared, and ravenously ate the food placed for them. These intervals of hibernation continued, in the case of the single male which I kept, until February 10, 1904.

On October 30, 1904, Mr. Cursiter sent me eleven living specimens. All these were very tame and never attempted to bite; in fact, this species seldom bites unless handled roughly or suddenly. In dispatching these animals to me Mr. Cursiter thus remarks on the cannibal tendencies common to all Voles and mice: 'Last week I mixed a few freshly caught ones with the old residents. The newcomers were immediately attacked and three were killed and eaten. Even in broad daylight the slightly wounded were being bitten, and I could not save their lives.' It is necessary to isolate females with young, as the latter are generally attacked by the males.

With regard to the breeding of the Orkney Vole Mr. Drane kindly sends me the following letter: 'In August 1904 I received six Orcadian Voles from Mr. Cursiter, and by the end of October they had increased to sixteen. Then there was a period of cessation in reproduction until February 28, 1905, when two of the



ORKNEY VOLES IN MOVEMENT.
From photographs by D. English, F.R.P.S.

females produced litters of three and four respectively. This species, in common with *E. skomerensis*, the Bank Vole, and common Field Vole, breeds with unlimited facility in confinement if they are only treated with sympathy and ordinary intelligence. They are all innocent, amiable, even *humorous* creatures, purely vegetarian, except as regards milk, of which they are all very fond; and until I knew this last Orkney Vole it was a canon of my belief that they never bite—and I include the common Water Vole (water rat). I have had them all in confinement, and was never bitten by any of them until these "Scotch Thistles" came to hand, who seemed to have appropriated the national *Nemo me impune lacessit*. Yet I hesitate—the *general* charge is not justified. Voles *are* an innocent amiable family, but I have been bitten by Orkney Voles repeatedly, and, as a matter of fact, never by any other species. This is in direct conflict with the experience of a friend of mine who maintains that he has been bitten by them all. *Quot homines tot sententiæ*. I have not, and there's an end. Among my Orkney Voles was *one* which would *always bite* me, so I slew him; the rest I handle daily and am not bitten; but still this species is not so generally amiable as the others. They fight desperately, at times, amongst themselves; and lately one of those I have became distasteful to his fellows, so they fell upon him and killed him savagely. They tore off his fur, rent his skin, pierced his cranium with their teeth. Teetotalers gone drunk, vegetable feeders almost turned cannibal. I must leave the inference and analogy. But *human* nature is much the same in all ages amongst all peoples; why not animals still more so? On a given occasion I witnessed copulation and isolated the doe; last week she produced four young. The period of gestation is twenty-one or twenty-two days.'

Voles may be considered adult in less than a year, but both in size and colour they improve considerably during the next two years of their lives.

Mr. Douglas English, to whom I sent a living pair of these Voles, describes them as 'most charming pets, not such fools as the Field Voles, not so inexpressibly smart as the Bank Vole.'

So far as I can learn, there has never been a plague of these Voles in Orkney, nor have they bred to anything like the same extent as the hordes that have done so much mischief in the South.

Writing of the family life of these Voles Mr. Drane sends me the following note: 'Between 2 and 7 A.M. on April 5, 1905, four young Orkney Voles were born. The young always announce their advent with much squeaking, but soon afterwards they become quite mute. On the eleventh day they were still quite blind

at 11 A.M., but on the 12th at 8 A.M. they could see perfectly, and came out to nibble at the lettuce leaves provided for their mother. When the parent detected my presence she seized with her teeth the young ones and forced them back into the nest-box, in precisely the same way as I have seen a poor woman fetch in her rambling young in the presence of danger. The fussiness, the anxiety, and the administered rebuke were ludicrously alike in both cases. At eighteen days old the young Orcadians were practically independent of their mother, but she would still drive them home in a peremptory manner. The excessive micturition of this species makes them somewhat dirty in confinement, and proper drainage is necessary.'







STUDIES OF ORKNEY VOLES.

Sub-genus *Arvicola*

In the skull of *Arvicola* the zygomatic arches are wider, and the brain-case broader and shorter than in *Microtus*. The teeth differ in their enamel pattern, as already shown in the chart. There are only five tubercles on the feet. There is a large musk gland on each side of the abdomen, as described in the specific characters of our Water Vole. All the species are amphibious: they are found both in the Old and the New World.

THE WATER VOLE

Arvicola amphibius, Linnæus.

Mus amphibius, Linn. 'Syst. Nat.' 12th ed. p. 82 (1766).
Mus terrestris, Linn. 'Syst. Nat.' 12th ed. p. 82 (1766); not of Schrank.
Microtus amphibius, Schrank, 'Fauna Boica,' vol. i. p. 72 (1798).
Arvicola amphibius, Lacépède, 'Mém. de l'Inst.' iii. Paris, p. 489 (1801); Bell, 'Brit. Quad.' 2nd ed. p. 316 (1874); Lataste, 'Le Natur.' tome ii. p. 349 (1883).
Hypudæus amphibius, Illiger, 'Prodr. Syst. Mam. et Avium,' p. 87 (1811).
Arvicola aquatica, Fleming, 'Brit. Anim.' p. 23 (1828).
Arvicola ater, MacGill, 'Mem. Wern. Soc.' vi. p. 424 (1832).
Arvicola amphibia, Jenyns, 'Brit. Vert. Anim.' p. 33 (1835).
Hemiotomys amphibius, De Selys-Longchamps, 'Ess. Monog. sur les Camps. des Env. de Liège,' p. 7 (1836).
Paludicola amphibius, Blasius, 'Fauna der Wirb. Deutschl.' Bd. i. Säug. p. 333 (1857).
Ochetomys amphibius, Fitzinger, 'Sitz. K. Akad. Wiss. Wien,' lvi. p. 47 (1867).
Praticola amphibius, Fatio, 'Les Camps. du Bassin du Léman,' p. 36 (1867).
Arvicola terrestris, Miller, 'North Amer. Fauna,' No. xii. p. 11 (1896).

