THE MAMMALS OF GREAT BRITAIN AND IRELAND

BY J. G. MILLAIS

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THE MAMMALS

OF

GREAT BRITAIN AND IRELAND



The Dim Red Dawn of Man

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 18 PHOTOGRAVURES BY THE AUTHOR
31 COLOURED PLATES BY THE AUTHOR, ARCHIBALD THORBURN, AND G. E. LODGE
AND 63 UNCOLOURED PLATES BY THE AUTHOR AND FROM PHOTOGRAPHS

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IN THREE VOLUMES—VOL. I.

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DEDICATED

BY SPECIAL PERMISSION

TO

HIS MOST GRACIOUS MAJESTY KING EDWARD VII.

PREFACE

THE subject of British Mammals has already been well treated in part by some of our ablest writers, but that it has been exhaustively dealt with must be denied by all who have any real knowledge of our wild creatures. There are three main essentials in a work dealing with any fauna:—first, scientific accuracy of arrangement; secondly, good pictures both in colour and black and white, drawn from life; and thirdly, exact information on the distribution and the life history of the various species. Now the first requisite is one that any desk-zoologist without experience can approach with ease owing to the plenitude of literature at his command. Much has been already written, and little that is new of a general character can be added except as to bats and seals and the rodents. But as regards the two other points—to my mind quite as important and most difficult—a complete knowledge of the wild life and the wild creatures themselves is necessary, and this can only be gained by time, patience, and observation.

It was my own want of knowledge as regards bats, mice, and seals that first led me to study this subject, for in no work could I find accurate accounts of these animals. It took me four years and four separate expeditions to gain full knowledge of the Grey Seal alone, and I have endeavoured to acquire firsthand knowledge of all the creatures I write about and illustrate. I may say, too, that, though I have been studying the Birds and Mammals of our islands since boyhood, this present work alone has occupied me for the best part of five years, and I still feel its incompleteness in certain parts. I have done my best, however, from all points of view to give the public a complete work on the subject.

More than thirty years ago Professor Thomas Bell published his admirable 'British Quadrupeds,' and it still remains a standard work on the subject, but as

Mr. Harting has justly remarked 'in thirty years readers have become much more critical, much more exacting; and naturally so, for they have learnt much in the meantime, they have read more and observed more for themselves, and have thus become able to check the statements of others by the experience thus gained.' British Mammals too have been dealt with by such able writers as William MacGillivray, Mr. Richard Lydekker, and Sir Harry Johnston, all of whom have treated our fauna from special points of view: MacGillivray giving admirable field notes of such common animals as came under his notice; Mr. Lydekker describing with much skill their classification and ancient history; and Sir Harry Johnston concisely elucidating for the student the whole history of Mammals, and in turn the origin of the British species and their subsequent history and kindred orders.[1]

Of recent years, too, many of our leading zoologists have published admirable treatises on British species or orders: notably the late Sir William Flower (Whales), Mr. F. E. Beddard (Whales), Mr. Thomas Southwell (Seals and Whales), the late Dr. Dobson (Bats), Mr. W. E. De Winton and Mr. Oldfield Thomas (Rodents), Mr. J. E. Harting (British Mammals generally), Messrs. J. A. Harvie-Brown and T. E. Buckley (Distribution of Scottish Mammals), the late W. Thompson (Irish Mammals), Dr. R. F. Scharff (Irish Mammals), the late A. G. More (Irish Mammals), Captain Barrett-Hamilton[2] and R. M. Barrington (Irish Mammals), Messrs. Alcock, Jameson, C. B. Moffat, and Professor Kinahan (Irish Bats), E. R. Alston (Scottish Mammals), Messrs. Coward, Oldham, Tomes (English Bats), the Rev. H. A. Macpherson, A. Trevor Battye, the late Rev. L. Jenyns (Blomefield), Wm. Borrer, G. H. Caton-Haigh, O. V. Aplin, J. R. B. Masefield, W. B. Tegetmeier, Rev. C. A. Bury, Miller Christy, G. T. Rope, W. Eagle Clarke, H. Charbonnier, J. Steele Elliott, Wm. Evans, Lord Lilford, W. D. Roebuck, Robert Service, Rev. J. E. Kelsall, E. Cambridge Phillips, Hy. Laver, Wm. Taylor, Sir William Turner, G. Dalgliesh, J. H. Bonhote, R. I. Pocock, the Hon. Gerald Lascelles are also a few names of those who by

[1] When Sir Harry Johnston's work appeared it came in for somewhat severe criticism from the pens of country gentlemen who were, perhaps, well acquainted with some particular animal, but these censors entirely overlooked the many admirable points in his book, which, as an exposition of scientific elucidation, is a fine piece of work.

[2] Captain Barrett-Hamilton's researches are by no means confined to Irish Mammals, for he has published a great deal of matter on all European Mammals.

their observations and notes have helped on the knowledge we now possess of British Mammals. C. J. Cornish, Oxley Grabham, and F. G. Aflalo have also written on British Mammals.

Of writers who have dealt with the past history and fossil remains of British Mammals, lasting work has been done by Sir Richard Owen—the pioneer of our knowledge in this respect, Dr. A. B. Smith Woodward, and Professor Boyd Dawkins, while the scattered literature of the subject is so vast in such journals as the 'Zoologist' and the 'Field' that I have found it no easy task to read everything that has been written. In these two publications alone the notes are so excellent that it is impossible to speak of them too highly. There are also original observations and views expressed in such first-rate publications as 'The Annals of Scottish Natural History,' 'The Irish Naturalist,' the volumes of 'Vertebrate Fauna of Scotland' (Harvie-Brown and Buckley), and the 'Transactions' of the Norfolk, Essex, Yorks, Hants, and Perth Natural History Societies. Many interesting facts concerning Mammals are also to be found in the recently issued volumes of the 'Victoria History of the Counties of England.' Mr. A. H. Cocks too has written some admirable papers on British Mammals in captivity.

Broadly speaking the above embrace the whole literature of the subject, and I have made it my business to read the greater part. It may seem strange that no one previously has taken the trouble to collect all this mass of material and edit it in book form: but it is not every naturalist who would care to give several years of his life to such a task, and few others are equal to the work.

One man, who is thoroughly conversant with the literature of the subject, I had always expected to write a good book on British Mammals, but he has given his attention to other subjects, and when I last spoke to him he said he was as far off the project as ever. I allude to my old friend Mr. J. E. Harting, formerly editor of the 'Zoologist' and editor of the 'Field.' He has had a very wide experience in summarising the works of others, and his knowledge of the distribution of our animals is great, but other engagements have monopolised his time, or perhaps I should not now be writing these lines.[1]

[1] As this work goes to press Mr. Harting has generously placed the whole of his valuable notes on British Mammals at my disposal.

To my publishers Messrs. Longmans, and particularly to Mr. C. J. Longman, I am much indebted for the spirit in which they have met me with regard to this work. Without the expenditure of a very large sum of money it would have been impossible to produce such a book as this. Mr. C. J. Longman generously left me entirely unhampered both as to time and monetary considerations, and any success it may have is largely due to his broad-mindedness.

My especial thanks are due to Mr. T. A. Coward, who has most kindly overlooked the proofs of this work and called my attention to the certain pitfalls into which we all tumble. His careful consideration and advice have been of the greatest help to me in many instances, and to his sound judgment in scientific matters relating to classification I am much indebted.

As to the illustrations, it was at one time my hope and ambition to do the whole work myself, but as time went on I found the task too great for one man. To complete it would delay the publication some six or seven years. I therefore approached my friend Mr. Archibald Thorburn, who cordially agreed with me that there ought to be a book on Mammals like Lord Lilford's 'British Birds' but with a complete letterpress, and with rare unselfishness and little monetary gain to himself he has given me of his best. I can assure the reader that it is not an easy task to draw most of the British Mammals from life, with suitable back-grounds which are themselves high-class works of art, and I am greatly indebted to Mr. Thorburn for the care and trouble he has expended on his part of the undertaking. Mr. George Lodge too has drawn all the species of British bats from life or immediately after death, and he has met me with an enthusiasm for the task which can be felt only by the genuine lover of nature. The carefulness of his work speaks for itself, and it is only by the expenditure of extreme care that individual species can be accurately represented.

In the present volume I have endeavoured to look upon the life of our Mammals from every point of view. Due attention is given to the chase of every creature where that animal is an object of pursuit, for the best sportsmen as a rule know as much about the animal they hunt as the man who sits in a chair and juggles with Latin names, although each writes from only one point of view.

Sport is the natural safety-valve and strength-giver to this latter-day existence. Unfortunately it must always be attended by a certain amount of cruelty, but we can so conduct it that such cruelty as exists is more than compensated for by the healthy tone that it imparts to the nation. Certainly the best and kindest men I know are all enthusiastic lovers of the chase.

There is and probably always will be a class in this country who severely criticise sport, but if it came to be a question of placing these people in authority I should be sorry to entrust myself to their tender mercies. They mean well, but to follow their counsels would be to eliminate all that is best from life and make us a race of cranks and pedants. Personally I have hunted and slain everything in Britain from a Lesser Shrew to the large whales, and I am not in the least ashamed of the fact.

Centuries go by and things alter just a little, but after all we do not change our natures in spite of the veneer of civilisation. The old story of the cave-dweller with his flint-headed arrows and his primitive scratchings on the reindeer bone is repeated to-day with the rifle, the hound, and the pencil. Still the reader must not think that I insist too much on the superior knowledge of the hunter over the scientific naturalist. The reverse is often the case, for in hunting the man who follows often sees only one aspect of the life of the beast he chases, and that not always the most interesting one, while he who keeps animals in confinement may also play a considerable part in adding to the knowledge of our wild creatures.

The genuine sportsman must be a bit of a naturalist, for it is not the killing of an animal that appeals to any but the most gross-minded. The naturalist absorbed in his pursuit gets the best out of life, for to him there is not one day or hour in the year that does not unfold some new and wonderful truth. To him the birds sing more sweetly, the mornings are fairer, and the skies more blue, than is dreamt of by the dwellers in our towns. Pleasures, these, that our plutocrats with all their wealth cannot buy. They are given rather to the simplest dweller on the hillside or in the valley who approaches the works of God in an humble and inquiring spirit. Here the naturalist finds day by day an inexhaustible mine of wealth, and as he learns to read the sights and sounds

of nature he gains that inexpressible 'something' which makes mere existence a glorious thing. The knowledge is generally of little worldly use, but man is compensated for all that. He is interested and wants to know more, and in that rapture of pursuing he finds the very keynote of human happiness.

The book is open, and it is for you, my friends, to read it, but this cannot be done in a day nor yet in a year. You must have patience and in time the reward will come. All who have enjoyed the real blessings of civilisation possess, though often in the crudest form, the desire to understand and interpret the beauties of nature. We see it now every day in the dilettanti and socially weary who join clubs for 'Nature Study.' These, generally the more healthy-minded of the blasé, only are striving after a healthy reaction. But the book will never open to them. They have come too late and have not the patience to pass through the initial stages, and so the greatest pleasure in life escapes their grasp.

I remember once in America a friend telling me a story of that wonderful genius Edgar Allan Poe. The poet was nearly mad from overstrain and financial troubles, all grinding on the wheels of an overstrung temperament. At midnight he rushed from the town, scarce knowing whither he was going. On and on he went, thinking of nothing but that he was going mad and must kill himself. At length, weary and without knowing where he was, he flung himself down on the grass by the country roadside. Dawn was breaking and at that moment he smelt the sweet scent of the dew-laden grass and the damp earth. Instantly he was sane again; a bird began to sing in a tree close by, and cheered by its melodious notes he fell on his knees and thanked God for his deliverance, for the desire to live had come again. There was something left to him after all, and he had found it.

The moral is not far to seek. In times of trial let us go out under the open sky and listen to the voice of Nature. There, under the whispering trees, we may find solace for our troubles while the transient clouds remind us that, like all things here, sorrow itself must pass away.

J. G. MILLAIS.

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*** *Page* 24, *line* 13 : *for* I. $\frac{2}{3}$ *read* I. $\frac{4}{5}$.

Page 94 : *add to footnote No.* 7 *after* '*M. Daubentoni*' : *Mr. William Evans has recorded in* '*Annals of Scot. Nat. Hist.*' (*July* 1901) *the occurrence of a Natterer's Bat, which is said to have been captured in Dalkeith Park, Midlothian, in* 1880.


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THE MAMMALS
OF
GREAT BRITAIN AND IRELAND

INTRODUCTION

During the past fifty years the works of our leading zoologists and palæontologists, such as Sir Richard Owen, Sir Archibald Geikie, Dr. A. R. Wallace, Professor Boyd Dawkins, and Dr. A. B. Smith Woodward, have rendered our researches in the ancient history of our islands a somewhat easier task than usually falls to the lot of those who would seek to fathom the mystery of the vanished ages in relation to the animals of any given country. Much has been done during this period to fill the gaps in the 'unwritten page,' and we now probably know more than any other people of the early condition of our land and the creatures that once inhabited it. Dr. Wallace, whose conclusions are very generally accepted by geologists, has placed Great Britain and Ireland under the category of 'Continental Islands,' implying that they are islands of considerable size, principally consisting of sedimentary rocks, and situated near a continent whose fauna and flora are very similar. Most of these 'Continental Islands' were doubtless at no very distant period united to the larger lands to which they are adjacent, and this is attested in our case by the similarity of the geological formations on both sides of the English Channel, the shallowness of the North Sea, and the fossil remains of animals found in dredgings from the bottom of the sea both in Norway and near the east coasts of England. It is also a fact that all the British Mammals, past and present, have been found in the adjacent countries of France, Germany, and Scandinavia.

It has been estimated that to unite our islands with the continent of Europe on the same plane would involve an increased elevation of 600 feet on our side. That they once stood at a much higher level is incontestable from the evidence we

have of submerged forests which have been discovered near Anglesea, Lancashire, Cheshire, Devon, Cornwall, and notably near Cromer in Norfolk. Excavations and boring operations have also revealed many ancient valleys and river-beds which doubtless formed part of the external surface of our islands prior to this subsidence, and at such a depth (250 feet) as to lead geologists to the conclusion that at no very distant date England must have been connected with France, Germany, and Norway.

Mr. Henry Woodward in his 'Geology of England and Wales' makes clear the various changes that have taken place in Britain subsequent to the deposition of the Norfolk Forest-bed, and Mr. Lydekker[1] thus arranges them in chronological order, without however giving an indication as to the probable duration of these different eras of time.[2]

'1. Deposition of the Norfolk Forest-bed, and indications of approaching cold.

'2. Deposits of Cromer, and the lowest Boulder Clay (an ice formation) of other parts; this being a period of elevation of land, accompanied by severe Glacial conditions.

'3. Period of considerable submergence, during which Marine sands and gravels were deposited in many parts, reaching nearly to the summit of Moel Tryfaen; this epoch being apparently equivalent to Dr. Wallace's great period of submergence.

'4. Period of elevation of land, during which a large portion of Britain was covered with sheet-ice, and the greater part of the Boulder Clay was deposited; this being the period when, according to the more general view, the country was uninhabited by the greater part of the Mammals with which it is now populated.

'5. A period of less severe climatic conditions, during which the brick earth and cavern deposits were laid down, and the climate gradually changed from intense cold to temperate and genial; Arctic and Southern animals visiting Britain, according as the conditions were the more favourable to the one or the other.

'6. A period of severe Glacial conditions, with glaciers and coast-ice, chiefly affecting Scotland and the north of England and Wales.

'7. Period of the retreat of the ice, when a few mountain glaciers alone remained, and Britain was probably isolated.

'8. Britain again continental; summer and winter temperatures more excessive

[1] *Allen's Naturalist's Library*, 'British Mammals,' pp. 9, 10, by R. Lydekker.

[2] Dr. Leith Adams says (*Zoologist*, 1877, p. 149): 'Unreckoned ages are included in these changes, and no one can form even an approximate idea, according to modern computation, of their extent and duration.'



IN THE MEADOWS.

PLEISTOCENE AGE.

than now; great forests largely prevalent. Incoming and spreading of existing fauna.

'9. Period of final insulation of Britain; the climate being moist, the great forests tending to disappear, and peat mosses prevalent.

'10. The present condition of things.'

Dr. Wallace, in his 'Island Life,' evidently differs from this view of the order of things, for he is of opinion that Britain underwent an entire submergence to a depth of two thousand feet, and that this submergence occurred during the latter part of the Glacial period and destroyed the entire fauna of the country, while most authorities are agreed that the destruction of the animals was due to the rapid development of the second Ice-sheet itself—a most reasonable conclusion, considering the manner and position in which most of the great creatures which inhabited Great Britain during the warm snap between the two eras of Glacial cold are found buried.

Both Dr. Wallace and Professor Geikie are, however, agreed that Britain was connected with the Continent at two distinct periods, and that the present fauna did not make its appearance until the second continental period; but this theory has been disputed by Mr. Bulman, who contends[1] that part of the original fauna survived the second Glacial period, owing to the fact that the Ice-sheet did not extend further south than the latitude of London, and that possibly it stopped short of this point. This would, of course, leave a great area of country, including the southern counties, which might have been free from ice, and so formed an asylum for the surviving animals. Mr. Bulman's contentions are thus lucidly summed up by Mr. Lydekker, who both as zoologist and geologist is qualified to criticise the subject from both standpoints.

'Without offering a definite opinion on a question so bristling with difficulties as the above, we may say that, so far as Mammals are concerned, we do not think that anything decisive one way or the other can be declared from the considerations referred to. If the ancestors of our present Mammals did survive the whole Glacial period in the south of England, there would of course be no difficulty in regarding them as having repopulated England and Scotland at its close. The case is, however, more difficult with regard to Ireland, which, on this hypothesis, must at the same time have been separated from the sister-island, since here, too, we must have had an area in which the present Irish Mammals

[1] *Natural Science*, October 1893.

survived the cold period. If, however, those that now exist there then survived, why did not at least as many persist there as in England? It can hardly be urged that the area free of ice in Ireland was too small for all the species, seeing that animals of the size of the Red Deer and the extinct Irish Deer are known to have lived in Ireland within the "recent" period, and must, consequently, on the hypothesis under consideration, have been among the survivors; it being evident that an area of land sufficiently large to have supported such creatures would perfectly well have also maintained such existing English Mammals as are unrepresented in the Irish Fauna.'

Dr. R. F. Scharff, in his able work on 'The History of the European Fauna' (1899), has carefully compared and combined the investigations of a large number of the best workers on the difficult subject of dispersion or distribution. Whether we agree or not with his conclusions, we must acknowledge that he has treated the subject in a masterly manner, and that his theories are based upon most careful study. He divides the great northern migration, that is the entry of northern forms into Europe, into two distinct movements—the Siberian and the Arctic—and shows that there was also an Oriental area from which many of our existing types were derived. He agrees that the British Islands were connected by land with one another and with the Continent, and gives weight to Professor Brant's idea of five phases of introduction. He is no believer in the universal destruction during the Ice Age; during that period he thinks a northern and southern fauna were mingled. Professor Boyd Dawkins, whose work he speaks of in the highest terms, does not acknowledge two Arctic migrations; he thinks that the southern Mammals came northward conjointly with a western movement of eastern forms. Thus, while southern Mammals travelled north, in summer, the eastern forms swung southward, so that, at different times of the year, the two streams occupied the same ground. This, he thinks, explains the strange mixture of northern and southern types in the Pleistocene cave deposits.

The Ice Age, Dr. Scharff considers, was not so severe that all the southern forms were destroyed; the earliest element—the Lusitatian, which came by way of a 'lost Atlantis'—arrived prior to the Glacial Epoch, and in some measure at any rate survived. The Alpine element followed, probably about the same time that the Arctic and Oriental migrations reached our shores, and finally, after Ireland had been cut off from Great Britain, the most recent, the Siberian, immigration took place. Professor Forbes, Mr. Carpenter, and Dr. Scharff are agreed about this sequence of events.



FOREST SCENE—PLEISTOCENE AGE.

To take individual species as examples: the Common Hare is an eastern form, which probably arrived very late, while the Mountain Hare, which is found in Scotland and Ireland, is undoubtedly an Arctic form. So, too, we have the Arctic form of the Stoat existing in Ireland, while only the eastern or Siberian form reached Great Britain. Dr. Scharff considers that 95 per cent. of our fauna reached us by the ordinary means of dispersal, and he gives little weight to the idea that Mammals might cross by 'ice-bridges' that during the Glacial periods made a possible highway across the North Sea. Captain Barrett-Hamilton, whose scholarly studies give him right to rank among the first critics, does not agree with Dr. Scharff's views with regard to the Pre-glacial origin of our surviving Mammals, especially with regard to the two species and their allied forms mentioned above. 'Rather,' he says, 'can we only regard these forms in the light of modern changes to suit peculiar climatic conditions. Mammals are so plastic, that were our mammalian fauna of anything like the age Dr. Scharff would like to make it, it would surely be the case that not only the few species which we know to have become more or less altered, but all our species, would be distinct from those of Continental Europe, and might even have progressed far enough along the course of differentiation to have become distinct genera.' In the able review of Dr. Scharff's book which Captain Barrett-Hamilton contributed to the 'Irish Naturalist' (1899, pp. 239–246), and from which the above extract is taken, he concludes with a word of warning: 'The subject is one of such immense difficulty, and one beset by so many complications, that it may well be that all our present beliefs may one day have to go to the wall. It may well be, as Dr. Scharff has suggested, that our fauna and flora, or much of it, is Pre-glacial; but, inclined as we are to believe him, we cannot help emphasising the great distance of time which undoubtedly separates us from the Glacial Period, as shown, for instance, by the result of the excavations made by a Committee of the British Association at Hoxne, in East Anglia (Liverpool, 1896). Even the immensely ancient palæolithic implements of Hoxne are separated from the chalky Boulder Clay by two distinct climatic waves accompanied by corresponding changes of flora! Who then can say that the long ages, the meagre history of which we owe to these excavations, may not some day be shown to have been of sufficient duration for the occurrence of all the changes and complications in our fauna and flora which form the subject of Dr. Scharff's volume?'

To summarise the various periods briefly, and to show to students at a glance the whole history of these different ages with the advance and retreat of animal life, I append the following table.

Secondary Epoch

Periods

TRIASSIC—Large Monotreme-like reptiles appear in Europe and North America.

JURASSIC—The origin of birds from reptiles.

CRETACEOUS—Chalk age and the age of reptiles. Appearance of Marsupials and Monotremes, as well as the first forms of Insectivores, Primates, and Ungulates without horns.

Tertiary Epoch

EOCENE—Advent of the true Mammalian families, such as the Cetaceans, Edentates, Marsupials, Ungulates, Carnivores, Rodents, Insectivores, Cheiroptera, and the Primates. Many existing types have altered but little since this period.[1]

MIOCENE—Mammalian order developing. Plant and animal life suggestive of a tropical climate.

PLIOCENE—Main orders of Mammals finally developed. The climate still tropical, and the possible advent of Man to Britain and the northern world.

PLEISTOCENE—At the beginning of this period Britain was still more or less tropical, the flora was abundant, and palm trees flourished as far north as Greenland. Our fauna was then and immediately afterwards at its best, and most of the undetermined orders developed into specialised types of the finest description. Soon after the commencement of this period occurred the first great Ice-sheet, carrying with it destruction and climatic change; and thereupon these islands acquired an Arctic fauna, consisting of such splendid species as the Mammoth, the Hairy Rhinoceros, the Elk, the Gigantic Fallow Deer, a superior type of Red Deer, Fallow Deer, Roe, Reindeer, Brown Bear, Cave-bear, Musk-ox, Saiga, Sabre-toothed Tiger, Cave-lion, Hyæna, Glutton, Wolf, Wild Boar, and many other magnificent creatures. At the close of this period came the second Glacial wave or Ice-sheet, which destroyed the greater part of this splendid fauna.

[1] At the present day we are still unable to give a satisfactory answer to the question, In what part of the world did Mammals first originate, and from what living creatures? They may have come from North America, the regions about the North Pole, Persia, India, or even South Africa. All suggestions are alike supposititious, especially the last named, for we still know next to nothing of the geology and palæontology of Africa. What is more certain is that Mammals probably evolved from Reptiles.



ON THE HIGH GROUND—PLEISTOCENE AGE.



BOAR AND WOLVES—RECENT.

Final Isolation of the British Islands

Quaternary Epoch

Prehistoric—The branching of species into sub-species, and the age of Neolithic Man. Britain covered with forests, which begin to disappear in parts and create the great mosses at the end of this period. Some of the finer creatures of the Pleistocene Age still surviving, such as the Wolf, Brown Bear, Red Deer, and Roe, and probably the Gigantic Fallow Deer, the Elk, and the Reindeer for a short time. The Gigantic Fallow Deer certainly survived in Ireland, and probably did so until the next period.

Recent—The beginning of human history and its course to the present day.

Going back no further than the Pleistocene Age, we find there were 113 species inhabiting Great Britain, Ireland, and the surrounding seas. Exclusive of the Cetaceans, which must ever have been somewhat erratic in their visits, we have lost since then many fine animals, notably such residents as the Glutton, the Walrus, the Ringed and Bearded Seal, the Lemming, the Rhinoceros, the Hippopotamus, the Mammoth, the Cave-lion, the Sabre-toothed Tiger, the Saiga, the Elk, the Gigantic Fallow Deer, and the Musk-ox; while the Brown Bear, the Wolf, the Beaver, the Wild Boar, the Aurochs, and possibly the Great Urus and the Reindeer, have become extinct within historic times.

It would be outside the purpose of this work to do more than attempt a monograph of British Mammals as they exist at the present day, and to deal shortly with those that have existed or become extinct within historic times. For fuller information on those animals which have only been found in a fossil state, I would refer my readers to such a work as Sir Richard Owen's 'British Fossil Mammals and Birds,' passing on to the terrestrial and marine wild animals now inhabiting Great Britain and Ireland and those that have disappeared within the historic period, as will be seen from the following list. We can now enumerate seventy-eight Mammals, terrestrial (exclusive of sub-species) or marine, although some of the latter are only rare visitors.

LIST OF THE BRITISH MAMMALS

* Extinct. † Introduced. I.=Ireland. S.=Scotland. E.=England.

TERRESTRIAL

1. Greater Horseshoe Bat (*Rhinolophus ferrum-equinum*). E.
2. Lesser Horseshoe Bat (*Rhinolophus hipposiderus*). I. E.
3. Barbastelle Bat (*Barbastella barbastellus*). E.
4. Long-eared Bat (*Plecotus auritus*). I. S. E.
5. Serotine Bat (*Vespertilio serotinus*). E.
6. Noctule Bat (*Pterygistes noctula*). E.
7. Leisler's Bat (*Pterygistes Leisleri*). I. E.
8. Pipistrelle Bat (*Pipistrellus pipistrellus*). I. S. E.
9. Daubenton's Bat (*Myotis Daubentoni*). I. S. E.
10. Natterer's Bat (*Myotis Nattereri*). I. S. E.
11. Bechstein's Bat (*Myotis Bechsteinii*). E.
12. Whiskered Bat (*Myotis mystacinus*). I. S. E.
13. Hedgehog (*Erinaceus europæus*). I. S. E.
14. Mole (*Talpa europæus*). S. E.
15. Common Shrew (*Sorex araneus*). S. E.
16. Lesser Shrew (*Sorex minutus*). I. S. E.
17. Water-shrew (*Neomys fodiens*). S. E.
18. Wild Cat (*Felis catus*). S.
19. *Wolf (*Canis lupus*). I. S. E.
20. Fox (*Vulpes vulpes*). I. S. E.
21. Pine-marten (*Mustela martes*). I. S. E.
22. Polecat (*Putorius putorius*). S. E.
23. Stoat (*Putorius ermineus*). I. S. E.
24. Irish Stoat (*Putorius hibernicus*). I.
25. Weasel (*Putorius nivalis*). S. E.
26. Badger (*Meles meles*). I. S. E.
27. Otter (*Lutra lutra*). I. S. E.
28. *Brown Bear (*Ursus arctos*). I. S. E.
29. Squirrel (*Sciurus vulgaris*, var. *leucurus*). I. (introduced). S. E.

TERRESTRIAL

30. *Beaver (*Castor fiber*). S. E.
31. Dormouse (*Muscardinus avellanarius*). E.
32. Harvest-mouse (*Mus minutus*). E.
33. Sub-species of *Mus sylvaticus*:
    - British Wood-mouse (*Mus sylvaticus intermedius*). I. S. E., Channel Islands, but not Hebrides.
    - British Yellow-necked Mouse (*Mus sylvaticus Wintoni*). E.
    - Irish Wood-mouse (*Mus sylvaticus celticus*). Ireland, Skye, Hebrides, and Shetland.
    - Hebridean Wood-mouse (*Mus sylvaticus hebridensis*). Lewis and Outer Hebrides.
    - St. Kilda Wood-mouse (*Mus sylvaticus hirtensis*). St. Kilda.
34. Common Mouse (*Mus musculus*). I. S. E.
    Sub-species: St. Kilda House-mouse (*Mus musculus muralis*). St. Kilda.
35. †Black Rat (*Mus rattus*). I. S. E.
36. †Brown Rat (*Mus norvegicus*). I. S. E.
37. †Alexandrine Rat (*Mus alexandrinus*). E.
38. Common Field-vole (*Microtus agrestis*). S. E.
39. Orkney Vole (*Microtus orcadensis*). Orkneys and Shetlands.
40. Water-vole (*Microtus amphibius*). S. E.
41. Bank-vole (*Evotomys glareolus*). S. E.
42. Skomer Vole (*Evotomys skomerensis*). Island of Skomer.
43. Common Hare (*Lepus europæus*). I. (recently introduced). S. E.
44. Mountain Hare (*Lepus timidus*). I. S. (Introduced into Wales and England.)
45. Rabbit (*Lepus cuniculus*). I. S. E.
46. White Cattle (*Bos taurus*). S. E. (introduced).
47. *Reindeer (*Rangifer tarandus*). I. S. E.

LIST OF THE BRITISH MAMMALS—*continued*

* Extinct. I.=Ireland. S.=Scotland. E.=England.

TERRESTRIAL

48. Red Deer (*Cervus elaphus*). I. S. E.
49. Fallow Deer (*Cervus dama*). I. S. E.
50. Roe (*Capreolus capreolus*). I. (recently introduced). S. E.
51. *Wild Boar (*Sus scrofa*). I. S. E.

MARINE

52. Grey Seal (*Halichœrus grypus*). I. S. E. and Wales.
53. Common Seal (*Phoca vitulina*). I. S. E.
54. Ringed Seal (*Phoca hispida*).
55. Harp Seal (*Phoca grœnlandica*).
56. Bearded Seal (*Erignathus barbatus*).
57. Hooded Seal (*Cystophora cristata*).
58. Walrus (*Odobœnus rosmarus*).
59. Southern Right Whale (*Balœna australis*).
60. Hump-backed Whale (*Megaptera boops*).
61. Sibbald's Rorqual (*Balœnoptera Sibbaldi*).
62. Common Rorqual (*Balœnoptera musculus*).

MARINE

63. Rudolphi's Rorqual (*Balœnoptera borealis*).
64. Lesser Rorqual (*Balœnoptera acutorostrata*).
65. Sperm Whale (*Physeter macrocephalus*).
66. Bottle-nosed Whale (*Hyperoodon rostratus*).
67. Sowerby's Whale (*Mesoplodon bidens*).
68. Cuvier's Whale (*Ziphius cavirostris*).
69. Narwhal (*Monodon monoceros*).
70. White Whale (*Delphinapterus leucas*).
71. Common Porpoise (*Phocœna phocœna*).
72. Common Killer (*Orca orca*).
73. Pilot Whale (*Globicephala melœna*).
74. Risso Grampus (*Grampus griseus*).
75. White-beaked Dolphin (*Lagenorhynchus albirostris*).
76. White-sided Dolphin (*Lagenorhynchus acutus*).
77. Common Dolphin (*Delphinus delphis*).
78. Bottle-nosed Dolphin (*Tursiops tursio*).

When writing his book on 'British Mammals,' Mr. Lydekker considered that Bechstein's Bat, having once occurred in Great Britain, could hardly be included in his list; but since that date (1895) several specimens have been taken, and he is now fully convinced of its right to be reckoned among the British fauna. The same author has, however, very properly excluded *Vesperugo discolor*, *Vespertilio dasycneme*,[1] and *Vespertilio murinus*, all of which (at the date of his writing) had been taken once in England, and were included by Bell in British Quadrupeds on the most slender evidence. The existence of the Reindeer within historic times is certainly doubtful, but as there is some evidence of its existence in Caithness and the Orkneys at the period when our history commences, I have included it in the above list. It is doubtful, too, whether the White Cattle should

[1] I cannot accept Sir Harry Johnston's inclusion of this Bat among British Mammals, or the statement that it has been found 'in several places in the south of England.'

be included, or, indeed, should be considered feral animals at all, as their sole claim rests on a possibility of their being deteriorated descendants of *Bos primigenius*; though they are far more likely to have originated from the domestic cattle of the ancient Britons that had escaped to the woods, and had, after years of liberty in a semi-feral state, been driven into enclosures by the first creators of the British Parks. Yet there is such interest in their history, which is without doubt of considerable antiquity, that they perhaps deserve the place which all writers on British animals have since given them. It is impossible, therefore, to ignore their presence. Recently two new Voles have been added to the British list. In 1903 Captain Barrett-Hamilton described a new species of Bank-vole from the island of Skomer, off the coast of Pembrokeshire, Wales, to which he gave the name of *Evotomys skomerensis*. The second new species was discovered by myself in the Orkneys some years ago, and described in the 'Zoologist' (July 1904) as *Microtus orcadensis*. This new Vole is of quite a different type from *Microtus agrestis*, and more nearly resembles the Boreal Voles of Scandinavia and Russia. *Mus hibernicus* I have discarded from the list, as it is now regarded by our best zoologists as merely a local variety of *Mus norvegicus*, the Brown Rat.

Thus it will be seen we have terrestrial mammals and marine mammals; the latter for the most part are rare visitors to our coasts. If we exclude purely marine animals, this is but a small number compared with those of the adjacent continents; and we can but look back with regret on the disastrous consequences of the second Glacial Epoch or the great submergence, whichever it was, that deprived us of such magnificent creatures as the Mammoth, the Rhinoceros, the Reindeer, the Elk, and the Gigantic Fallow Deer. It is more than likely, however, that had these great beasts survived to such a period as the landing of the Normans (which it is quite possible the Gigantic Fallow Deer and the Reindeer may have done), most of them would quickly have been exterminated by human agency, owing to their great bulk and ease of capture.

THE BATS

Order CHEIROPTERA

Scientists are still at variance as to the origin of the Bats. We know that the first thing to fly over the face of the earth was an insect, which had probably developed from some legged sea-worm, and that all forms of elementary life originated from 'the face of the waters.' In time the abundance of insect life tempted the fish from the waters, and by causing them to lead a partially terrestrial life, the first amphibians were created. The slow but steady workings of evolution produced the reptiles, which still fed upon insects, and these, in order to successfully secure their flying food, gradually acquired powers of flight, until the earth was inhabited by the great *Pterosaurians*, or flying dragons. Some reptiles changed but little during this struggle for supremacy, but others continued to develop until they took the form of the earliest birds, the ancestors of our avian life. By a similar gradual change, roughly a parallel process to the development into birds, certain of the reptilian forms became our first mammals, marsupial in character, from which again our present mammalian forms were derived by intricate and divergent lines of specialisation. All this we know through the wonderful discoveries of our leading palæontologists, such, for instance, as Sir Richard Owen, Charles Darwin, and T. H. Huxley; and it is truly remarkable that what was known so crudely, yet withal so correctly, to the writer or writers of the first chapter of the Book of Genesis, should have at last been more or less made plain by the researches of a few clever men in the space of a little over fifty years.

The first Insectivores pursued their food upon or below the earth and in the trees as they do to-day. Naturally, the mere action of taking the insects from elevated positions led to the necessity of leaping after the prey, developing in certain forms this power of leaping to a wonderful degree; so, to-day, we have that little animal, the galago, which makes surprising springs through the air, and apparently presents us with a connecting link between the Bat and Lemur families.

We may, indeed, presume that the Bats were derived from the Lemurs, the lowest order of the Primates, or perhaps that our existing Bats and Lemurs were evolved from a common stock of primitive Primates, for it is evident that they exhibit certain close affinities; their dentition, nocturnal habits, and general bodily form are very similar, and it is only in the claws and nails of the hands and feet that any real difference exists.

The order of Bats is divided into two sub-orders—namely, the *Megacheiroptera*, the Fruit-eaters, and the *Microcheiroptera*, the Insect-eating Bats. The first sub-order includes a number of large Bats which frequent Southern Asia, Madagascar, Africa, and Australia, but which do not inhabit Europe. They are supposed to be of a more antiquated origin than the insectivorous Bats. Their form is more simple, the ears lacking the tragus; the molar teeth, as a rule, being without cusps, and, as their Greco-Latin name implies, they are much larger animals than are included in the sub-order to which all the British species belong.

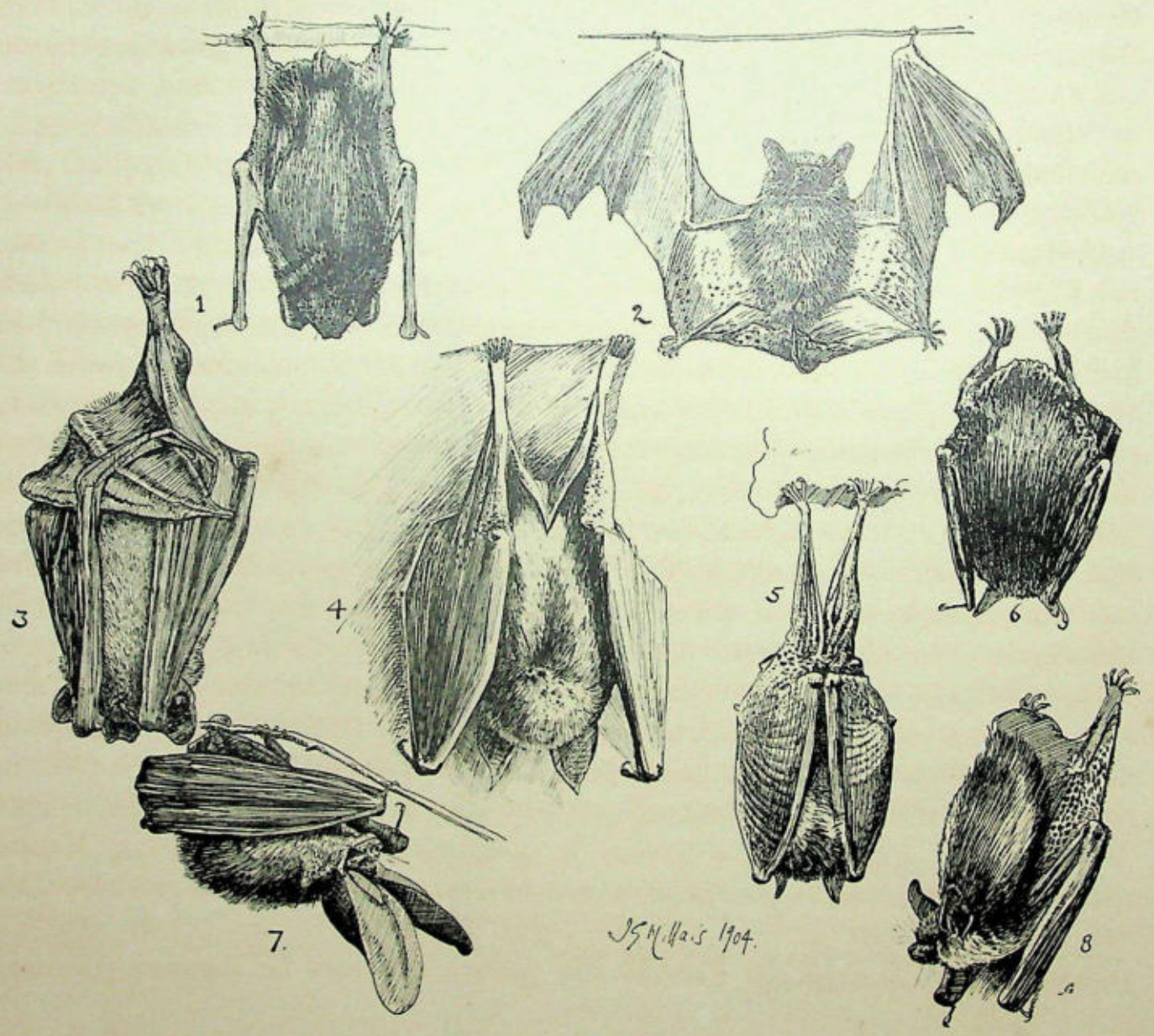
The *Microcheiroptera*, or Little Hand-bearers, are, comparatively speaking, small mammals. Unlike the Fruit-eaters, they are widely distributed throughout the world, but do not, so far as we know at present, occur in the Arctic or Antarctic regions; their range, however, extends to a high northern latitude.[1]

Bats are the only mammals endowed with the power of true flight, for we cannot accept the aerial passage of such creatures as the so-called flying squirrels and the phalangers as being more than a prolonged leap assisted by the flat expansion of the flank skin. In Bats the bones of the fore-limbs are especially elongated, and between the fingers and from thence to the hind-limbs and tail there is a wide membrane which converts the hands into effective organs of aerial locomotion. The first finger of the fore-limb is short, and furnished with a hooked claw which fulfils various purposes; the other four digits, which are without claws, are characterised by their extreme length and slenderness. They are actually longer than the forearm, the third being considerably the longest. When the wing is fully extended the membrane is tightly stretched between the second and fifth digit, but when the animal is at rest it is packed more or less loosely against the flank; during hibernation, however, the *Rhinolophidæ* completely surround the front of the body with their wings, resembling in this respect the characteristic

[1] Bats occur in Finland, and I have lately seen large numbers of an American Bat (whose name I do not know) hawking at evening on the banks of the N.W. Gander River, in Central Newfoundland. I have also seen a Bat—I think *B. barbastellus*—at Namsos in Norway, which is but little south of the Arctic Circle, where also *P. auritus* occurs, while *V. Nilssonii* ranges so far north as Tromso.—J. G. M., 1903.



THE BARBASTELLE IN REPOSE.



VARIOUS BATS IN REPOSE.

1. Leisler's Bat.
2. Pipistrelle.
3. Noctule.
4. Greater Horseshoe Bat.
5. Lesser Horseshoe Bat.
6. Long-eared Bat with ears folded.
7. Long-eared Bat about to sleep.
8. Whiskered Bat.

attitude of rest of some of the Fruit Bats. From the fifth digit the wing membrane is extended to the hind-limb, the knee of which is directed backwards, and from thence it stretches to the tail, which is held, both when at rest and when in flight, in different positions in various species, being sometimes folded forwards and sometimes backwards.

The mammæ are two in number and are placed on the breast. The external and internal development of the reproductive organs resemble those of the Primates, while the brain is of a low order, to be compared, rather, with that of the Insectivores. The ears in the insectivorous Bats are peculiar in the fact that the outer and inner sides start from separate bases, and not from a common point as is the case in the Fruit-eating Bats; they are often exaggerated to a remarkable degree, being larger in proportion to the size of the animal than in any other class of mammals. The tragus, earlet, or ear-covering, as it is variously called, is also frequently proportionately large. The remarkable shape of the nose, nostrils, and the surrounding development, is characteristic of some of the insectivorous Bats: this extraordinary ornamentation is sometimes extended to the lower lip; and the face of the animal, with its small deep-set eyes, is certainly quaint, and to some minds repulsively hideous. None of our native Bats, however, can rival the Tomb Bats of Egypt in this respect; they certainly carry off the palm for ugliness in a world of beautiful creatures.

Like the true seals, most of the Bats are furnished with cusped teeth, those of the cheeks especially possessing sharp cusps (separated by transverse grooves) which are well adapted to hold and crush the insects, many of them hard-bodied, on which they live. Most Bats possess a large number of teeth, sometimes to the number of thirty-eight, which consist of two pairs of incisors in the upper jaw, and three in the lower; a pair of canines, occasionally of remarkable strength for the size of the animal, three pairs of premolars, and three pairs of molars in each jaw. These teeth are, comparatively speaking, powerful or otherwise according to the nature of the insects which are preyed upon; for instance, while the Greater Horseshoe, the Serotine, and the Noctule Bats, which feed largely on big flying beetles —dors and chafers—possess large and strong teeth, the Whiskered, the Pipistrelle, and Daubenton's Bats, which subsist on smaller and, as a rule, softer-bodied creatures, have small teeth.

Bats, though occasionally tempted out on warm still days, are crepuscular or nocturnal in their habits. We generally observe them in the evening, when they are hawking for their food—insects, which are captured at various elevations.

It has been suggested that Bats are aided, when in flight, in their avoidance of obstacles by the extraordinary sensitiveness of the wing membrane, and in certain species by the nasal appendages; this question, however, requires further scientific investigation. Most species capture their prey in flight and devour it on the wing, but some will convey it to their retreats and hang suspended while they make their meal. In these diurnal retreats Bats hang head-downwards, suspended to some crack or minute projection by the sharp hooked claws of their feet; as a rule they are gregarious, large numbers occupying the same retreat, but sometimes they are solitary. Towards evening they begin to wake up, and with much quarrelling and crawling over each other's bodies they move towards the exit hole, which is frequently so small that only one Bat at a time can creep through. About October, and sometimes earlier, all the British species hibernate, and in most cases sleep without interruption until the spring; occasionally Pipistrelles and Long-eared Bats may be seen on the wing on warm winter days and evenings.

Bats can walk or climb with a varying degree of ease. The limbs are moved laterally: first the thumb on one side is pushed forward, followed by the corresponding hind-foot; then the other foot is raised high and brought forward, and lastly the wing on that side is advanced. When the Bat is in a hurry these movements are jerky, and in any case it progresses better on the perpendicular than on the horizontal. The Long-eared Bat is an exception to this rule, for it can run, by the same means, at a fairly swift pace, even upon a perfectly smooth surface.

In the pages of the 'Field' and other papers correspondents often call attention to the fact that they have seen Bats swimming, the animal generally having got into the water through some accident. All Bats can swim well. I have experimented with nearly all the British species by placing them in a glass tank to observe their movements. They all progress in a similar fashion in the water: the head is held high and looks upwards, so that the mouth is clear of the water; the wings are raised and advanced, then pushed downwards and backwards, so that the animal rows itself forward with an easy movement. With the exception of the Horseshoe Bats, which carry the tail in its usual position recurved over the back, all the species carry the tail and feet straight and extended behind. The feet, which are generally spread out, are not used when swimming. So soon as they emerge from the water the Bats dry themselves with great swiftness by shaking themselves violently, dressing their fur, and taking short flights.

Writing to his friend Thomas Pennant in September 1767, Gilbert White

stated that he knew of only two British species of Bats, *Vespertilio murinus* and *Vespertilio auritus*, which we now recognise as the Pipistrelle and the Long-eared Bat. The great Linnæus, too, then knew no other European species. Shortly afterwards, White, however, identified the Noctule (1771), and Pennant was not long in discovering a fourth species, the Greater Horseshoe. Since then no fewer than fifteen species of Bats have been reported at various times as occurring in Great Britain, but three of these—namely, *Vespertilio murinus*, the Parti-coloured Bat; *Myotis dasycneme*, the Rough-legged Bat; and *Myotis myotis*, the Mouse-coloured Bat—have no claim to be included in the list of our mammals. Mr. Lydekker has included all these three species in his list of British mammals, I think, without due consideration of their claims; while he has thrown doubt on the validity of *Myotis Bechsteinii*, Bechstein's Bat, which, as I shall show when dealing with the species, has as much right to a place as the remaining eleven. Sir Harry Johnston considers that *Myotis dasycneme* deserves a place in the British list; after mentioning the example which the late Lord Lilford found *swimming* on the River Stour, he says 'it has been found in Warwickshire, and in several places in the south of England,' but after careful inquiries I do not feel satisfied that these records are quite reliable.

Two of our Bats belong to the *Rhinolophidæ*, and the rest to the large family *Vespertilionidæ*. The Barbastelle (*B. barbastellus*) appears to me to be closely allied to the Horseshoe Bats, and I have therefore placed it immediately after the *Rhinolophidæ*.

The study of the habits of our Bats and Seals has been lamentably neglected, and even naturalists who are well acquainted with other branches of our fauna are, as a rule, unable to distinguish between our different species, and cannot even point to any work which supplies information on the subject. Some years ago, when I was anxious to learn the differences between the various species of small Bats, I took two rare Bats in the flesh to an old friend who is generally considered to be one of the best authorities on British mammalia. He assigned incorrect names to both species, a fact which I presently discovered by capturing Bats of the same and kindred species. That little incident proved to me that a complete history of our British mammals, with a correct account of their habits and illustrations of the various species correctly coloured, was a desideratum.

By writing many letters, searching caves and other retreats in winter, and standing in likely places with a gun on summer evenings, I succeeded, in the course of two years, in holding in the hand, either alive or freshly killed, examples

of all the true British species of Bats; I may therefore claim that the pictures and photographs here presented are fair representations of the various animals as they exist in life. I have, however, made a concession to my scientific readers: the caudal appendage, its contiguous membrane, and the hind-feet are often important factors in the identification of species, and I have, therefore, in some cases depicted the animals with the tails extended, although this is not the position in which they are usually held when in flight.

'First catch your hare' is, of course, the difficulty with Bats; but when that is accomplished, the habits of the animals in captivity may be studied with more or less ease, for most of our British species will take food—flies, moths, and beetles—from the hand within a very short time of their capture. It is, perhaps, hardly safe to say that they become tame, if by that we mean that they are easily domesticated, but they soon recognise the hand that supplies food, and exhibit very little fear of man. After a long journey in a close box, especially if it is a metal one, they are generally in poor condition, but even in these circumstances they will sometimes take food in the course of a few minutes. The Long-eared Bat is by far the easiest to tame, but others—the Greater Horseshoe, Noctule, Pipistrelle, and Natterer's Bat—will often feed immediately after being captured. Fresh air is of vital importance for their welfare, and it is well to remember that Bats, like other animals, require water; indeed, they will often drink before they will eat, sucking water or milk from a camel-hair brush with relish. If Bats are to be kept in good health in captivity, the boxes or apartments in which they live must be clean, and Bats of different species should be confined in different compartments, or fatal quarrels may result. It is also advisable to allow them to fly; for exercise, even in a room, is necessary.

Bats spend the daytime and hibernate in winter in various retreats—crevices in walls, old buildings, the roofs and towers of churches, beneath cottage eaves, in caverns in limestone, chalk, sandstone and millstone grit, in old copper, lead, and coal workings, behind shutters and window blinds, and in hollows in trees. The Noctule seems to prefer a hollow in a tree, but its congener the Pipistrelle is most catholic in its choice of a retreat; the Serotine is partial to cottage eaves, and the Horseshoe to caves; in every species, however, we find that, though a preference may be shown for some particular style of retreat, no invariable rule can be asserted. In most works on natural history we find it stated that Bats hibernate in a mass or cluster, and that the cluster consists of individuals of one species only; this is not always the case. When there is a large colony of, say,

Pipistrelles, Daubenton's, or Greater Horseshoe Bats, we frequently find them clustered together; but I have often found four or five different species inhabiting the same cave—not clustered, but dotted about singly on the walls or in the crevices, a Natterer's close to a Pipistrelle, and a Long-eared beside a Lesser Horseshoe.

In winter, sleeping Bats may be picked by hand from the foothold to which they are clinging; I have found one of the new electric torches very useful for searching crannies. The winter sleep is not so profound as one would imagine from the description in many books, for when handled a hibernating Bat will generally wake up sufficiently to protest; some Bats—Daubenton's, Natterer's, and Bechstein's, for example—are particularly aggressive, and will attempt to bite immediately they are handled. In any case the lethargy is shaken off in the course of a few minutes, and very soon after the captive has been transferred from the hand to a box it will be heard crawling about and squeaking.

In summer it is more difficult to obtain specimens of Bats, but they may be captured by means of a butterfly-net placed over the entrance to their retreat at the time they are making their exit, or they may be shot with a charge of dust-shot, a collector's gun being a useful weapon. An ordinary 12-bore will be found necessary for the high-flying and dodging Noctule. Bats may be knocked down with a whip or a trout-rod; but when successful, so far as the capture is concerned, it is often bad for the rod as well as for the Bat. I have known them to be knocked down with a stick, and even an umbrella, and to be captured in a net at the end of a long handle; but a little experience of various implements will impress the operator with a profound respect for the Bats, for they exhibit a marvellous agility in avoiding a blow.

Bats have few enemies, for man can hardly be included in that category; domestic cats will sometimes capture and eat them, and hobbies and kestrels have been known to slay them, while owls, especially Long-eared Owls, kill a fair number; fragments of the skulls or other bones of Bats are frequently to be found in the cast-up pellets or 'plugs' of owls.

Anyone who has made a close study of the habits of Bats must accept the fact that they migrate. Perhaps in most cases it should be termed a partial migration, for it is not easy to compare it with the regular migration of our summer and winter birds, which cover in their journeys anything from two hundred to five thousand miles. The migrations of Bats are, as a general rule, merely a seasonal change of abode, and the two retreats may be only a few miles apart.

I am convinced that the smaller species frequently migrate from a cool summer retreat to a warm winter spot in which to hibernate, though the Noctule may range, in some cases, further than other species. It has been stated that our Bats cross the Channel, but this I can scarcely believe, unless it is an exceptional case when an individual is blown across by a strong westerly wind. If this is so, however, how is it that we do not receive return visits from continental species, such as *Myotis myotis*, which is a common Bat in France?

A regular partial migration, or change of abode, takes place at least twice a year in most species; but the rule is not hard and fast, for certain situations—notably the church roofs in many known localities—are occupied by colonies at all seasons of the year. Many colonies, however, occupy summer retreats until August or September, but are not to be found in these places during the winter months; whereas caves or other warm abodes, which during the summer were not inhabited by Bats, are occupied by colonies of Bats of a similar kind to those which were found in the summer retreats in the immediate neighbourhood, or perhaps several miles away. Instances of these migrations are given when treating of the different species. Fluctuations of temperature are only side issues in connection with these seasonal movements. The great food question, rather than the question of heat or cold, induces birds and the larger mammalia to migrate from place to place; natural internal warmth can only be maintained by a constant supply of nourishment, and animals must follow the food supply or perish. When the winter frosts drive the insect life to hibernate, slays the imagines, and leaves only the immature stages hidden away in the form of eggs or pupæ beneath the earth or in some secure retreat, when the plants are shrivelled and apparently dead, and the seeds are buried and the fruits lost beneath the mould or the snow, the birds must seek for food elsewhere or die. They travel to warmer climes until the vernal warmth brings forth the latent life once more in the country of their birth, and of the birth of many many generations of their ancestors. So, too, the Bats, during the summer, live in a pleasant, though perchance draughty hole in a tree or in the battered roof of some old boathouse, where they are in the midst of the insect hordes on which they subsist; but when the insects fail them in the autumn, and the days get cooler, they seek some warmer refuge wherein to hibernate. Here they sleep until the spring, when they again change their home for one more convenient for their food supply. Thus, we find Bats in the caves at Cefn, Tremeirchion, Henley-on-Thames, and Chislehurst from October until March or April; but during the summer these refuges are deserted, at any rate by the

majority of the animals, and in the sandstone levels at Alderley Edge it is unusual to come across any Bats during the warmer months.

Mr. G. Dowker[1] found that the Noctules which hibernated in the roof of his house at Wingham, Kent, were absent for about two months—July and August—during which time he concluded that they were living an arboreal life, while others have from time to time brought forward evidence which proves that this seasonal change of abode is very general. Some writers have even contended that a much fuller migration takes place in certain species.

The phenomena connected with hibernation are still little understood, and the whole question of winter sleep among mammals requires investigation. Dr. N. H. Alcock[2] gives the results of his observations as follows: 'When one of these animals, a bat for instance, intends to hibernate, the following phenomena are observed. The animal retires to a secluded spot, hangs itself up, and gradually becomes motionless. Its temperature falls to within a few degrees of the surrounding air, and its breathing becomes shallow and irregular. If accurate measurements are taken, it is noticed that much more oxygen is absorbed than is accounted for by the carbonic acid given out, so that the animal actually gains in weight. The heart beats more slowly and less forcibly, and the activity of the nervous system is much reduced.

'On awakening from this condition in the spring, these phenomena are reversed. The animal's temperature rises, sometimes as much as 31 in fifteen minutes. The muscles shudder convulsively, the heart beats more strongly, and the skin, before pale, assumes a rosy blush. Respiration becomes more rapid, and there is a great discharge of carbonic acid from the lungs.

'The cause of hibernation has been said to be due to the cold, to a limited supply of air, to want of food, to an autonarcosis with carbonic acid, or to changes in the processes of the cells of the brain; the question is still undecided.'

To these philosophical remarks Dr. Alcock adds that Bats 'store their food internally,' and that they occasionally wake up and eat. Instances of this kind—bats moving when in their winter quarters and having food in their stomachs and digested matter and waste matter in their intestines—have repeatedly come under our observation; but it seems possible that, when the nervous and vascular activity is at a low ebb, digestion may be retarded, and that food may remain in the stomach for a considerable time without being assimilated.

[1] *Zoologist*, 1891, p. 305.

[2] *Irish Naturalist*, viii. 33.

The homing instinct, so noticeable in migratory birds, appears to be present in Bats. Mr. Gyles, of Waterford, experimented with some Pipistrelles which he had captured on an island in the River Suir; he conveyed them to some distance away on the mainland, and then released them separately. Although the sun was shining brightly and there was a strong wind blowing against them, each of the Bats, after a turn or two in the air, went off in a bee-line for its home on the island.[1]

The period of gestation varies considerably in the various species of Bats: it lasts from six or seven weeks in some species to three months in others. One or two young are produced, but a single young one seems to be more common than a couple; thus the colonies increase slowly, if they increase at all. Considering the fact that Bats have few enemies, it is not surprising that the birth rate should be low; for were many young to be born, the balance of nature would be disturbed. Bats breed once a year—in spring; in or about the month of July, when the young make their aerial *début*, they are about three parts grown. At birth they are blind and naked, and the mother cleans them at once, and lifts them from the interfemoral pouch, into which they are dropped, to the breast. They attach themselves firmly to the nipples, clinging closely to the mother's body with their thumbs and feet. The mother Bat takes the young one with her when she goes forth in search of food, and when at rest she covers it with one wing, sometimes suspending herself by the thumb of the other wing. Thus the young remains until it is about half grown, or indeed until in July the mother induces it to use its wings. During the day the young of most Bats keep up a constant querulous cry, and when they go abroad with their parents in the evening they may be heard constantly calling as they follow them through the air.

The young of British Bats are generally greyer, and in some cases, such as Daubenton's Bat, are darker than the adults; but Mr. R. Newstead informs me that some immature Lesser Horseshoes which he examined were lighter in colour than the older ones. These Bats were full grown, but their reproductive organs were not fully developed.

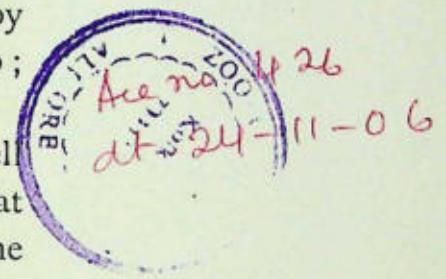
Fossil remains of Bats are rare, but they are present in the Upper Eocene of the Paris Basin. *Vespertilio parisiensis* of the Gypseous series of Montmartre[2] approaches near to our existing forms, and a *Rhinolophus* is also found. Sir

[1] *Zoologist*, 1883, p. 173.

[2] Nicholson, *Manual of Palæontology*, ii. 413.

Richard Owen and others have found remains of Bats in the more recent cave deposits, but these were referable to existing species, generally the Greater Horseshoe and Noctule.

Bats, especially in winter, are very subject to the attacks of parasites; I have found three or four different parasites infesting a Natterer's Bat which I examined during the colder months. Where a large colony of Bats exists in a dwelling-house or building which is frequently used, these parasites sometimes become a great nuisance, and cases have been cited where a house has for a time been rendered uninhabitable, the only remedy being the wholesale destruction of the otherwise harmless little hosts. At Swineshead, in Lincolnshire, the church was occupied by a large number of Bats, and owing to the inconvenience suffered by the worshippers, a raid was made upon the Bats some four or five years ago; about 700 were destroyed.[1]



This, however, is not the only cause of complaint against Bats, for the smell from their droppings is sometimes very offensive. The whole wall of a room at Brickhill, near Bedford, had to be pulled down recently in order to eject the odoriferous tenants of the space behind; the Bats entered through a tiny hole in the outer wall of the house. About four hundred Pipistrelles were slain on this occasion, the family who resided in the house being obliged to leave until the place had been thoroughly disinfected. Mr. Charles Rothschild, a great authority on the subject, has kindly supplied me with the following notes on the six different fleas which subsist upon Bats.

'All the fleas,' he says, 'that have hitherto been found on Bats in this country belong to the same genus, Ceratopsylla.[2] This genus is a very distinct one, and comprises all the fleas found on Bats all over the world. All the species of this genus that have so far been recorded from Great Britain exhibit more than one comb on the tergites of the thorax and abdomen. This character, however, is not peculiar to *all* the known Bat fleas; and one species possessing only one comb, and that on the prothorax, is found on the Continent on *Rhinolophus ferrum-equinum* and *R. hipposideros*, though *at present* it has not been found in Great Britain. It should be borne in mind, when discussing the fleas found on Bats, that Dr. Taschenberg, who wrote the first monograph on these insects, only recognised one species of eight-combed Bat fleas, imagining that all Bat fleas with eight combs were identical with *C. octactenus*, Kolenati. This view is now generally

[1] Oxley Grabham, *Field*, March 29, 1902.

[2] Compare Wagner, *Horæ Soc. Ent. Ross.* xxxii. 32 (Separatum) (1898).

admitted to be incorrect, and consequently the older records of *C. octactenus* are unreliable, as they probably designate more than one species.

'At the present time, six perfectly distinct species of Bat fleas have been recorded from Great Britain, four of which bear eight combs on the thorax and abdomen.

1. *Ceratopsylla elongatus*, Curtis, 'Guide,' p. 36 (1829); id. 'British Ent.' ix. No. 417 f. (1832); N. C. R. 'Nov. Zoolog.' vol. v. p. 542, pl. xvi. fig. 6 (♀), 8 (♀), 10 (♂) (1898).
2. *C. intermedius*, Rothschild, 'Nov. Zoolog.' vol. v. p. 543, pl. xvii. fig. 15 (1898).
3. *C. octactenus*, Kolenati, 'Parasiten d. Chiropt.' p. 31 (1856), and iii. f. 31 (1857).
4. *C. jubatus*, Wagner, 'Horæ Soc. Ent. Ross.' xxxii. 30 (Separatum) (1898). [N. C. R. as *octactenus*, 'Nov. Zoolog.' vol. v. p. 543, pl. xvi. fig. 7 (♀), 9 (♀). N. C. R. 'Nov. Zoolog.' v. 544.]

One species bears six combs on the thorax and abdomen. This is *C. hexactenus*, Kolenati, 'Parasiten d. Chiropt.' p. 51, Taf. IV. (1856).

And one species bears five combs on the thorax and abdomen, which is *C. pentactenus*, Kolenati, 'Parasiten d. Chiropt.' p. 32 (1857); Saunders, 'E.M.M.' xxvii. 66 (1892).

'The first-named species—*C. elongatus*—as far as I know, has been found only on the Noctule. It appears to be not uncommon on that Bat, especially in the spring, and it is, moreover, by far the largest flea found on any Bats in this country.

'The second species—*C. intermedius*—is exceedingly rare in this country, and here appears to be absolutely confined to the Serotine, though the late Dr. Nitsche in Germany secured a large series of it from *V. discolor*. The British specimens that I have were collected by Messrs. Savile Reid and Ogilvie Grant at Yalding, in Kent. Messrs. Brazener Brothers, of Brighton, however, sent me another specimen taken from a Serotine Bat they caught near that town. The real *C. octactenus* is very rare in collections. It appears in this country to be absolutely confined to Natterer's Bat. It is a very small species.

'The fourth-named—*C. jubatus*—is the commonest of all the Bat fleas in this country. I first recorded it as British. Of course, there is little doubt that most of the former records of *C. octactenus* refer to this species. It is a very common flea on the Pipistrelle, and also occurs on several other species of Bats, but has never, as far as I know, been found on the Noctule.

'*C. hexactenus* is the common flea found on the Long-eared Bat. It is apparently only a straggler on other Bats.

'*C. pentactenus* was introduced into the British list by Dr. David Sharp of Cambridge, who secured a fairly large series of it from some Noctule Bats during the winter. I have received it from Cambridge from Noctule Bats, but this species is always far scarcer on the Noctule than the previously mentioned *C. elongatus*, and, in my experience, does not frequent the Noctule in other localities than Cambridge. I have found odd specimens of this flea on the Pipistrelle and the Long-eared Bat, and have also received one taken from a Natterer's Bat. This flea generally occurs during the winter months in larger numbers than it does in the summer.

'Beside these fleas, Bats suffer from the attacks of certain lice and mites, the latter being frequently found in large numbers upon the wing membrane; but perhaps the most formidable-looking parasite of the Bats is that wingless degenerate dipterous fly, *Nycteribia*, a blind or partially blind insect which possesses strong hooked claws by which it clings to its host.'

Family *RHINOLOPHIDÆ*

The Leaf-nosed Bats

The Leaf-nosed Bats are characterised by the curious appendages which surround the nasal apertures, folds or processes of vascular skin, often partaking of the form of a leaf or horseshoe; the nostrils are unusually large. The leaf-like development is considered to be an organ of perception, but the actual function is not thoroughly understood. Two members of this family, both included in the same genus, occur in our islands. The *Rhinolophidæ* are Old World Bats, being distributed throughout the temperate and tropical regions, but they are unknown in the Western Hemisphere.

Genus *Rhinolophus*

In *Rhinolophus* the first hind-toe has two joints, and the others three; the tragus or earlet is absent, but the antitragus is separated by a notch from the outer margin of the external ear. The teeth consist of two upper and three lower pairs of incisors, a pair of canines, the same number of premolars as incisors, and three pairs of molars in each jaw; the incisors in the upper jaw are rudimentary, and the anterior pair of premolars in the same jaw are of insignificant size. The horseshoe-shaped pad which adorns the nose has two indented grooves on each side of the nostrils, and behind these rises an erect and pointed excrescence; this excrescence is flattened in front and is situated midway between

the nostrils. The anterior margin of the horseshoe is deeply cleft in the centre. Immediately behind the cartilaginous protuberance, which stands out at right angles to the facial plane, another of a similar character but slightly larger rises nearly perpendicularly. The eyes are very small, and can be seen only when the Bat's head is in profile; if, however, the head is held below the line of vision they can be seen from the front. The ears are lateral and placed somewhat widely apart.

The Greater Horseshoe Bat

Rhinolophus ferrum-equinum, Schreber.

Vespertilio ferrum-equinum, Schreber, 'Säugethiere,' i. 174 (1775).
Rhinolophus ferrum-equinum, Leach, 'Zool. Misc.' iii. 2 (1817).

Characters.—Expanse of wings, about 10½ inches (270 mm.). Length of head and body, 60 to 65 mm.; tail, 38 mm. Dentition: I. $\frac{2}{4}$; C. $\frac{1}{1}$; P.M. $\frac{4}{6}$; M. $\frac{6}{6}$. The second lower premolar is very minute and is placed externally to the line of the other teeth, while the second upper premolar is placed close to the canine. The general colour of the back and head is a reddish brown, some individuals having a greyish tinge. The males are generally the greyest, and the females are sometimes almost golden brown. The great difference in size between this species and the Lesser Horseshoe will prevent confusion between the two in all cases where the animals are adult. The late Mr. W. Borrer remarked that the fur in winter is thicker than in summer; but I cannot confirm this opinion, for specimens which I have examined show little difference in the density of the pelage at any season of the year. Until full grown the young are very grey (Plate I, lower left hand fig.).

Distribution.—The Greater Horseshoe Bat has a wide geographical range, occurring in all parts of temperate Europe and Asia north of the Himalayas, as well as in North Africa. How far south it extends into Africa is not at present known.

In the British Islands it is essentially a southern form, being rare, if indeed present, north of the Midland counties, while in Scotland and Ireland it is unknown. The Greater Horseshoe is, as a rule, an inhabitant of caves, which may account for its thin distribution, but locally it is numerous. It was first recognised as a British species by Dr. Latham, who discovered it at Dartmouth; since then its occurrence has been recorded from many places in the south, no locality being more famous for it than Kent's Hole at Torquay.



THE GREATER HORSESHOE BAT.

RHINOLOPHUS FERRUM-EQUINUM.

LIFE-SIZE.

This Bat is found in many parts of Devonshire, and I have seen examples which were taken in the vicinity of Taunton, Somersetshire, where I myself shot two—at Rumwell Hall, close to the town—in the autumn of 1884. A colony resides permanently in the roof of Wells Cathedral, where I obtained six living examples taken on June 20, and six more in August, 1903. Lesser Horseshoe Bats and Barbastelles occupy other parts of the same building. The Greater Horseshoe has been recorded from Bristol, Clifton, and Weston-super-Mare, and further west, from Swansea and Pembroke in Wales.[1] In Hampshire, Mr. Hart has taken the Bat many times near Christchurch, where he remarks that it is common in the neighbourhood of the old Priory Church. It is interesting to note that here, as at Wells, the species inhabits the building all the year round, for Mr. Hart's examples were captured in May, August, September, and October.[2]

Mr. R. F. Tomes found the Greater Horseshoe in underground workings in the greensand near Godstone in Surrey, but regards it as rare.[3]

When we were writing the history of the Mammals of Sussex, for the Victoria County Series, Mr. A. Butterfield and I made a careful survey of the county, searching throughout the district for the purpose of obtaining information about distribution. We found only one authentic instance of the occurrence of the Greater Horseshoe—namely, that an individual was discovered on the sail of a fishing boat on Brighton beach in January 1890.

This Bat also occurs in other southern counties, ranging from Gloucester to Kent. It was recorded from Tomson Manor House, in Dorset, by Mr. J. Salter,[4] and is fairly numerous in the Isle of Wight. Mr. A. G. More, in Venables' 'Guide to the Isle of Wight,' remarks upon its abundance; Sandown, Farringford, and Bonchurch are also given as localities in the island where it is specially plentiful. In Essex and Kent it occurs near Colchester, Rochester, Maidstone, Dover, and Canterbury. I have seen examples from most of these localities. In 1842 Mr. Borrer found it abundant at Canterbury, where it used to fly from about dusk until dark,[5] and I hear that it still frequents the old cathedral town.

The reputed occurrence of the Greater Horseshoe in Wensleydale, Yorkshire, was disproved by Mr. W. D. Roebuck, and we cannot but think that the record of this species from Merionethshire demands further investigation. Mr. G. H. Caton-Haigh recorded this Bat on the authority of Mr. Oxley Grabham, who

[1] *Field*, January 1, 1881; and Kelsall, *Zoologist*, 1884, p. 483, 1887, p. 89.
[2] 'Hampshire,' *Victoria History of the Counties of England.* [3] 'Surrey,' *ibid.*
[4] *Zoologist*, 1865, p. 9835. [5] *Ibid.* 1874, p. 4125.

took the example from a disused mine in the neighbourhood of Penmaenpool.[1] Mr. Caton-Haigh says: 'I have failed to meet with this Bat myself, though I have paid much attention to the small mammals of the county referred to.' Mr. Harting says[2] that it has been found in Glamorgan.

It is interesting to know that this Bat occurs even in London. Its presence has been known for some years, and Mr. De Winton tells me that he has seen it on several occasions hawking for food in the Gardens at Regent's Park. The Pipistrelle, Long-eared, and Noctule also inhabit Regent's and St. James's Parks. The Rev. J. E. Kelsall[3] records the occurrence of this Bat at Oxford, though on the Berkshire side of the river, in October 1875.

That the Greater Horseshoe has been an inhabitant of our islands for ages is proved by the bones, found in conjunction with and in the same state of disintegration as those of the hyæna and rhinoceros, in the deposits of cave-earth in Kent's Hole, Torquay. Sir Richard Owen was of opinion that it was the only species which occupied the cavern; but this is not so, for now, at any rate, the Lesser Horseshoe occurs there.

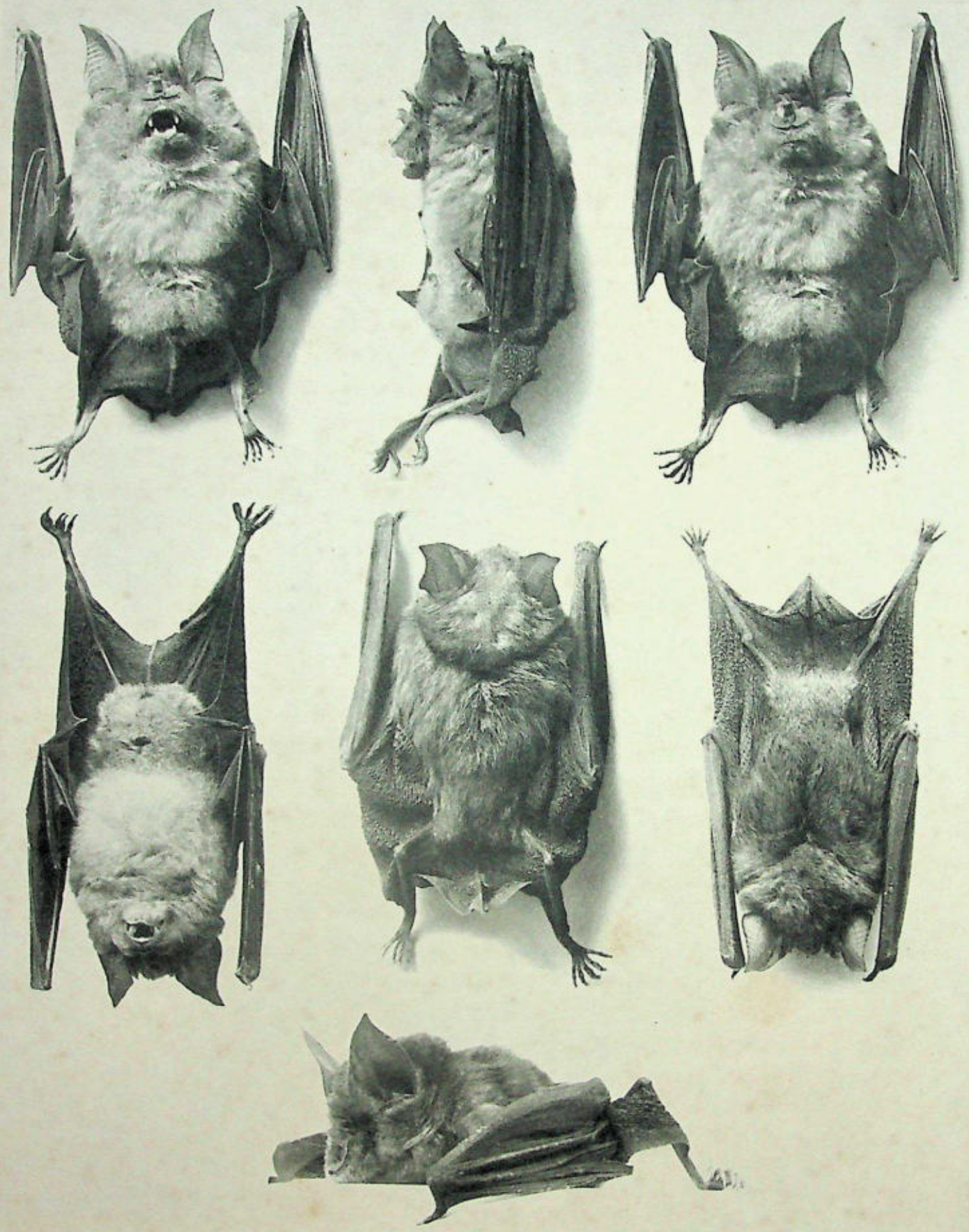
Habits.—As a rule, the Greater Horseshoe delights to cluster far in the depths of caves or the galleries of old buildings during the day, but this is not always the case. Mr. Mitchell, who obtained some specimens for the Rev. H. A. Macpherson from a cave in Devonshire,[4] says: 'The Bats seem to prefer the mouth of the caves to the interior parts, for although I went in a great distance, I failed to see a single Bat beyond a certain limit—*i.e.* where the daylight failed absolutely.' It is possible that at different months of the year the Bats may frequent different parts of the caverns, the partial migration, already referred to, being confined to a movement within the same cave. Mr. Mitchell took these Bats in August.

In Wells Cathedral, the caretaker informs me, the Bats mass together at the end of a dark passage close to the roof; he adds that they do not associate with any of the other four species which inhabit the edifice.

The Greater Horseshoe is rather late in the evening in making its appearance. It hunts for its food—moths[5] and flying beetles, especially the fern-chafer—at an elevation of from thirty to thirty-five feet above the ground. In flight, when seen to advantage, this Bat exhibits more grace than power and activity, the character-

[1] *Zoologist* 1896, p. 433. [2] *Ibid.* January 1887. [3] *Ibid.* 1884, p. 483. [4] *Naturalist*, 1886, p. 337.

[5] This Bat will eat the following moths—namely, the Common Yellow Underwing, *Triphæna pronuba*, the Broad-bordered Yellow Underwing, *Triphæna fimbria*, the Pearly Underwing, *Agrotis saucia*, and the Herald Moth, *Scoliapteryx libatrix* (*Zoologist*, July 1887). I have reason to believe that it also devours a certain spider found in the caves where they live.



The Greater Horseshoe Bat.

Life Size.

istics of the Noctule; it sails and flutters with a delicate butterfly flight, which is exceedingly attractive. Its broad wing area is noticeable, and gives the animal a larger appearance than it actually possesses. In the open air the flight seems slow but full of grace and buoyancy. On a hot August day in 1903 I released two, placing them upon an old oak in front of my study window; they soon woke up, and for half an hour flew to and fro before my window, giving me ample opportunity to watch their actions. They often arrested the movements of the wings, and sailed with motionless wings for a distance of thirty or forty feet, reminding me of the action of a gull following a ship. Every now and then they alighted with the characteristic acrobatic somersault on the oak where I had placed them. At first they flew alone, apparently searching the eaves of the house for some entrance hole; but finally they took wing together and disappeared in the direction of St. Leonard's Forest.

When the Greater Horseshoe alights it does not seize an object with the thumbs and then turn round, but performs a curious and very rapid somersault in the air, close to the object on which it wishes to alight, seizing hold with the feet. This, as I shall show later, is not the ordinary manner in which Bats settle.

The exact duration of the flight of the Greater Horseshoe has not been satisfactorily ascertained, but it seems probable that it is abroad during the greater part of the night, retiring before daylight to its retreat. It does not devour all its food while in flight, but conveys some to its diurnal resting-place; it devours these while clinging to the walls or rocks. Mr. A. G. Berry tells me that he has swept up a dustpanful of moths' wings and beetle cases, the discarded remnants of a night's foray, from beneath the sleeping-place of a cluster of these Bats.[1] The Rev. H. A. Macpherson examined some of this litter from beneath the Bats in the Devonshire caves, and found that the majority of the wings of moths were those of the large Yellow Underwing; cockchafers, dor-beetles, and other Coleoptera were represented in this refuse.