Local Names.—*Water Rat*, *Brown Water-rat*, *Black Water-rat* (English); *Craber*[1] (Old English); *Lamhalan*[2] (Gaelic); *Water Ratton*, *Water-rat* (Scottish); *Llygoden y dwfr*, *Llygoden y dwr* (Welsh).

Mr. Gerrit S. Miller, in a footnote on page 11 of his 'Genera and sub-Genera of Voles and Lemmings' ('North American Fauna,' No. 12) says that, as

[1] From the French *crabier*.

[2] Also applied to the water shrew.

Lataste has already shown, the *terrestris* and *amphibius* of Linnæus are the same animal. 'The *Mus amphibius* of Linnæus,' he remarks, 'is nothing more than a figment of the imagination based on Ray's misconception that there is a large aquatic Vole with webbed feet.' According to this argument the species should be called *Microtus terrestris*, Linn., or, if we accept Mr. Miller's sub-genus, *Arvicola terrestris*, Linn. For the present, however, I prefer to retain the name *amphibius*.

Characters.—This, the largest of our Voles, differs from the other species inhabiting Britain in possessing a moderately long tail. The fur is long and thick, and generally has an external appearance of grey brown. If examined closely the fur of the upper parts is pure grey in the hidden portions and a mixture of pale yellowish brown and black hairs on the lower parts; the outer hairs are generally sandy brown. Sometimes a reddish tinge is noticeable over the whole coat in winter, especially in the case of southern specimens. The vibrissæ are black with whitish ends. The eyes are black. The hind feet are sparsely haired and covered with fine yellowish-grey hairs on the upper surface. The tail is covered with black hairs and often has a pure white tip. The first upper molar has five and the second and third have four prismatic spaces, whilst in the lower jaw the first molar has seven spaces, the second five, and the third three spaces. In the case of the first lower molar the first three spaces are often imperfectly separated. The incisor teeth are brownish yellow.

The limbs are somewhat small compared with the body, which is short and thickset. The ears are short and buried in the fur: they are covered with sparse hairs externally and the aperture of the internal ear is capable of being closed by an 'operculum.' The claws are yellow with lines of purple on the upper surface.

The presence of musk glands is peculiar to this sub-genus, and these are described by Miller in the following manner: 'The species of *Arvicola* are provided with a large musk gland on each side of the abdomen. These glands lie immediately in front of the hind legs. They are regularly oval in outline, the long axis parallel with the long axis of the body. The surface, which is slightly raised above that of the surrounding skin, is closely and irregularly wrinkled, and has much of the appearance of very fine honeycombed tripe. Each gland bears a sprinkling of fine hairs much shorter than the fur, but at first sight appears to be naked.'

The following are the measurements in millimetres of five adult specimens taken in England and Scotland:

Sex	Locality	Colour	Head and Body	Ear	Tail	Hind Foot
♂	River Earn, Perth	Brownish grey	255	9	130	32*
♂	Perth . . .	Black above, grey below. Some brown spots.	253	9	110	31
♂	Perth . . .	Brownish-black above, brown grey below, white tip to tail.	240	8	111	30
♀	Knepp, Sussex .	Brownish-grey with reddish tinge, white tip to tail.	210	8	110	30
♀	Forres, Nairn .	Jet black all over	205	7	108	28

* A very large specimen.

The black variety of the Water Vole has long been known to Continental naturalists, for Pallas found it in Siberia. In Great Britain it was first noticed[1] by William MacGillivray, who went so far as to claim specific rank for it. Later, however, he abandoned this view, and considered it in the position it now occupies, merely as a variety. When the Scottish naturalist wrote (1830) this dark variety was supposed to exist only in Scotland, but it was afterwards recorded by the Rev. L. Jenyns from the fen ditches of Cambridgeshire, where it is still abundant, as well as by Lubbock in Norfolk. More recently this melanotic variety has furnished the subject of an excellent paper[2] by (the late) Rev. H. A. Macpherson and Mr. O. V. Aplin, who have carefully summarised and collected notes on its occurrences in various parts of England and Scotland up to the year 1892. In summarising their collection of notes the writers say (p. 282):

'It will be seen from the statistics thus furnished that this melanotic variety is rare in England, occurring sporadically in many districts widely distant from one another, but only well established in the fen country of Norfolk and Cambridgeshire. On entering Scotland it appears to be very local until we reach the Trossachs in the west and the watershed of the Tay on the east coast, north of which it occurs almost as generally as the familiar brown form.'

In most of the English counties this dark variety has been noticed by competent observers. Macpherson and Aplin give Cumberland, Westmorland,

[1] 'Description of a Species of *Arvicola* common in Aberdeenshire,' *Mem. Wern. Nat. Hist. Soc.* vi. May 1, 1830, p. 425.