There seems to be a prevalent notion that all Bats sleep during the day; they undoubtedly do *when they get the chance*, but when Bats are in a cluster they are usually in a constant state of quarrelsome unrest. They appear to be keenly sensitive to draughts; and for the sake of warmth, those on the outside are constantly clambering over their companions and forcing their way into the cosy interior of the mass. This of course leads to trouble, protest, and retaliation,

[1] I must confess that I am quite ignorant as to the manner in which these Bats carry their food to their retreat, since the interfemoral pouch seems to be incapable of being bent forwards.—J. G. M.

so that a cluster of Bats is a restless, squeaking congregation throughout the day; no individual can secure much repose. When, as occasionally happens, a colony is at rest, the voices of the Bats are exceedingly mild and gentle; indeed, half a dozen Greater Horseshoes which I kept in confinement for a short time exhibited a charming disposition, and did not, as is generally the case with other species, attempt to bite when handled. Their tiny voices could hardly be heard at the distance of a yard or two.

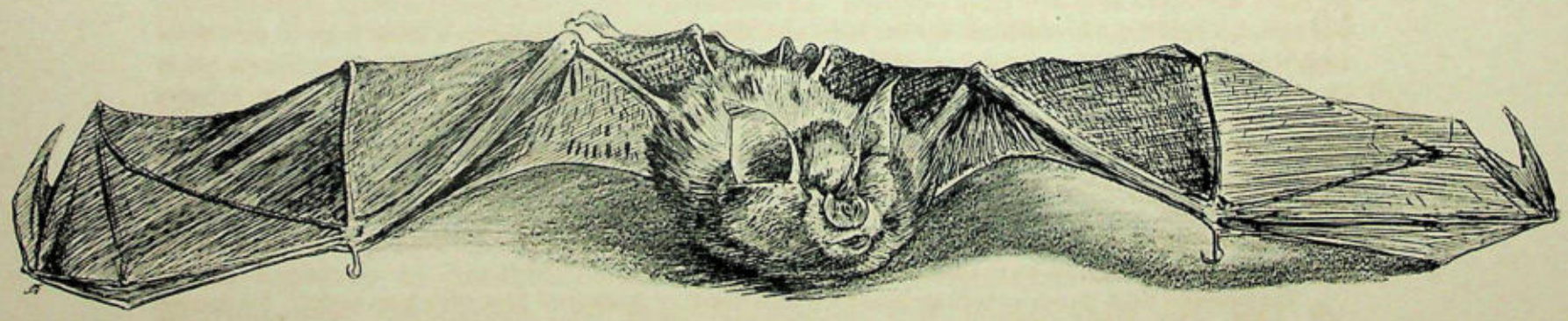
The idea that the wing membrane of Bats is an extra sense-organ does not seem without foundation, for they exhibit a marvellous power of avoiding obstacles when in flight, even in the dark. The eyes of all our British Bats, with the exception of the Long-eared, are insignificant, and their sight must be impeded by the abundant mystacial hairs which surround the organs of vision. In the Horseshoes, which possess the smallest eyes of any of our British species, the nasal appendages may be an additional aid in this respect. One of the nasal excrescences, cut off immediately after death and examined under the microscope, will show how vascular, and therefore sensitive to air-pressure, this organ must be. Blind men frequently exhibit a highly specialised nervous appreciation of objects which they cannot see, being aware of the presence of an article before they touch it. No doubt this is accounted for by the atmospheric conditions between the two bodies, and by the development of the sense of touch through the constant use of the nerves. In the same manner the Bats may be able to distinguish, with great rapidity, the presence of an obstacle by the air-pressure, or rather slight difference in the air-pressure, when they approach it.[1]

[1] Not long ago a Government Commission investigated the case of a sculptor in Paris who, while still learning his profession, had become blind at the age of twenty-one. He continued to work, and was so successful that he gained distinction over sighted competitors. A wool-dealer was also found who, after the loss of his sight, was a better judge of wool by the sense of touch than he had been before; one of his deals involved an outlay of 150,000*l.*, and he had no one to assist him in his business. These are examples of the development of the sense of touch in human beings, and it is not a far cry to realise that the same sort of development may have taken place during the long ages of evolution in the perceptions of the Bats. In blind men who can appreciate the presence of an object without touching it, it is probable that the uncovered face is the portion of the body which is most sensitive, so that we may consider it as 'facial perception.' A highly impressionable man, although quite blind, can distinguish between a brick or stone wall, a wood fence or a hedge, and it is known that this 'facial perception' is keenest on a bright clear day; a foggy atmosphere confuses him. Again, if a blind man's face be covered he is helpless and unable to utilise his abnormal faculties.

The somewhat cruel, though exceedingly interesting experiments of Spallanzani have often been quoted. He deprived Bats of sight, and as far as possible prevented them from smelling or hearing, and then released them in places previously unknown to them. He found that they could fly down narrow passages, turning at right angles, without colliding with the walls; neither did they strike against threads which he stretched across the passages in various places. Cuvier considered that the membrane of the wings was the organ of perception in these experiments. De Jurine, however, who tried similar experiments, found that when the ears were sealed the Bats struck against objects; but the highly specialised ears of Bats are probably as



GREATER HORSESHOE BAT CRAWLING UP A WALL, SHOWING POSITION OF THE TAIL.



GREATER HORSESHOE BAT RESTING WITH EXTENDED WINGS.

However highly specialised the wing membrane and nasal organs may be, there can be no doubt that Bats use their eyes and can probably see fairly well. We are not, however, able to tell whether the eyes or the ears are used most for detecting the presence of insects when in flight; probably both are keenly on the alert. Spallanzani's cruel experiments led him to think that Bats depend 'almost entirely on the exquisite sense of touch of the whole surface of the flying membrane,' but we know that under certain conditions both eyes and ears are utilised.

A Greater Horseshoe Bat which I released in my study flew about for an hour or two without touching any obstacle. The walls of the room were covered with stag and roe skulls and horns; but the Bat flew in and out of these with remarkable skill, notwithstanding the fact that its wings were large and broad. Sometimes it would swoop across the room and fly beneath my legs and the legs of the chair upon which I was seated; then, passing under the table, it would rise towards the cornice, turn in the air and catch it with its hind-feet. Hanging thus head-downwards, it would look sharply from side to side, its nervous little head shaking as if it were afflicted with St. Vitus's dance. The body swayed constantly from side to side, sometimes turning more than half a circle, and the ears were in movement, twitching nervously, the whole time. For a few minutes it remained hanging, and then launched forth again on a fresh voyage of discovery. When first released from a box it flew to the window, but it did not strike against the glass; apparently it ascertained that there was some medium which prevented it from passing to the outer air, for it did not again approach the window. Occasionally, when tired, it would alight upon a polished mahogany table with its wings fully extended, and while in this attitude I managed to obtain a sketch. It experienced no difficulty in rising from this position, springing up from a smooth surface with ease and buoyancy; it was, indeed, the most skilful flyer of any of the British Bats which I have watched.

While this Bat was flying about in my room, others of the same species which were shut up in a box in the corner of the study were squeaking occasionally; whenever their voices rose to a high pitch the flying Bat would swoop down, settle on the box, and attempt to get in. The voice of the Greater Horseshoe is a somewhat subdued squeak, but the call of the young is louder. While clinging to their mothers, or when following their parents about when nearly full grown, they keep up a constant high-pitched double cry. Some Bats which I received

sensitive to air-pressure, independently of the action of waves of sound, as any other portion of the body—face skin or wing membrane.

from Somersetshire in August 1903 had among them two nearly full-grown young ones; these called, apparently without ceasing, throughout the day and night.

When this Bat is preparing to sleep, it begins to doze gradually, nodding its head a little and ceasing to look about; finally, the head falls and hangs straight, and the whole animal commences to shiver. This muscular movement soon ceases, and the animal is asleep. Generally the wings hang somewhat loosely to the sides at first, but I have seen the Greater Horseshoe assume the characteristic sleeping and hibernating attitude of the Lesser Horseshoe; probably this position is common to both species.

The tail of the Greater Horseshoe lies flat over the back when the animal is flying, but when a capture is made it can bend it forward at will and use the interfemoral membrane, or sac formed by the membrane between the legs, as a receptacle for its victim until it has secured a hold.

When hanging, the tail is either pointed outwards or pressed closely to the back, while when walking up a perpendicular surface it carries the caudal appendage in the curious manner I have endeavoured to illustrate. This species, like its congener the Lesser Horseshoe, does not walk or climb with the ease exhibited by other species; indeed, it seems a Bat of the air, having no rival in grace of flight, but being comparatively clumsy on the ground. The first time I saw a Greater Horseshoe carrying its tail in the curious manner I have just described, I could not help being struck with its resemblance to a certain real or mythical personage whom most of us are anxious to avoid. Here he is avoiding good St. Dunstan, and reminding one of the old nursery lines:

> Did you ever see the Devil,
> With his wooden spade and shovel,
> Digging taties in his garden
> With his tail cocked up?

Lesser Horseshoe Bat

Rhinolophus hipposiderus, Blanford.

Noctilio hipposideros, Bechstein, 'Naturgeschichte Deutschlands,' p. 1194 (1801).
Rhinolophus hipposideros, Leach, 'Zool. Miscell.' iii. 2 (1817)
Rhinolophus hipposiderus, Blanford, 'Faun. Brit. Ind. Mamm.' p. 277 (1891).

Characters.—Expanse of wings, about 8½ inches (210 mm.). Length of head and body, 37 mm.; tail, 27 mm. Dentition: As in the Greater Horseshoe Bat, only



Greater Horseshoe Bats hunting their prey.



THE LESSER HORSESHOE BAT.

RHINOLOPHUS HIPPOSIDERUS.

LIFE-SIZE.

Printed in Vienna

that the second upper premolar is separated from the canine by a pronounced space, and between them is the minute anterior premolar. The sharply pointed ears are shorter than the head; their outer margins are indented, and separated from the antitragus by an angular notch. The nose ornaments are very similar to those of *R. ferrum-equinum*, but the frontal leaf is lanceolate and, comparatively, slightly broader, while the upper horn is longer, thinner, and without the concave notch in the anterior ridge. The colour is similar to that of the last species, being grey-brown above and very pale grey with a brown tinge on the under surface of the body. The young are similar in colour to those of the Greater Horseshoe, being a pure grey above and below; this colour is retained until they are full grown in November.

Distribution.—The range of the Lesser Horseshoe Bat extends, so far as is at present known, from Britain to North-west India, and over North and North-east Africa. In Europe it is found as far north as Finland and the Baltic littoral.

In the British Islands the range of the Lesser Horseshoe is much wider than that of its larger congener, for it is found in Ireland and in many parts of England and Wales where the other species is absent.

The Lesser Horseshoe is more abundant in the southern than in the northern shires, and it is found in most of the localities where the Greater Horseshoe occurs, often frequenting the same cavern or building. It has been taken several times in the famous Kent's Hole at Torquay, and the probable explanation of the failure of the late Mr. W. Borrer to discover it there in 1893, is that he searched for it during the time when it was absent on some partial migration. Mr. Borrer states that it frequents a cavern in the cliff near Paignton in the same county. I have seen examples taken at Truro, Cornwall, Eccles in Devonshire, and Wells in Somersetshire; also from Marlborough in Wiltshire, the county where Montague first recognised it as a British species. In Hampshire it appears to be rare, Mr. Hart only once obtaining one in the neighbourhood of Christchurch (July 1899);[1] but in Worcestershire Mr. Tomes reports it as fairly common. He found numbers in the roof of Ragley Hall near Alcester, where, he remarks, although numerous they were always found hidden away singly.[2] It has been recorded from Welford in Warwickshire, and, passing further east, I have seen specimens from Colchester in Essex and from Chislehurst and Maidstone in Kent. In Surrey Mr. Tomes found it, together with the Greater Horseshoe, in the greensand workings at Godstone.

[1] 'Hampshire,' *Vict. Hist. Count. Eng.*

[2] 'Worcester,' *ibid.*

This by no means common Bat is found in the heart of London, for nowadays Kensington Gardens are far from the western confines of the great city. I had often noticed Bats, which I was quite sure were not Pipistrelles, hawking about the Round Pond and Serpentine on summer evenings; but opportunities for obtaining specimens were scarce and park-keepers watchful, so that I was unable to gratify my thirst for knowledge. Since then Mr. O. Grant tells me he has also often seen these vespertinal flitterers, which we have since recognised as Lesser Horseshoe Bats. About twelve years ago a large elm was felled in the Gardens, and within it were discovered a few Bats, one of which, when taken to the British Museum, was identified by Mr. J. E. Harting as referable to this species.

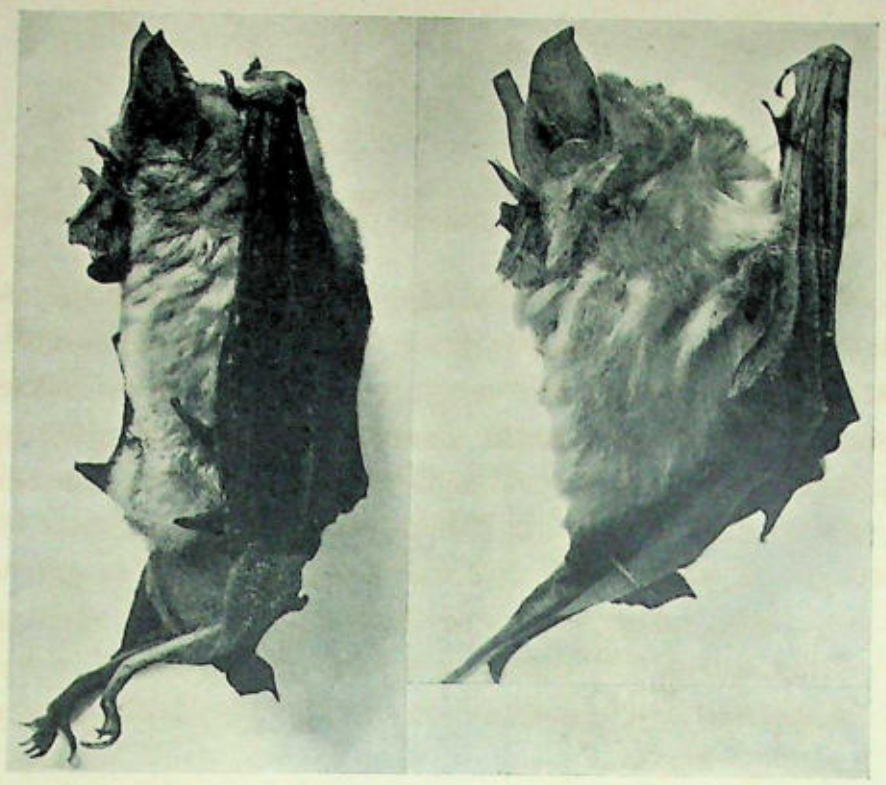
Throughout the Midlands the Lesser Horseshoe is thinly distributed in suitable localities; it has several times been recorded from Yorkshire, having been found in old coal workings at Washburn and Pateley Bridge, and also near Nidderdale and Ripon, by Mr. William Storey;[1] near the last-named place it was first recorded from the county by Mr. Ingleby. It has even been recorded from Northumberland and Durham, Derbyshire and Notts. There is a single rather doubtful record from Cheshire, the Bat being stated to have been taken in the sandstone quarry at Storeton in 1834, but Mr. T. A. Coward has failed to find any likely lodgment for the Bat in the quarries as they now exist. I have, however, examined an example from the millstone grit at Swythamley in Staffordshire, close to the Cheshire border, and it has also been found in limestone caves in Derbyshire, in the neighbourhood of Buxton. The Rev. T. E. Kelsall contributed to the 'Zoologist' (1887, pp. 89–93) an exhaustive paper which contains all that was known about the distribution of this species up to 1887.

Mr. Lydekker and Sir Harry Johnston make the astounding statement that the Lesser Horseshoe is not known in Wales, although, long prior to the publication of the 'British Mammals' of the latter author, Mr. G. H. Caton-Haigh had recorded it from Merioneth and Denbighshire,[2] and Mr. R. Newstead's account of the Lesser Horseshoe at Cefn, and his photographs of the sleeping position of the animal, had been published in the 'Zoologist.' It was also a generally known fact that the Bat occurred in the limestone caves of Denbigh before Mr. Lydekker's work was published in 1895, and the Rev. T. E. Kelsall's paper included Glamorganshire and Pembroke. Mr. J. E. Harting also pointed out that Donovan[3] took

[1] *Field*, 1884, lviii. 499; and *Zoologist*, 3rd ser., 1895, xix. 65.

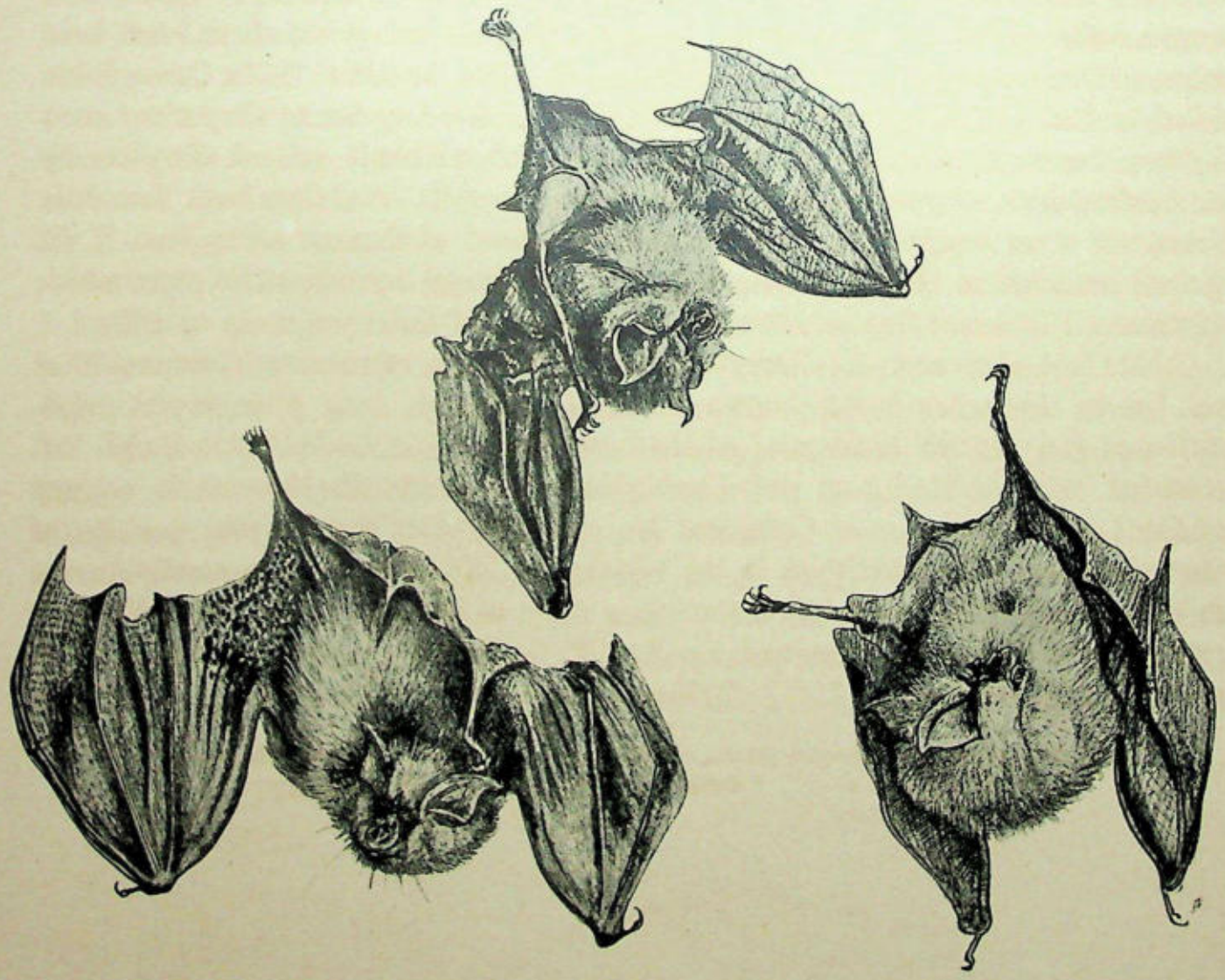
[2] *Zoologist*, 1887, p. 152.

[3] *British Quadrupeds*, pl. ii.



This illustration shows the difference between the Greater (left-hand figure) and the Lesser (right-hand figure) Horseshoe Bat apart from size. The figure of the Lesser Horseshoe Bat is magnified to the size of the Greater Horseshoe Bat, which is represented life-size.

The form of the nasal ornaments is seen to be quite distinct.



A LESSER HORSESHOE BAT DRESSING HIS FUR AND COMBING HIS HAIR WITH FOOT AND CLAWS.

an example of this Bat at Raglan Castle in Monmouthshire. Mr. R. Newstead, Mr. C. Oldham, and Mr. T. A. Coward have frequently taken this Bat in these caves, and in the caverns in the same formation at Tremeirchion in Flintshire; while Mr. Coward found it in an old lead mine in the Ceiriog Valley, and Mr. Oldham has examined an example which was found with several others in a cave at Tal-y-Bont, in the Conway Valley, Carnarvonshire.[1] It seems probable that this species occurs throughout the limestone in North Wales.

Dr. A. R. Young[2] stated that the Lesser Horseshoe Bat had been found with the Long-eared at Crookston Castle, Renfrewshire, but Mr. E. R. Alston[3] failed to find any trace of the specimen, and suspected that there had been a mistake in identification. No other record is known for Scotland, and unless some confirmatory evidence is forthcoming, we can only consider that the species does not occur north of the Tweed.

The Lesser Horseshoe has been recorded from co. Clare and co. Galway in Ireland, and according to Professor Kinahan it is the 'Common Bat' of the former county. Mr. F. J. Foot first recorded the species for Ireland, having found it in the Ballyallia Cave, near Ennis, in 1857,[4] and again in a cave near Quin in 1859. Professor Kinahan and Mr. Foot afterwards discovered it, in 1861, in Vigo Cave, Inchiquin, and in another small cave in the neighbourhood. They also found it in three caves at Edenvale, near Ennis. In Galway one was taken by Professor King in 1858, and Mr. A. G. More presented two from Cool Park to the Dublin Museum. Dr. H. Lyster Jameson, who has made a special study of the Irish Bats, is of opinion that it has also occurred in co. Westmeath.[5]

Habits.—Montague first discovered that the Lesser Horseshoe Bat was an inhabitant of this country, and he identified it as a distinct species. His name, *Vespertilio minutus*, is obviously inapplicable, and we are driven to use Bechstein's doggerel Greek, or Blanford's correction of his name; when a name is once given, and we are satisfied that the author appreciated the specific characters of an animal, it is wisest to retain it.

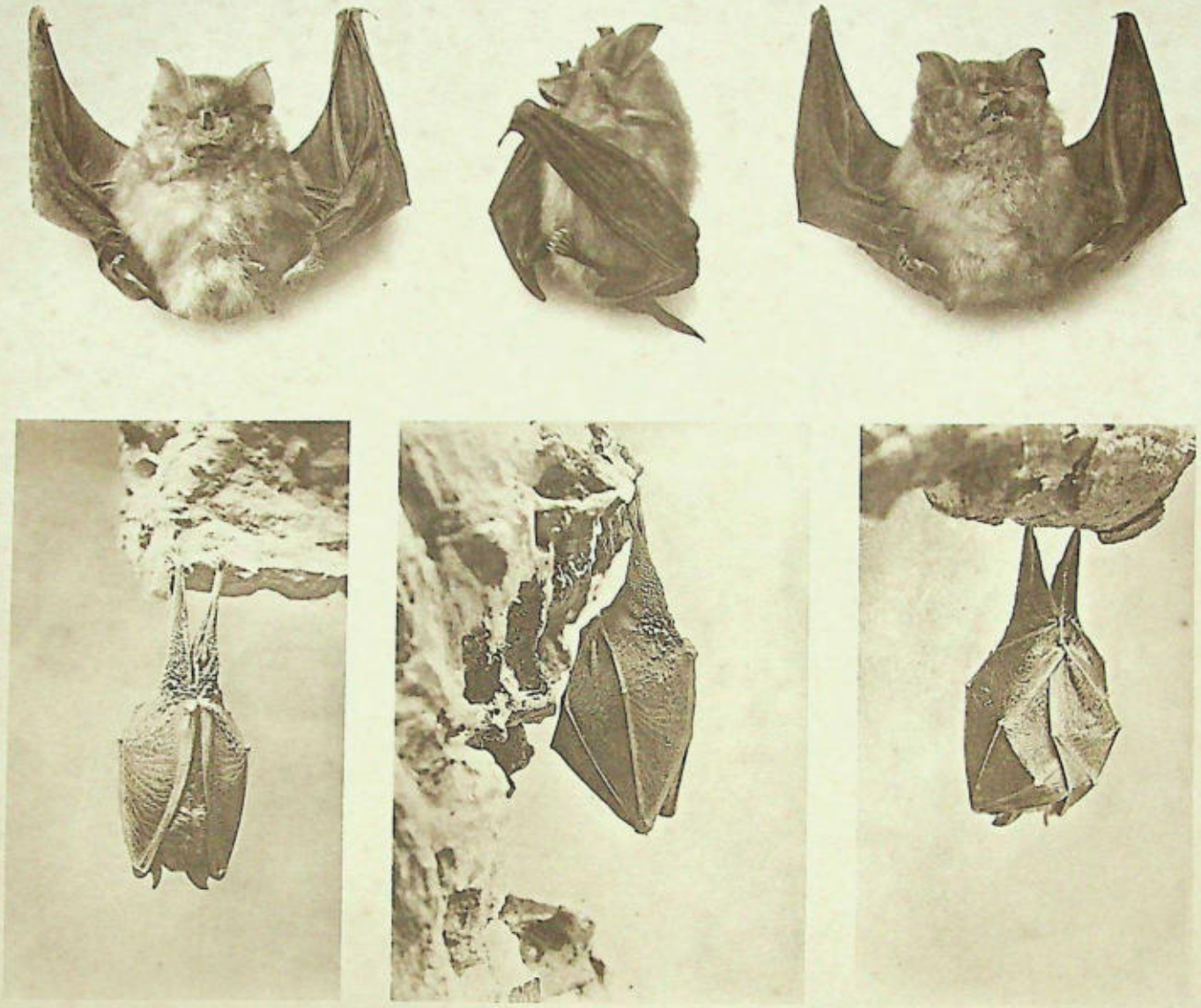
Zoological literature provides us with scanty information about the characteristics and habits of the Lesser Horseshoe, most authors contenting themselves by saying that it resembles the larger species in all ways. Doubtless this is true in the main, but it is, in most cases, merely a way of getting out of a difficulty.

[1] *Zoologist*, 1903, p. 430.
[2] *New Statistical Account*, 'Renfrewshire,' 1845, p. 162.
[3] *Fauna of Scotland*, Nat. Hist. Soc. Glas., p. 7, 1880.
[4] *Proc. Dublin Nat. Hist. Soc.* ii. 152.
[5] *Irish Naturalist*, 1897, p. 36.

In November 1903 I received four Lesser Horseshoe Bats alive from Mr. T. A. Coward, who had taken them in the limestone caves at Cefn in Denbighshire. One, evidently a young male, died at once, but the others survived for several days and gave me opportunities of observing their movements and attitudes in flight and when at rest. If possible, the Lesser Horseshoe has even greater powers of flight than its congener, a fact which has been remarked by other observers. Two of these Bats, which I liberated in my study, flew for a quarter of an hour before attempting to alight. Their flight was more rapid and the wing-beats more frequent, but they did not appear to me to possess the same grace and buoyancy upon the wing as the Greater Horseshoe; there was more 'whirr' and restlessness in their actions, and I did not notice them sail through the air for any distance; some of the same batch of Bats, which Mr. Coward retained to watch, sailed on motionless wings several times, swooping downwards towards the floor and passing under the legs of the furniture. He informs me that he has allowed several species of Bats to fly in his room, but never noticed any other species fly so low, an inch or so above the floor, for any length of time. The action of alighting and the nervous manner in which they looked about when hanging were similar to what I have already mentioned about the Greater Horseshoe; they appeared to be extremely sensitive to any sharp sound, bright light, or the near approach of my hand. On two occasions I extended my hand towards one of them which appeared to be hanging asleep with its back towards me, and though it was obvious that it could not see me, the Bat became aware of the approaching hand, quivered, looked round, and flew.

After these Bats had been at rest for some time, they would permit me to touch them without flying away. The eyes in the Lesser Horseshoe are almost hidden, and it is difficult to understand how they see at all, though they certainly use the eyes, raising the head when hanging, in order to look about. It is difficult to understand how this species carries beetles and moths to its retreat unless they are conveyed in the mouth, for the interfemoral pouch does not appear functional as a carrying sac; the tail is bent upwards over the back, and does not appear to bend forward naturally. I do not think that the tail membrane is used for pouching victims in the same manner as we find it employed in other species. Mr. C. Oldham's opinion agrees with mine. He says:[1] 'Even if the tail were curved beneath the body during flight, its shortness and the small extent of the interfemoral membrane would constitute only an inefficient pouch, and it seems

[1] *Zoologist*, 1899, p. 474.



The Lesser Horseshoe Bat

improbable that in the genus *Rhinolophus* these parts subserve the same purpose as in *Plecotus*, *Myotis*, and *Pipistrellus*.' Mr. Oxley Grabham records[1] that he took eighteen large parasites from a specimen of this Bat which were identified by Mr. E. E. Austen as *Nycteribia Hermanni*, Leach.

Mr. Robert Newstead, Curator of the Grosvenor Museum, Chester, in whose company Mr. Coward and Mr. Oldham have many times visited the Cefn Caves, communicated an interesting note on the hibernation of this species to the 'Zoologist' (1897, p. 537).

When visiting the caves on April 12, 1897, he found a number of Lesser Horseshoe Bats, and says: 'The examples met with were easily accessible, and one of them was photographed *in situ*;[2] but the strong light from the magnesium ribbon put the little creature in a nervous state of apprehension, and the resulting picture was not good, so I was obliged to resort to more favourable conditions in order to obtain the result here portrayed. On both occasions the Bats were hibernating, but awoke on the slightest provocation; and when removed from the cave became very active and readily took wing. On April 12, at 1.30 P.M. the temperature of the Cefn Cave, about twenty yards from the entrance, was 9° C., just 1·25° C. colder than the shade temperature outside.

'I placed my captives in a well-ventilated cage in a suitable atmosphere, but the frail little creatures died in a few days. When sleeping they cling most tenaciously to the rock, and the feet are placed somewhat closely together, rarely are they widely separated; but I noticed one example hanging for a long time with its legs completely crossed. With the exception of the upper portion of the head with the tips of the ears and a narrow dorsal space, the animal is completely enshrouded in its wings. Sometimes the head is also covered, but the space between the forearms is always exposed. The fingers bend suddenly inwards at the joints, and all meet on the ventral parts of the body, where they, together with the membrane, form an irregular pentagon. The anomalous position of the tail is noteworthy: it is reflexed over the back with its accompanying membrane closely overlapping the wrinkled membrane of the legs, thus forming a deep narrow trough—an excellent apparatus to carry off any drops of water that might fall upon it from the roof of its habitat. Viewed in profile, the animal bears a remarkable resemblance to the pupa of a butterfly, and is altogether a most interesting little creature to study.

'An examination of their rejectamenta showed that they had been feeding,

[1] *Naturalist*, 1899, p. 69.

[2] Mr. Newstead has been so kind as to allow me to reproduce these photographs.

almost exclusively, upon the smaller species of Lepidoptera; there were fragments of other insects, but I failed to ascertain the order to which they belonged.'

Mr. Coward has supplied me with the following notes on the Lesser Horseshoe Bat, which he has found on several occasions, and has watched both in its native caves and in his room at home. He says: 'I have taken this Bat in the caves at Cefn, Denbigh; at Tremeirchion, Flintshire; and in an old working in the limestone between Glyn and Llanarmon in the Ceiriog Valley, also in Denbighshire. I have also had a specimen from Kent's Hole, Torquay.

'All these Bats were taken in March or April; and from the fact that there was matter in the intestines of some killed immediately and fresh droppings below where others were hanging, it appears likely that they either feed in the caves or had been abroad. In every case the Bats were hanging: some were suspended from a smooth roof, clinging to minute inequalities, others were at the top of holes in the caves; in such positions the face of the Bat was always turned towards the nearest wall. Both sexes hung in company; the largest gathering consisted of ten Bats. In one water-worn hole a male and female were together, an inch or two apart. When first found the Bats all hung with perfectly straight legs; their ears were partly folded back, and their faces hidden. They noticed the light at once, and began to sway slowly from side to side; then they bent their long legs and drew themselves up, swinging with more vigour. The tail in every case was recurved over the back. When the head was exposed and the ears were extended, as the Bats woke up, the movements became quicker; when awake, the ears were constantly in motion, the head was jerked upwards and sideways, and the whole body was swung on the legs. One Bat turned its body fully a quarter of a circle many times.[1]

'When first touched the Bats uttered a low squeak; the voice is quite different from that of any other Bat I have examined. I have always found this species difficult to keep; Mr. Oldham and Dr. Alcock have also been unsuccessful. One which lived four days took readily to mealworms after the juice of one had been smeared on its face; the first day it would only eat half a mealworm, but the next day it took six fair-sized worms and a small caddis-fly. It would not touch this fly until it had eaten the grubs. This Bat found great difficulty in masticating the hard skin of the worms, its teeth being small and its jaws feeble, but it took to them well and asked for more, biting my fingers and even taking a bit of my jacket in its mouth. It drank water from the end of a camel's-hair brush, and also

[1] These attitudes and movements are exactly similar in the Greater Horseshoe Bat.—J. G. M.

took a little milk. When walking on the table the tail was held above the back, and when it was struggling with a large worm there was no movement of the tail perceptible. It several times, however, made a movement with its head as if it wished to "pouch" the struggling worm in order to secure a firmer grip; the tail is so short that the interfemoral pouch could hardly be used for this purpose. We tried to see if the tail was extended in flight—the legs are certainly held straight behind—but we could not make out with certainty. When the Bat dipped its head downwards, to secure a better grip, it appeared to use the ends of the fingers in pushing the prey towards its mouth; it did not use the thumb. It also took a worm from the table, an action which it is difficult to teach to a Noctule.

'When alighting after a short flight the agility of the Bat was most noticeable. Most Bats when they alight seize the object on which they are settling with the thumbs, and then rapidly turn round and take hold with the feet. The Horseshoes, when an inch or so from the object, turn in the air, taking hold at once with the feet. We watched this over and over again. The Bat alighted on a curtain, a smooth brass rod, and even on a smooth wall-paper. Noctules will attempt to settle on the wall, but always slip off; the Horseshoe clung at once.'

With reference to a more recent visit to the Cefn Caves in November 1903, Mr. Coward sends me some further notes about this Bat which throw some fresh light on its hibernation and methods of feeding.

'The main entrance to Cefn Caves is halfway up a steep bluff of limestone. Within, galleries run both up and down. We found Lesser Horseshoe Bats both on the upper and lower galleries; and in the places where we found them, there were no Bats when we visited the place in August. The caves are, as a rule, dry, though water drips through the rock in places, and the ground was wet below where some were hanging. We saw altogether between two and three dozen Bats, but except in one place they were separated and not hanging close together. The temperature of the caves, some ten yards from the entrance, was 46° Fahr. All the Bats were hanging so that their bodies did not touch the wall. Most of them were not so completely wrapped up as I have seen them in the late winter or early spring. Beneath where Bats were hanging there was a quantity of dung, showing, I think without doubt, that the Bats had been feeding after they had begun to occupy their winter quarters, for in August there was *no* dung in these particular places. The dung smelt strongly, a thing I had not noticed before. Most of the Bats were suspended from the roof of the tunnel, but some were hanging from projections on the walls. None of the Bats seemed very cold, and

I had come to the conclusion that hibernation was not yet profound before I found evidence of the fact. I noticed one Bat, a little way in front of us, hanging with its wings by its sides, and with its head up, bent at the neck, watching us as we approached. Its head was in constant nervous movement, and it flew before I could touch it, dodging smartly and disappearing in the darkness. A little later we found a blind cave, which evidently, judging from the surface soil and roots, is near the outer air. Here there were two Bats wide awake: they dropped from their holds when I approached, and, after some smart dodging, slipped under my arm and over the shoulders of my friends and passed out into the darkness. At another place, where an old exit is closed by an open barred gate, there were two Bats on the wing. They could easily have passed through the bars into the light, but they turned and twisted until they had passed us and gone further into the cavern.

'The fact that these Bats were not asleep so late in the year—November 18—seems to me to show that though the winter quarters are occupied in autumn, actual hibernation does not commence at once. The quantity of dung also shows that the Bats had been feeding, but whether within the caves or not I cannot say. There is plenty of food in the caves, even at a great distance from the entrance. Numerous gnats and small dipterous flies sleep on the walls, as well as the two moths *Scotosia dubitata* and *Gonoptera libatrix*, the former being the most abundant. A large spider (*Meta menardi*, Latr.) also abounds. Remains of this spider, and of a moth of the family *Tinea*, but not recognisable remains of either of the cave-haunting moths, are to be found in the dung. Many of the Bats uttered a chattering squeak when handled, and some bit savagely immediately they were taken from their holds.

'Outside the caves there is a natural arch, and in the roof a supplementary arch, where there is a hole, blind, water-worn, and smooth at the top. In August we found the floor of this hole thick with old dung, and when I entered it this time the smell of the recent dung was very strong. There were eleven Bats hanging to the top of this hole. We attempted to photograph them *in situ* (a failure) by flashlight, and directly the light was on, some of the Bats looked down, but none flew, although the hole was soon full of smoke. This hole, being nearer the outer air, was probably colder than the caves, so that hibernation may have been more profound. Nevertheless, these Bats, when brought out, squeaked and struggled, and were wide awake in a few seconds.

'The Bats have two distinct cries: one is a short, sharp "chap" or "chip," and

the other a chatter, pitched much lower than the high-pitched cry of most other Bats. The tail is carried in a recurved position when the Bat is placed in a recumbent position. So far as I could see, when watching the Bats flying round my room, the tail is still carried in an elevated position.

'The interfemoral pouch can be of no use to Bats when they want to secure a grip of their prey; but when I was feeding one of them, and had given it a large struggling mealworm, it several times put its head under the right wing, scraping the worm into position by pressing its head against the membrane. Once, but once only, it touched and moved the worm with the tips of the fingers, using the right wing. I found that sometimes the right, sometimes the left wing is folded over the other. The Bats use the thumb occasionally during their toilet, but as a rule use the feet. The long leg can be either brought below the belly or stretched up over the back to scratch the head. The last position is most curious. (See illustration.)

'The Bats show no desire to run, like Pipistrelles or Noctules; indeed, they seem awkward when on a flat surface. They are ever ready to jump up and take wing. They did, however, what a Noctule would not do, pick up bits of worm which they had dropped on the table. Can this mean that the Horseshoe sometimes feeds when at rest? I take it that the reason the Noctule does not trouble about anything that it has dropped is that it has no chance of recovering food dropped while on the wing.[1] In a room the wing movements are not very rapid, and the Bats constantly sail, as if gliding down an inclined plane, on motionless wings.

'I found them to be thirsty little things, drinking either milk or water.'

Mr. R. Newstead, who kept some of the Bats obtained on this date (November 1, 1903), was much struck with their powers of flight, and experimented to ascertain how far the legs and adjacent membrane were used for steering; he tied the legs of one Bat together and then released it, but he found that the Bat appeared to suffer no inconvenience and flew and dodged with perfect ease.

That the Lesser Horseshoe is no exception to the general rule that Bats seek a different summer and winter retreat is shown by Mr. Coward's researches; for he also visited the Tremeirchion Caves in July 1903, in order to obtain some Lesser Horseshoes for me, but found that there were no Bats in them at that season, although in early spring they frequent the galleries.

[1] *Cf.* Oldham, *Zoologist*, 4th ser. vol. iii. p. 471.

THE TYPICAL BATS

Family *VESPERTILIONIDÆ*

The distinguishing feature of the family *Vespertilionidæ* is the presence o a tragus or earlet, and, so far as all our British species are concerned, th absence of the nasal ornamentation so characteristic of the *Rhinolophidæ*. Th tail is contained within the interfemoral membrane, or is extended for a short wa beyond the edge. Our genera are distinguished from certain other genera, nc represented in Britain, by the fact that when the wings are closed in the positio of repose the first joint of the middle or third digit is extended in the line c the arm, instead of being folded back upon the metacarpal bone.

In the upper jaw there are either one or two pairs of incisors, and thre pairs in the lower; the premolars consist of from one to three pairs in the upp and either two or three pairs in the lower jaw.

Formerly the family was divided into four genera: *Synotus*, *Plecotu* *Vesperugo* or *Scotophilus*, and *Vespertilio*; now, according to Messrs. Gerr S. Miller and Oldfield Thomas, who have thrown much new light on the gener characters of American and European Bats and have also carefully studied t intricacies of nomenclature and corrected many errors, we have six—v *Barbastella*, *Plecotus*, *Vespertilio*, *Pterygistes*, *Pipistrellus*, and *Myotis*. These, course, are the genera which are represented by British species; other genera the family, as well as many species included in the six mentioned, occur in parts of the Temperate and Tropical zones.[1]

Genus *Barbastella*

The genus *Barbastella*—or, as it was until recently termed in defiance of t law of priority, *Synotus*—consists of only two species, our European *Barbaste barbastellus* and the Indian *Barbastella darjilingensis*. Bell considered that exhibited close affinities to the *Rhinolophidæ*, and therefore placed it at

[1] The recent changes in classification and nomenclature do not meet with universal approval, but we have considere wisest to follow Messrs. Miller and Thomas, whose careful researches will, we hope, lead to the general adoption of corrected names according to the laws of priority. If we only consider the animals which occur within the restricted limi our islands, the generic distinctions may seem slight and insufficient; but we have to face the fact that many other mem of a family are represented in other parts of the world, and in forms allied to our British species we find the specific differe so marked that the subdivision of genera becomes a necessity.



1 2 3 4. The Long-Eared Bat

5 6 7 8. The Barbastelle

end of the *Vespertilionidæ*, as a connecting link between the two families. Mr. Lydekker, however, gives it position between *Plecotus* and *Vesperugo*. I am inclined to place it in the position assigned to it by Professor Bell. The characters of the genus are given with regard to the British species.

The Barbastelle

Barbastella barbastellus, Schreber.

Vespertilio barbastellus, Schreber, 'Säugethiere,' i. 168 (1775).
Barbastellus Daubentonii, Bell, 'Brit. Quad.' p. 63 (1837); 2nd edit. p. 81 (1874).
Barbastellus communis, Gray, 'Ann. Mag. Nat. Hist.' ii. 494 (1838).
Synotus barbastellus, Keyserling and Blasius, 'Wirbelthiere Europ.' p. 55 (1840).
Barbastella barbastellus, Miller, 'Ann. Mag. Nat. Hist.' ser. vi. vol. xx. p. 379 (1897).

Characters.—Ears high and broad, starting from the centre of the forehead and almost touching on their inner margins; outer margins slightly concave, with a small projecting lobe on the upper third of the edge; tragus broad at the base, with a circular notch at the lower extremity of the outer margin, narrowing rapidly from the base towards a sharp point halfway up the centre of the true ear. Fur soft and deep, and of very fine texture; sometimes black, sometimes deep red brown;[1] the distal ends of the hair of the back grey or white, giving a beautiful silvery appearance to the coat. Flanks tinged with grey. Muzzle rather thin, and gape comparatively small. Feet very slender; wing membrane deep. Expanse of outstretched wings, about 10⅛ inches (258 mm.). Head and body, 60 mm.; tail, 38 mm.; ears, 12 mm. Dentition: I. $\frac{4}{6}$; C. $\frac{2}{2}$; P.M. $\frac{4}{4}$; M. $\frac{6}{6}$.

Distribution.—The Barbastelle was first described by Daubenton in 1759, and subsequently by Buffon, who found the species common in France. It is now known to range throughout southern Europe, and even into the more northern countries, being found in the south of Scandinavia according to M. Nilsson, and Brunchorst and Grieg ('Norge Pattedyr,' 1899, p. 5).[2] Beyond Europe it is found in northern Africa, temperate Asia north of the Himalayas, and in Arabia, but in India its place is taken by the closely allied *B. darjilingensis*.

Although a few examples of the Barbastelle have been recorded from midland

[1] This is a constant type, and not a variety, as described by Bell and more recent writers.

[2] In September 1900 I saw a Bat at Namsos, in Norway, which I believe was referable to this species; but as I saw it for a few seconds only, I may have been mistaken.—J. G. M.

and northern counties in England, it must be considered to be a southern species, and it does not occur in Scotland or Ireland. It was first noticed by Sowerby, some seventy years ago; he obtained an example from the powder mills at Dartford in Kent. I have seen specimens from the Chislehurst Cave in the same county, the place from which Bell obtained the living example which he describes in his 'British Quadrupeds'; it is now, I fancy, rare in that cavern, for my friend Mr. Hett, who has made several visits to this deep chalk cavern for the purpose of obtaining Bats, has never come across a Barbastelle. In the adjoining county of Sussex it is occasionally met with. Mr. W. Brasenor, in 1886, received an example which had been killed near Horsham,[1] and in July 1903 I shot a Barbastelle close to my house in Horsham. Unfortunately, the little creature was too close to my gun and I blew it to bits. I saw what I am sure was another Bat of this species close to the same place in June 1902. On a recent visit to Mr. Eardley Hall, of Henfield, I was shown by him a beautiful example of the golden-brown form of this Bat (figured on Plate III) which he had taken with two others from an old summer-house in his garden in the spring of 1880. Mr. Doubleday[2] found it not uncommon in Epping Forest, Essex; and Mr. H. Laver upholds this view, considering that it is probably frequently overlooked in the county.[3] Mr. R. Mitford recorded it for Surrey[4] from an example obtained in Richmond Park, and Professor G. R. Buckton captured it at Haslemere. In the summer of 1902 a Barbastelle flew into the bedroom of Mr. A. Thorburn, who resides at Hascombe, Surrey, and he kindly forwarded me the specimen in the flesh. Previous to this the species has been recorded twice within this county. Bell described the Barbastelle as being not rare in Warwickshire, but it does not appear to be really abundant anywhere now. It has been recorded from Worcestershire by Mr. R. F. Tomes,[5] where he says it is solitary in its habits and rare in its distribution; from Gloucester by Mr. H. Charbonnier,[6] who obtained an example which flew into a house in Stroud; from Northampton by Lord Lilford, who obtained three examples altogether[7] from that county and one from the roof of a cottage in Elton, Huntingdonshire.[8] Mr. Jenyns knew the Bat to have occurred in Cambridgeshire and Northamptonshire, and Professor Newton recorded it for Norfolk, where Mr. Southwell says it is not rare,[9] and Mr. J. H. Gurney has found it in Suffolk.

[1] *Zoologist*, 1887, p. 151. [2] *Ibid.* 1843, p. 6. [3] *Vict. Hist.*, 'Essex.' [4] *Zoologist*, 1860, p. 6953.
[5] *Vict. Hist.*, 'Worcester.' [6] *Zoologist*, 1892, p. 329. [7] *Ibid.* 1894, p. 187. [8] *Ibid.* 1894, p. 395.
[9] *Vict. Hist.*, 'Norfolk.'



THE BARBASTELLE.

BARBASTELLA BARBASTELLUS.

LIFE-SIZE.

Printed in Vienna

It is rare in the New Forest district in Hampshire, Mr. Hart having met with only one or two near Lymington in 1900; but I am informed by Mr. A. G. Berry that a small colony exists in the roof of Wells Cathedral, Somerset. In Dorset it has been found near Weymouth, and it is said to occur in both Cornwall and Devon. Passing further north, Leicestershire and Cheshire are mentioned as counties where it has been found, but the record for the latter county depends solely upon a specimen in alcohol in the British Museum, which is labelled 'Cheshire.'[1] The most northerly locality where the species has occurred is the neighbourhood of Carlisle, Cumberland; the Rev. H. A. Macpherson examined two examples in the collection of Mr. Bond which had been obtained near Carlisle by the late T. C. Heysham many years before.

Habits.—Mr. Eardley Hall, of Henfield, Sussex, who has had good opportunities of observing this Bat, tells me that it almost invariably comes out in broad daylight, and that it flies with the delicate uncertain flight of the Horseshoes. It flies low, and does not range far from its retreat. Mr. Hall's remarks about the diurnal flight of the Barbastelle are interesting, but may be the result of observations made upon a single colony, for my own experience does not lead me to think that this habit is general. Mr. A. G. Berry writes me 'that the Barbastelles in Wells Cathedral come out about the same time (dusk) as the Horseshoe Bats,' and this has been my opinion also. Certainly, the two specimens which I observed and one of which I shot at Horsham were hawking for food at 9 P.M. in June and July; they flew very low and with uncertain irregular flight. This Bat can be recognised by this flight—slow and erratic—as well as by the exceedingly black colour of the pelage; but if in the hand it cannot be confused with any other species, for the ears springing from the centre of the forehead are a character which distinguish it from all the other British Bats excepting the Long-Eared Bat, whose abnormally long ears, however, prevent confusion. German naturalists say that it will flit close past the observer, so near, indeed, that the flutter of its wings may be heard. They also state that it constantly changes its diurnal retreat, and Mr. R. F. Tomes confirms their remarks about its flight; he describes it as slow, irregular, and owl-like. Further observations on the habits of the Barbastelle are required.

Bell records an albino and a partially white variety of this species.

[1] Dobson, *Cat. Chir. in Coll. Brit. Mus.* 1878, p. 177.

Genus *Plecotus*

The genus *Plecotus* includes but two representatives, one inhabiting North America, and the other being found in Europe, Asia, and North Africa. The description of the European Long-eared Bat will supply the general characters of the genus.

The Long-eared Bat

Plecotus auritus, Linnæus.

Vespertilio auritus, Linn., 'Syst. Nat.' 12th edit., vol. i. p. 47 (1766).
Plecotus auritus, Geoffroy, 'Desc. de l'Egypte,' p. 118 (1812).

Characters.—The Long-eared Bat cannot be confounded with any other species, for its enormous ears are about the same length as its head and body—$1\frac{3}{4}$ inches—and when extended they give the animal a truly remarkable appearance. The tail, which is slightly prolonged beyond the interfemoral membrane, measures about the same. The tragus, which is very noticeable when the Bat is at rest, is also very large; it is rounded on its outer edge, and tapers to a point. The feet, compared with the other true Bats, are large and strong. The gape is wide, and the snout somewhat sharply pointed when the animal is viewed in profile: the nostrils are crescentic; the muzzle full, rounded, and abundantly furnished with hairs. The eyes are noticeable in life, being distinctly visible when the animal is looked at full in the face; this Bat does not seem so sensitive to light as some of the other species. The general colour is brown above and ashy grey on the ventral surface; immature Long-eared Bats are darker and greyer than adults. Dentition: I. $\frac{4}{6}$; C. $\frac{2}{2}$; P.M. $\frac{4}{6}$; M. $\frac{6}{8}$. Expanse of wings, 10 inches (255 mm.). Head and body, 45 mm.; tail, 45 mm.; ear, 33 mm.[1]

Distribution.—The Long-eared Bat has a wide range in temperate Europe and Asia, extending from Ireland in the west to China, and probably the Pacific coast, in the east. It also occurs in North Africa. In England it is found in every county, being one of the commonest species in our country lanes; the same may be said of Wales, though there are many parts of the Principality which have not yet been thoroughly worked by naturalists. In Scotland it is found throughout the southern counties, but is rarer in the Highlands. It is common about Perth

[1] These measurements were taken from a large female, but I have seen apparently full-grown males which did not reach these dimensions.



THE LONG-EARED BAT.

PLECOTUS AURITUS.

LIFE-SIZE.

and Dunkeld, where I have taken specimens; Mr. Coward has also had a number from Montrose. The late Mr. T. E. Buckley took a Long-eared Bat at Torcastle in West Argyle in 1884; and the late Mr. E. A. Alston states that it occurs in Arran, Islay, and Mull,[1] but he did not know of its occurrence in the Outer Islands, or in Orkney or Shetland. I am glad to be able to add this species to the list of Mammals of the Outer Hebrides. When I was returning from snipe shooting one August evening in 1900, I observed a Bat flying about the farm buildings at Balranald, North Uist. Thinking that it was a Pipistrelle I did not molest it; but two evenings later it flew past me at close quarters and I saw that it was larger and of a lighter colour than the Pipistrelle. Presently it returned to hawk round some stunted alders, and I shot it; I found it to be a Long-eared Bat.[2]

The Long-eared is one of the few Bats which have been recognised as occurring in the Isle of Man. Mr. Kemode did not know it as a Manx Bat, but in September 1885 one was shot at Bride and exhibited at a meeting of the Isle of Man Natural History and Antiquarian Society.[3]

The distribution of the Long-eared Bat in Ireland is so wide that it is safe to consider that it occurs in almost every county; in Kerry, Cork, Carlow, and Westmeath, it outnumbers the Pipistrelle. There is hardly an old church or cave where the Bat is not found, and the colonies appear to be larger than those we find in England. Mr. H. Lyster Jameson,[4] in his account of the distribution of Irish Bats, says that the best-known colonies of the Long-eared Bat are in the roofs and towers of churches, and states that large colonies exist in Kilmore Cathedral (co. Cavan), Charlestown church (co. Louth), Castle Macadam church (co. Wicklow), and Cappagh church (co. Waterford). In Leitrim and Monaghan this Bat is fairly common, but in Mayo it is considered rare.

Habits.—I cannot agree with Mr. Lydekker when he states, in his 'British Mammals,' that the Long-eared Bat is 'essentially an inhabitant of the open country.' Although, at times, it has a habit of hawking above and round the upper shoots of hedgerows, it is most distinctly an arboreal species, and may generally be observed after sunset flying in a delicate moth-like fashion in and out of the foliage of some large oak or ash. Such general statements, as that a Bat is an inhabitant of the open country, are open to criticism when they are the

[1] *Fauna of Scotland*, Nat. Hist. Soc. Glas. 1880.

[2] By a curious coincidence I saw a Camberwell Beauty butterfly on the same day, the only one I have seen in Britain; I failed to capture it, although I pursued it relentlessly for over an hour.

[3] *Manx Note Book*, 1886, ii. 48.

[4] *Irish Naturalist*, February 1897.

result of observation made at one particular time or season, and are not borne out by a close study of an animal under different conditions and in different localities.

In my garden at Horsham I see these Bats nearly every evening in the summer, and find that they never stay long about the hedgerows, but soon work back to some large oaks in my neighbour's garden, where they flutter in and out of the foliage until it is too dark to see their movements. This habit of hunting in the foliage of large trees is characteristic of the species, though it is shared by the Whiskered Bat. Wherever I have watched the Long-eared Bat, in Sussex, Suffolk, and Perth in Scotland, where there is a small colony in my uncle's garden at Bowerswell, I have always noticed its preference for large trees in a wooded district. This view is corroborated by Dr. N. H. Alcock and Mr. C. Moffat, whose paper on this species[1] is one of the most masterly accounts of the species which have ever been written. Nothing could be more accurate than the account given of the flight of this Bat and its manner of taking its prey.

'To observe this Bat on the wing, it is a good plan to wait at dusk under some tree whose foliage is not too dense to be seen through—an ash is probably the best that can be selected—and watch for its appearance among the branches overhead. From about thirty-two or thirty-five minutes after sunset, its figure may, almost any summer evening, be thus detected against the sky, gliding and hovering in a stealthy manner among the outer sprays of the tree. It threads its way with a beautiful facility among the twigs and leaves, often seeming rather to swim than to fly, so slight is the visible movement of the wings. Poising, at times, like a humming-bird, it appears to be picking something from the leaves; at other times it suddenly plunges into the middle of a spray, and remains for several seconds clinging to the twigs, no doubt securing or eating some insect. It is not uncommon to see one ash tree occupied at the same time by five or six of these Bats—though each comes and departs by itself—all gliding in the same noiseless and lemurine fashion among the leaves, and all, to the casual bystander, practically invisible. The long ears are often thrown forward so as to resemble a proboscis, and may be distinctly seen if the observer is posted immediately below the Bat.

'When one of these Bats leaves a tree, if its object is merely to pass to another quite near at hand, it darts through the air with a swift arrowy flight; but when a longer expedition is contemplated the mode of quitting the tree is different.

[1] *Irish Naturalist*, December 1901.

The Bat plunges headlong to within an inch or two of the ground, and then skims away in a jerking zigzag fashion—much as a nightjar does—over the surface of the field. The swift plunging descent taken on these occasions is very remarkable, and renders it a difficult matter to keep the animal longer in sight.'

Undoubtedly the Long-eared Bat takes some of its food on the wing, but for the most part it seizes the insects when they are at rest on the leaves. Many writers have recorded that they have seen these Bats taking small moths from the catkins of various willows in the spring, when the larger trees are still devoid of foliage; and on more than one occasion this species has been observed to alight upon the fresh dung of cattle and devour the red flies which infest it. Mr. J. Steele Elliott[1] apparently thinks that the Bat does not actually settle on the twig, but hovers in front of the blossom, in the manner described by Dr. Alcock, to take the nectar-stupefied moth. I think, however, that Dr. Alcock is right: sometimes the Bat remains on the wing and sometimes it settles on a twig. From the windows of my study I have seen a Long-eared Bat come into the rose garden, and hawk in and out among the bunches of violas and tufted pansies growing close to the ground, and from which it certainly obtained some insects. It never actually settled on a flower, although it appeared about to do so many times, but searched in and out of narrow spaces which I could not have imagined it could fly through without striking its fluttering wings.

The food of the Long-eared Bat appears to be varied, although there can be little doubt that moths are its principal article of diet. The remains of various species of Coleoptera and Diptera have been found in its droppings; in captivity, like all other Bats, it seems to prefer mealworms to any other food, but it also eats the common bluebottle with avidity, and will not refuse raw meat. Mr. O. V. Aplin[2] was of opinion that at Bloxham, Oxfordshire, at any rate, the moths which were mostly devoured were the Buff Ermine (*Spilosoma lubricepeda*), the Yellow Underwing (*Triphæna*), and the Silver Y (*Plusia gamma*); he judged from the litter of wings left in an outhouse by the feeding Bats. Mr. J. E. Harting says[3] that several species of *Tæniocampa* are taken from the blossoms of the sallows by this Bat.

When capturing its prey the Long-eared Bat, in common with several other species, uses the interfemoral pouch as a trap or bag in which to hold its captive until it is firmly gripped. Mr. C. Oldham's careful observations on the mode in

[1] *Zoologist*, 1897, p. 231. [2] *Ibid.* 1889, p. 382. [3] *Ibid.* 1889, p. 245.

which Bats secure their prey[1] sum the matter up, and, as he remarks, clear up several loose statements of former observers.

'When walking, most of our British Bats carry the tail curved downward and forward beneath the body, the interfemoral membrane forming a pouch or bag. If a moth or other large insect be encountered, the Bat seizes it with a rapid snatch, slightly spreading its fore-limbs with the wings still folded, and, pressing them firmly on the ground at the carpus in order to steady itself, brings its feet forward in order to increase the capacity of the pouch, into which, by bending its neck and thrusting its head beneath its body, it pushes its prey. If the moth be a large one, the Bat often struggles convulsively for a few seconds before it can adjust its grip to its satisfaction; but once in the pouch the insect rarely escapes, and, when effectually secured, is brought out and eaten openly. If the Bat can be induced to feed while hanging head-downwards, suspended by its toes, its actions can be observed much more easily. Its tactics are then more efficacious, as the tail is not pressed close to the belly, and the pouch is, in consequence, held open, as it would be, of course, during flight.' He then remarks that Bats which capture most of their food on the wing probably use the pouch in this manner, and 'one species, at any rate, has actually been observed to use the interfemoral membrane as a pouch when on the wing.' My friend Mr. J. R. B. Masefield writes: 'I have no doubt whatever that the Long-eared Bat makes use of the interfemoral pouch in the way you mention. I have been close to them when picking moths off sallows, and the Bat always hovers when taking off the moth, and bends up the tail so as to form a receptacle for the insect as it drops. As you know, the sallow-feeding *Noctuæ* (*Tæniocampa gothica*, *stabilis*, *instabilis*, *cruda*, &c.) all drop immediately the flower or bush is touched or shaken, and thus the head of the Bat and the interfemoral pouch form a trap from which the moth cannot escape.' Both Mr. Oldham and Mr. Coward have experimented with Long-eared Bats, and have found that large moths, such as *Scotosia dubitata* and *Gonoptera libatrix*, both of which winter in the caves in which the Long-eared Bats hibernate, are invariably pouched; and even a large and lively mealworm was treated in the same manner, but smaller insects were eaten openly.

Mr. William Jeffery, of Chichester,[2] observed that the Long-eared Bats which frequented his porch used to hang suspended from the roof and in that position devour the moths and beetles which they had captured, allowing the wings and elytræ to fall to the ground. He also watched a number of Bats of this species

[1] *Zoologist*, 1899, p. 471.

[2] *Ibid.* 1890, p. 71.

feeding upon *Plusia gamma*, a moth which was then swarming round the blossoms of an arbutus. Many of the moths were picked from the blossoms, the Bats closing their wings and folding back their ears while they devoured their prey; but he does not state whether they clung to the twigs or hung suspended.

Like all our other Bats, excepting perhaps the Pipistrelle which comes out in almost any summer weather, the Long-eared Bat seems to be much affected by atmospheric conditions. In dull thundery weather it seldom appears, and even on fine evenings after rain, when insect life is especially abundant, it is somewhat uncertain if we shall observe it abroad; in 'set fine' weather it may be looked for from thirty to forty minutes after sunset. Some individuals, however, will not emerge from their retreats so early; indeed we find, if we observe Bats, that the first few examples which we notice on the wing by no means prove that all of that species have waked up and gone abroad. Bats will leave their retreats at intervals of many minutes, and on some nights, when perhaps the weather is not very enticing, only a few out of a colony will venture forth at all.

The Long-eared Bat is nocturnal and not crepuscular, as some other species undoubtedly are. Whether, at all times, it remains out all night is a question which cannot be easily settled, but that it does feed and fly much later than other species, and is also frequently abroad in the early hours of the morning, is certain. Mr. Tomes[1] says: 'At all hours, through the dead of the night, and in the darkest nights, in the open fields, or elsewhere, we have heard the shrill chatter of the Long-eared Bat over our heads, its voice, once known, being easily recognised from that of any other species.' Alcock and Moffat[2] also state that some interesting observations were made at midnight and after midnight during the third week of August at Ballyhyland; a Long-eared Bat visited a conservatory during the night, feeding upon insects which had entered through the open door. They have also observed it feeding in the early morning until about an hour, and sometimes rather less, before sunrise. Other writers have commented upon this fact.

In Ireland and in the south of England, at any rate, the Long-eared Bat begins to hibernate about the middle of October, though individuals are frequently noticed on the wing later in the year. During cold weather they retire to some cave or other warm retreat and sleep continuously, with the large ears tucked away beneath their wings and the tragus protruding. They are, however, the lightest sleepers of all our Bats, and if disturbed will generally wake up, chatter, and attempt to bite if touched. There is abundant evidence to prove that

[1] Bell, 2nd edit. p. 75.

[2] *Irish Naturalist*, Dec. 1901, p. 244.

this species will break the winter sleep if the weather becomes warm. Even in caves and old buildings they will, when hibernating, shift their position from one crevice to another. Mr. C. Oldham experimented on the Long-eared Bats which winter in the sandstone tunnels at Alderley Edge, sometimes marking individuals and sometimes only recording the spot where they were hanging without disturbing them; he found that in both cases the Bats frequently moved. Dr. Alcock and Mr. Moffat give[1] the results of a series of interesting observations made upon a Long-eared which had chosen a hole in a beech for its winter quarters. It was discovered first at the end of December, and when a finger was inserted into its sleeping-place it snarled savagely; next day it had gone, and it did not return until after a frost which ended on January 3, when the thermometer remained at 46° until midnight. For three weeks it slept in the hole, being examined nightly, and never seemed to change its position; when, however, the thermometer was as high as 44° the Bat fidgeted during sleep. When, on Feb. 12th, the temperature rose two degrees still higher, it became restless, crept to the mouth of the hole, and sat for about three hours on the trunk with its eyes open but with its ears still folded back. The temperature still rose, but a high wind, which became a storm, drove the Bat back into its hole; yet it came out again the next evening. For a week it remained asleep, although the temperature was 51° on the 21st. Next day it was missing, and a long spell of cold weather set in; no doubt the Bat had retired to warmer quarters. For a few days during March it returned, and then it was not seen again until April 10.

'By this period of the spring one might have supposed that its hibernation was over; but the Bat's conduct proves the reverse, for during the next three nights—April 10, 11, and 12—it did not fly at all. On the 10th it was visited with a lantern at 7.35, 9.5, and 11.5 P.M.; on the 11th at 8.45 P.M.; and on the 12th at 8 and 10.30 P.M.; and on all these occasions was seen sound asleep. On the evening of April 13, however, it quitted the hole at 7.45 P.M., and did not again return. On the same night a Bat of this species—probably not the same individual—was seen flitting round a willow. The respective temperatures for the four nights of April 10 to 13, taken about 8 P.M., were 43°, 41°, 43°, and 45°.'

To these remarks the authors add that 'hibernation in the case of the Long-eared Bat, at any rate, is not as profound or as unbroken as was at one time supposed, but is repeatedly interrupted; and, apparently, this is liable to occur whenever the thermometer rises above 46° F.'

[1] *Irish Naturalist*, 1901, p. 245.



LONG-EARED BATS HUNTING FOR FOOD.

These bats are fond of closely investigating oak foliage and pick the insects off the leaves.

The same observers incline to the view that this Bat frequently passes the winter in a solitary condition, which is a fact I have often observed. I have taken four examples in St. Leonard's Forest, all hibernating alone; and on four visits to Mr. Heatley Noble's cave at Henley I have seen eight Long-eared Bats, all of which were hanging by themselves in crevices. Messrs. Oldham and Coward have observed the same thing in the Alderley Caves; they have never met with the Bats there in clusters.

In summer, Long-eared Bats are frequently gregarious; I have found them partial to old boathouses, cowsheds, and the roofs of churches. I believe this species is the only British Bat which will pass the summer months actually in the open, sheltered only by the roughness of the bark of a tree on which it has chosen to sleep. On three occasions, when strolling through the woods of St. Leonard's Forest, close to my house, I have been attracted to a particular tree by the cries of this Bat, and on searching the bark have found a Long-eared. In one case the selected tree was a Scotch fir, and the Bat was snugly ensconced in a depression in the bark; on another occasion, after half an hour's search, rendered difficult by the ventriloquial qualities of the Bat's voice, I discovered three together; they flew at once, in broad daylight, when I attempted to capture them. Mr. Coward has found them clinging to the bark of a birch, and has known them shelter in summer in the holes in beeches. They will also hide behind window shutters; but in winter they show a marked preference for caves, though hollow trees and the eaves of old houses are sometimes resorted to.

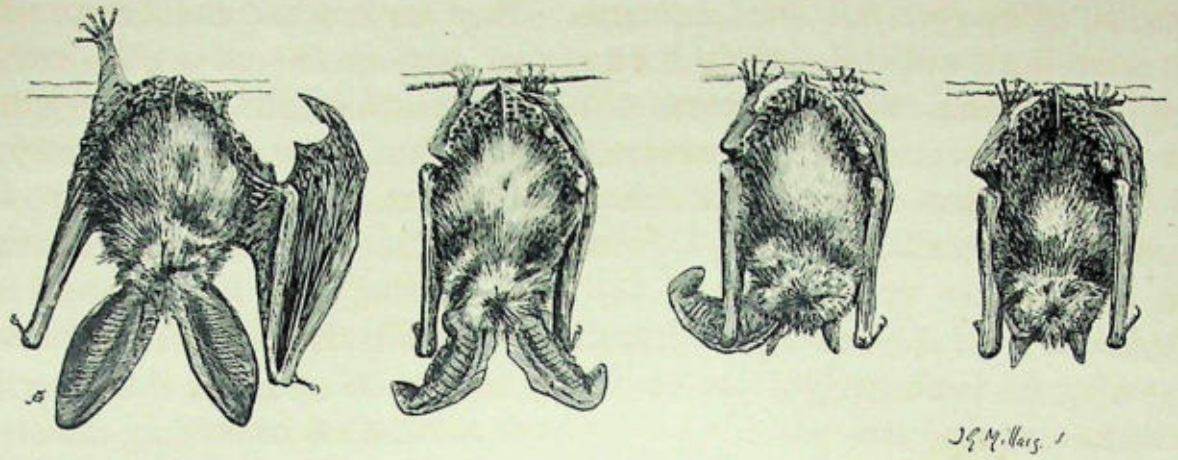
Changes of locality are by no means infrequent: a colony will abide for the summer in some old building or shed, deserting the place for warmer situations before the winter begins; but often these summer gatherings collect for only a few weeks during the latter part of the summer or early in autumn. From this Messrs. Alcock and Moffat deduce that 'since these swarms are so much more frequently noticed in July and August than at other seasons; and since there is also evidence' (as in an instance cited) 'that they are not composed exclusively of the young of the year' (a statement which some authors have made), 'it seems natural to infer that the social instincts of this species are strongest in summer, and that individuals which have lived solitary lives during the rest of the year become, at that season, gregarious.'

The Long-eared Bat is easily kept in confinement; I have known them remain in good health for a considerable time under such conditions. Though shy just at first, they soon become tame, and will fly to their owner and take a

mealworm or fly from his hand or dress. They are brighter and more intelligent than other Bats, and two which I kept were ever on the alert and lively, even during the daytime. One of these, which I obtained in mid winter, appeared to be as lively when released in a room as if it had never been to sleep at all. This Bat, like my Greater Horseshoes, found no difficulty in rising from a perfectly smooth surface; indeed, I do not think that Bats often do. It would fly round and explore every corner of the room, turning and twisting with agility. The ears were carried well forward in flight. Unlike the Horseshoes, however, it always alighted in an upright position, clinging first to an object with the thumbs, and then reversing its position; it would sometimes remain in this unusual position for a few minutes. When climbing or walking it used the limbs alternately, advancing with a curious jerky movement, more awkward on a flat surface than on an upright climb. This Bat can run with a considerable speed. When about to fly, the head is raised, the ears pricked forwards, and the animal looks about with a particularly intelligent air, as if taking in all its surroundings. When in this position its eyes look very bright and intelligent. It will sometimes hang by one foot when going to sleep, allowing the other foot to stand out free, but this curious position is by no means peculiar to the Long-eared Bat.

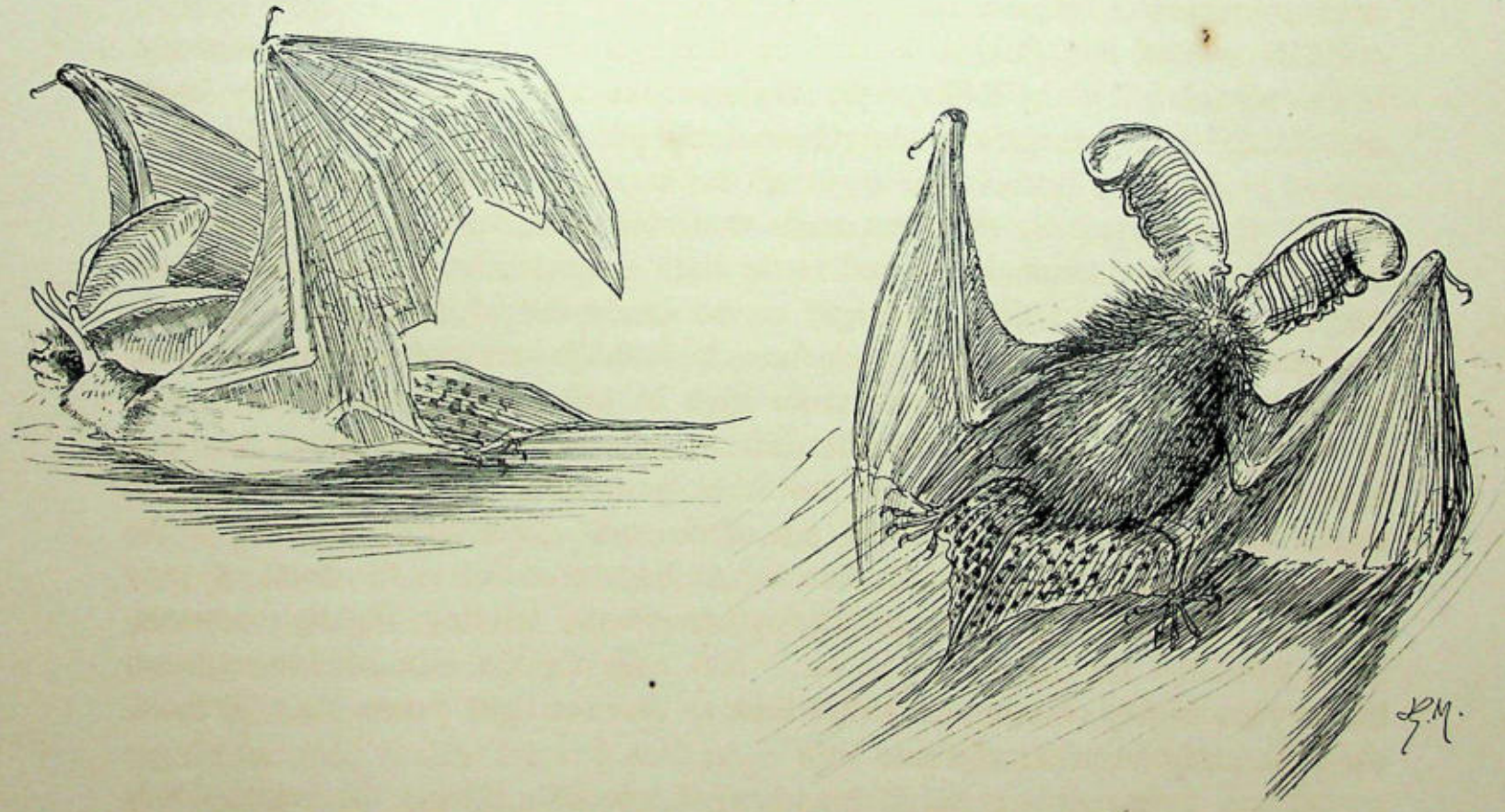
The ears of this Bat are so striking that a longer description is necessary. In the second edition of Bell (p. 78) they are thus described: 'Enormously large, oval-oblong, semi-transparent, and transversely plicated; the outer margin commences immediately behind the angle of the mouth, and the inner third of its breadth is supported by three extremely thin slender cartilages, the elasticity of which must tend to restore the ear to its erect position after being turned under the arm during sleep; these cartilages extend nearly the whole length of the ear, and the inner margin is bent back from the middle cartilage, forming a broad longitudinal fold, which is ciliated at its edge, as well as along the carina formed by its duplicature. About a line from its base is a small lobe projecting laterally, so that when the ears are erect the two lobes touch each other; this lobe is hairy, thicker and more opaque than the rest of the ear. Immediately beneath it the ears are united over the forehead, forming an angular notch at the point of their junction. Tragus elongate, lanceolate, rather obtuse, bending slightly outwards, about two-fifths the length of the ear.' Not only are the ears semi-transparent, but they are highly vascular, and when held so that the light passes through them, are remarkably beautiful objects.

When preparing to sleep, the Long-eared Bat brings the ears slowly



A LONG-EARED BAT GOING TO SLEEP (FROM LIFE).

Notice the manner in which the ears are gradually relaxed and folded under the arms, only the tragus or ear coverlet protruding.



A LONG-EARED BAT SWIMMING (FROM LIFE).

downwards, and they have at first a 'kink' in them; sometimes they are bent backwards deliberately until they lie close along the body, covered by the projecting elbow-joint, but sometimes they are folded smartly back with a sudden action, though the eyes of the Bat remain open and watchful for a considerable time before sleep overtakes it. The tragus always points forward, and the ordinary observer may well be excused for mistaking the tragus of a sleeping Long-eared for the true ear. The folds in which the closed ear lies are remarkable, and when the Bat wakes up it unfurls them slowly and with deliberation, often remaining for some time with them at 'half-cock.' The ears do not always work simultaneously, and quaint indeed is the appearance of the little creature when one ear is fully extended and the other either entirely closed or only half unfurled. I have found them in their retreats hanging in this curious posture.

That these ears are organs of great sensitiveness can be well imagined from the way in which the animal uses them, pricking them and moving them forward; when searching a tree for moths they are directed forward, but when the Bat is flying they are held well in line with the head. M. de Jurine's cruel experiments, following on those of the Italian naturalist Spallanzani, showed that when the ears were closed the animal was more or less helpless, banging against objects in its flight, although the loss of sight did not appear to inconvenience it. Bingley, in his 'British Quadrupeds' (1809, p. 45), enlarges upon the ideas of Edwards, and Pennant, that the tragus is specially formed to act as a valve to the large sensitive ears when the creature is asleep; they are, he says, 'evidently given to the animals for the purpose of keeping out noxious insects, and preventing any other extraneous matter from entering their head during sleep.' This notion, however, is false, as any observer can see for himself if he will examine a sleeping Long-eared Bat; the tragus does not seal up the auditory opening, but hangs free.

The Long-eared Bat is rather quarrelsome in its disposition, and will attack and bite Bats of any other species which venture into its retreat. It has been noticed to attack and drive away the Pipistrelle from the neighbourhood of its feeding-ground. If kept in confinement, it is wisest to place this species in a cage by itself. Mr. W. Storey[1] found, moreover, that some captive Long-eared Bats made short work of a young one which was confined with them, not only killing it, but devouring it entirely.

In different circumstances this Bat, as well as other species, has considerable

[1] *Naturalist*, 1886, p. 21.

power of variation in its voice. One call is uttered when signalling to its own species, and apparently the same note is uttered during a quarrel; but a very different cry—a querulous, long-drawn, childlike note—is used when it is handled or surprised. The usual chirping squeak—the first-mentioned call—is often pitched so high that many people are incapable of hearing it at all.[1] The shrill call is uttered both when the animal is at rest and on the wing, and young Bats, only a few days old, can use the same cry.

The female Long-eared generally gives birth to only a single young one; the young are born about the beginning of June.

As a rule, I should say, this species is less troubled by parasites than is the case with the other British species; the Long-eared, like other Bats, is cleanly in its habits, performing an elaborate toilet after feeding, and Bell says that one Bat will even assist another in this office, but I cannot say that I have ever noticed this myself. Like other Bats it is playful, pretending to bite, but not injuring others of the same species when running up against or over their bodies.

Albinism is considered rare in Bats; but we must, before taking this as a fact, remember that comparatively few of the great numbers of Bats which inhabit our islands come under the direct notice of observers. I have seen or heard of a good number of white or partially white varieties of the Long-eared Bat. The most perfect albino of any British mammal which I have examined was a Bat of this species in the collection of the late Mr. W. Borrer, of Cowfold, and which is now in the Dyke Road collection at Brighton. It was captured at Horsham, Sussex, in May 1872. Another was taken here in the same year: it passed into the collection of the late Mr. F. Bond, of Staines, and from him to the possession of Mr. J. Whitaker, of Rainworth, Notts. A cream-coloured variety was obtained in Norfolk, and I have seen another in the Science and Art Museum, Dublin. Mr. Oxley Grabham mentions[2] one which was found at Alresford, Hants, and Mr. C. Oldham and Mr. Baring each recorded examples in the pages of the 'Zoologist' (1890, p. 349, and 1898, p. 261). The specimen which Mr. Oldham mentions was captured at Goosnargh, Lancashire, in 1866; it was light cream colour, and had pink eyes and nails. Mr. W. E. Clarke[3] records a melanic Long-eared Bat, which was captured at Masham, Yorks.

[1] There is an old superstition in Sussex that persons over forty years of age are unable to hear the cry of the Bat; but this idea doubtless arises from the fact that the hearing of most people declines with age. There is a note on the organ so high and shrill that only those with the best hearing can distinguish the sound.

[2] *Field*, 1902, xcix. 476.

[3] *Naturalist*, 1894, p. 68.