[2] *Zoologist*, 1892, pp. 281–293.

Yorkshire, Cheshire, Oxfordshire, Shropshire, Lincolnshire, Nottinghamshire, Huntingdonshire, Cambridgeshire, Norfolk, Kent, Sussex, and Somerset. In Cambridgeshire I have seen large colonies of black Water Voles in the fen ditches. It is curious that they are always blacker in summer than in winter in this county,[1] and I have never seen perfectly black examples such as occur in the North of Scotland. In the South of England the variety may be considered rare. I have only twice noticed it: once at Wiveliscombe, in Somerset, where Mr. Cecil Smith used to live, and twice on the Arun at Horsham, in Sussex. It has recently been recorded from Watford[2] and Suffolk.[3]

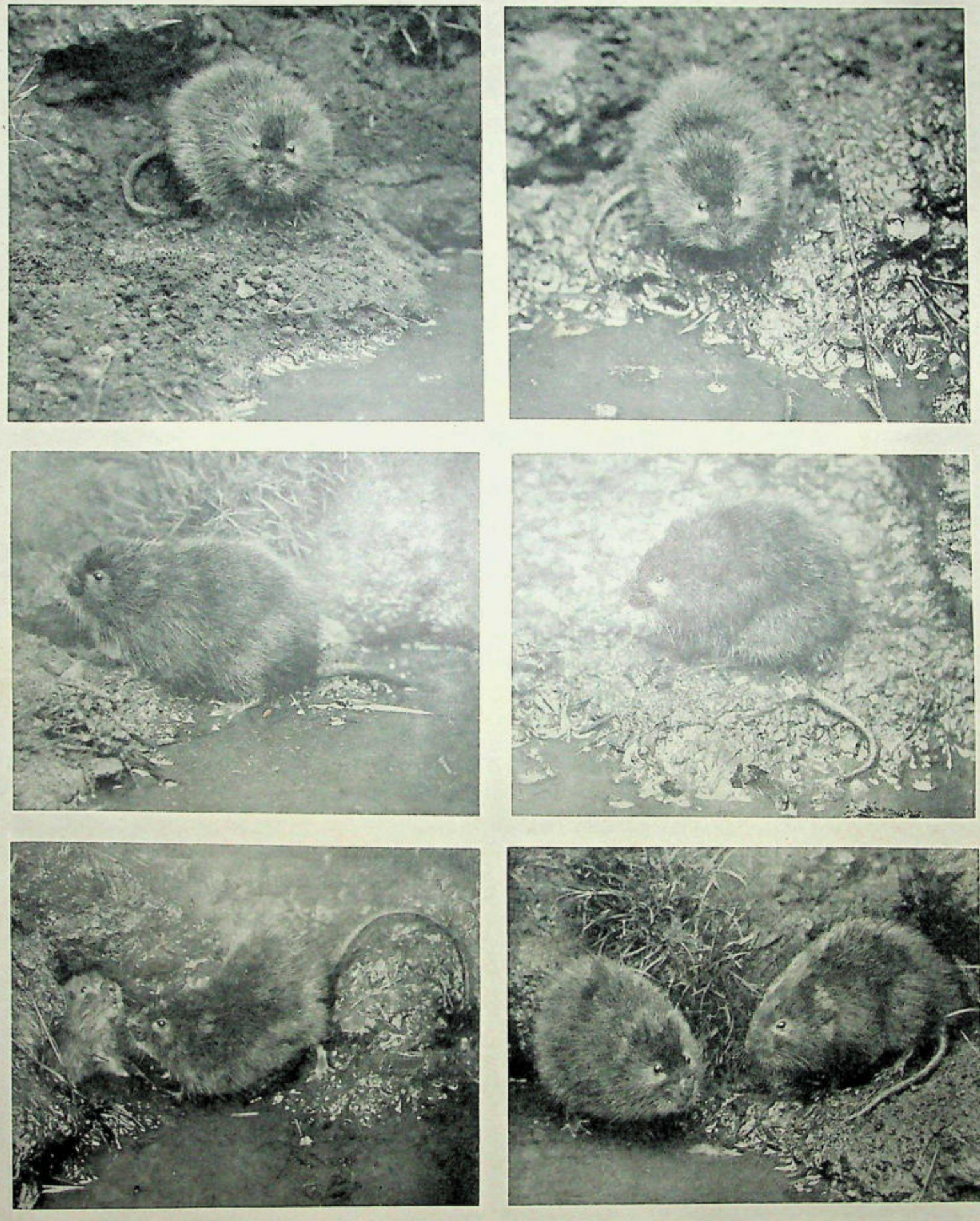
From Wales this dark form has only once been recorded. In Scotland south of the Clyde and the Tay the dark variety is rare and local, but north of these two waters it rivals the brown variety in numbers, and in some parts it seems to be the only form. From Nairn, Elgin, Moray, and East Sutherland come the blackest examples.

Distribution.—The Water Vole has a wide distribution throughout nearly the whole of Europe and the greater part of Asia north of the Himalayas. It is found in Siberia, but is unknown east of China. In England it is abundant in all suitable localities, but is comparatively scarce in South Wales, although common in Anglesey and the streams of North Wales. In Scotland it is found in all the low-lying districts except Argyllshire, whilst it is absent from the outer islands of the west coast as well as Orkney and Shetland. It is also unknown in Ireland.