Genus *Vespertilio*

According to the law of priority the genus *Vesperugo* of Keyserling and Blasius must give place to the older genus *Vespertilio*, and Miller further subdivides the genus into *Pterygistes* and *Pipistrellus*. By the same rule the *Vespertilio* of Dobson and others become *Myotis*.

The ears, in *Vespertilio*, are comparatively small, rounded, and set far apart. The outer margin starts from behind the angle of the mouth, anterior to the tragus, which is short, and has its outer margin convex and its inner concave. The inner margin of the ear arises just behind the eye, which is small, and both inner and outer margins, at their points of junction with the head, are distinctly lobed. The muzzle is short, broad, and full; the face scantily clothed with hair. Below the calcaneum, or spur, there is a lobe or rounded expansion of the interfemoral membrane. The tail is shorter than the head and body. There are two pairs of incisor teeth in the upper jaw, and three in the lower, one pair of premolars above and two below, and three pairs of molars in each jaw.

Species belonging to this genus are found distributed throughout the world, with the exception, however, of the Polar regions. Only one species occurs in our Islands, though another has been included, without just claim.

The Serotine

Vespertilio serotinus, Schreber.

Vespertilio serotinus, Schreber, 'Säugethiere,' i. 167 (1775).
Scotophilus serotinus, Grey, 'Mag. Zool.' ii. 497 (1838).
Vesperugo serotinus, Keys. and Blas. 'Wiegmann's Arch. für Nat.' p. 312 (1840); Dobson, 'Cat. Chir. Brit. Mus.' p. 191 (1878).

Characters.—Ears broad and rounded at the tips; inner margins slightly convex, with a rounded lobe at the base. Outer margins straight; emarginate opposite the base of the tragus, and with a convex lobe behind the mouth. Tragus much larger and more pointed than in *Pipistrellus*; broadest above the base of the inner margin of the true ear, thence narrowing to a rounded tip; inner margin only slightly concave, outer convex, with a small lobe at the base.

Head broad and flat; upper lips full and scantily clothed with hair; the rest of the face almost devoid of hair. Pollex thickened at the base, perhaps the rudiment of a suctorial disc. Calcaneal lobe narrow and insignificant compared with *Pipistrellus*.

Colour: dark brown on the dorsal surface, the fur having a peculiar glossy or oily appearance; under parts paler, with a varying tinge of grey or yellow. In different parts of the range of this species considerable variation occurs in the pelage, but as complete seasonal and age series of skins are lacking from most places, it is unwise to dogmatise.

Expanse of wings, from 12 to 13 inches[1] (300 to 325 mm.). Head and body, 70 to 77 mm.; tail, 47 to 52 mm.

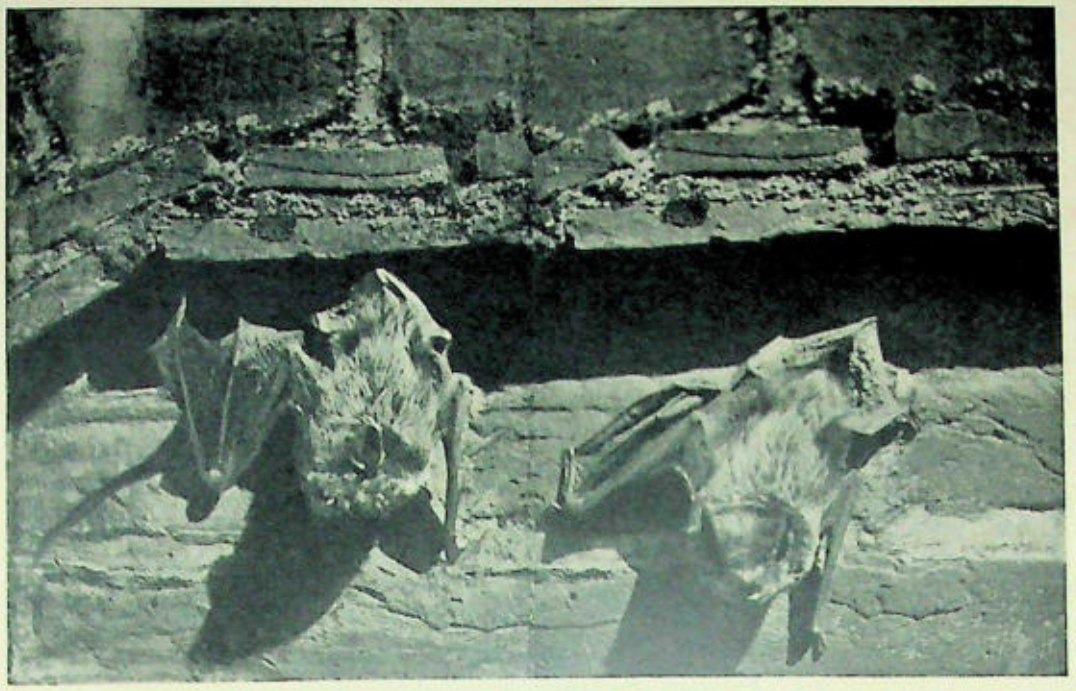
Dentition: I. $\frac{4}{6}$; C. $\frac{2}{2}$; P.M. $\frac{2}{4}$; M. $\frac{6}{6}$. The teeth, especially the canines, are very strong; the upper incisors are bifid, and the lower trifid and crowded.

Distribution.—This Bat has a very wide distribution, being found throughout temperate Europe, and in Asia as far east as Western China; it has been stated to occur in Japan. In Africa it ranges as far south as the Gaboon, where a form with paler under parts is found. In North America it ranges from Winnipeg to the Isthmus of Darien and the West India Islands, and is even said to frequent some parts of South America.

In the British Islands it is decidedly rare and local, being confined to counties in the south or south-east. Kent is the only county in which it may be said to be common; it occurs near Folkestone, Maidstone, Canterbury, Riverschurch, Charlton, Waldershare, Dartford, Wingham, and Yalding, and no doubt in other places from which it has not yet been recorded. At Yalding it is quite common, and Colonel Savile Reid tells me that not infrequently a hundred individuals may be seen on the wing at one time.

In the neighbouring county of Sussex the Bat is much rarer, being found in only a few localities. In October 1851 the late Mr. W. Borrer obtained ten Serotines from Waldershare, near Dover, and released them near his house at Cowfold. When hibernation was over in the following April, he could only discover that three or four remained, but these stayed in the neighbourhood until the autumn, disappearing in October; the following spring he did not see any. In 1870 or 1871 Mr. Borrer found that there was a considerable colony of Serotines at Henfield, and as he felt sure that many years before there were none

[1] Mr. W. Ogilvie Grant tells me that he has measured an unusually large male which taped more than fifteen inches across the wings.



A SEROTINE EMERGING FROM ITS RETREAT.
Photographed from life at Fawkham, Kent, by BERNARD BUTTRESS, M.D.



SEROTINE BATS ON THE WING.

in that neighbourhood, he concluded that his Bats had migrated thither and had settled down.[1] Mr. Eardley Hall, who now lives in Mr. Borrer's old house at Henfield, informs me that the Serotines are still there, but I did not see anything of them when visiting there in 1901, 1902, and 1903. Mr. Hall has not seen them during the last two years.[2] He discovered a colony of Serotines in the Vicarage, Burpham, near Arundel, in April 1893, when he counted eighteen in all, and while handling them was so severely bitten that blood was drawn.[3] In the following year he found that there was a colony in Arundel church; and two Serotines, identified by Mr. W. B. Ellis, were taken from the church on October 5, 1893, while another was obtained from a locality a few miles distant,[4] from which we may conclude that the Serotine occurs regularly in this district. Another colony, consisting of about twenty Bats, exists at Guestling Rectory, near Hastings;[5] the Rev. E. N. Bloomfield writes me, saying that he first noticed the Bats there in 1888. The Serotine is also known to occur at Fairlight, near Hastings.

Mr. H. Laver failed to find this species in Essex, but Mr. Miller Christy added it to the list of Essex mammals. Some time prior to the sixties one was shot at Coggeshall, and Mr. Christy identified the specimen, which had been preserved,[6] and he captured one himself in his bedroom at Pryors, Broomfield, on August 25, 1894.[7]

The Serotine is rare in Hampshire. The late Lord Lilford had specimens sent him from that county,[8] and he was of opinion that it also occurred in Northamptonshire; but Mr. L. E. Adams,[9] though describing the Bat as rare and local, does not produce any further evidence of its occurrence than Lord Lilford's supposition. In the Isle of Wight it is commoner, being reported by the Rev. C. Bury, Messrs. Bond, Hadfield and Moore,[10] and others, from Bonchurch, Sandown, Freshwater, and Ventnor. All appear to be agreed, however, that it is rare nowadays in the island, and I failed to obtain a single specimen in 1902.

According to several writers the Serotine has occurred near London, but Mr. J. E. Harting failed to find that it had been noticed in the county of Middlesex. In the Midlands its occurrence seems to be very casual, and I can only find one or two reliable instances: Mr. Coburn informs me that some years ago one was sent to him which had been captured in the neighbourhood

[1] *Zoologist*, 1874, pp. 4, 126.
[2] In 1903 Mr. Hall again reports Serotines as fairly numerous at Henfield.
[3] *Zoologist*, 1893, pp. 223, 224.
[4] *Ibid.* 1893, p. 458.
[5] *Ibid.* 1894, p. 261.
[6] *Ibid.* 1883, p. 173.
[7] *Ibid.* 1894, p. 423.
[8] *Ibid.* 1887, p. 65.
[9] *Vict. County Hist.*, 'Hants.'
[10] Harting, *Zoologist*, 1891, p. 201.

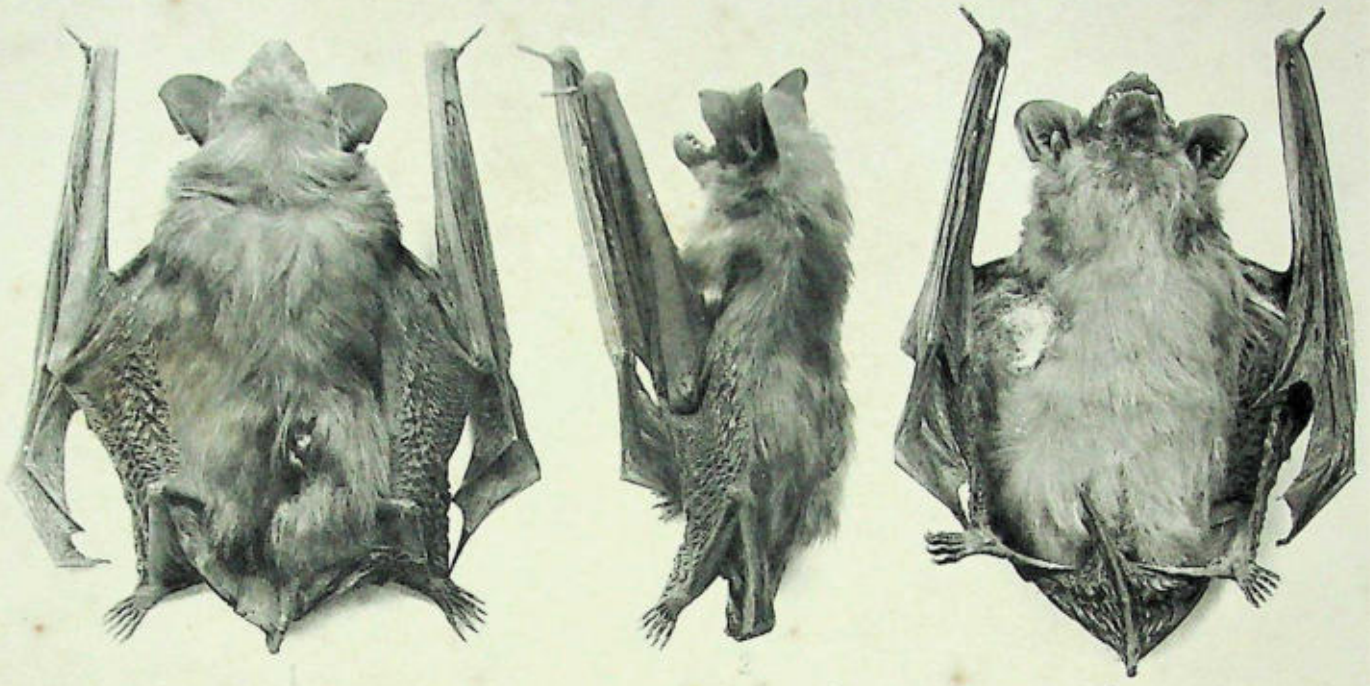
of Birmingham;[1] this is probably the northern limit of its range in Britain. A Serotine from Tintagel, in Cornwall, is recorded in Dobson's 'Catalogue of Chiroptera in the British Museum.'

The Bat which figured in the Newcastle-on-Tyne Museum catalogue as a Serotine was examined by Mr. W. D. Roebuck, and proved to be, as suggested by Mr. Harting, a Noctule. The species does not appear to occur in Wales, Scotland, or Ireland.

Habits.—The Serotine, a Bat which was first described by Daubenton in 1759, is crepuscular in its habits, emerging on fine evenings rather later than many other species; in June and July it does not come forth until a little before nine. In many of its habits the Serotine resembles the Noctule, but its flight is different, being more fluttering and uncertain. It may be distinguished on the wing by the fact that the tips of the wings are more pointed than in the Noctule. Like the Noctule it does not always fly in the same way: Mr. Eardley Hall says that it nearly always flies with a fluttering, uncertain flight, keeping very low down; but Colonel Reid tells me that in the neighbourhood of Yalding he has seen it, on fine evenings, flying at a great altitude. According to my experience both are, in a measure, right; when the Bat first emerges from its retreat it flies low, hovering above the bushes and the outer branches of trees in order to catch moths, but as the light fades, it mounts higher and higher, until, just before darkness sets in, it has ascended far above gunshot. It is not easy to account for this alteration of altitude, which is, certainly sometimes, reversed in the case of the Noctule; but it may be that the Bat ascends to feed upon certain high-flying and late-appearing insects, or perhaps the insects upon which it feeds at a low altitude ascend themselves when the light fades. The manner of flight is so different from that of the Noctule that we can hardly draw a parallel; but the latter Bat does not often rise to a great height gradually, but generally, after a beat or two up and down the glade near its retreat, an altitude of forty feet or so, mounts rapidly to an elevation of as many yards or more.

A characteristic common to both species is a sudden, oblique, and headlong dive during flight; this may be caused by the dart after some prey which is flying below them, or it may be aerial play—delight in the wonderful power of flight. This 'header' is perhaps more noticeable in the Serotine than in the Noctule; in the former Bat the manœuvre is frequently repeated. Mr. Oxley Grabham, writing to the 'Field,' March 29, 1902, says that he has shot a Serotine

[1] *Zoologist*, 1892, p. 403.





1.2.3.4. The Serotine 5.6. The Pipistrelle

(two thirds life size)



THE SEROTINE.
Vesperugo Serotinus.
5/6 Natural size.

Litho. W. Greve, Berlin.

with the thumb hooked into the wing of a cockchafer, and believes that the pollex is frequently used to rend hard-bodied insects when the Bat is flying. He further considers that the dive may be caused by the loss of balance when the thumb, and consequently the wing on one side, is thus temporarily disabled. As there is no evidence to support the theory that the thumb is used for this purpose, and as the 'header' is a distinct dive, and not a tumble, we do not think that Mr. Grabham's argument is sound. When a Bat is shot, and one wing broken, it comes down either straight to the ground, or falling over and over in the air; the Bat, when diving, has complete control over both wings. Probably the thumb of the Bat which Mr. Grabham shot had become entangled in the wing of the beetle which it had just caught, either when it received the charge of shot or as it fell.

Both the Serotine and Noctule are apparently influenced by atmospheric conditions, being sensitive to cold and damp; they seldom appear unless the evening is fine and warm. If the weather is 'set fair,' during a long spell of warm weather, we may see many on the wing. The Serotine does not come out so early in the evening as the Long-eared, Pipistrelle, and Daubenton's Bat, but when a colony is waking up the members follow one another out of the exit hole with rapidity, and there is not so much struggling and squeaking prior to emergence as when a colony of Noctules are coming out for the night. The Serotine, though showing a preference for the neighbourhood of trees and wooded gardens, will range freely over the open country, but it does not appear to wander so far abroad as the Noctule.

Although the Serotine is often described as a solitary Bat, in this country at any rate it appears to live in small colonies in old churches, hollow trees, or cottage roofs. The last-named resort is a favourite one, and, considering the size of the animal, it is surprising how small the entrance hole often is. Mr. Eardley Hall told me of the difficulty he experienced when trying to obtain a specimen from a cottage roof at Burpham, in Sussex; the Bats were not far in beneath the eaves, but he was unable to get them out, although he fished for them for about an hour, until it occurred to him that the smoke from his pipe might be of use. He blew some smoke into the hole, causing dire confusion among the inmates, who came swearing and coughing to the mouth of the hole, fighting to get out. As he captured them they all attempted to bite, and the one which he retained made its canines meet in the back of his hand. Serotines and Noctules, being provided with strong and very sharp teeth, require careful handling. In Paris it

is said that Serotines spend the day in the piles of wood which are brought to market; it is worth mentioning that nearly all the hitherto published accounts of this Bat's habits have been largely taken from the experiences of continental naturalists; the able article by Mr. J. E. Harting, and other notes which have appeared from time to time in the 'Zoologist,' are perhaps the only exceptions.

The Serotine appears to retire for hibernation rather earlier than the Noctule, and it sleeps until the beginning of April. According to the observations of the French and other continental writers, the Serotine produces only a single young one at a birth; the young are born early in June.

The following parasites were taken by Mr. Oxley Grabham from the pelage of a Serotine: *Typhlopsylla elongata*, *C. octactenus*, *Argas pipistrellæ* and *Sarcoptes vespertilionis*.

There is still plenty to learn about the habits and hibernation of this interesting Bat, as indeed there is about even the commonest of our British species.

The Parti-coloured Bat

Vespertilio murinus, Linnæus.

Vespertilio murinus, Linnæus, 'Syst. Nat.' 1st edit. x. 32 (1758); Nilsson, 'Skand. Faun.' p. 17 (1847).
Vespertilio discolor, Natterer, in Kuhl, 'Deutsch. Flederm.' p. 43 (1819).
Scotophilus discolor, Gray, 'Mag. Zool.' ii. 297 (1838).
Vesperugo discolor, Keys. and Blas. 'Wiegmann's Archiv für Nat.' p. 312 (1839); Dobson, 'Cat. Chir. Brit. Mus.' p. 204 (1878).

Schreber's *Vespertilio murinus*, the Mouse-coloured or Common Bat of the Continent, was not the species to which Linnæus gave the name in 1758. Linnæus did not know the Mouse-coloured Bat, but he *did* know the Scandinavian *Graaskimlet flaggermus*, or 'Tabby' Bat, and named it *Vespertilio murinus*. The oft-repeated error was corrected by Mr. G. S. Miller.

The Parti-coloured Bat is referred to here only because it has been included by other authors, but it has no claim to a place in the British fauna. It has been found twice in the country, though the first occurrence appears to have slipped the notice of most writers. Mr. Hancock has an example which was taken, in the year 1834, from the rigging of a vessel in Yarmouth Roads,[1] and the

[1] *Trans. Norfolk and Nor. Nat. Soc.* 1873–4, i. 80.

second was taken by Dr. W. E. Leach, at Plymouth, in 1874. As Mr. Thos. Southwell, and others, have pointed out, there can be no doubt that both these Bats were conveyed in the rigging or cargo of ships plying to these ports.

Genus *Pipistrellus*[1]

The generic characters of *Pipistrellus* are very similar to those of *Vespertilio*, but there is a striking difference in the dentition, for whereas in *Vespertilio* there is only one pair of premolars in the upper jaw, in *Pipistrellus* there are two. As in all the *Vespertilionidæ*, the upper incisors are separated by a wide space, which, when the skull is examined, presents a striking gap between the incisors and canines on each side. The other characters are best described by comparing *P. noctula* with *V. serotinus*. Three species of *Pipistrellus* occur in the British Islands: *Noctula*, *Leisleri*, and *Pipistrellus*.

Noctule

Pterygistes noctula, Miller.

Vespertilio noctula, Schreber, 'Säugethiere,' i. 166 (1775).
Vespertilio magnus, Berkenhout, 'Synops. Nat. Hist. Gt. Brit.' p. 2 (1789).
Vespertilio altivolans, White, 'Nat. Hist. Selborne,' letter 37 (1789).
Scotophilus noctula, Gray, 'Mag. Zool.' ii. 497 (1838).
Vesperugo noctula, Keys. and Blas. in 'Wiegmann's Archiv für Nat.' p. 117 (1840).
Pterygistes noctula, Miller, 'Ann. Mag. Nat. Hist.' ser. vi. vol. xx. p. 379 (1897).
Pipistrellus noctula, Thomas, 'Zoologist,' 4th ser. ii. 100 (1898).

Local Names.—*Great Bat*, *Red Bat*, *Rat-bat* (Bucks and Berks), England.

Characters.—The Noctule is generally spoken of as the largest British Bat, but this is hardly correct, for the Serotine approaches it very nearly in size, and individuals are sometimes quite as large. The wing is broad and not so pointed at the tips, and the membrane starts from the distal end of the tibia and not from the base of the toes. The head is very broad and flat; the muzzle furnished with prominent glandular swellings, which are sparsely covered with hair. The ears are separate, thick, and bluntly rounded; their outer margins convex and

[1] Mr. G. S. Miller, following Dr. H. Allen, separates *Noctula* and *Leisleri* from *Pipistrellus* under the genus *Pterygistes*, Kaup., but Mr. Oldfield Thomas (*Zoologist*, 1898, p. 100 n.) points out, and we think with reason, that until more is known about the exotic *Pipistrelli*, the slight differences hardly warrant this further subdivision. *Pterygistes* differs from *Pipistrellus* in the size and form of the upper incisors and in the position of the first premolar, which in the former is very small and is pushed behind the canine.

turned backwards, slightly notched below the tragus, and continued to below the angle of the broad mouth; basal lobe distinctly rounded. The inner margins are nearly straight, convex near the eyes. The tragus is much shorter than in the Serotine; it is broad and obtuse, narrow at the base and broadening to a rounded and expanded tip, which is covered with minute hairs. The well-developed nostrils are simple crescentic openings with a hollow between them. The pollex is short and thickened at the base; the feet and toes strong. Only the tip of the tail, which is carried bent downwards between the legs, protrudes beyond the interfemoral membrane.[1] Below the calcaneum is a large rounded thickening of skin, the post-calcaneal lobe, which is much more noticeable in this species than in the Serotine. The colours of individuals vary to a certain degree; old males and females are a rich glossy chestnut brown, but young animals are darker. The Noctule emits a strong, musky odour, which some people appear to consider very offensive.

Expanse of outstretched wings, from 13 to 15 inches (325 to 375 mm.). Head and body, 76 mm. Tail, 51 mm.[2]

There is considerable variation in size, adult Noctules sometimes measuring less than the above dimensions.

Dentition: I. $\frac{4}{6}$; C. $\frac{2}{2}$; P.M. $\frac{4}{4}$; M. $\frac{6}{6}$. The gap between the incisors is very noticeable in the skull of the Noctule. The outer upper incisor is unicuspidate and shorter than the inner incisor.

Distribution.—The Noctule is widely distributed throughout temperate Europe and Asia; it occurs in Japan, Java and Sumatra, Nepaul and Sikkima. In Africa the extent of its range is not known, but it has been found in the north and east.

It is generally considered to be a southern species in England, but the explanation of that statement is that its range is not fully worked out; in the southern, eastern, and midland shires it is plentiful in suitable localities. It occurs in many of the London parks—notably St. James's, Regent's, Hyde, and Battersea Parks, and the grounds of the Bishop's Palace at Fulham. In the northern counties, Northallerton is generally considered to be its northern limit, but it is common throughout Yorkshire. It is abundant in Cheshire, and occurs more or less plenti-

[1] Sir Harry Johnston's remark (*Brit. Mam.* p. 88) that 'the tip of the tail projects for *less than one inch* [the italics are mine] beyond the membrane' is correct, but very misleading. The projecting portion is only a mere fraction of an inch.

[2] 'The largest I have shot,' says Mr. T. A. Coward, 'was an old male, very golden in colour, which measured 356 mm. across the wings, 77 mm. head and body, and 57 mm. in the tail; possibly the wings were not stretched to their greatest extent.'



THE NOCTULE.
Vesperugo Noctula.
5/6 Natural size.

Litho. W. Greve, Berlin.

fully in Lancashire. In the Lake District it is rare, though it occurs at Kendal.[1] The late Rev. H. A. Macpherson, who reported it from Carnforth, in Lancashire, considered that some large Bats which were observed on the Solway were referable to this species. It is not supposed to occur in Northumberland or Durham, but Mr. Harting suggested that the reputed Serotine which was captured at Cleadon and preserved in the museum at Newcastle-on-Tyne was a Noctule, and when Mr. T. Southwell and Mr. W. D. Roebuck examined the specimen they found this to be the case. Other examples have since occurred in the county of Durham.[2]

So far it is not known to have occurred in Scotland; the late Mr. E. A. Alston[3] did not credit Sir William Jardine's statement[4] that it had been seen on the Annan in Dumfriesshire.

Lydekker and Johnston, somewhat blindly following Bell, declare that the Noctule is not known in Wales, though so far back as 1887 Mr. G. H. Caton-Haigh had found it to be common in Merionethshire.[5] Throughout North Wales it is widely distributed, and is abundant in certain localities; Mr. C. Oldham observed it at Bettws-y-coed, and Mr. Coward found it plentiful at Nevin in Carnarvonshire in 1895. He writes: 'I have found the Noctule common in many localities in Denbigh, Flint, and Carnarvon. The most westerly point where I have met with it was Nevin, where the Bats used to fly in August along the tops of the cliffs. The distribution of this species in Anglesey seems to be irregular; near the Bridges it is common, but at Penmon, and in one or two places more inland, we met with only one or two. We shot some of the solitary Bats at Penmon to make sure of the species.'

Thompson did not include the Noctule as an Irish mammal, but Lydekker mentions two specimens which were obtained in co. Armagh in 1876; they were sent to Dr. Dobson, who pronounced them to be immature Noctules.[6] Mr. R. M. Barrington considered them to be Leisler's Bats, and subsequent events showed that he had reason for this supposition. In 1878, as pointed out by Dr. N. H. Alcock,[7] Dobson catalogued these identical specimens as *Vesperugo Leisleri*. More than ten years later the subject was brought forward again, Mr. Barrington sending more large Bats to Dr. Dobson, who found that in certain particulars they agreed with both *Noctula* and *Leisleri*, and he was inclined to consider that the Irish form of Leisler's Bat differed from the English; he stated, indeed, that they

[1] Harting, *Zoologist*, 1887, p. 170.
[2] *Zoologist*, 1887, p. 260.
[3] *Fauna of Scotland*, 1880, p. 7.
[4] *New Stat. Acc. Dumf.* p. 175.
[5] *Zoologist*, 1887, p. 293.
[6] Harting, *ibid.* 1887, p. 168.
[7] *Irish Naturalist*, 1899, p. 170.

appeared to be an intermediate form between the two species. Dr. Dobson's untimely death prevented further investigation of the matter, but Mr. De Winton informed Dr. Alcock that he did not see any difference between the English and Irish Leisler's Bats. Dr. Alcock says that 'there seems to be very insufficient evidence at the present time for admitting the Noctule as an Irish species.'[1]

Habits.—The Noctule was first described by Daubenton in 1759, and twelve years later Gilbert White discovered that a large Bat, which he had been observing for some time previously, had not been recognised as a distinct species in England. In his delightful journals he gives some of his observations of its habits, and calls it *altivolans*, 'from its manner of flying high in the air'—a characteristic of the species, but by no means an invariable habit. *Vespertilio altivolans*—the Great Bat—we now know as the Noctule, and although we have added much to the original notes which White recorded, we find that some of them are wonderfully accurate. It is only fair to state that for fully a hundred years no one was in a position to dispute the observant parson's statements, for until quite within recent years little attention was paid to our Bats.

In summer and winter alike the Noctule is gregarious, great numbers associating together in the diurnal retreats and in the *hibernacula*. Near Cambridge and at Frostendon, in Suffolk, I have seen large numbers on the wing at the same time. When residing at the latter place in 1883 and 1884 I was much struck with the immense numbers of Noctules which lived in some old oaks in the Rev. E. Hickling's grounds; so many as two hundred might be seen on any fine evening in the summer flying above a small meadow only about three acres in size. The Bats usually flew low, so low indeed that I shot several with a small No. 2 saloon pistol. By means of a ladder a friend and I reached the dens of some of these Noctules in a couple of the oaks, and extracted over a hundred of the Bats, selecting the largest examples and releasing the others. The stench from the retreats was almost overpowering. The Bats were quite as abundant in four or five other policies in the neighbourhood where old oaks were plentiful. Bell mentions that 185 Noctules were taken from the roof of Queens' College, Cambridge. When I was a graduate there in 1884 the species was exceedingly abundant about Queens' and Jesus Colleges, and at the 'Backs'; I have seen Noctules hawking above the King's Parade in the very centre of the town.

From the middle to the end of March, or early in April, the Noctule wakes from

[1] *Irish Naturalist*, 1899, p. 171.

its winter sleep, and if the season be open may be seen on the wing. Mr. Tomes recorded its appearance so early as March 12, Mr. C. Oldham noticed it first on the wing in Cheshire on March 18 in 1902 and on March 20 in 1903, and Mr. Coward found that two, which were taken from a house roof in Knutsford on March 19, contained a mass of undigested food—mostly beetle remains, from which he concluded that they had been on the wing.[1] Hibernation appears to begin in October, not September, as stated by Bell and others; and if the autumn is fine and warm, the Bats will continue to feed until the end of this month or even the beginning of November. I have three times observed Noctules on the wing in November at Warnham Pond, near Horsham—once on the 1st and twice on the 3rd—and the Bat was on the wing during the whole of the middle of the day. Whenever I have observed this Bat on the wing in late October or in November it has been taking a diurnal and not a vespertinal flight, probably because, at that season, insects are to be found more during the warmth of the day than in the cool of the evening. Dr. Juckes, of Horsham, informs me that in 1903 he saw a Noctule abroad on two consecutive days in November—the 17th and 18th—hawking in the afternoon above the Bishopric at the end of the town. Mr. O. V. Aplin has an even later date than this for Oxfordshire, namely December 3, but the Noctule is certainly not so frequently seen on the wing during winter as its congener the Pipistrelle.

The Noctule affects well-wooded districts; it loves the neighbourhood of old oaks, ashes, and beeches. Bell, and Alston and Tomes, considered that it was altogether arboreal, at any rate in the counties of Warwick and Hampshire; they cite, however, the occurrence of the Bats under the eaves of Queens' College. Although the Noctule is undoubtedly a tree-loving species, it by no means confines itself to retreats or *hibernacula* in hollow trees; Mr. J. E. Harting mentions a colony in the thatch of a cottage roof in Sussex, Messrs. Coward and Oldham watched a large number emerging from beneath the eaves of the little church at Nant Glyn, in Denbighshire, and many other instances have been mentioned by different observers.

The time when the Noctule emerges for its vespertinal flight varies in relation to sundown according to the season of the year. Even then weather makes a difference, and, as Mr. Oldham remarks,[2] 'wind, temperature, and other atmo-

[1] Noctules were seen on the wing at Knutsford on March 8, 1904, as Mr. Coward informs me. This is the earliest date of spring appearance I have heard of.

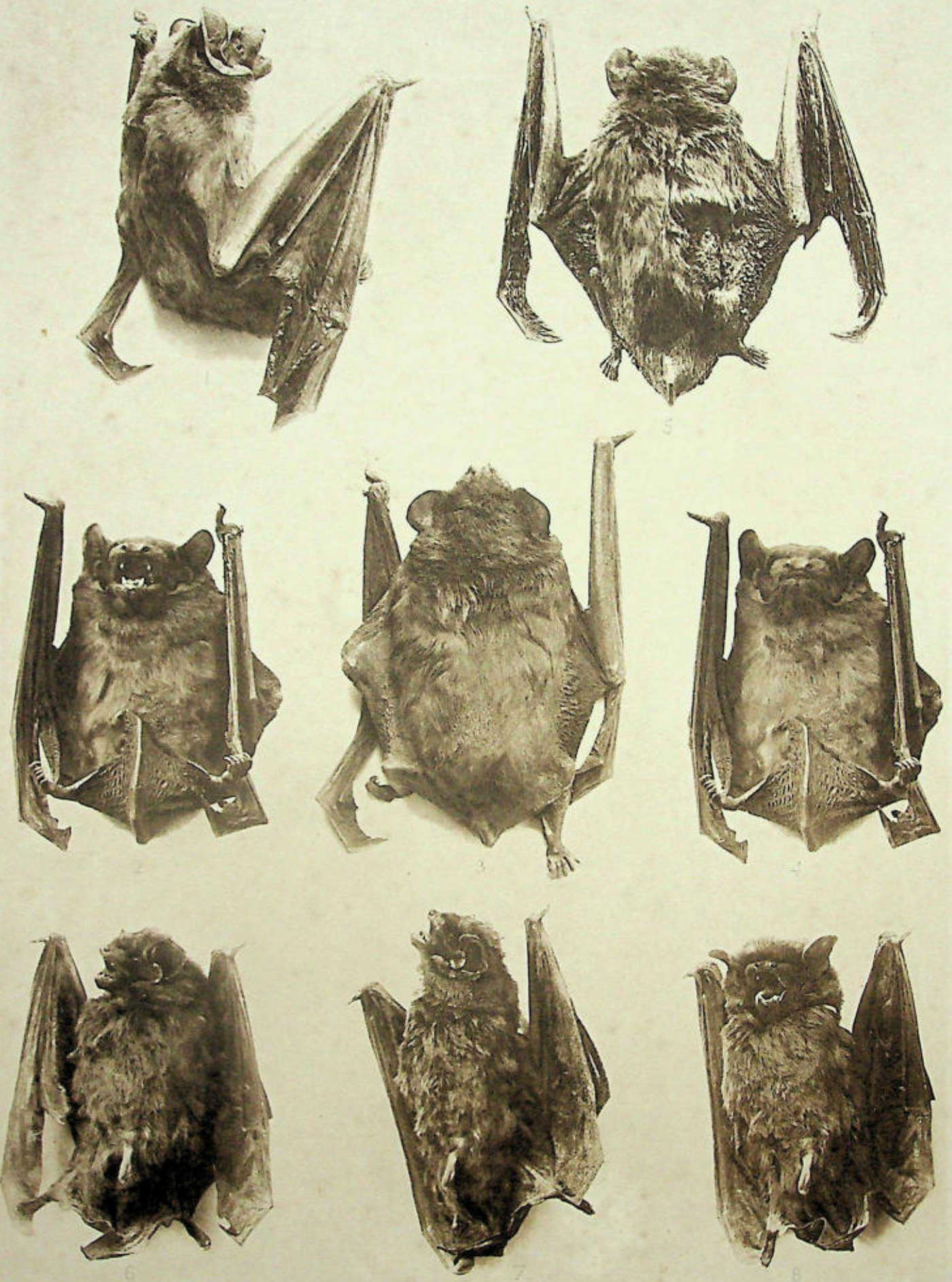
[2] *Zoologist*, 1901, p. 51.

spheric conditions, rather than the actual hour of sunset, probably determine the time at which the Bats emerge and the duration of their flight.' In his interesting 'Observations on the Noctule'[1] Mr. Oldham gives a table of times at which he observed Noctules emerging from two colonies at Alderley Edge, Cheshire, one in a beech, the other in a fir. The times show a good deal of variation, the latest time being twenty-eight minutes after sunset on April 21; in May, and again in early August, the Bats came out about twenty to ten minutes after sunset, but towards the end of August the interval was considerably reduced, until on August 14 they emerged seven minutes before the sun went down. After that the intervals were irregular throughout August and September, varying from four minutes to fourteen minutes after, until on September 29 they did not appear until the sun had been down for twenty-four minutes. Mr. Oldham thinks it possible that individual Noctules do not always resort to the same den throughout the summer, as the numbers which emerge are not constant. Even when conditions appear favourable, according to our powers of judgment, it sometimes happens that no Noctules will appear, although on a previous night many have been on the wing. One evening a whole colony will be abroad, and the next but one or two individuals will come forth. Cold and wet generally keep them in their dens, but I have occasionally seen them hunting when rain was falling heavily and the night was distinctly chilly. Mr. Oldham says: 'Rain, if not heavy, does not incommode them while feeding, but if the night be cold and windy few or none will be seen.

Noctules, when they emerge from their retreats in the evening, sometimes come out with great rapidity, but more generally there is a considerable interval between the individual exits. The Bats appear, by instinct, to know where their food for the evening is to be found, and make for the desired direction, if the feeding ground be some little distance from the trees in which they have been hiding, without any hesitation and without seeing the direction in which others that have emerged before them have flown. On June 9, 1902, an excellent evening in every respect for making observations, I made the following notes on the exodus of a colony in Denne Park, near Horsham.

At 8.35 P.M. I stationed myself near a great ash, one of a clump of trees near Denne House, where I had previously noticed that a colony of Noctules occupied a large slit in the trunk. At 8.45 I heard the squeak of a Bat which was evidently moving towards the exit hole, and almost immediately a Noctule

[1] *Zoologist*, 1901, pp. 51–59.



1234. The Voclule 5678 Leaster Bat

(Life size)

emerged, dropped a distance of about ten feet, opened its wings, and flew with a somewhat feeble fluttering flight at the altitude of about thirty feet above my head. Then it rose rapidly until it was well out of gun-shot, and made off to the southward, being distinctly in sight for about half a mile, until a large covert hid it from my view. A minute later there was a scratching and fighting within the hole, and then a second Bat came out, dropped and fluttered, and flew off in exactly the same manner as the first. At intervals of one to two minutes, for half an hour, Noctule followed Noctule out of the hole, most of them coming out singly, and all dropping and rising in a similar manner. Occasionally two emerged at the same moment, and from where I stood I could see them quarrelling at the mouth of the hole. Each Bat, though unable to see the direction in which the previous Bat had gone, took exactly the same line, and on the following evening I followed up the line and came upon the whole colony hawking over a meadow more than a mile and a half away.

Three days later the Bats from this colony were feeding in the immediate neighbourhood of their home tree, and the following week I saw about twenty at the extreme west of Denne Park, and as I failed to find the Bats feeding elsewhere I concluded that they belonged to the same body. On this evening I saw a couple heading right across the park to its western limits to join the others. It is very difficult to understand how these animals can communicate to each other that cockchafers or other insects are flying on a particular night at a particular spot, though no doubt their finely developed sense organs enable them to locate food within a certain radius. When each Noctule came out, there was no hesitation noticeable as to the direction in which it should fly; all went off in the same southerly direction to the field a mile and a half away, without seeing the others, and the Bats I saw later, heading across the park, can hardly have been able to see where their companions were feeding. It must be remembered that the insects upon which they feed fly in different places at different times, their location being influenced by wind, temperature, and season; perhaps the Bats are sensible to the same influences, and instinctively know where food will be found on a certain night by their appreciation of atmospheric and seasonal variations.

Mr. Oldham[1] noticed that the Bats left their den in rapid succession: 'on August 27 twenty-two emerged within a minute'; and when he and Mr. Coward were watching Noctules at Nant Glyn on April 5, 1896, the first emerged at 7.15, followed at short intervals by seven others, but 'at 7.25 between twenty

[1] *Zoologist*, 1901, p. 53.