Remains of the Water Vole have been found in numerous British caves, as well as in the brick earths of the Thames Valley, and Mr. Lydekker suggests[4] that 'not improbably' its bones occur in the Norfolk forest-bed, which would place the species as a resident in this country in the early Pleistocene age.

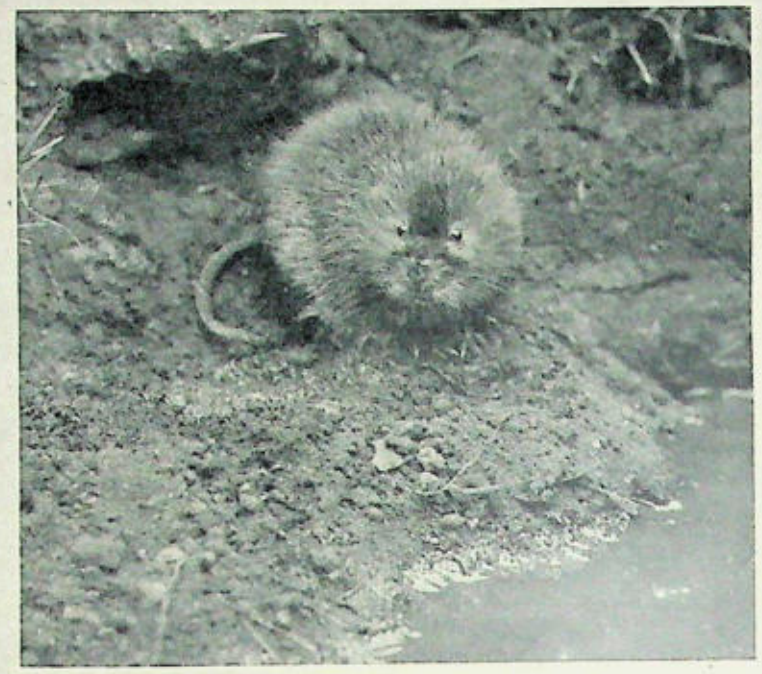
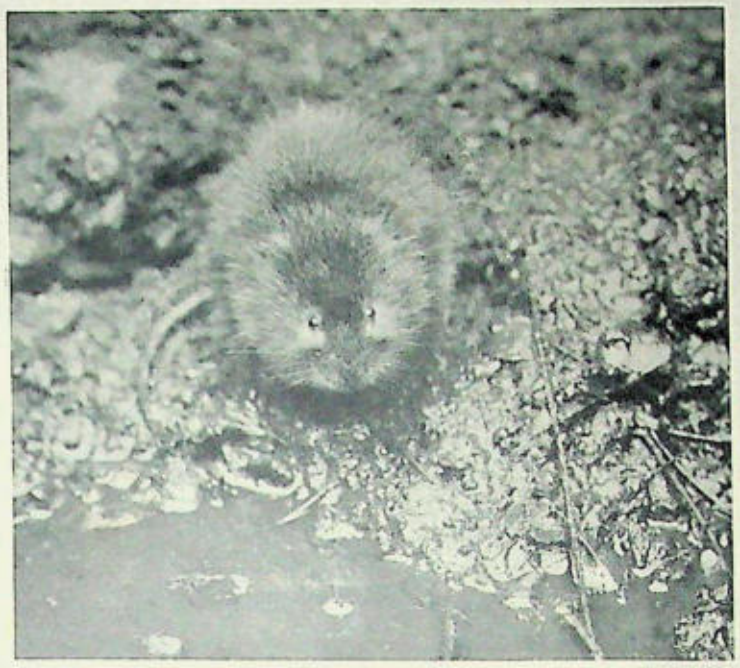
Habits.—Commonly met with along the banks of sluggish rivers, streams, mill-dams, and fen ditches, the Water Vole does some mischief in undermining the banks and releasing the water. Sometimes it burrows in meadows at a distance from water, and I have seen one killed by a terrier in a grass field where it had made a burrow over a mile from the river Arun. It will sometimes frequent ploughed fields. Thus Gilbert White (Letter xxvi. to T. Pennant) says: 'As a neighbour was lately ploughing in a dry chalky field, far removed from any water, he turned out a water rat that was curiously laid up in an hibernaculum

[1] A regular trade is done in Cambridge in the sale of the hides of these black Water Voles.
[2] *Zoologist*, 1902, p. 232. [3] *Ibid.* 1898, p. 122. [4] *British Mammals*, p. 218.