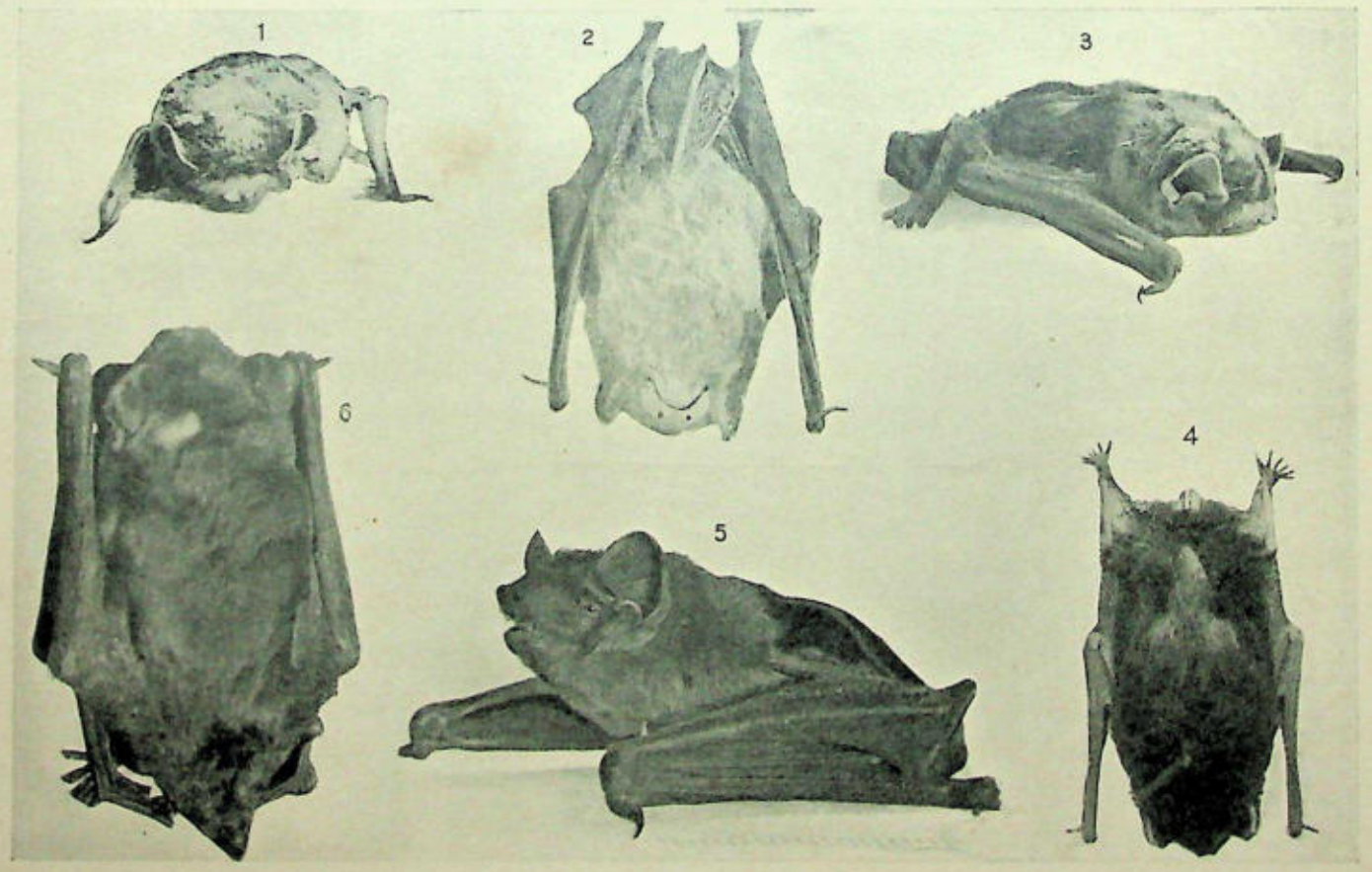
and thirty appeared in quick succession,' so quickly, Mr. Coward tells me, that it was almost impossible to count them.

Most Bats which I have kept in confinement went through the same manœuvres when awaking from sleep, and Noctules are no exception to the general rule. A slight muscular twitching is first noticeable, affecting the whole body; the head is moved slowly from side to side, and the animal begins to pant. Gradually the actions increase until, as the heart gains power, the little creature pumps and pants as if it were in the throes of a fit. Then the eyes open and the head is raised, the temperature having risen enormously, and the Bat is awake. Generally the process of waking takes from ten to fifteen minutes, but in some species it is much quicker than in others. Probably the act of waking takes less time if the Bats are disturbed near the hour when they should normally rouse up for the evening, and certainly a Bat wakes, as a general rule, with greater rapidity in summer than in winter. Noctules often are fully awake in a minute or two, and Mr. Oldham's remarks about some which he obtained from a beech confirm this. 'At 7.15, some three-quarters of an hour before their time of flight (on May 8), the jarring of a ladder against the tree caused some of the Bats to squeak. When I broke away the dead wood, however, and exposed them to the daylight, they made no attempt to escape, but remained huddled together in a comatose condition in the upper part of the cavity, their low temperature during sleep being apparent when I handled them. As I detached them from the sides of their den, to which they clung tenaciously with their feet, hanging head-downwards, one wakened sufficiently to escape. The others, placed in a linen bag, were transformed in a minute or two from cold inert creatures to a hot struggling mass.'

When the Noctule first starts to fly in the evening it shows a certain hesitation in its method of flight; perhaps the creature is not fully awake. But after wavering and fluttering in its first beat or so, it recovers from the uncertainty, rises, and flies with a wonderfully powerful command of its wings. The flight is, generally speaking, straight and rapid—sustained—but it is varied by sudden twists, turns, wheels, and dives, sometimes only a few feet of an oblique drop, sometimes eight or ten yards. Mr. Tomes, in 'Bell,' states that the drop 'is occasioned by some large and intractable insect having been captured, and the anterior joint of the wing, with its well-armed thumb, is required to assist in retaining it until masticated.' On this point I cannot agree, having frequently carefully watched the animal on the wing; the dive is probably intentional, either aerial sport or a desire to drop to a lower altitude in pursuit of an insect which is flying below.



NOCTULES COMING OUT FOR THE EVENING HUNT.



A COMPARISON BETWEEN THE NOCTULE AND LEISLER'S BAT.

1, 2, 3, 4, Leisler's Bat. 5, 6, The Noctule.

If a Noctule is shot in one wing it comes down in a descending spiral, the uninjured wing beating the air; and if one wing was occupied with its prey the action of falling would be somewhat similar, whereas the dive is certainly generally made with both wings extended, and is not a drop, but an oblique dive. The Noctule is easy to shoot when it first emerges; but when in full flight its dodges and twists are as bad as those of a snipe or woodcock; the animal also exhibits great vitality, and will carry shot for some distance before it falls.[1]

When a number of Noctules are flying together they constantly keep up a sharp squeaking, especially when they are chasing one another. The pitch of the voice is not so high as in some other species, but yet it is inaudible to some ears; it may be imitated, as suggested by Dr. Alcock, by striking a halfpenny with a sixpence. Before the Bats emerge from their den in the evening there is generally a good deal of conversation, and sometimes during the daytime a retreat may be localised by the squeaking from within. Again, when the Bats have returned it takes them some time to settle down, and much squeaking and scratching may be heard. When Mr. Oldham was making his observations he heard the Bats squeaking on cold and windy evenings when none emerged. The voice is capable of great variation. Mr. Coward shot an old male, which, when it fell, squeaked almost as loudly as a shot rabbit; it died almost immediately after it had reached the ground.

The elevation at which Noctules fly is by no means constant; as a rule, they rise to a considerable height soon after they emerge, and may be seen, on a fine evening, flying with the swifts. A little later they descend lower, and as the darkness draws on they sometimes fly quite low. I have, however, known them to fly at an altitude of about thirty feet for the space of half an hour, and then rise until they were almost out of sight. Late in the autumn, when the insects are swarming above the damp water-meadows, they will course up and down at a height of not more than six or ten feet.

Noctules vary their hunting ground, sometimes remaining close to their home trees, and sometimes travelling to a considerable distance, either in colonies or singly. One small colony of about twenty individuals which reside in old chestnuts on the north side of Horsham, and which may be seen hawking from the high

[1] At some time the reader may wish to kill a Bat for scientific purposes, and ignorance of how to accomplish this may lead to unintentional cruelty. Bats cannot be killed by the ordinary methods employed in killing birds; their vitality is much greater. Two ways, however, cause instant death. The edge of a tumbler pressed sharply on the neck of the Bat close to the skull dislocates the vertebræ, or the Bat may be thrown sharply, back downwards, on to a stone or board floor.

road, never appear to go far from their dens. When I have watched them I have noticed that they confine their beats to a couple of park-like fields, on the border of which are the trees in which they sleep. When they come to the boundaries of the fields, the town on the north, the brickfields on the south, the road to the east, and the houses to the west, they wheel round and return; I have never seen a Noctule fly across town, brickfields, or road. They generally confine their attention to the vicinity of two large ponds, for insect life abounds above water. On the other hand, a few Noctules which live on the edge of St. Leonard's Forest are persistent wanderers; I see them going singly, far and wide, travelling to a great distance from their home. Mr. Coward has seen Noctules feeding along the edge of low cliffs in North Wales at a considerable distance from any trees, and a friend of mine, who used to be fond of shore shooting at Winchelsea, tells me that in August and September he used repeatedly to see a Noctule or two coming from the inland woods to hawk along the beach above high-water mark.

The duration of the vespertinal flight of the Noctule is remarkably short; I have seen Noctules which had first emerged from their holes at 9 o'clock and later begin to return before 10. One evening I ascended a large oak frequented by Noctules, and remained there from 9 until 11. The hollow was occupied by ten or a dozen Noctules; eight came out, within my arm's reach, between 8.50 and 9.5. The first which returned passed me several times before it entered the hole at 9.55, and though the light was nearly gone, I distinctly heard rather than saw five or six others enter and squeak within the hole between that time and 11 o'clock. Mr. Oldham, in the paper already referred to, remarks that the return of the Noctules to their den was not so regular as their exodus in the colonies which he watched. 'During August and September, at any rate, on fine still evenings, the duration of the vespertinal flight is sometimes less than an hour; on August 27 a Bat entered the den fifty-five minutes, and on September 4 fifty-seven minutes, after the first had emerged. On each evening, however, the flight in some cases lasted at least an hour and a half; and on September 5 some of the Bats were absent for more than two hours.'

Noctules generally, if not invariably, seize their prey in the air, tearing off the wings and wing-cases of beetles and flies with their strong teeth and crunching up the insect while they remain on the wing. When the Bats are flying at no great altitude the champing of their jaws as they devour the hard-



A party of Noctules on the wing

bodied beetles may be distinctly heard. I have known the elytra of a beetle to fall upon my face when I have been watching the animals which were feeding above me, and it seems probable that the wing-cases are stripped off by the Bat simultaneously, for I have twice found the elytra lying side by side. There does not appear to be any evidence to support the theory that the Noctule uses the thumb to dismember its prey; when in confinement the Bat certainly never does so, but if a large and powerful insect is seized it is invariably pouched—thrust into the interfemoral pouch—until a firm grip has been secured; after this it is devoured openly, the head, wings, and often the legs, dropping from the Bat's jaws; the Noctule is expert at 'shelling' its victims. No attempt is made to recover fallen portions of the food, and, as Mr. Oldham has pointed out, this looks as if the animal was in the habit of feeding on the wing, when an attempt to recover a fallen bit would be next to useless.

The food of the Noctule consists very largely of Coleoptera; the chafers, especially *Melolontha vulgaris* and *Rhizotrogus solstitialis*, and other high-flying beetles, appear to be more sought after than moths, though the latter are also taken. Even the hawk-moths are captured; Mr. A. Whitaker, of Barnsley, informs me that he watched a Noctule pursue and capture a poplar hawk-moth. In captivity the Noctule will devour almost any beetle or moth, and Oldham and Coward experimented with various kinds of food. Mealworms—the larvæ of a beetle, *Tenebrio molitor*—were always readily taken, and these and *Cicindela campestris* were eaten without any attempt at pouching. Large moths, such as *Xylophasia polyodon* and *Phlogophora meticulosa* and the large dor-beetles, *Geotrupes stercorarius*, were almost always thrust into the interfemoral membrane. A cricket was pouched, but cockroaches were treated in this fashion only when they struggled, but once a cockroach was gripped all the fight seemed to pass away from it. Mr. Oldham supplies a list[1] of the moths with which he experimented, and he also points out how moths whose warning colours appear to indicate that they are distasteful were seized but rejected. *Euchelia jacobææ* was seized and rejected twice with evident signs of disgust by the Noctule, and the common magpie moth, *Abraxas grossulariata*, was treated in the same way. An oil-beetle (*Meloe*, sp.) was persistently refused by Mr. Coward's Bats.

Noctules will drink on the wing; I have seen them pick up water as they flew over the surface in the same manner as Daubenton's Bats; in captivity they will drink from a saucer, lapping like a dog.

[1] *Zoologist*, 1901, p. 58.

The following account of the behaviour of the Noctule in captivity, together with notes on its food and habits, is extracted from an article by Mr. T. A. Coward in the 'Scotsman,'[1] and refers to the Bats which Mr. Oldham and he had under observation.

'In a free and unconstrained condition, the habits of any nocturnal animal are difficult to observe, but the Noctule so easily adapts itself to captivity that it is strange that so little is known about its ways. Of all kinds of Bats that either Mr. Oldham or I have kept in captivity, the Noctule has most readily accepted its changed conditions. It requires no taming process to induce it to feed, and it rapidly connects human fingers with the food they supply, though it never seems to recognise that fingers are not as edible as insects. When wounded or captured, the Noctule bites fiercely, and though its teeth are not large enough to make a serious wound, they are sharp enough to draw blood and to give a painful nip. For some weeks I kept a couple of these Bats in a box, releasing them every night in my room to enjoy a short flight. There were nineteen Bats in the hollow tree where they were captured, and sixteen of them were males, which looks as if it is true that the sexes congregate separately. Almost immediately the Bats were captured, they took food from the hand. Their favourite article of diet was mealworm, which they preferred to dor-beetles or cockchafers, their staple food in the natural state. Mealworms, the hard-skinned larvæ of a beetle, can hardly be considered a natural food, for the Bats never have an opportunity of obtaining them, but even when so replete that they would refuse other food, they would continue devouring mealworms as long as they were supplied.

'When the first mealworm was offered to them they did not understand it, but after one had been broken and its juice smeared on the face of the Bat, they required no further introduction, but plainly asked for more. In a very short time they recognised my hand as a supplier of food, and ran across the table towards it, but so frequently did they nip my fingers in grabbing at the worm that I found it advisable to use a pair of forceps. There was no trace of anger in their biting, but simply a ravenous desire for food. As the Noctule always feeds upon the wing, they did not understand that any portion of their food which they let drop could be recovered again, and they would walk over a maimed and struggling insect to ask for more food. We—for Mr. Oldham kept a couple at the same time that I did, and his experiences were similar to mine—sometimes got them to pick up a mealworm from the table, but it was evident that they

[1] April 7, 1903.

considered it a fresh capture, and never learnt to search for anything they had dropped.

'If the box was opened during the day time or early in the evening, the Bats were always in a comatose state, and required a great deal of waking; but between 7 and 8 P.M. they generally woke themselves. If by chance we were unable to feed them during the hour or so in which they were awake, they would relapse again into their former lethargy and required waking before they would take food. The diurnal sleep of the Noctule is profound, almost similar to the lethargy of hibernation; the temperature falls considerably, and, as Dr. Alcock remarks with medical precision, the "breathing becomes shallow and irregular—'Cheyne-Stokes' in type." He also points out that upon awakening the temperature sometimes rises as much as 31 degrees in fifteen minutes. The waking process is very singular. I would take a Bat in my hands to warm it for a few minutes. The breathing then became very rapid, the animal shuddering and panting, as if in fear; it seemingly pumped itself into activity. When at last it was wide awake, the appearance of the animal was quite changed; its little body felt quite hot, the bright eyes glistened, and the ears were in constant motion. Raising itself on the carpals, it would patter towards me, and, if I did not at once supply food, would climb up my arm and snuggle down at the back of my neck, from where it would shortly take wing. Generally the Bats seemed loth to take wing, preferring to run about the table; but after a good feed and a long drink—for they are thirsty little creatures—they liked a short fly round the room. They would lap water from a saucer, or lap or suck it from the end of a camel's-hair brush. Raw meat and shreds of fish they took after a little teaching, but they seemed to find more difficulty in masticating flesh than the horny bodies of beetles or mealworms.

'Mealworms, small moths, and beetles were eaten without difficulty, but when any large beetle, such as a dor or chafer, was seized the Bats were obliged to overcome its struggles. This was done by a very curious action. The tail of the Noctule is curved forward when the animal is at rest or walking, the interfemoral membrane forming a bag or pouch; and when any large obstreperous insect is seized, the head is rapidly bent under the body and the insect pushed into the pouch till the Bat secures a good grip. Directly the prey is seized the Bat, slightly spreading the fore-limbs and pressing them firmly to the ground at the carpals, raises itself and brings the feet forwards so as to increase the capacity of the pouch. If the insect was not very large the movement was very rapid and the head was withdrawn at once, but when feeding our Bats we sometimes gave

them beetles or moths which were powerful, and the Bat's head would then be held in the pouch for a second or two until a really firm grip had been secured, when the head would be withdrawn and the insect eaten in the open. The motion of the Bat's jaws is exceedingly rapid, and the crunching noise they make when masticating the hard cases of beetles can be heard as they fly overhead. The process of devouring a large beetle is more interesting than pleasant to watch, for though the jaws are working quickly, the insect passes but slowly down the throat, and the maimed legs and wings continue moving when most of the body is consumed. In no case did our Noctules make any attempt to touch their prey with the forearm.

'After food and exercise the Bats invariably performed an elaborate toilet before settling down to sleep. The ablutions were performed as they hung by one leg, and it was marvellous to see with what ease they reached every part of their head, body, or wing membranes with the other leg. They sucked their toes and they combed and smoothed out the whole of their fur, twisting the while into most impossible-looking positions.

'My male Bat was much fonder of exercise than the female, and would remain upon the wing a long time. It seldom struck against any object, though it would fly just over my head, brushing lightly against my hair. Once it struck the electric lamp with its wings, though it would fly round and round the wires without touching them. Whenever it settled on any object, it clutched first with the thumbs, reversing itself at once and taking hold with its feet.'

Mr. Coward has also kindly sent me some further notes about his Noctules in captivity. 'I have found,' he says, 'that they will eat shreds of meat, especially when dipped in water, and also fish. Cockroaches and crickets were appreciated, and a female I kept would eat three dor-beetles at a sitting, always rejecting the head and wing cases. Spiders, flies, moths, and most beetles were eaten, but they refused an oil-beetle, and rejected a small beetle with red warning marks, spitting it out with evident disgust. Some refused tiger-beetles, but others when hungry would eat them. When fully awake they would come to be fed, recognising the fingers and a pair of forceps as food suppliers; they would run across the table with their jaws chattering, and climb up my arm to search for food. When they got hold of any large object, like a *Geotrupes* or the forceps, they at once tucked it into the interfemoral membrane, often falling over on their backs in the struggle.

'When I first had them they were rather clumsy in a room, bumping against a white ceiling and the electric lamps; but they soon learnt their way about, and

I often lost them for two or three days at a time, for they would creep behind the books on the shelves and not come out for two or even three days. When they did emerge they were hungry. They always pitched head uppermost, turning round at once. When flying the tail was stretched out. A male and female which I kept together lived for a long time; the female was bad-tempered and frequently bit the male, but I never saw him retaliate. These Bats delighted to run about on the top of one of my bookshelves; they ran well, holding themselves very erect, and pattering along on the carpals and feet; they could rise with ease from the table or floor, springing up with a little bound. They drank a great deal from a brush, and voided a great deal of urine almost immediately afterwards. They often flew at me, skimming the top of my head, and would crawl all over my clothes; but I fancy it was explained by their associating me with their beloved mealworms.'

According to Mr. George Daniell, who published his experiences with a female Noctule which he retained in confinement for some time,[1] the period of gestation exceeds thirty-eight days. A female in his possession was delivered of a single young one on June 23, 1834; she reversed her position just before the birth of the young, and, holding by her thumbs instead of her toes, dropped the new-born Bat into her interfemoral pouch, and from there transferred it to her nipple, wrapped it in her wing-membrane after cleaning it, and changed again to her normal position. Continental observers have recorded the birth of two young at once, but, in England at any rate, a single offspring appears to be more usual. The young, when first born, are blind and nearly, if not perfectly, hairless, and are slightly larger than a newly born mouse. The hair grows slowly, but by September they are half-grown and well clothed with hair.

Hibernation does not appear to begin at once, for in October Noctules are restless and quarrelsome in their dens; they may be heard 'seething' and fighting for the warmest places in the centre of the mass. By November they have become comatose, and are quieter than some of the smaller Bats in their *hibernacula*. The statement that Noctules hibernate in separate colonies of males and females is not quite correct; no doubt this occasionally happens, as colonies have been discovered which consisted entirely of one sex, but sometimes the sexes are mingled together. Out of nineteen taken by Mr. Oldham from a beech, sixteen were males.

[1] *Proc. Zool. Soc.* 1834.

Leisler's Bat

Pterygistes Leisleri, Kuhl.

Vespertilio Leisleri, Kuhl, 'Deutsch. Flederm.' p. 38 (1817).
Scotophilus Leisleri, Gray, 'Mag. Zool.' ii. 497 (1838).
Vesperugo Leisleri, Keys. and Blas. 'Wirbelthiere Europ.' p. 46 (1840).
Pipistrellus Leisleri, Thomas, 'Zoologist,' 4th ser. vol. ii. p. 100 (1898).

Characters.—Leisler's Bat is considerably smaller than the Noctule and differs from it in several respects. The number of teeth is the same in both species, but the cross-section of the outer upper incisor is equal to that of the outer lower incisor, whereas in *Noctula* it is only half the size. In *Noctula* the lower incisors are crowded, but in *Leisleri* they lie in a semi-circle, in line with the jaw. Perhaps these characteristics are not constant, for the late Dr. Dobson admitted that he was puzzled by some Irish specimens, finding that they differed in some respects from the typical *Leisleri*.

The fur is on the whole not so richly coloured and glossy as in the Noctule: and it is a rich dark brown at the base, with light brown or yellowish terminals; these terminals give a general chestnut appearance to the pelage, which, however, lacks the golden lustre of the larger species. Immature examples are described as being darker than adults, and Dr. Alcock found that in several which he examined the males were darker than the females, but as this was not an invariable rule he suspected age variation. Mr. Coward noticed that a *Leisleri* which he shot lacked the strong odour of the Noctule, but, as he suggests, it is not safe to dogmatise on a single instance. The feet are small and weak, the claws being diminutive. The Bat was called by Bell the Hairy-armed Bat, on account of the band of rich golden-brown hair which covers the upper part of the membrane below the forearm, and extends from the flanks to the thumb. This character, however, is not distinctive, being shared by the Noctule; indeed, this tract of hair is often thicker in the Noctule than in Leisler's Bat.

The measurements appear to vary, as indeed they do in all Bats. Dobson gives head and body 2·3 inches, but Alcock sometimes found them to reach 2·6. I have measured two which I obtained in the flesh from co. Wicklow, and should say: Head and body, 57 to 70 mm.; tail, 44 mm.; expanse of wings, 10 to 10½ inches (255 to 267 mm.).



LEISLER'S BAT.

PTERYGISTES LEISLERI.

LIFE-SIZE.

Distribution.—Leisler's Bat ranges from the Azores and Madeira in the West to the Himalayas in the East; it is found throughout Europe and part of Asia, and perhaps occurs in northern Africa. Its distribution in our Islands is still little understood; it appears to be very local, and in England is nowhere common. Mr. Tomes[1] states that it occurs in the counties of Warwick, Worcester, and Gloucester. Mr. H. Charbonnier[2] obtained a number in Yorkshire, and though the identity of the species was questioned there is no doubt that he was correct, for Dr. Alcock confirmed the identification and a specimen is preserved in the British Museum. A single example was obtained in Cheshire,[3] and Mr. Coward, who shot the Bat, saw another Bat with a similar flight at the same time; this specimen is now in the Chester Museum, and the identification was confirmed by Dr. Alcock and Mr. De Winton. In Norfolk[4] the Bat is said to have occurred, fourteen examples being obtained; but the Rev. L. Jenyns, who examined them, stated that a mistake had been made.[5] It is now, lacking further information, hardly safe to pass an opinion on the correctness or incorrectness of the identification, but it is worth mentioning that Mr. Jenyns was uncertain whether the Bats were young Noctules or 'a distinct species.' Sir Harry Johnston[6] says: 'Hitherto it has been recorded from the western midlands of England, the Lake District, and the north-east and east of Ireland.' He gives no indication of where or when this Bat occurred in the Lake District; it is not mentioned by the late H. A. Macpherson—and we can only imagine that it is a case of careless copying from Lydekker's remark that 'according to Mr. Montagu Browne, it is *unknown* as far north as Leicestershire, as also in the Lake District.'

In Ireland, the home of this species in the British Islands, it takes the place of the Noctule; it occurs, so far as is at present known, in the north-east and eastern counties, from Derry to Wicklow. Prof. Kinahan first recorded the occurrence of Leisler's Bat,[7] from Belvoir Park, Antrim, and from Belfast, where it was discovered in 1858.[8] Mr. H. Lyster Jameson[9] supplies a full list of occurrences and localities in Antrim, Down, Armagh, Fermanagh, Cavan, Louth, Dublin, Wicklow, and Kildare. He heard of a large Bat, which he expects was a Leisler's, from Galway, but a specimen which was sent to him never reached him, so that until further information is forthcoming the western county has to be

[1] Bell, *Brit. Quad.* 2nd edit. p. 27. [2] *Zoologist*, 1892, p. 329. [3] Coward, *ibid.* 1899, p. 266.
[4] Paine, *Ann. Nat. Hist.* 1839, ii. 181. [5] Harting, *Zoologist*, 1887, p. 169. [6] *Brit. Mam.* 1903, p. 90.
[7] *Proc. Belfast Nat. Hist. and Phil. Soc.* April 1860. [8] *Proc. Dublin Nat. Hist. Soc.* ii. 154.
[9] *Irish Naturalist*, 1897, pp. 41, 42.

omitted. Mr. C. B. Moffat added Westmeath,[1] and Dr. Alcock Derry[2] to the counties in which the Bat had been found, and no doubt, if attention were given to the matter, it could be recorded from more southerly and westerly localities, as well as from Tyrone, Monaghan, and Meath.

Habits.—Kuhl described this species from the Bat which Leisler had discovered and called *Vespertilio dasycarpos*. It obtained a place in Bell's first edition on the strength of a single example which was preserved in the British Museum and was stated to have been obtained in England. In the second edition of Bell's work, Mr. Tomes added a fuller description from observations made in Warwickshire, but it was not until recent years that any reliable account of the habits of the species was published. To Dr. N. H. Alcock[3] we are indebted for most of the following observations.

Towards the end of April Leisler's Bat comes forth from its winter sleep; the first were observed on the wing on April 21, 1899, in Wicklow. In the neighbourhood of Dublin, where the Bat is common, Dr. Alcock had failed to find it earlier, though a Bat which he had in confinement woke up and fed on March 11, relapsing into its lethargic condition again on a return of cold weather. In 1898 it was not observed abroad later than September 16. The time of emergence in the evening varies a little according to the season, but it may be taken as about fifteen minutes after sunset; the Bat in confinement woke up regularly about 8.30. The duration of the evening flight appears to be about an hour, and Dr. Alcock's remarks about this species are equally applicable to the Noctule. He says: 'I have not been fortunate enough to come across any of the resting-places of these animals, so that the times given above are only approximate, being taken from observations made in the open. Still, making every allowance for error, the facts are sufficiently remarkable. A mammal that rests for six months in the year, that only feeds for one hour a day during the other six, spending this hour in rapid and sustained flight—as great a contrast as can be imagined to its previous condition—certainly presents a very curious picture of animal economy.'

When the Bat first emerges it flies at a considerable height, 'taking long sweeps and wide zigzags,' and though sometimes remaining for a short time in the neighbourhood of some wood or other favourable feeding-ground, it does not continue for long on the same beat. Mr. Jameson says the flight is 'go-ahead and

[1] *Irish Naturalist*, 1897, p. 135. [2] *Ibid.* 1899, p. 174. [3] *Ibid.* 1899, pp. 171–180.

hawk-like' when compared with that of the Pipistrelle, and Mr. Coward states that the flight of two which he watched in Dunham Park, Cheshire, one of which he secured, was slow and somewhat irregular, 'at an altitude level with the tops of the old beeches,' from which trees the Bats had emerged. Later in the evening the Bat flies lower, in this and another respect resembling the Noctule in its habits, for when a number are flying together they frequently chase each other with loud squeakings; the cry, measured by Dr. Alcock on Galton's whistle, corresponded to 17,000 vibrations, a fairly high pitch.

The diurnal retreats of the species are hollow trees and house roofs, but whether it choses different places for summer and winter resorts is not known. The food consists of insects, Lepidoptera and Diptera—remains of the fly, *Scatophaga stercoraria*, and of a caddis, were found in the stomach of a Leisler's Bat by Mr. G. H. Carpenter.

Mr. Coward informs me that he recognised the Bat which he shot on May 8, 1899, by its peculiar flight; he was watching for Noctules at the time, and was much struck by the difference in the flight of the two species, though a few nights later he fired at and brought down a female Noctule which, at first sight, he had thought to be a Leisler's Bat. When he picked up the Bat the darkness of the pelage and the absence of smell struck him as being peculiar, though he had no idea that the species occurred in the county.

The Pipistrelle or Common Bat

Pipistrellus pipistrellus, Schreber.

Vespertilio pipistrellus, Schreber, 'Säugeth.' i. 167 (1775).
Vespertilio pygmæus, Leach, 'Zool. Journ.' i. 560 (1825).
Scotophilus pipistrellus, Bell, 'Brit. Quad.' 2nd edit. p. 34 (1874).
Vesperugo pipistrellus, Keys. and Blas. in 'Wiegmann's Arch. für Nat.' p. 321 (1840).
Pipistrellus pipistrellus, Thomas, 'Zoologist,' 4th ser. vol. ii. p. 100 (1898).
Local Names.—*Common Bat*, *Flittermouse*, *Mouse-bat*, *Back-bearaway* (Yorks); *Leather-wings* (Midlands); *Rear-mouse* (Hants); *Blin'-bat* (Scotland).

Characters.—Ears oval triangular, and about two-thirds the length of the head; deeply notched on their outer margin and lobed as in this genus. Tragus, widest above the base of the inner margin of the ear, slightly inclined forward, and with a rounded tip; inner margin slightly concave, outer margin convex, with a small lobe at the base, above which is a slight cavity. Muzzle rounded and

sparsely covered with hair, almost naked in immature animals; the glandular swelling also more noticeable in adult than young examples. Nostrils reniform; nose blunt and slightly emarginate between the nostrils. Eyes small and deeply set in the head. Feet small; the calcaneal lobe well developed. Dentition as in the Noctule, but the inner upper incisor markedly bifid in the crown.

The colour varies considerably. Out of fifty-four examples, obtained in one locality in Sussex, the majority were russet-brown, slightly paler on the belly; three were very pale brown, with the naked parts of the face very dark. The hair is parti-coloured, being nearly black at the base. Irish examples are uniformly paler than English or Scotch; I have seen them a very pale brown, almost sandy, with yellowish-red fur on the head. The young, when first clothed with hair, are much darker than adults; they are generally brownish-grey, and in some instances brownish-black. Outstretched wings, 8 to 8½ inches (200 to 215 mm.); head and body, 43 mm.; tail, 30 mm.

Distribution.—The Pipistrelle is found throughout temperate Europe; in Asia it occurs so far south as Kashmir, but an allied species, which also occurs in Europe, replaces it in India and Australia. Its range in Africa is not known, but it occurs in the north of that continent.

In the British Isles it is a common Bat in all parts, being commoner in England and Wales than in the north of Scotland. I have met with it at Tresco Abbey in the Scilly Islands, and it is found in the Orkneys, and perhaps occasionally in the Shetlands,[1] for so far back as 1774 Low mentioned a small Bat in Unst which probably was the Pipistrelle. It has frequently been taken in the Inner Hebrides, and from time to time in the Outer Hebrides. In Ireland it is generally distributed and common, being, however, outnumbered by the Long-eared Bat in some localities, just as it is outnumbered by this species and Daubenton's Bats in some places in England and Scotland. It occurs in the Isle of Man, and has been recorded from several of the islands off the Irish coast.

Habits.—Though the Pipistrelle is rightly known as the Common Bat, it is within comparatively recent times that the great error of our earlier naturalists was exposed, an error of nomenclature. To them the Common Bat was the Common Bat of the Continent—*Vespertilio murinus*—as they then called it. Pennant is perhaps to blame for the original mistake, but he was blindly followed until the

[1] On a recent visit to the Shetlands (1904) I could only obtain one recent record of the species in those Islands. This occurred in June 1903, when Mr. Burgess, Postmaster, North Rooe, North Maven, captured one and brought it to Lerwick for identification.



THE PIPISTRELLE OR COMMON BAT.

PIPISTRELLUS PIPISTRELLUS.

LIFE-SIZE.

...nted in Vienna.

Rev. L. Jenyns showed that the two species were not the same, and that our Common Bat was Schreber's *Pipistrellus* and not the *murinus* of Linnæus, although it was very much later that it was discovered that a further error was being made and that Linnæus's Bat was not the generally accepted Common Continental Bat.

Even to-day the average man talks about the Common Bat, and though he is frequently right it is not his fault, for he fails to distinguish the various species which inhabit our Islands. The Pipistrelle—the better name because it prevents confusion—inhabits the British Islands in countless thousands, hiding during the daytime in all sorts of cracks and crannies in trees, rocks, and buildings, and coming forth in the evening, when the fading light prevents the ordinary observer from realising its extreme abundance. While the thrush is still chanting its even-song, while the swallows, martins, and swifts are yet harrying the insect hordes, ere the glow has faded from the western sky, the little harbinger of the night comes forth in country lane, by wood and covert side, in village and country town. Sometimes a crepuscular robin, feeding late, has his chosen beat invaded by the Bat, but though he may assault the rival insect-eater, his powers of flight are no match for those of the winged mammal.

The flight of the Pipistrelle is erratic; it seldom rises to any great altitude—fifteen or twenty feet perhaps, but not often higher, though it will occasionally fly round the tops of tall beeches or rise to pass over some trees in its beat. Sometimes it flies round the upper branches of forest trees, sometimes it whirls and circles round and among the trunks only a few feet above the ground. I have seen it flying high—out of gunshot—above the broad Tay, while Daubenton's Bat skimmed the surface of the water.

When the Bat first emerges its flight is slow, fluttering, and uncertain, but a little later it will often dart here and there, dodging and twisting with great agility and wonderful rapidity. For a moment we see it silhouetted against the sky, then it is lost against the dark background of the foliage. As a rule it flies on a regular beat, remaining in one spot for a long time if food is plentiful; a tree or a building will form the centre of its repeated round, and it will continue to fly within a few yards of this spot for perhaps hours. At other times the beat is longer and more varied, and may lead over a house, a road, round a building or wood; but if the Bat is observed to pass a particular spot it may be expected there again in either a few seconds' or a few minutes' time. Every fine evening in the summer—roughly about 8.30 P.M.—five or six Pipistrelles appear in front of my house, having emerged from their retreat in a crevice in the wall of my

museum. Nightly they go through the same performance; passing down a carriage drive, they cross the end of the museum, rise to an altitude of about 40 feet to clear the tops of some high oaks, drop towards the rhododendron bushes beyond, pass over a lawn, turn sharply round more oaks, wheel again and mount over the first trees, and drop towards the front of the house, to repeat the same route again and again. In a lane hard by are two other small colonies, one in a low shed and the other in the thatch of a cottage roof; the inhabitants of these retreats take a much shorter nightly round, beating up and down the lane, varying the extent of their flight according to the abundance or scarcity of the food which they find abroad—flies or gnats.

The flight cannot be accurately described, it varies so much; but it is sometimes rapid and irregular, sometimes fluttering and moth-like; the Bat flies higher on fine evenings than when the air is heavy, without doubt because the atmospheric conditions influence the altitude at which insects are to be found. The duration of flight is longer than is the case with the Noctule; the Pipistrelle comes out earlier and retires later. There does not, however, appear to be any reason to suppose that it is nocturnal, like the Long-eared; probably it only flies late into the evening, and then retires for the remainder of the night and the following day.

The Pipistrelle is generally on the wing earlier than other Bats; we may expect it before the middle of March if the season is favourable; from then until October or November it continues to appear whenever the night is fine and still. Mr. D'Urban observed that in Devon its advent was coincident with the appearance of the *Noctuidæ* upon the sallows; it feeds upon these moths, taking them on the wing as they hover round the catkins.

Large quantities of the smaller moths are devoured by the Pipistrelle, though flies, gnats, and other dipterous insects form the greater part of its diet. Mr. G. H. Caton-Haigh[1] has pointed out that, in spite of the small size of the Bat, the common crane fly, *Tipula oleracea*, is a favourite food. As the Pipistrelle, when in confinement, constantly pouches an insect if it finds it too large and powerful to tackle with ease, and even if it does not thrust its prey into the interfemoral membrane presses it against its body until it has overcome the struggles of its victim, it seems probable that this method of securing its prey is employed when the Bat is on the wing. Certainly this species, like the Noctule, captures and devours most, if not all, of its prey when in flight, and it is impossible to believe that a habit

[1] *Zoologist*, 1887, p. 293.

which has been noticed by so many observers should be adopted by all alike when their conditions of life are altered.

The Rev. W. Bingley, writing in 1809, describes the actions of a captive 'Common or Little Bat.' 'I held one of the common house-flies in my fingers, in such a manner as to touch the animal's nose, and rouse it from sleep: it made a kind of a smack with its mouth, threw itself suddenly forward by its hind feet, and immediately devoured the insect. I then caught for it one of the large blue flesh-flies. I touched its nose with this, as I had done with the former, and the animal seized it precisely in the same manner. But, in the latter case, there was some difficulty. The fly was so large that, notwithstanding the width of the Bat's mouth, it could not entirely have admission. My curiosity was excited to know in what manner it would so dispose the fly as to get it down its throat: since its fore-feet were evidently useless for that purpose. I was soon satisfied. The animal, raising itself somewhat higher than usual on its fore-legs, bent its head with great dexterity under its belly, and forced the insect into its mouth by thrusting it from side to side against that part of the membrane which extended betwixt the two hind legs.'

Bingley, though not quite grasping the meaning of the performance, had formed a good idea of what the Bat did; this pouching action, as Mr. Oldham has pointed out and as I have myself observed, is common to most Bats. Mr. Coward noticed the use of the carpal on one occasion, but not in any way to rend the prey; he writes: 'The Pipistrelle is almost as easy to feed as the Noctule, but one or two which I have kept have shown a dislike to being handled, squeaking and biting when touched. One, on a single occasion only, held a struggling mealworm on the table with its carpal, and this Bat would also pick up food which it had dropped. As was the case with the Noctules, this Bat did not seem to notice any loud noise, but the rustle of paper, the striking of a match, or indeed any sharp, though low sound, attracted its attention at once.'

Pipistrelles will drink on the wing; I have seen them hover for a second over a pool or river, and dip their heads to the water. Mr. Coward observes that when the Bat drinks in this fashion, it raises the wings straight above the back, appearing to alight for a second upon the water, a little widening ring of ripples showing where the Bat has touched the surface.

The Pipistrelle is catholic in its choice of a retreat, but perhaps the largest colonies are those in church roofs or belfries. A crack in the wall of a house, a hole in a tree, behind rotten bark, signboards, window shutters, or crannies in

rocks or caves, serve its purpose equally well. I obtained fifty-two from two windows at Warnham Court in 1902; they were secreted behind the woodwork of Venetian blinds. Sometimes the Bats are gathered in such numbers as to become a nuisance to the inhabitants of houses. Part of the rectory wall at Claxby, in Lincolnshire, had to be pulled down before a large colony of Pipistrelles could be ejected; their squeaks and scratchings, and the odour from their excrement, had become intolerable. The station-master's house at North Grimstown, Yorkshire, according to Mr. Oxley Grabham,[1] was overrun by the parasites from a colony of two or three hundred Pipistrelles some time since, and the Bats had to be got rid of.

When kept in confinement the Pipistrelle readily takes food—flies, raw meat, and mealworms—and will become quite tame, flying to the hand which offers it food. Its movements can be studied under these conditions, and without doubt it finds no difficulty in rising from a flat and slippery surface, in spite of the repeated statements—mostly copied from Geoffroy—that the Bat cannot rise from the ground. It crawls more slowly than the Long-eared Bat, and is not so jerky in its motion; it can, however, run at a considerable speed. When it is climbing up a wall the tail is used as an additional support, being extended backwards and held in a curve with the tip pressed against the surface of the object up which it is climbing. As Mr. Oldham remarks, 'for the time being it is analogous to the stiffened rectrices of a woodpecker or tree creeper.'

The period of hibernation commences in early October as a rule, but if the autumn is mild Pipistrelles will remain on the wing until the end of this month or the beginning of November. In Ireland—at Fermoy, near Cork—I have seen it on the wing at the beginning of this latter month, for the autumns there are frequently mild. The winter sleep is not profound, and no species more frequently appears on warm winter days than the Pipistrelle. A little sunshine in December, January, or February will bring out the gnats, and the Pipistrelle will often follow, looking out of place, perhaps, as it flies in the sunshine, but yet perfectly able to follow and obtain the food it desires. Even when we should imagine that the Bats were wrapped in their deathlike sleep, we find that they move within their retreats. One day an individual will be hanging asleep near the entrance hole, and the next it will have vanished, having pushed its way further in among its fellows for warmth.

The idea that the Pipistrelle only hibernates in the company of Bats of its own species is erroneous; I have found it in caves, either singly or in couples,

[1] *Field*, March 29, 1902.

where Daubenton's, Natterer's, Bechstein's, Long-eared, or Whiskered Bats were also sleeping. Frequently a different retreat is occupied in summer and in winter, as is so frequently the case with other species; Mr. Boyes, of Beverley,[1] found a large colony which always in summer occupied the back of a signboard on an inn in Bishop Burton, Yorkshire; there were a great number packed behind the board, and the landlord told him that 126 had been counted as they left in the evening. In the winter the resort was deserted.

The number of young at a birth appears to be almost always one, and not two, as is generally asserted by continental naturalists; that two are occasionally born is known, but it is very exceptional in England at any rate. Albino Pipistrelles are rare, in spite of the variation in the colour of the pelage. When, as a lad, I used to spend my holidays at Condover, in Shropshire, I was much disappointed at not being allowed to fire at a white Bat, which I believe was a Pipistrelle, which used to frequent the farm buildings; the peace of mind of the cows was considered to be of greater importance than a white Bat. Subsequently the animal was killed and passed into the hands of John Shaw, of Shrewsbury, but I have been unable to trace its ultimate destination. A white-winged variety of the Pipistrelle was killed in Gloucestershire in September 1901.[2]

The Pipistrelle may be captured in many ways, but all present more or less difficulty. A net may be placed over the exit hole, or they may be taken in a butterfly net as they sally forth in the evening, if the operator is skilful. A lantern on the ground will attract them, and they may then be netted, and as the animal is undoubtedly attracted by bright objects—I have often had them swoop and hover round the barrel of my gun—a piece of paper at the end of a stick or rod is recommended as a means of bringing them within striking distance. However, it is one thing to have a Bat within a few inches and another to knock it down. I was advised to try a trout rod as an instrument for their destruction, and went forth one night and brought a Pipistrelle down with the first stroke. About a month later I wanted another, and took my best rod out again; after three or four nights spent in swishing the air, with the expenditure of much 'golf' language and a serious accident to my best rod, I came to the conclusion that the efficiency of the method had been overrated. The Pipistrelle can dodge, and appears to take delight in so doing when anyone is attempting to capture it, for it will return again and again to the vicinity of the attacker, and when he makes a stroke will whirl round and round him with lightning speed.

[1] *Field*, August 29, 1903.

[2] *Zoologist*, Dec. 1901.

Genus *Myotis*

Three pairs of premolars are present in each jaw in *Myotis*, so that the total number of teeth is 38. The upper incisors are nearly equal; the outer incisor points downwards or curves slightly outwards, and the inner incisor is directed inwards. The ears are long and narrow—usually about the length of the head—and the tragus is narrow and somewhat pointed, straight or curved slightly outwards. The outer margin of the ear springs either from opposite the inner margin of the tragus or from a slight distance in front, but not from the angle of the mouth. The head is long, the crown elevated, and the muzzle pointed and clothed with hair; the glandular swellings are so slight as to be scarcely noticeable. The nostrils are simple and crescentic; the post-calcaneal lobe very small or absent. Generally speaking, the members of this genus are less robust than those of *Pipistrellus*.

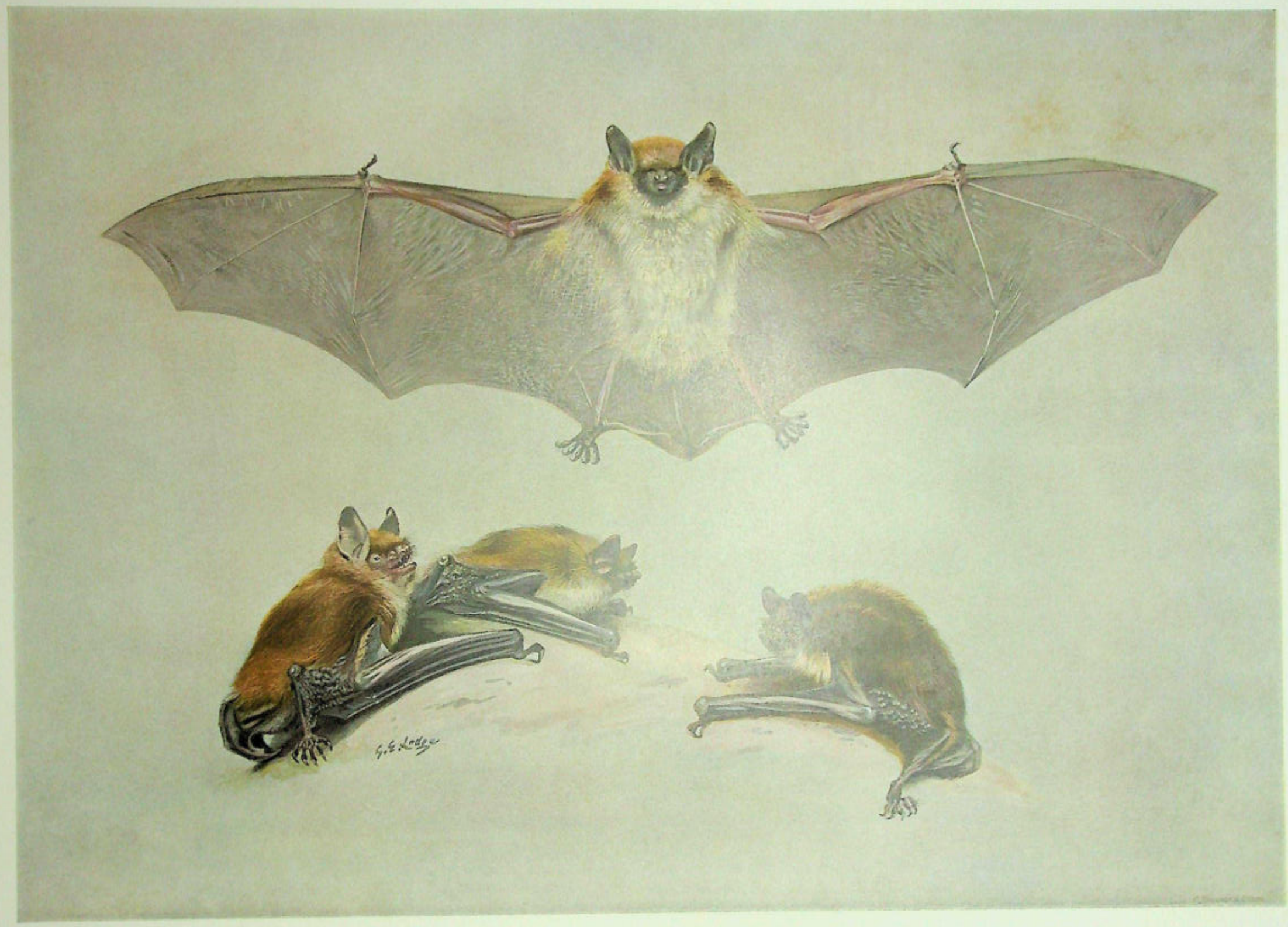
Representatives of this genus are found in all parts of the temperate and tropical regions in both hemispheres. Four species occur in our Islands—*Daubentoni*, *Nattereri*, *Bechsteini*, and *mystacinus*—and two others have gained a place in the British list on very insufficient evidence: these are *Myotis* and *dasycneme*. There is a family likeness between the four British species, but the characteristic points—as shown in the illustrations—are sufficiently distinct to prevent confusion.

Daubenton's Bat

Myotis Daubentoni, Leisler.

Vespertilio Daubentonii, Leisler, in Kuhl, 'Deutsch. Fled.' p. 51 (1817).
Vespertilio emarginatus, Jenyns, 'Brit. Vert.' p. 26 (1835).
Vespertilio ædilis, Jenyns, 'Ann. Nat. Hist.' p. 73 (1839).
Myotis Daubentoni, Miller, 'Ann. Mag.' ser. vi. vol. xx. p. 379 (1897).

Characters.—Daubenton's Bat has not infrequently been confused with Natterer's and the Whiskered Bats; it, however, possesses very much larger feet than either of these species, and the wing membrane arises from the metatarsus, which distinguishes it from the Whiskered Bat, where the membrane springs from the base of the outer toe, while the tip of the tail, extending about $\frac{1}{12}$th of an inch beyond the interfemoral membrane, and the absence of the lash of hairs on the



DAUBENTON'S BAT.

MYOTIS DAUBENTONI.

LIFE-SIZE.

edge of the interfemoral, are quite sufficient to prevent confusion between it and Natterer's Bat. The interfemoral membrane is distinctly notched on either side of the tail. The ears are practically an equilateral triangle with rounded points; the base of the outer margin is convex, and slightly concave or straight above; there are two notches, and the inner margin is convex throughout. The tragus measures rather less than half the length of the ear, is narrow and pointed, and has a single lobe at the base. The eye is small and surrounded by a naked space; the face scantily clothed with dark brown hair. In colour this Bat is golden-brown above, with very dark brown markings, across the forehead; the eyes are dark brown. The ventral surface is yellowish grey; the basal half of the hairs are dark brown. Immature examples are dark brown with a tinge of golden-brown on the dorsal surface. Expanse of outstretched wings, nearly 10 inches (250 to 255 mm.); head and body, 49 to 51 mm.; tail, 44 mm.

Distribution.—Daubenton's Bat is an inhabitant of North Africa and temperate Europe and Asia, being found even so far to the East as Japan. It occurs in Scandinavia and Russia, ranging further north than many species. The distribution of this common Bat in our Islands was little understood a few years ago, indeed its occurrence in any particular locality was considered worth recording in scientific journals—a very desirable thing until any species is known to be generally distributed. The pages of the 'Zoologist' contain many records of the capture or occurrence of this species, and special attention may be called to the able article by Mr. J. E. Harting (1889, pp. 161–166) and the supplementary note by the Rev. J. E. Kelsall on page 308 of the same year. From these notes it will be evident that the distribution of Daubenton's Bat is wide, but it may not be out of place to give a summary of the localities mentioned here and in other places. We find the species occurs, and is frequently common, in Cornwall (Cocks), Devon (Dobson's 'Cat.'), Dorset (Borrer, Dale), and Hants (Borrer). At Christchurch, where Mr. Borrer found the Bat so abundant in the old church in 1874, I found large numbers flying over the river Avon twenty years later, and I hear that the species is just as common now. In the New Forest Mr. Coward has observed it flying near Boldre, Brockenhurst, and other places. The Rev. C. A. Bury recorded it from the Isle of Wight. In Sussex Mr. Borrer noted it near Brighton, and I have found it numerous in several localities in St. Leonard's Forest and near Horsham. It is known to occur in Kent, Surrey, and Middlesex, where Yarrell obtained specimens in Islington. In Berkshire, Oxon, and all along the Thames Valley it is fairly plentiful; Mr. Aplin has recorded it from Oxford,

and I have seen it and obtained examples at Henley-on-Thames. No doubt the numerous Bats which Gilbert White noticed on the river between Richmond and Sunbury were referable to this species. It is common in many places in Essex (Laver, Doubleday), Worcester (Jenkinson, Tomes), and Warwick (Bell, Aplin, and Tomes); I have seen numbers on the Avon, near Leamington. It occurs in Hereford, Suffolk, Norfolk, Lincoln, and Bedford (Elliott). The first British example which was recognised was taken in Milton Park, Northamptonshire, and was described by Jenyns as *Vespertilio emarginatus*; but Bell showed that the specimens were not referable to Geoffroy's *emarginatus* but to Leisler's *V. Daubentonii*. Leicester (Browne, and others), Stafford (Garner, Oldham), and Derbyshire (Mosley, Oldham) have been added to the list, and in the last county and in Shropshire the Bat is very common. I have found it exceedingly common in the neighbourhood of Shrewsbury, where there are large sheets of water, on the Severn, and at Beaumer, near Condover. My friend Mr. Bevil Stainer, of Peplow, sent me in June 1902 a hamper containing seventy-four Bats of this species which he had obtained in the caves in the neighbourhood of the lake at Hawkstone. Nearly all were adults, both sexes being present, but there were a few full-grown dark-coloured immatures. I released all but four on the evening of their arrival, and next morning found five dead on the wall of my house. Several of the Bats remained in the neighbourhood for some time, and probably found their way eventually to St. Leonard's Forest.

Daubenton's Bat is abundant throughout Cheshire, and Mr. T. A. Coward writes: 'I have taken the species in the sandstone workings at Alderley together with the Long-eared and Whiskered Bats. Though this Bat is undoubtedly much later in its evening flight than the Pipistrelle when it is to be seen flying low above the water, I am not at all sure that it does not fly high for some time before it descends to the surface of the water. I have repeatedly seen Bats which were not Pipistrelles some half-hour before I noticed the first Daubenton's on the water. On cold nights, when other Bats were scarce, I have seen numbers of Daubenton's skimming the pools. I have taken the species in beeches, in caves, and in the roofs of cottages; one that we found at Alderley was not hanging, but was tightly wedged in a longitudinal crack in the rock. The young appear to be born in June; I had a number which were captured as they emerged from an old tree in Tatton Park, and several of them were quite juvenile; their wings were very narrow, their breasts covered with dirty white hair, and their bellies naked.' North of Cheshire the Bat is found in every county, being common in Yorkshire

(Clarke), Lancashire, Durham, and Northumberland (Selby, Bolam), while in the Lake District it has been obtained from many of the waters, and is described (Macpherson) as local but not rare.

No doubt the Bat occurs in many of the Welsh counties, but so far little is known of its distribution. Mr. Caton-Haigh[1] recorded it for Merioneth, and Mr. C. Oldham[2] found it common in the Conway Valley (Carnarvon and Denbigh).

The distribution of Daubenton's Bat in Scotland is not yet fully worked out, but it has been found to occur in widespread localities. In Perthshire I have found it fairly numerous in the Dunkeld district, and it occurs in the neighbourhood of Perth and at Glen Dochart (Grieve). Mr. George Sim, the veteran naturalist, of Aberdeen, tells me that he has known the Bat all his life on Dee-side, and has met with it in other localities in Aberdeenshire. Formerly there was a large colony in the Castle of Gight, and a small gathering in a keeper's house at Glentana; Mr. Sim sent me one in the flesh in June 1902. W. Macgillivray obtained an example in Aberdeen Cathedral in 1840,[3] and was the first to recognise the species in Scotland, although Fleming had recorded it as *V. emarginatus*[4] from Fifeshire. Subsequently J. Macgillivray found two colonies, eighty in all, in the cathedral,[5] but since that date Mr. Sim says[6] the cathedral 'has been altered and a new roof put on,' so that the Bats have deserted the locality. Elsewhere we have records of the species from Banff (Edward), Dumfries (MacGillivray), Kirkcudbright (Gray), Renfrew and Glasgow (Alston), Argyll (Campbell), and Edinburgh. Before Mr. C. Campbell found this species, in company with Long-eared Bats and Pipistrelles, at Kinlochaline,[7] I suspected that it would be found to occur in Western Argyll, for it is frequently found within the same area as Natterer's Bat.

The species is locally common in Ireland; Dr. Lyster Jameson[8] gives the known distribution in 1897, recording it from Donegal (Lydekker), Londonderry (Thompson), Down (Knox), Kildare (Kinahan), and Wexford (Barrington). He found two large colonies in Bohoe Caves, Fermanagh, in July 1895, and saw many flying over the River Glyde at Braganstown, co. Louth. The colony discovered by the late Professor Kinahan was at Tankardstown Bridge, in the masonry, so that the species may be claimed by Queen's Co. as well as by Kildare. The Wexford example was taken nine miles from the coast, 'flying low over the deck' of the Lucifer Shoals Lightship on April 21, 1891.

[1] *Zoologist*, 1887, p. 293. [2] *Ibid.* 1898, p. 317. [3] *Edin. N.P.J.* xxxi. 205.
[4] *Brit. An.* p. 6. [5] *Ann. Mag. Nat. Hist.* viii. 230. [6] *Vert. Fauna of Dee*, 1903.
[7] *Ann. Scot. Nat. Hist.* vi. 248. [8] *Irish Naturalist*, 1897, pp. 39, 40.

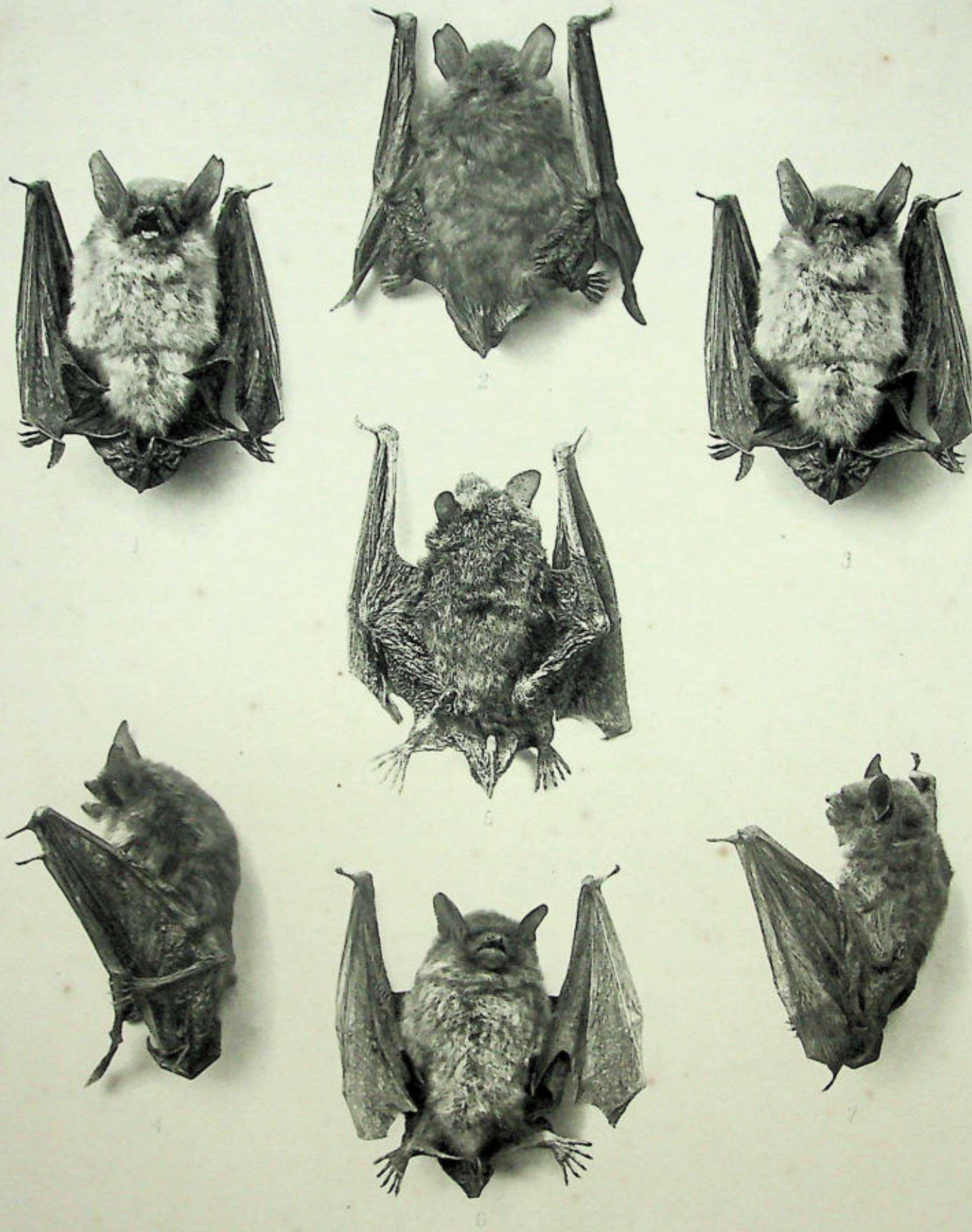
Habits.—Daubenton's Bat, like Natterer's and Bechstein's Bats, may be described as a forest-loving species, though, if we can use the expression, it is aquatic in its habits, loving the vicinity of water and delighting to hawk over the surface of lakes or still stretches of broad rivers or canals. It generally emerges early in the evening, sometimes flying long before dark; it does not always resort to the surface of the water at first, but flies along the copses or round the trees at a moderate height, but generally in the neighbourhood of its chosen feeding-ground. A little later in the evening the whole colony descends to the water, generally flying in the centre of the lake or river, the Bats skimming low along the water and dipping from time to time to take a fly from the surface or to drink, leaving a faint ripple behind. In Norway the Bat is known as the 'Vandflaggermus,' or Lake Bat—a very apt name. The Bats continue this mode of flight until it is dark, and indeed it is sometimes impossible to realise their presence save when an occasional reflection is seen as the little animal passes across the gleaming water or the gentle splash of a tiny body reaches the ear when the creature touches the water. When I have been out in a boat watching their flight, the Bats have passed so close to me that I could almost catch them with my hand, and they seemed to pay no attention to my presence. It is hardly surprising that at times a late fisherman will hook one which has mistaken his artificial fly for a real insect; cases of Bats captured in this manner are common, and when the captive is examined by an expert it is generally found to be referable to this species.

The manner of flight is peculiar to the species, and it is somewhat strange that the Bat has not been more frequently noticed. Sometimes it will zigzag along the surface like a swallow flying slowly in thundery weather, and sometimes it sails with slowly quivering pinions in a manner which reminds one of the flight of the common sandpiper. Doubtless the frequent dips, sometimes made several times within a few feet, are for the purpose of drinking as well as picking up a half-drowned fly. In captivity both this species and Natterer's Bat will sometimes use the thumb or wrist to push a large insect into the mouth.

But little is known about the duration of the flight. Dr. Alcock[1] gives fifty-four minutes after sunset as the time when the Bat was first seen in the open, but could not determine when it returned. The late W. Borrer[2] found that at Ullswater and Grasmere the species did not only fly at night on the lakes, but during the daytime skimmed the water within the boathouses. Professor Kinahan

[1] *Irish Naturalist*, 1899, p. 31.

[2] *Zoologist*, 1874, p. 4127.



1 2 3 4 5 6 7

1 2 3 4. Natterers Bat. 5 6 7 Daubentons Bat.

(Vespertilio)



THE EVENING FLIGHT OF DAUBENTON'S BATS.



NATTERER'S BATS HUNTING FOR FOOD.

heard the Bats in the masonry of Tankerstown Bridge scrambling and fighting about an hour before they emerged, which they did between 9.30 and 10.30 in June, coming out somewhat slowly. One night, when the weather was not good, the Bats were returning again half an hour after they had emerged.

In summer Daubenton's Bat frequently selects some old tree near water for a diurnal retreat, but even at this season it sometimes lives in a cave, while the roofs of buildings are also occupied. As a rule the retreat is near water, but in some cases it is a considerable distance away, and examples have been found where there is no open water in the neighbourhood, as, for instance, at Preston, near Brighton. Caves are the most generally selected domiciles in winter, and personally I have not met with this species in any other retreat, although it is known to hibernate in the roofs of churches and other buildings. At Christchurch, Hants, the verger informed me that large numbers of a small Bat occupied the roof of the old church, both in summer and winter. I asked him to send me some of these Bats, and in June 1902 received fifty-two, all of this species; there were both males and females, and some young Bats, and I found that they exhibited a greater variety in colouration than in the batch of Bats I received from Hawkstone, Shropshire.

The late W. Borrer writes[1] about the Bats in this church: 'One evening in July 1899 I strolled into the churchyard of Christchurch, Hants, and my attention was called to a great squeaking of Bats, of which I saw a continuous stream issuing from an aperture in the north wall of the church. They all appeared to be making towards the river; both their note and their flight were new to me. The next day I called on the verger, and got him to show me into a chamber in the church with which this aperture communicated; there, clinging to the ceiling and the walls, I saw many hundreds of this species. The floor, too, had many large heaps of their excrement, which I advised the aforesaid verger to experimentalise with in his garden; in some places these heaps were quite knee-deep. The Bats were clinging together in great masses; I stirred them up with a long stick, and many took to flight. I had, however, great difficulty in capturing them with a butterfly net, but, the place being very warm, I took off my coat, and, standing quite still, was rather surprised as well as pleased to find that many settled on my *white* shirt sleeves, and I easily took as many specimens as I required. On several evenings after I saw numbers flitting much in the manner of sand martins over the surface of the river near the bridge in the town, never appearing

[1] *Zoologist*, 1874, p. 4125.

to rise very high in the air, and seldom flying much beyond the river banks. One of those I obtained in the church had a young one clinging to the nipple, which in no way appeared to impede the flight of its parent.'

Mr. Symington Grieve[1] found Daubenton's Bats in large numbers spending the day in cracks in the precipitous cliffs that border Lochs Ure and Dochart. He could hear the 'chirping of the young' from the opposite side of the loch; 'an ebbing and flowing sound, which from a distance resembled a wail, was caused by the arrival and departure of the old Bats, which were evidently supplying their young with food.' One of these young ones was clinging to the *back* of a female, but afterwards, when the mother was hanging, it was rolled up in the membrane of the left wing. The Bats were in this situation only in summer; in September all had left.

Daubenton's Bats do not always hibernate in clusters; I have found them singly in caves occupied by other species, a habit which appears in all species of British Bats with the exception of the Serotine and Noctule. Like most Bats this species is much troubled by parasites in winter, and at this season, if disturbed, it shows fight and protests loudly; the voice is high pitched.

The light grey under parts of this species are almost as conspicuous in flight as those of Natterer's Bat, and I have found that when Bats of these two species are flying together it is no easy matter to distinguish one from the other. If observed closely, however, the narrower and more pointed ears of Natterer's are discernible, while the wings of this Bat are paler in colour and have a finer sweep than those of Daubenton's. Both species are adroit at avoiding capture, even when in a confined space. I remember, when visiting Mr. Heatley Noble at Henley-on-Thames, we released one of each species in his room; Mr. Noble, Mr. O. Grant, and I spent ten minutes in trying to capture them; even when we had cornered them they dodged the stroke of a tennis racket with wonderful skill.

The examples depicted were captured at Christchurch in June 1902; a young one in grey pelage is shown on the right of the plate.

[1] *Ann. Scot. Nat. Hist.* 1894, iii. 193.

Natterer's Bat

Myotis Nattereri, Kuhl.

Vespertilio Nattereri, Kuhl, 'Deutsch. Fled.' p. 33 (1817).
Myotis Nattereri, Miller, 'Ann. Mag.' ser. vi. vol. xx. p. 379 (1897).

Characters.—Natterer's Bat possesses a lash of short stiff hairs on the margin of the interfemoral membrane, a character which distinguishes it from all other British Bats. The shape of the membrane also differs from that of other members of the genus, a character which is best understood by comparing the plates. The wings arise from the base of the toes, the tail is almost enclosed within the membrane, the feet are short, and the calcaneum extends about half the distance between the ankle and the tail. The muzzle is long and pointed, the sebaceous gland prominent, and the lips furnished with long hairs. The ears, slightly longer than the head, are narrow and inclined outwards, the lower portion of the outer margin has a convex expansion. The tragus, about half the length of the ear, is narrow, sharply pointed, and inclined outwards. The tail is about the same length as the head and body. The fur is thick and of delicate texture, reddish brown or yellowish brown in colour on the back, with a slight tinge of grey; the hair is parti-coloured, being dark brown at the base and reddish at the tip. The parti-coloured hair of the under parts—dark grey, almost black at the base, tipped with white or yellowish white—gives a light appearance to the ventral surface. Across the forehead and round the eyes the fur is dark brown. The dentition is the same as in the last species. Expanse of the wings from 10½ to 11 inches (267 to 280 mm.); head and body, about 51 mm.; tail, 51 mm.

Distribution.—The range of Natterer's Bat is more restricted than that of many other British species; the species is confined to Europe, but is found from Ireland to the Urals and from southern Scandinavia to the Alps. In the British Islands it is somewhat local, but has occurred in so many counties that we can only conclude that it is generally distributed; more information, however, is required for Wales and Scotland. In a valuable paper on this species[1] Mr. J. E. Harting gives a list of occurrences and references for the following counties: Cornwall, Devon, Dorset, Hants, Isle of Wight, Sussex, Kent, Essex, Middlesex, Berks, Oxon, Cambridge, Northampton, Suffolk, Norfolk, Leicester, Warwick, Worcester, Stafford, Shropshire, Lincoln, Yorkshire, Durham. Since that list was published

[1] *Zoologist*, 1889, pp. 241–248.

many localities in these counties have been added, and also occurrences in Surrey,[1] Nottingham,[2] Bedford (Elliott), Lancashire,[3] Cumberland,[4] Huntingdon and Gloucester.[5] Mr. T. A. Coward informs me that Mr. Oldham and he have failed to identify the species in Cheshire, although they have examined one which was captured at Christmas-time 1892 in a forge at Red Bank, one of the most thickly populated districts of Manchester; probably this example had been introduced in produce, and may have come from some more rural part of Lancashire, or from Cheshire, which is only a few miles distant. The late Rev. H. A. Macpherson noted the presence of a colony at Castletown, in Cumberland, in 1886, and also stated that the Bat was known to the late Mr. T. C. Heysham, who had obtained specimens in the county.

Mr. Harting mentions Mr. Caton-Haigh's record for Merioneth in Wales, and Mr. Backhouse[6] records thirty-six taken from a ruin in North Wales, but the exact locality is not given. We cannot add to the two localities given for Scotland—Inverary, where the example in the British Museum was obtained by the late Duke of Argyll, and Edinburgh.[7]

For Ireland Mr. Harting mentions cos. Wicklow, Kildare, Queen's, Cork, and Dublin, while Mr. Hart[8] adds Donegal. Dr. H. Lyster Jameson[9] gives a fuller list, adding Fermanagh, where he found examples associated with the Daubenton's Bats in Bohoe Caves, Louth, and Longford. He points out that the Wicklow and Dublin records evidently refer to the same Bats, but makes no mention of the example from co. Cork recorded by Mr. Darling. The counties of Kildare and Queen's are both mentioned, as the examples recorded were taken from the masonry of the bridge which crosses the river Barrow, dividing the two counties. This record was stated to be erroneous, for most of the Bats proved to be Daubenton's; but Dr. Jameson points out that one of the specimens was found to have a fringe of bristles on the interfemoral membrane, so that we may safely conclude that, as at Bohoe, the two species were inhabiting the same retreat.

[1] Buckton, *Vict. Hist.* 'Surrey,' and Dalgleish, *Field*, vol. c. p. 506.

[2] Buttress, *Zoologist*, 1892, p. 144. [3] *Ibid.* 1893, p. 457. [4] Harting, quoting Macpherson, *ibid.* 1889, p. 309.

[5] Kelsall, *ibid.* 1889, p. 308. [6] *Ibid.* 1898, p. 493.

[7] *Proc. Glas. N.H.S.* iv. The original record of the Inverary specimen is to be found in Dobson's Catalogue of the *Cheiroptera* in the British Museum (1878), p. 307. The specimen was received in the flesh and is now preserved in spirit bearing the date 1858. In a footnote on p. 6 of 'A Fauna of Argyll and the Inner Hebrides,' Messrs. Harvie-Brown and Buckley inform us that in one of Robert Gray's letters that zoologist refers to Natterer's Bat as having been discovered (1880) 'in dozens in the hole of a tree,' and 'is in plenty near Dalkeith,' Midlothian. I certainly question this record, and think the species referred to was probably *M. Daubentoni*.

[8] *Zoologist*, 1891, p. 271. [9] *Irish Naturalist*, 1897, p. 39.



NATTERER'S BAT.

MYOTIS NATTERERI.

LIFE-SIZE.

Habits.—Natterer's Bat is a forest-haunting species, inhabiting heavily timbered land or woods in the vicinity of some water. In summer it emerges from its retreat--often a cave or old tree—early in the evening, and Mr. J. E. Harting says that it may often be seen abroad in daylight. It frequently resorts to a river or other extensive sheet of water, and there can be no doubt that the reason why this and other species of Bats select such a place is that they find insect life abundant over water. As a rule Natterer's Bat flies at a moderate elevation, sometimes only a few feet, sometimes thirty feet above the surface of the pool; I have, however, seen it fly as high in the air as a Noctule when, the weather being exceptionally fine, insect life was abundant at a high altitude. As the Bat feeds at a greater elevation than Daubenton's Bat, and as it flies with a somewhat slow and even flight, it may be distinguished from this species when the two are, as often occurs, flying in company. Natterer's Bat does not turn and twist in its flight, and when seen in company with Daubenton's Bat its wings appear larger, paler, and have a more russet tinge. If seen from below against a dark background —as in a cavern or room—the light under parts are very noticeable; but it is by no means safe to say that a white-breasted Bat is necessarily a Natterer's Bat, for when I have seen half a dozen of both species flying together I have found it impossible to distinguish the darker forms of the Natterer's from the lighter types of Daubenton's Bat, and in certain lights the darker under parts of the Whiskered look almost silvery. Mr. Coward noticed this in a Whiskered which he watched when it was flying at mid-day. At close quarters the narrow sharp-pointed ears of Natterer's Bat are easily recognised; they are generally carried well forward, in the manner of those of the Long-eared Bat.

Natterer's Bat has small and delicate teeth, from which we should imagine that it feeds upon gnats or very small insects; it is known to capture small Diptera and Micro-lepidoptera. I have often seen this Bat swoop down and touch water over which it was flying, but it did not dip in the same manner as Daubenton's Bat; it dropped to the surface, and rose again at once. I was not able to satisfy myself whether it was drinking or picking an insect from the surface; on one occasion I shot a Bat in the act of dipping, but it had no insect in its mouth when I examined it.

In the autumn Natterer's Bats retire to the roofs of churches, old buildings, caves, or other retreats for the period of hibernation, and at this time they become gregarious. These colonies are restless, and the Bats are constantly quarrelling; during the early part of winter there is a state of turmoil rather

than rest, until the deep sleep of winter has reduced most of the Bats to lethargy. Even then some members of the colony will cause confusion by attempting to push among those of their fellows who are crowded together, so as to benefit by the heat; the Bats over which the cold outsiders crawl will rouse up and protest with loud squeaks. Sometimes a Bat will move away from the mass and hang alone in a cold and draughty situation. I have found that such solitary individuals showed a great difference in the soundness of their sleep; some would rouse and protest immediately they were touched, their eyes however remaining closed, while others were passive and showed little sign of life until they were placed upon their backs—an unnatural position which seldom fails to rouse a Bat. I have found both Natterer's and Daubenton's Bats hibernating in an upright position, holding by all four limbs, and sometimes have discovered them lying on their bellies in a crack.

When collecting Bats in Mr. Heatley Noble's cave at Henley-on-Thames, where this species abounds, we have, while examining the outside of chambers in which Bats were hidden, heard the voices of the little creatures within, proving that some at least of the hidden colony were on the move. Like many other Bats, Natterer's will bite fiercely on being awakened from sleep, but I do not consider that it is fair to argue that this shows a malevolent disposition, as some writers state.

The time at which Natterer's Bat first appears in the spring is not known, but I have not seen it out early in St. Leonard's Forest; indeed, I have not noticed it on the wing in that locality before May.

Mr. A. Whitaker, of Barnsley, made some interesting experiments upon a Natterer's Bat in order to verify for himself the truth about the cruel experiments of Spallanzani and others. He obtained a Natterer's Bat and covered its closed eyes with wax, fastening it with a little patch of rubber and solution, and then released the Bat in a room in which it had not been before. When, on previous occasions, other Bats had been at liberty in this room they had usually circled round close to the ceiling; but this blinded Bat at first flew in a hesitating manner, and then, gaining confidence, went straight towards the closed door. It stopped when about six inches away, and hovered slowly along the line of the top and right down the side, without doubt keeping its position through its sensitiveness to the slight draught which came through the tiny chink. Finding no opening large enough to get through, it flew quickly down the room towards the fireplace, no doubt again feeling the draught, but turned away when it felt the heat of the fire. It flitted

then close to the wainscot, hesitating repeatedly at a spot where the woodwork was a little sprung and there was again a sensible draught. It flew quickly, passing under chairs, of which there were twelve in the room besides other furniture, and never even touched anything with the tips of its wings. An attempt to catch it showed that, although incapable of sight, it was well able to dodge; but it constantly stopped in its flight, hovered, and scratched at the covering over its eyes. When a stick was held in its direct path, it avoided it when three or four inches away. When it wanted to rest it settled on one of the weights of a gas chandelier in quite an orthodox manner, and when a hand was stretched out to capture it, it flew off again before it was touched. This experiment is interesting, especially when we hear that the animal's sight was in no way injured when the wax was removed; it shows that the power of ascertaining the presence of an object does not depend entirely upon sight, and that the difference of air-pressure was perceptible by the animal.

Natterer's Bat is often called the Reddish-grey Bat, but this is not a very happy title; indeed, the colour is almost yellowish grey. Its specific name, from which its usual title is derived, was conferred upon it by Kuhl, who first described it, in honour of the great Austrian naturalist.

The examples depicted were captured by me at Henley-on-Thames in February 1902.

Bechstein's Bat

Myotis Bechsteini, Leisler.

Vespertilio Bechsteinii, Leisler, in Kuhl, 'Deutsch. Fled.' p. 30 (1817).
Myotis Bechsteini, Miller, 'Ann. Mag. Nat. Hist.' ser. vi. vol. xx. p. 379 (1897).

Characters.—Bechstein's Bat is rather larger in the head and body than either of the two last species; it has a wide gape and long narrow upright ears, characters which are useful to note, while the absence of the lash of hair on the interfemoral membrane is quite sufficient to prevent confusion with *M. Nattereri*. The tail is shorter than the head and body. The wing membrane springs from the base of the toes; the wings are similar in form to those of the last species, and the colour of the fur approaches it. It is reddish brown above, the hair being parti-coloured, lighter at the tips and pale grey beneath, though not quite so light as in *M. Nattereri*. By far the most striking feature, and one which even a casual observer may note, is the size and shape of the ears. They first bend

outwards at an angle of 78°, and then turn upwards to the perpendicular, ending in a rounded point. The illustration, which exhibits this feature, was drawn immediately after death, and shows that the engravings in Bell's 'British Quadrupeds'[1] are not reliable; the artist evidently drew from dried skins, and Bell himself describes the ears as 'oval,' which they certainly are not. Other writers have copied from Bell and repeated the error. The tragus, which resembles that of *Nattereri*, is only one-third the length of the ear.

Measurements of an adult male: expanse, 11 inches (280 mm.); head and body, 57 mm.; tail, 44 mm.

Distribution.—Like the preceding species, Bechstein's Bat is only known to occur in Europe; its range extends from England to southern Russia, and from Sweden to Italy.