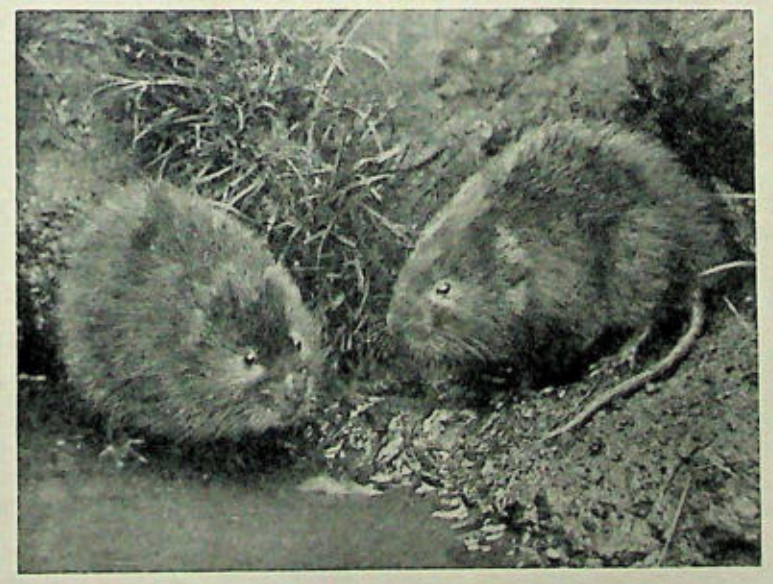


WATER VOLES.

From photographs by D. ENGLISH, F.R.P.S.





WATER VOLES.

From photographs by D. ENGLISH, F.R.P.S.

artificially formed of grass and leaves. At one end of the burrow lay above a gallon of potatoes, regularly stowed, on which it was to have supported itself for the winter.'

The Rev. H. A. Macpherson noticed that a colony of Water Voles had taken up their abode in the sandhills of Ravenglass, in Cumberland, and many other instances could be cited of their making their winter retreats far from water.

Mr. W. Evans, in his excellent little book on the 'Mammals of the Edinburgh District' (p. 65), has noticed another instance of a colony living amongst sandy ground, 'where a small stream enters the sea at Gosford Bay.' In fact, in Scotland, as the same writer remarks, any kind of ground seems to suit it so long as there is water at hand, and it may be found in marshes near the coast, ditches bordering fields, ponds in plantations, or in burns high up amongst the hills.

Few of our native animals have been more unjustly vilified than the inoffensive and harmless Water Vole. Owing to a certain external resemblance to the brown rat he has few friends, and to most people he is only a water rat. Often brown rats frequent the burrows of Water Voles, and lead a semi-aquatic life, and so the innocent suffer for the sins of the guilty, for the average countryman is seldom discriminative.

Outside their tortuous burrows, on the grassy bank, Water Voles may be seen nibbling their meal of grass roots or water plants almost any fine morning or evening. They are to a great extent diurnal, especially in the spring and autumn, when they are often abroad the whole day. They are wonderfully quiet and peaceable animals, and love to sit for hours lost in a 'brown' study. When unmolested they soon become very tame, and will permit a close approach. I know of one small colony in a ditch by Warnham Pond, where the Water Voles have often passed by me at a distance of three yards without being alarmed. I have sat among the willows and watched them diving for roots at such close range that one almost imagined oneself to be an honoured guest. They like to sit up on their haunches to devour their food, but an insatiable appetite, common to all Voles and mice, soon sends them again to the water to search for provender.

If you have time and patience at your command you can approach closer to the Water Vole and enjoy his society with greater intimacy than any other British mammal. I have often watched a Water Vole diving for flag-shoots, and by running in to the spot where he had disappeared have met the surprised animal as it reached the surface. Then if you keep perfectly still, or have already

taken advantage of some cover, our amphibious friend will simply stare at you and go on with his dinner. I was crawling along, stalking some young rabbits, one May morning, when a Water Vole came out of the water of a brook almost at my elbow. A small bramble bush partly hid me from his view as he landed on the opposite bank. Here he sat up and kept alternately staring at me and trying the wind. Then, doubtless satisfied that I was only some strange tree-stump, he walked to the water's edge and reached out for a leaf of marsh marigold which was growing in profusion around him. For five minutes I had an excellent view of his mode of feeding. Balancing himself on his hind legs he seized a leaf by its supporting stem: this he bit off about one inch below the leaf, and then quickly resuming a sitting-up posture, and at the same time transferring his food to the forepaws, he rapidly devoured both stem and leaf. In this manner he quickly cleared a small plant of its young growth, but did not touch the flowers or the larger leaves. Having exhausted the resources of his immediate surroundings he quickly plunged into the water, dived, and disappeared from view.

The Water Vole is a fairly fast swimmer, but not to be compared in diving powers or rapidity of movement with the brown rat,[1] and like the beaver may often be seen swimming with the hind legs only. It dives with ease and swims faster under water than on the surface. When moving on the surface it exposes the whole of the head and back; but if it suspects danger it can 'sink' the body and show only the nose. As it generally emerges close under a bank it takes advantage of the cover of a leaf or floating waterweed, and so becomes practically invisible. In such a position it will remain stationary for some minutes.

Mr. Douglas English, who has been so kind as to photograph most of the smaller British mammals for me, and who is himself a keen lover of nature as well as an accurate observer—two things not always synonymous—sends me the following interesting notes on the Water Vole:

'I have frequently kept Water Voles in captivity, and have found them hardy and, in most cases, easily tamed. I have never been able to induce a Water Vole to eat anything outside the vegetable kingdom, and I have never trapped a Water Vole with anything but a vegetable root.

'For keeping them in captivity I have realised that the first essential to

[1] I have often tested this in a pond. In a very long swim, however, I believe the Water Vole would have the best of it, as it would rest afloat on the surface, as a beaver does, when it became tired, whereas the terrestrial brown rat would probably become frightened and 'race' itself to death by drowning.

their well-being is that they shall have an adequate supply of water. It is not sufficient that they should have only a drinking supply, they must have facilities for a complete plunge-bath. In default of this they will, in two or three days' time, be practically blinded by the solidification of the oily matter which is secreted round or from their eyelids. It cakes into a white wax, but the complaint is cured in a few hours by a return to more normal surroundings.

'I have recently kept a pair in a galvanised iron tank, tilted so as to ensure six inches in depth of water at one end and *terra firma* at the other, and I have observed them mainly with the intention of discovering the reason of my frequent failures to mark a Water Vole's emergence after he had once dived. I was helped to at least a partial solution of my difficulty by the fact that a considerable quantity of dead leaves and other rubbish was blown into the tank, which was always open at the top. In course of time portions of this sank to the bottom; other portions remained floating on the surface.

'I came to the following conclusions:

'(1) The Water Vole does not normally stay below the surface for more than twenty seconds. Apart from breathing difficulties, a longer period of submergence has the effect of soddening his long hair and wetting his skin. After a normal dive his skin is practically dry.

'(2) If he suspects danger he will rise under some kind of cover, such as a floating leaf. He will raise this on his nostrils so that he can breathe, and yet in the shadow of it be practically invisible.

'(3) In default of floating cover he will *take up cover from the bottom.* I noticed this so frequently that I cannot avoid the conclusion that it is instinctive.'

The burrows are often long and rambling, but usually have two upper surface holes, and at least one sub-aquatic one. Where a colony has been long in residence these galleries, from being constantly extended, often let the water out of canals and mill-dams. Speaking of the burrows Mr. English says:

'It is generally recognised that at least one entrance to a Water Vole's burrow is sub-aquatic. It was impossible for my Voles to burrow in the rockery hill which I had provided for them. In the hard weather (for some days the six-inch depth of water was frozen solid) I provided them with some hay. They stood the frost well, but, as far as I could determine, made no use of the hay as nest material. When the thaw came they constructed a burrow. In the first place they completely wetted the hay. Any fresh supply was similarly treated. Out of the wetted hay they made a nest, or rather a succession of nests (for the

experiment was repeated), each with one outlet perpendicularly upwards and doubtless used for ventilation, and one beneath the surface of the water.'

They are very cleanly animals, and are constantly polishing up their fur, and Mr. English says they are the only animals he has ever seen which can reach and dress their hindquarters with their own hind feet.

The Water Vole feeds almost exclusively on vegetable matter. In hard weather it will attack potatoes, turnips, and carrots, and the bark of willows and osiers. In summer it lives on duck-weed, American pond weed, the roots of water-lilies, marsh marigold, and has a liking for the succulent and inner portion of certain sword-flags. This plant it gnaws off near the root, and after conveying it to the nearest landing place consumes it at leisure. In similar fashion it eats the large horse-tail (*Equisetum*).

Owing to this vegetarian diet the flesh of the Water Vole is said to be not unpalatable, for Buffon tells us that the French peasantry sometimes ate these animals in times of scarcity.

Mr. Harting[1] says: 'There is no truth in the statement that the Water Vole is carnivorous,' but this assertion, I think, requires considerable modification. Doubtless the habit of partaking of animal food is very rare, but several instances of the animals eating flesh, fish, and molluscs, vouched for by experienced naturalists where confusion with the brown rat was extremely improbable, have come under my notice.

Not a few writers have imagined that the Water Vole was piscivorous on account of fish-bones being found in its burrow, but the presence of these bones may be accounted for by the fact that the kingfisher often chooses the hole of the Water Vole as a nesting site. Izaak Walton does not hesitate to dub the 'Craber' (Water Vole) as a fish-destroyer with whom 'any honest man might make a just quarrel,' and Cuvier assigns to the Water Vole a diet of 'frogs, insects, small fish, and the fry of greater,' and even worse charges, such as the destruction of young ducks &c., are laid against this inoffensive creature. Even St. John, generally a good observer, says it preys on fish and toads; but in nearly every case such destruction is the work of the brown rat.

On the other hand, however, Mr. A. Patterson, of Great Yarmouth,[2] says: 'The fact is, the Water Vole is somewhat carnivorously inclined, or rather piscivorous, I am fully satisfied, having observed them on several occasions devouring small fish left on a "rond" beside my house-boat when moored in Kendall.' And, again, he

[1] *Vermin of the Farm*, p. 21.

[2] 'Mammalia of Great Yarmouth,' *Zoologist*, 1898, p. 306.



A Water Vole Colony.

has found Water Voles eating the swan mussel, and quotes a letter from Sir E. Newton, who believes that they eat the bivalve (*Anodonta*). Mr. Patterson thinks they devour crayfish,[1] and has found them eating small roach which he had thrown away.[2]

Mr. Gordon Dalgleish has recorded[3] the fact that he has twice caught the Water Vole in an ordinary steel trap baited with meat. The Rev. Francis Jourdain is convinced of the carnivorous propensities of this animal in Derbyshire, and has kindly sent to me a series of notes relating to this point. He thinks that they devour frogs and small trout[4] occasionally. 'One day,' he says, 'in September 1904 a great deal of scuffling was heard in the water, and looking through the rails which run along a small stream in my garden a Water Vole was seen with a troutlet. It came to the bank and began to eat it, but a friend who crossed the brook disturbed the animal, which immediately took to the water. Previously a number of small trout about an inch long had been seen lying dead.'

Other corroborating evidence is furnished[5] by Mr. Briggs, who says he has seen a Water Vole creep out of a hole and filch one or two fish he had thrown on the bank of the river Trent; and Mr. Fred Curtis,[6] who states that in January 1900 he came across a recently excavated burrow and dug it out. He found the tunnel surface 'beautifully lined with bones of every description. From the size and shape of many of them I gathered that they were the bones of some frog, though they were certainly not all frogs' bones. Besides the bones there were . . . wings, head, and armour-plating of the *Dyticus marginalis* . . . empty cases of some small chrysalids . . . fragments of small land and water beetles . . hundreds of freshwater shells . . . cleverly gnawed . . . also a large quantity of grass still fresh and green,' &c. This burrow, he had every reason to believe, was tenanted by a Water Vole and not by a brown rat; but in this instance it is quite possible he may have been in error.

Like all the Voles, this species does not hibernate, but takes short spells of repose when the weather is unusually severe.

The nest is made of dry grass or some aquatic vegetation bitten up into small pieces. The young, which number from five to eight, are seldom seen before the month of June, and at least two families are produced in the warm months.

[1] See also O. H. Latter, *Natural History of some Carnivorous Animals*, p. 69.

[2] *Notes of an East Coast Naturalist*, pp. 267–270; see also *Zoologist*, 1902, p. 11.

[3] *Zoologist*, 1902, p. 66.

[4] See also *Field*, July 16, 1887 (Water Vole taking a live minnow when used for a bait for trout). H. H. Gray in the *Field*, January 17, 1903, also states they take trout up to 10 inches in length.

[5] *Zoologist*, 1861, p. 4993.

[6] *Nat. Hist. Journ. and Sch. Reporter*, March 15, 1900, p. 36.

The young are sometimes seen as early as April and as late as September. The nests are usually placed in a cavity in the burrow, but occasionally they are found above ground. Thus Mr. T. A. Coward writes: 'In 1887 I found two or three spherical nests of the Water Vole in the reeds at Pickmere: one of these contained blind young. The nests were entirely composed of bitten aquatic vegetation. The date was June 25.'

Mr. Lionel Adams informs me that he has found on the bank of the river Penk several nests of the Water Vole two or three inches above the water, placed in the rushes (after the fashion of a reed-warbler's nest), and constructed of dried rushes.

Water Voles often carry their young about, as dogs do their puppies, and this habit has frequently been observed. They will transfer the young, still blind and naked, from one dwelling-place to another.

Young Water Voles are very helpless until they are more than half-grown: in fact, this is the case with all the members of this family. I have seen a female Water Vole carrying a young one half as large as herself. Unlike the Otter, who often buries her young under water as she transports them from one place to another, the Water Vole holds her burden high and clear of the stream, apparently fearful of wetting her delicate charge. Yet, curiously enough, young Water Voles, if suddenly disturbed even at an early age, can both swim and dive well. Recently when digging out a nest the young, which were not larger than Orkney Voles, plunged into the water fearlessly and swam away.

About the only charge that can be laid against the Water Vole is the damage it does to young willows and osier beds at the commencement of hard weather; it has been known to attack apple trees,[1] but this is rare. It is said to visit gardens occasionally, and to carry off French beans and early peas, but evidence on this point is for the most part only circumstantial.

Plagues of Water Voles are rare in this country, and only one such local visitation has been reported in recent years. This occurred on the Humber in 1896. It was at first thought that the animal was the brown rat, but subsequent investigation proved it to be of this species. A cutting from the 'Eastern Morning News' thus described the outbreak:

'The Humber Conservancy Commissioners have not yet solved the difficult problem of how to rid Reed's Island of the plague of rats that now infest it, nor are they—the most ready means, the flooding of the island, having failed—likely

[1] See W. Evans, *Mammalia of the Edinburgh District*, p. 64.

to do so in a hurry. What a few years ago was a splendid pasture land, and sustained thousands of sheep on its rich verdure, is now the home of myriads of rats. It is burrowed from end to end, and so densely populated is this habitat of the rodent that it is said that it is almost impossible to put your foot down without standing upon a rat-hole. It is only about a year ago that the rats got the upper hand, and the Commissioners have of late been very much exercised as to the eviction of their unwelcome tenants. It was decided to cut openings in the banks which surround the island, and thus let in the Humber waters at spring tide, with a view to drowning master rat and his numerous family. The openings having been made at considerable expense, the water was let in recently, but not with the result anticipated. As the water advanced the rats fled from their holes in tens and hundreds of thousands, and made for the banks, which remained high and dry. The screeching and snarling of the rats as they fought for foothold beggared description. Many were doubtless drowned by the inundation, but, being for the most part expert swimmers, the impression made on the numbers of the great army was practically nil. Adjudging rightly that a day's sport might be had shooting the vermin, a party of gentlemen went down one day in the Commissioners' launch, among them being Sir Ralph Payne-Gallwey, Colonel Burstall, Mr. Legard, Colonel W. H. Wellsted, Mr. M. Samuelson, Mr. E. T. Sharp, Mr. H. Saxelbye, Mr. E. D. Davis, Captain Hume (the Humber conservator), and others. Hundreds of rats succumbed to the firing of these gentlemen, and it was manifest that extraordinary measures will have to be taken to rid the island of the pest. The inundation seems to have done little good, and to shoot them down would be an impossibility. Poisoning has been thought of, but that is deemed of no value, since the Reed's Island rat appears to live on the roots of grass and herbs under which he burrows. Already considerable excitement prevails in North Lincolnshire on account of the invasion of these rats. Nightly they swim across in swarms, notwithstanding that the channel between the island and the Lincolnshire coast is at least five hundred yards wide. Their "footings" have been observed on the foreshore, and their location in fields hard by is certain. The farmers are, however, almost helpless to check them, since they shun the stackyards and granaries. In fact, the rat of Reed's Island appears to be a rodent quite distinct from the common rat with which we are familiar. He has a tail and hindquarters like the latter, but his head and ears are more like those of a cavy, while he has a soft furry skin of a rich tawny hue. It is said that in some places this kind of

rat is bred in captivity for the sake of their rich skins, which are a marketable commodity. Who knows, then, but what the rat plague of Reed's Island will not turn out the ill-wind that will blow the Commissioners good? A rat farm with such furry-skinned inhabitants might prove a little gold mine to them if it were only exploited.'

A note on the above by Sir R. Payne-Gallwey[1] says: 'Reed's Island consists, or rather did consist, of 600 acres of very rich and valuable land (grass and clover), formerly reclaimed from the sea. Four or five years ago between 2,000 and 3,000 sheep and cattle might be seen grazing on its then extremely verdant surface. Now there exists scarce sufficient pasture to feed one rabbit, and the entire island is as brown and rough as a ploughed field from the excavated earth thrown out of their burrows by the, I may safely write, millions of rats. The island is throughout as flat as a billiard table, and is surrounded by earthen banks about ten feet in height to keep out the sea. These banks were last month cut through in several places and the apertures made were fitted with sluices to retain the tide on the island, which was then completely flooded. It was hoped, through this drastic measure, the rats would be drowned. The animals are, however, at present masters of the situation, as though a few thousands—a trifle only of their numbers—have doubtless succumbed, the great majority have taken refuge in the broad banks, which for their entire length of several miles are so riddled with holes that they are like sieves. As the animals are the common water rat, I fear that the idea of drowning them is akin to trying to drown a fish. Starvation may eventually have some effect if their burrows and the ample store of roots to be seen laid up therein are covered with water; but, rather than starve, the rats are sure to escape by swimming to the mainland, as many have done already, and we shall be no nearer an extirpation than now.'

Water Voles have a good many enemies. Otters, stoats, and weasels constantly prey upon them, and amongst the birds the heron is their principal foe. I once observed a heron dancing about in an extraordinary fashion in a water meadow near Marlborough, and on closer inspection saw that it was either playing with or trying to kill a large Water Vole. Becoming suspicious the bird quickly swallowed its prey and flew away. These birds must destroy large numbers of Voles, for Mr. Coward says: 'The pellets thrown up by the herons in the Tabley heronry seem to consist almost entirely of the fur of the Water Vole.' Owls also account for not a few. Certain large fish such as pike, eels, and trout

[1] *Field*, February 22, 1896.

will capture Water Voles as they swim across the water. Pike have often been seen in the act of taking them; and a large eel, 2 feet 9 inches, was shot in Thurston Burn, Northumberland, in the act of swallowing a full-grown Water Vole.[1] An eye-witness[2] thus describes the attack of a large trout on one of these mammals: 'One evening I was fishing on a small pond which is well stocked with trout. The water was very low and clear. I disturbed a small water rat, which plunged in at my feet, and, swimming under the surface, made straight across the pool. When it was about 10 feet or 12 feet away from me it rose to the surface, and in an instant a trout, which looked about 2 lb. weight, rose at it in a most determined way and took the rat down. There could be no mistake about it. The water was quite clear, and I could see the fish distinctly. There was a short struggle under the water, and the rat rose again and made for the bank, while the trout swam slowly away up the pond.'

Varieties of this species are uncommon. A bright buff-coloured Water Vole was shot near Derby in September 1852. A pure albino was captured at Cossey, near Warwick, in July 1880. I have seen another in the possession of Mr. Borrer of Cowfold. This was killed at Albourne, Sussex, in January 1875. In Mr. Harting's notes I find records of four other white examples.

Mr. Patterson[3] says, 'four white examples were taken near Yarmouth in 1892, and a cream-coloured one was noticed by a ditchside on the Caistor marshes a year or two after.'

Two pure white Water Voles were killed at Brimpton, Berks, in 1903,[4] and on January 10 an albino at Inhurst, near Basingstoke.[5] A pied variety is recorded and figured in the 'Ann. Scot. Nat. Hist.' 1903, p. 65. It was taken in the Solway district, and is recorded by Mr. R. Service. Mr. O. V. Aplin has also noticed some albinos, and Mr. Whitaker has one albino, four sandy, and one pied example.

[1] *Nat. Hist. Trans. North. and Durham*, vol. v. 1877, p. 341.
[2] *Field*, July 30, 1904 ('Sandiway').
[3] *Notes of an East Coast Naturalist*, p. 270.
[4] *Field*, January 17, 1903.
[5] *Ibid.*

END OF THE SECOND VOLUME

PRINTED BY
SPOTTISWOODE AND CO. LTD., NEW-STREET SQUARE
LONDON

599.0941
09415
MIL (v.2)