Only a few examples of this Bat have been discovered in England, but I cannot but think that when the study of the *Cheiroptera* becomes more general we shall hear of the species from more localities than are now recorded; at any rate, in the South of England. The first British examples of Bechstein's Bat were taken many years ago by Mr. Millard in the New Forest, and are preserved in the national collection in Cromwell Road. It was not until 1886 that a second discovery of the species, again in the New Forest, was made by Mr. E. W. H. Blagg, who took two from a dozen or more which he found in a woodpecker's hole.[2] The Bats were captured in July, and were satisfactorily identified. So far the species was not known to occur beyond the confines of the Forest, but on March 10, 1901, when visiting the cave in the chalk on the property of Mr. Heatley Noble, at Henley-on-Thames, I was fortunate in finding an adult male. I communicated a short account of the capture, with a description of the Bat and a drawing, to the Proceedings of the Zoological Society, June 4, 1901, for no correct picture of this rare British Bat had hitherto been published.

Up to the present time these are the only known occurrences of the Bat in Britain; the two examples mentioned by Mr. J. E. Harting,[3] which were thought to be referable to this species and were in the collection of the late Mr. F. Bond, were examined by Mr. Harting and me, and we agreed that they were undoubtedly Natterer's Bats. The reported occurrence of the species at Godstow, near Oxford, has also been proved erroneous.

Habits.—Nothing is known about the habits of Bechstein's Bat in our own country, and what little has been published either shows that the continental

[1] 2nd edit. pp. 52, 53. [2] *Zoologist*, 1888, p. 260. [3] *Ibid.* 1888, p. 260, edit. note.



BECHSTEIN'S BAT.

MYOTIS BECHSTEINI.

LIFE-SIZE.

writers have not fully studied the matter or that its habits here and in Germany differ. In North Germany—and especially in Thuringia, where it is common—it is often called the 'Long-eared Bat,' on account of the prominent ears. Its habits are said to resemble those of the last-named species. It is stated to live in holes in high trees, and to be generally found singly, to emerge late in the evening, and hunt the woods and lanes near its retreat. The flight is described as being slow, even clumsy, and at a low elevation.

When Mr. Lydekker published his 'British Mammals' he was of opinion that the species had but slender claim to rank on the British list, but probably he has since altered his view. He remarks that the Bat never resorts to buildings or caves, and that it does not associate with other species of Bats; these statements are made on the authority of some continental writers who were evidently not well informed, for even in Thuringia the Bat constantly hibernates under the tiles of houses, and the example I found in the chalk cave at Henley-on-Thames was lying in a crevice close to a couple of Natterer's Bats, while Pipistrelles, Daubenton's, and Long-eared Bats were hibernating in the same cave. This Bat was wide awake, and remonstrated when I picked it up, biting and uttering a series of querulous screeches, not unlike the cries of a very young child.

Whiskered Bat

Myotis mystacinus, Leisler.

Vespertilio mystacinus, Leisler, in Kuhl, 'Deutsch. Fled.' p. 58 (1817).
Vespertilio siligorensis, Hodgson, 'Ann. Mag. Nat. Hist.' ser. ii. vol. xvi. p. 102 (1853).
Myotis mystacinus, Miller, 'Ann. Mag. Nat. Hist.' ser. vi. vol. xx. p. 379 (1897).

Characters.—The shape of the interfemoral membrane of *M. mystacinus* is a good character by which to distinguish it from other species of this genus. It is almost straight, not lobed as in *Nattereri*, or notched, and with the tail terminal projecting, as in *Daubentoni*. The wings take origin from the base of the outer toes; the feet are small; the nose and naked part of the face are shorter and the eyes more hidden than in *Daubentoni*. The muzzle is narrow, and the sebaceous glands small; the ears, as long as or a trifle longer than the head, have rounded tips. The basal lobe forms a right angle with the outer margin of the ear; the inner margin is slightly convex at the base and straight above; the upper part of the outer margin is concave, the lower portion convex, with a lobe at the base.

The tragus is narrow at the base and convex on the outer margin, narrowing to a rather blunted tip. The dentition resembles that of other members of the genus. The wing membrane and the ears are dark in colour, sometimes almost black. The hair, with its dark bases and light sandy-brown terminals, gives a somewhat dark brown colour to the pelage of the upper surface, the ventral surface is darker than in the other species, and is grey. In winter the pelage is much darker than in summer. The few dark hairs which adorn the forehead and muzzle are responsible for the somewhat inappropriate name. Daubenton's Bat has an even more hairy face than this species; however, the English name, Whiskered Bat, agrees with Leisler's original specific name, so that it would be unwise to alter it now.

Expanse, 8½ inches (216 mm.); head and body, 39 mm.; tail, 35 mm.

Distribution.—This small Bat has a wider range than some other members of the genus *Myotis*; it is found throughout Europe, from Ireland to the Urals, and from Finland to France and Spain, while it is known to occur in many parts of temperate Asia, from Asia Minor to China; it occurs in Sikkim and Nepaul, and in Africa north of the Sahara.

Throughout England the Whiskered Bat is generally distributed, and though little known in many localities it is decidedly common in some counties. There are records of its capture in the following counties, and possibly in others which have slipped my notice: Middlesex, Kent, Surrey, Sussex, Hampshire, Isle of Wight, Devon, Dorset, Buckingham, Berkshire, Oxford, Worcester, Warwick, Essex, Northampton, Cambridge, Leicester, Stafford, Shropshire, Yorkshire, Derbyshire, Cheshire, Lancashire, Cumberland, and Durham; from some counties these records are so numerous that I can only think that the statement that it is a rare Bat is the result of the general inattention to the order. In Wales it has not been reported from many places, though Mr. Caton-Haigh, who has found it in Merioneth, says it is common in many localities in North Wales, and Mr. Oldham found it as far to the west as Lleyn. As yet it has been recorded three times for Scotland, from East Lothian and Rannoch. In Ireland its distribution is so widespread, or rather it has been found in places so far apart, that it seems probable that it is commoner than is suspected. Dr. Jameson mentions[1] Clare, where the first Irish example was brought to Prof. Kinahan by a cat in 1853, and described by him as *V. Daubentoni*, but found to be really referable to this species[2]; co. Louth, where it is not uncommon at Killencoole; and two localities in co. Fermanagh. Dr. Alcock[3] adds Dublin, on his own authority and that of

[1] *Irish Naturalist*, 1897, p. 38. [2] *Proc. Dub. N.H.S.* i. 148. [3] *Irish Naturalist*, 1899, p. 55.



THE WHISKERED BAT.

MYOTIS MYSTACINUS.

LIFE-SIZE.

Mr. Welland, and Mr. Charles Langham[1] gives another locality, Tempo Manor for Fermanagh.

Habits.—Our knowledge of the habits of the Whiskered Bat is scanty, although the animal is not uncommon in many districts. It is said to be more or less solitary both in winter and summer, but it sometimes hibernates in colonies. Mr. O. Grabham[2] describes a gathering of these Bats which he discovered behind the old-fashioned shutters of a cottage; other companies have also been met with, but in some places—as, for instance, the sandstone tunnels at Alderley Edge, Cheshire—the Bats are always scattered about, though Long-eareds and Daubenton's occupy the same levels.

It emerges early in the evening, and flies swiftly, but with a more sustained and regular flight than the Pipistrelle; it frequents lanes, the borders of woods, hedgerows, and other shelter, and does not appear to fly much in the open. It is not infrequently found in the vicinity of water. Personally I have had little opportunity of observing this species on the wing; one Whiskered Bat, however, spent the day in an old cowshed close to my house at Horsham, and though I never found it in its retreat, I used to see it evening after evening flying round an old oak close to the shed. Its manner of flight, passing in and out of the foliage in search of food, reminded me of the flight of the Long-eared Bat, but I never saw it take an insect from the leaves. It frequently came within a few feet of me, but it turned and twisted with such rapidity when apparently chasing gnats, one moment outlined against the sky, the next lost against the dark background, that I was not able to get a shot at it from a respectable distance. I was determined to identify the species, for I could not feel sure of it in these circumstances, and was finally obliged to shoot it at close range; when I picked it up I found it was useless as a specimen, but was pleased to find that I had not been mistaken in my identification. There can be no doubt that the Bat is more or less arboreal in its habits, feeding among foliage; Mr. Tomes[3] says: 'At the present moment there is quite a large colony of Whiskered Bats in the roof of the house of the writer at Littleton, from which place more than a hundred were seen to emerge one evening in July 1899. They dropped out of a hole in the slates, either singly or in twos or threes, and lost no time in getting into the top of a large walnut tree, through which they passed and scattered off to other trees to feed among the branches. The flight of this Bat may be described as quivering through and through the branches and among the leaves.'

[1] *Zoologist*, 1896, p. 350. [2] *Field*, March 29, 1902. [3] *Vict. Hist.* 'Worcester.'

Mr. T. A. Coward informs me that the Whiskered Bat is common in Cheshire and the neighbouring counties. He says: 'I have frequently seen it flying in the daytime in spring and early summer. On June 3, 1898, I knocked down two while they were hawking for flies over the River Dane at Wincle and round a clump of trees on the bank. The sun was shining brightly at the time, and the grey under parts looked quite silvery when they caught the light. I secured only one, which proved to be a male, for the other was not injured when knocked down, but rose again and flew up the river. In this district—the hill country between Cheshire and Derbyshire and Staffordshire, where the millstone grit touches on one side the new red sandstone of Cheshire and on the other the limestone of Derbyshire—the Bat is by no means rare; I have found it in the daytime clinging to the rough stone walls which serve instead of hedgerows. My friend Mr. Oldham has met with it in many places in this neighbourhood. We have often found it hibernating in the sandstone tunnels at Alderley Edge, but it does not spend the day in these tunnels in summer; we once found one sheltering behind loose bark on a fir in Delamere Forest, but this is the only occasion when we have met with it on trees in the daytime. The tunnels are full of insects, mostly gnats and diptera, while there are a number of spiders and two moths—*Scotosia dubitata* and *Gonoptera libatrix*, both of which species Mr. Oldham found a captive Whiskered would eat and enjoy. It is by no means certain that the Bats do not feed within the tunnels during winter; they certainly do at some time during their occupation, though the wings of the moths, which litter the floor of the tunnel in many places, are not the leavings of the Bats but of wood mice.' 'When touched, even in the depth of winter, the Whiskered Bat will open its mouth, chatter its teeth, and squeak. The cry is low pitched for a Bat.'

The same writer kindly visited these caverns for me in December 1903, and sent two Whiskered Bats so that I might make studies from life. When liberated in a warm room they woke up slowly, and when they took to flight were typical of the genus in their actions. They did not remain on the wing for long, but soon relapsed into sleep, shivering all over as they dozed off in the same manner as when they were waking.

Caves, quarries, and house roofs are used as diurnal retreats in the summer, and also as sleeping quarters in winter. The date when the Bats awake for the summer is not known, but Dr. N. Alcock,[1] in his interesting paper on the species in Ireland, gives the earliest dates when the species has been noticed abroad, by no

[1] *Irish Naturalist*, 1899, pp. 53–57.





Walter del. et lith. No. 5.

The Whiskered and Bechstein's Bat (Lower left-hand figure)

means proving, however, that this is the time of awakening. Mr. Hart saw it on April 15, Mr. Tomes on the 16th, and Mr. Coward on the 26th of the same month; in all three cases, strange to say, the Bats were flying at noon. A captive Bat which Dr. Alcock had under observation began to hibernate on October 7, and a few days later its respirations fell in seven minutes from 120 to 10 per minute; it died about a month later. Dr. Alcock suggests that in all probability hibernation out of doors would have commenced at an earlier date. The pitch of the voice of this Bat, measured by Galton's whistle, was considerably less than 8,000 vibrations, a very low pitch for a Bat.

Mr. C. Oldham[1] gives some particulars of the Whiskered Bat in captivity. His Bat was taken from the workings in Alderley Edge on November 27, and at first refused to take food; it did not appear to understand mealworms, although Noctules, and other Bats, will take them readily if a little of the inside of the worm is smeared over their muzzles. Mr. Oldham, after five days, placed some of the moths from the tunnel—*Scotosia dubitata*—in the cage with the Bat, and though it would not pay any attention to them at first, it devoured them all the next day, leaving only the legs and wings. He then tricked the Bat by fixing the wings of moths upon a mealworm, and after that he had no trouble, for the Bat became absurdly tame and would take worms from his hand. He found it had an enormous appetite; one evening, after a good feed the day before, it devoured, in the course of six hours, eight mealworms, a large spider, and six of the moths, and the next night it took seven more moths. On another occasion it ate two fragments of raw rabbit, seven mealworms, one *dubitata*, and two of the thick-bodied *G. libatrix*. When first captured the Bat bit, but it never showed any temper afterwards. It did not fly much, but was constantly in motion when at liberty and awake, running about on a table; when compelled to take wing, it soon tired and alighted on an upright object or on the floor. It could rise from a flat surface with ease. 'The sense of sight,' says Mr. Oldham, 'seems to be but feeble in the Whiskered Bat. The example under notice could not see, or at all events recognise, a mealworm or wet paint-brush if more than an inch from its face. As this species is more diurnal than any other British Bat, and may frequently be seen abroad at midday in summer, the inability of my captive to see objects an inch away cannot be attributed to the dazzling effect of too strong a light, especially as this inability existed equally in the daytime and in the artificial light of a lamp.' This Bat sometimes slept prone upon the floor, and it usually wakened of itself during the

[1] *Zoologist*, 1899, pp. 49–53.

evening, and sometimes in the day. This point is interesting, for it must be remembered that this Bat was kept during the period of hibernation. Mr. Oldham experimented with his Bat, watching its method of pouching its food; he fed it when it was on a glass through which he could watch it from below; he found that the animal used the interfemoral pouch in a more perfect manner than he had previously noticed in any other species; but after a time, when it discovered that mealworms did not struggle much, it ceased to thrust them into the pouch. It did not pick up any portion of its food which it allowed to drop. This Bat was very cleanly after a meal, but it also supported several external parasites. Mr. Oldham found a large tick and two fleas upon it; the fleas were identified by Mr. E. Saunders as *Typhlopsylla hexactenus*.

Mr. Oldham also contributed to the 'Zoologist' (1899, p. 475) a note about the Whiskered Bat, which, although Bats are so adroit at avoiding obstacles, had managed to fix itself upon a thorn, which had pierced the interfemoral membrane; the Bat was dying when found, and in its struggles it had twisted the membrane tightly round the twig to which it hung.

Another example of the voracity of the Whiskered Bat is given in the paper mentioned by Dr. Alcock; his captive devoured at one meal two large bluebottles and sixteen smaller flies. Dr. Alcock found that his captive moved in its cage during the period of hibernation; we can only conclude that under certain circumstances the winter sleep is not profound.

The late Mr. W. Borrer[1] received a male Whiskered Bat which was shot in January 1853 when flying in the daytime, so that it appears that a fine winter day will tempt the animal forth. A Whiskered Bat, he says in the same article, was captured during the daytime, when it had flown against the white smock of a rustic.

The examples on Plate IX. were drawn from a living Bat which was taken by Mr. H. Hett in the chalk cave at Chislehurst in January 1902.

[1] *Zoologist*, 1874, p. 4125.

The Mouse-coloured Bat

Myotis myotis, Bechstein.

Vespertilio murinus, Schreber, 'Säug.' i. 165 (1775).
Vespertilio murinus, Keys. and Blas. W. 'Arch.' v. Bk. i. 306 (1839).
Vespertilio myotis, Bechstein, 'Naturg. Deutsch.' i. 1154 (1791).
Vespertilio myotis, Nillson, 'Skand. Faun.' p. 20 (1847).
Myotis myotis, Miller, 'Ann. Mag. Nat. Hist.' ser. vi. vol. xx. p. 379 (1897).

I have already pointed out the confusion which has arisen from a misunderstanding about the species to which Linnæus gave the name of *V. murinus*, and why Kuhl's specific name of *Myotis* should be conferred upon this Bat, the 'Common Bat' of the Continent, but not of Scandinavia. The claim of this large Bat to be included in the British list is so slender that I have thought it wisest to leave it out, and only to mention the occurrence in order to show my reasons. The first record, if it is really a record, of the species is of one which is preserved in the national collection, and which was said to have been taken prior to the year 1835 in the gardens of the British Museum in Bloomsbury. Dr. Dobson entered this specimen (unless the labels had been mixed, a by no means uncommon thing in even the best collections) in his 'Catalogue of the Cheiroptera' as being of British origin; but when we consider the many 'ifs,' and the possibility that a Bat might easily be introduced with a museum specimen, we cannot think that this record is of sufficient value. Since then reputed occurrences of the species in Dorset and the Isle of Wight have been proved incorrect. Mr. Lewis Bonhote[1] recorded another example, which was identified by him; it was a specimen in the Cambridge Museum, and it is said to have been taken in a room at Girton College in 1888. Without throwing doubt upon the accuracy of Mr. Bonhote's identification, we feel strongly that the origin of the Bat is unsatisfactory, for it had probably been introduced by artificial means if the specimen labelled is actually the one which was captured at Girton.[2]

The claim of the Rough-legged Bat, *Myotis dasycneme* (Boie), is even more slender. The example which is supposed to be the one mentioned in Dobson's 'Catalogue' was captured when 'swimming' on the river Stour by the late Lord

[1] *Zoologist*, 1893, p. 387.

[2] Mr. Bonhote himself doubts the authenticity of the specimen. He tells me that next to Girton College is a large nursery where great numbers of foreign trees and shrubs are constantly received. The Bat probably came in one of these.

Lilford, and was noticed in the 'Proceedings of the Linnæan Society' (1853, p. 260) as a variety of *M. Daubentoni*, and afterwards referred to the present species by Mr. Tomes.[1] Nevertheless it is omitted from the second edition (1874) of Bell's 'Quadrupeds' by Mr. Tomes. I also fail to understand why it has been included by Sir Harry Johnston, and what his evidence is for the remark that it has since 'been found in Warwickshire, and in several places in the south of England.'

[1] *Zoologist*, 1854, p. 361.

Order INSECTIVORA

THE INSECT-EATING MAMMALS

THIS group of mammals, which is represented in our Islands by the Hedgehog, the Mole, and the Shrews, is one of the oldest of existing orders. The Insectivores possess certain archaic characters, which are found in only two other groups—namely, the Marsupials and Monotremes—and were doubtless among the first mammals to appear on the surface of the earth.

It is a curious fact that although the characters of most mammals have altered considerably since early Pliocene days, many of the *Insectivora* have remained practically unchanged. The Hedgehogs, Moles, and Shrews are to-day similar in many respects to their ancestors of the end of the Secondary Epoch.

The Insectivores, as their name implies, are insect-eating animals. With few exceptions they are small, terrestrial, and nocturnal or crepuscular in habits, spending the day below the ground or hiding in dense foliage. A few families are exceptional; the large Tree Shrews are arboreal and diurnal, the Water Shrews also diurnal and more or less aquatic, while the Moles are both nocturnal and diurnal in their subterranean dwellings and runs.

As a rule, the Insectivores have five toes upon each of their plantigrade feet, and these toes are armed with strong claws to assist them in digging or locomotion. The snout is long, being extended beyond the lower jaw. Sometimes it is elongated until it becomes a proboscis; for example, in the Jumping Shrews (*Macroscelididæ*) and Desmans (*Myogale*), and indeed in our British Lesser Shrew. A well-developed clavicle or collar bone connects the scapula and sternum, forming one good character to distinguish an Insectivore from a Carnivore, and the smooth lobe of the brain in the former is a further point of difference. In addition to the absence of a fore-limb which can be used for flight, the *Insectivora* may be distinguished from the *Cheiroptera* by the position and number of the teats; these,

which vary in number from seven to twelve pairs, are placed upon the abdomen and not the breast.

The dentition of the order is more varied; it ranges from the powerful teeth of the Tenrecs to the minute teeth of the Lesser Shrew, which can scarcely be distinguished with the naked eye, and the form of the various teeth varies in different families. As a rule, however, the canine is not very different in form from the incisors and premolars, and lacks the great development and marked peculiarities of the tusk of the *Carnivora*. The upper molars are cusped in a V- or W-shaped pattern, giving greater holding capacity. The molars are always broader in the upper than in the lower jaw.

In general structure the Insectivores approach more nearly to the Marsupials than to any other order, and we may conclude that they are descended from these ancient mammalians. It is noticeable in this respect that their range, so to speak, dovetails into the range of the Marsupials, for they are found throughout the globe with the exception of the continents of South America and Australia, the only geographical areas, save a portion of the North American continent, where we find Marsupials.

Family *ERINACEIDÆ*

THE HEDGEHOGS

THE *Erinaceidæ* or Hedgehogs inhabit Europe, Asia, and Africa, but the family is not represented in the Malay Archipelago, Burma, Siam, South China, Ceylon, and Madagascar.

Genus *Erinaceus*

Only one species of Hedgehog occurs in the British Islands. *Erinaceus europæus* of Linnæus differs in many respects from the other Old World Hedgehogs. The generic characters are included below in the description of our species.

THE COMMON HEDGEHOG

Erinaceus europæus, Linn.

Erinaceus europæus, Linn. 'Syst. Nat.' edit. x. 52 (1766); Bell, 'Brit. Quad.' 2nd edit. p. 102 (1874).

Erinaceus europæus occidentalis, Barrett-Hamilton, 'Ann. Mag. Nat. Hist.' ser. vii. vol. v. p. 362 (1900).

Local Names.—*Hedgehog*, *Hedgepig* (England); *Urchin* (Old English); *Urchin*, *Hyrchoune* (Scotland); *Crainaig* (Gaelic); *Draenog* (Wales); *Hérisson* (France); *Pindsvinet* (Spiked Swine) or *Bustdivilen* (Norway).

Characters.—A thick mail of sharp-pointed spines, which are stoutest in their median portion, covers the whole of the upper parts of the Hedgehog; this covering extends from the back of the forehead to the rump, and down the sides to a line drawn from the lower margin of the ear to the angle of the hind leg. The spines are closely implanted; they are dirty white or yellowish in colour, and have black or dark brown rings near their centre, usually in three bands. By means of a subcutaneous muscle,

the *panniculus carnosus*, the Hedgehog can roll itself into a ball and hold itself firmly in that position with all the spines erect and pointing outwards or forwards, or if necessary, as in swimming, the spines can be directed backwards and lie closely along the body. A dense pelage of coarse buff or yellow-white hair covers the remainder of the body; on the under surface these hairs are either dirty brown or dirty white, generally intermingled. The proportion of dark and light hairs varies in different examples; in some the under surface is more or less uniform brown, but in others it is whitish. The muzzle is ashy black, the snout and lips black and naked. The ears are broad and round, and are partially hidden by the hair of the cheeks. The legs are short, the claws stout and moderately long. Six teats are present on both sides of the abdomen of the female.

Dentition: I. $\frac{6}{4}$; C. $\frac{2}{2}$; P.M. $\frac{6}{4}$; M. $\frac{6}{6}$. The shape of the teeth is somewhat remarkable: the inner pair of incisors in the upper jaw, which are separate, are conical and placed vertically; in the lower jaw they are directed forwards. The cusps on the molars in the upper jaw are very marked, and are arranged in the usual W-shaped pattern, with the exception of the last molar, which has one triangular cusp. Length of head and body, about 8 to 10 inches; of tail, $\frac{3}{4}$ inch to $1\frac{1}{4}$ inches.

Captain G. E. H. Barrett-Hamilton has demonstrated[1] that there is considerable local variation in the European Hedgehog, and he points out that it is generally possible to distinguish our British forms from the continental forms. He describes our Hedgehog under the name of *E. europæus occidentalis* subsp. nov., taking for his type a male with the largest skull he has seen, which was obtained by Professor W. Eagle Clarke in Haddingtonshire in April 1899. His characteristics are as follows: 'Colour of under side a mixture of dirty white and dirty brown without definable pattern. Spines with at least three bands. Skull with conspicuous frontal processes to the premaxillæ, with a blunt or nearly square posterior termination, and seldom showing a sharply defined point or angle; these processes usually extend backwards for more than half the length of the nasals.' In his type the skull measures 57 mm. in basal length and the breadth at zygoma is 34 mm., while in a specimen from Cardiff it is 53 mm. and 36 mm. respectively. In a Norwegian specimen, similar presumably to the type described by Linnæus, the measurements are 55·5 mm. by 36 mm., and the frontal processes of the premaxillæ, though extending backwards half the length of the nasals, end in a sharply defined point. These differences in the skull enable him to distinguish the British Hedgehog from

[1] *Annals and Mag. Nat. Hist.* ser. vii. vol. v. pp. 360–368.



THE HEDGEHOG.

ERINACEUS EUROPÆUS.

any of the other local races. His dimensions of three British specimens are as follows:

Male from Cardiff:	Head and body,	263	mm.	Tail,	20	mm.	Hind foot,	43 mm.
„	Haddingtonshire „	218	„	„	17	„	„	42 „
„	co. Clare „	252	„	„	30	„	„	40 „

Dr. Lönnberg severely criticised Captain Barrett-Hamilton's remarks, and showed that the cranial characters were not constant in Scandinavian Hedgehogs. Captain Barrett-Hamilton[1] admits that he was perhaps relying on insufficient evidence, his range of specimens being too small; but the fact remains that though the characters may not be absolutely constant, he was able to distinguish the British specimens in the national collection from all the others. We give his reply to Dr. Lönnberg. 'Relying on the rule that such differences, even if slight, are usually not meaningless, I assumed that they would be borne out by a larger series of specimens than I at that time had before me. Dr. Lönnberg finds that this is not so; and I can only say that, while I am sorry that my opinion seems to have been erroneous, I am only too glad to find here in the Hedgehog another check to those who, while refusing to recognise colour differences, pin their faith with an inconsistent fidelity on what are frequently the shadowy characters of the cranium.' These characters, he points out, may be abnormal where they differ from the majority, 'a fact which, when still larger numbers are available, may yet prove the saving of my subdivision of the Hedgehogs.'

Distribution.—The European Hedgehog is found throughout the greater part of Europe, ranging from central Scandinavia to Spain and Italy. In Spain the colour is often, at any rate, paler, and in many cases the bristles lack the black central band, and in Italy also, according to Captain Barrett-Hamilton, the animal is slightly paler. In Asia allied forms have been described by different names; and a specimen from Roumania closely approached the Syrian form in colour. In Syria we have *E. concolor*, Martin[2]; in Siberia, *E. sibiricus*, Erxleben; in Eastern China, *E. dealbatus* of R. Swinhoe; and in Amurland, *E. europæus* var. *amurensis* of L. v. Schrenck.

In England the Hedgehog is widely distributed, being found in every county. It occurs in the market gardens within a few miles of London, and indeed is everywhere common, in spite of constant persecution by farmers and gamekeepers. It is common over the arable land at the foot of the Welsh and Lake District

[1] *Ann. Mag.* vi. 245.

[2] *Proc. Zool. Soc.* 1837, p. 102.

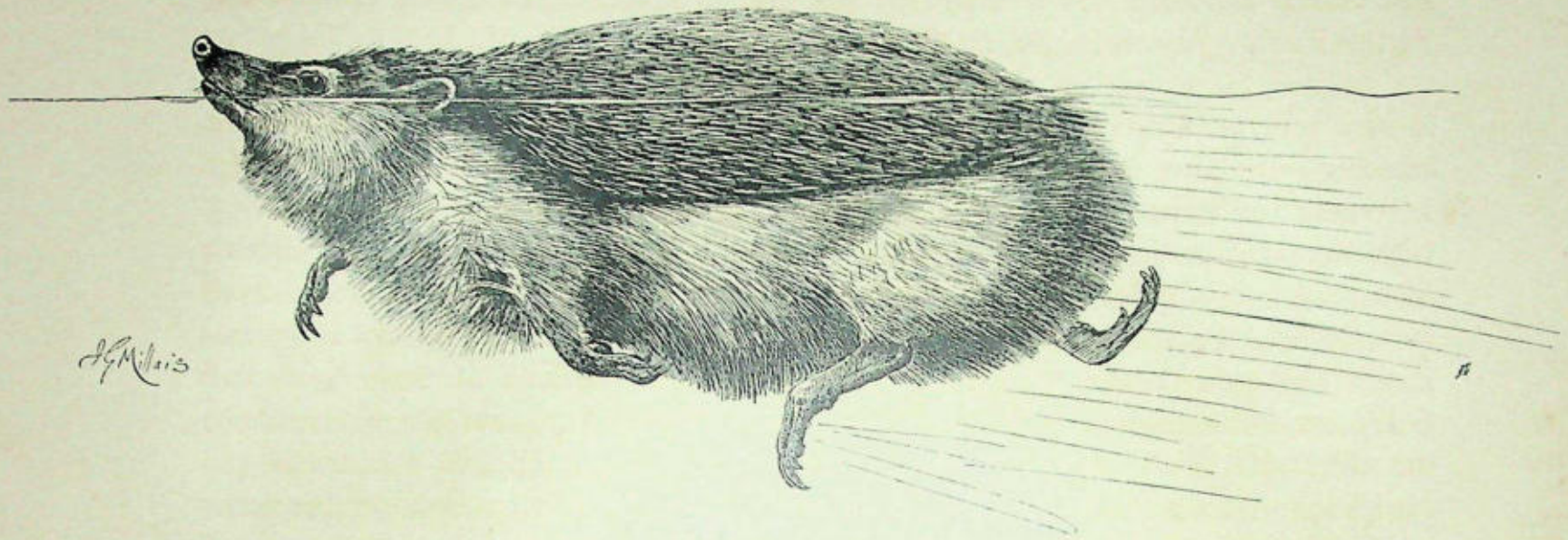
mountains, and is numerous over the whole of southern, eastern, north-eastern, and central Scotland. It is especially plentiful in Midlothian, Stirling, Dumbarton, Perth, Forfar, Aberdeen, Banff, Nairn, and Elgin.

In the Highlands of north Perthshire, Argyll, and Inverness the Hedgehog is very rare, possibly owing to the difficulty a Lowland animal would experience in crossing mountains, but it is found here and there in the cultivated land in eastern Inverness and Ross. In western Ross-shire it appeared about 1890, probably having been imported in baled hay[1]; there are several notes in the 'Annals of Scottish Natural History' of its occurrence in and about 1902 in western Argyll, and I have recently been informed by Mr. Alfred Gathorne-Hardy that it is abundant at Portalloch. The animal was introduced into the eastern portions of Sutherland and Caithness, but according to Harvie-Brown and Buckley[2] is absent in a wild state in the west. Mr. W. Mackenzie[3] does not agree with this opinion, and thinks that the Hedgehog has occurred in a wild condition in Sutherland for a considerable time; he found one so far back as 1872 near Tressady Lodge, and has seen others more recently.

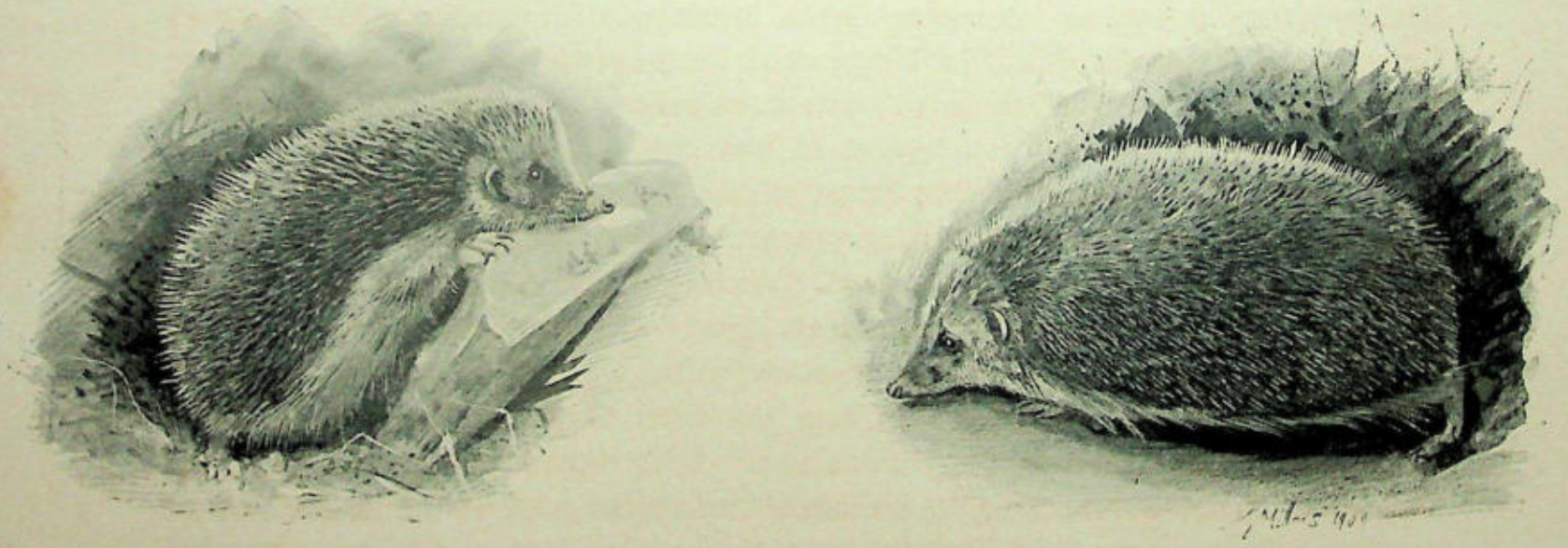
When Pennant wrote, at the end of the eighteenth century, he declared that the Hedgehog was 'not found beyond the Tay; perhaps not beyond the Forth,' but his knowledge was certainly limited. Harvie-Brown and Buckley, while stating that it is still unknown in Mid-Lochaber, say that it does not occur in Mull; but Maclaine, of Lochbuie, contributed to the 'Annals of Scottish Natural History' (1895, p. 193) an interesting list of prices paid for vermin on the estates of Torosay and Lochbuie, Mull, in 1825, which includes the sum of threepence per Hedgehog. It is hardly likely that so low a reward would be offered if the creature had been rare.

It appears, however, that the range of the Hedgehog is extending in Scotland, or has extended within recent years, for such observers as MacGillivray and Thomas Edward noted its increase. Writing of its status in Aberdeenshire[4] MacGillivray says: 'Although twenty years ago of very rare occurrence, or confined to particular tracts, the Hedgehog is now generally dispersed over the district, being found in all the lower parts, from the coast to the higher valleys in the interior—in many places in great abundance. It is especially plentiful along the Dee, as at Ballater, Banchory, and about Aberdeen, as well as in the parishes on the Don. In some parts of Formartine it is also abundant, and of late years has

[1] Hinxman and Clarke, *Ann. Scot. Nat. Hist.* 1903, p. 70.
[2] *Faun. Moray Basin*, i. 155.
[3] *Ann. Scot. N.H.* 1897, p. 191.
[4] *Edin. New Phil. Jour.* 1844.



HEDGEHOG SWIMMING.



STUDIES OF HEDGEHOGS.

extended more or less over the greater part of Buchan.' Sim[1] gives several new localities where the species has recently appeared.

Thomas Edward found the Hedgehog rare in his youth in Banff, but later it became common. Personally, I have found it fairly numerous about Pitgavenay, in Elgin, in the vicinity of Nairn, and in the low ground along the Moray Firth to Inverness. Beyond that it occurs about Beauly, Strathconan, and Dingwall, but north of Invergordon it becomes very rare.

The Hedgehog is absent from most of the islands except from those where it has been introduced. It is said to be common in Bute.[2] It was introduced into Orkney in 1870, but does not seem to have increased, though in the Shetlands it has done better. It is found on the shores of Loch Tingwall, near Lerwick, where it was introduced by a farmer who planted whins for its protection. It is also found near Cunningsburg, Mossbank and Loch Spiggie, Weisdale and Dale in Delting.[3]

The Hedgehog is distributed throughout Ireland; Thompson's statement that it is found everywhere in suitable localities is somewhat qualified; but Barrett-Hamilton[4] suggests that, as in the case of other Irish mammals, it is often the direct agency of man which has curtailed distribution.

Habits.—Dating from the close of the Secondary Epoch, the Hedgehog has remained in Europe with little or no change in form or size until the present time. Sir Richard Owen has described[5] the jawbone and teeth of an extinct *Insectivore* very closely allied to the Hedgehog of the present day, but which seems to have been a slightly larger species with different dentition; but many fossil remains of our Hedgehog have been found in Pleistocene and Pliocene strata, and even early Miocene, which give conclusive evidence of the great antiquity of this animal. The Hedgehog was well known to the ancients; but Linnæus gave the first systematic name to the animal.

Of all the wonderful means which Nature has taken to protect her children, the upper covering or armour of the Hedgehog is not the least remarkable. Here we have a slow-moving, easily killed animal, incapable of any real powers of attack and defence, which has survived through countless generations by means of this formidable covering, a protection which generally ensures safety from even the most determined antagonists. 'Its close covering,' says Bell, 'of sharp spines—which are hard without brittleness, sufficiently elastic to bear great violence without breaking, and fixed with astonishing firmness in the tough

[1] *Fauna of Dee*, 1903. [2] Colquhoun, *Sporting Days*, p. 101. [3] *Faun. Shetland Islands*, p. 57.
[4] *Irish Naturalist*, 1895, p. 5. [5] *British Fossil Mammals*, p. 26.

leathery skin—forms not only a solid shield to protect it from the effects of blows or falls, but a shirt of prickly mail sufficiently sharp and annoying to deter all but a few thoroughbred dogs' (or a half-starved fox) 'from venturing to attack it.' Its power of rolling itself up into a compact ball and presenting to its attacker a bristling *chevaux-de-frise* is effected by means of a broad series of muscles found beneath the skin of most mammals, and known as *panniculus carnosus*.

As soon as a Hedgehog observes a man and is surprised in the open, it will stop and listen; then lower its head between its fore-legs and at the same time erect its bristles. If the intruder passes by it soon assumes its normal position, but if touched or attacked it at once rolls itself up into a compact ball which becomes tighter and tighter in proportion to the amount of annoyance to which it is subjected. Bell, whose account of the Hedgehog is admirable, goes on to say: 'The strength and elasticity of this covering is such, that we have repeatedly seen a domesticated Hedgehog run towards the precipitous wall of an area, and, without hesitation, without a moment's pause of preparation, throw itself off, contracting at the same instant into a ball, in which condition it reached the ground from a height of twelve or fourteen feet; after a few moments it would unfold itself and run off unhurt.'

Endowed with such resources, it is a wonder that any enemy among the carnivorous animals has the means, the aptitude, or the cunning to 'crack so strange a crib'; yet I have seen more than one high-couraged terrier, with tongue, mouth, and lips torn and running with blood, persevere until it has crushed its way in and killed its prey. It is not known how the fox manages to open and kill the Hedgehog, which it certainly does at times, but, rendered desperate by hunger, it probably achieves its aim, like the dog, by grand assault or careful opening.[1] The badger, too, often kills and eats the Hedgehog, but in this case the task of opening must be an easy one; the badger's fore-paws and claws

[1] More than one observer has stated that the fox carries the Hedgehog to water, into which it rolls its prey until it unfolds; but this is almost *too clever* and requires confirmation. The statement, too, that stoats and weasels have attacked and killed Hedgehogs must also be accepted with reservation.

One writer has asserted that foxes roll Hedgehogs to the edge of a bank or cliff and then push them over, causing them to open by the fall and concussion. For a curious description of this see Ælian, lib. vi. cap. lxiv. By an odd circumstance, on the very day on which I had written the above lines I came on a workman holding a Hedgehog in his handkerchief on a road near Staines. A wire-haired terrier accompanied him and seemed much excited, so I concluded that he had some living creature in his handkerchief. On addressing the man he told me that his terrier killed many Hedgehogs and said that he would show me how it was done. I certainly expected to see the dog attack his quarry in a general fashion, but to my surprise he did nothing of the sort, but by working away with the nails of his forepaws he at last made an entrance sufficiently large to get one of his paws fixed against the chest of the Hedgehog, while with the other he drew up the head and forced it back. Then he gave it one nip on the throat, and the tragedy was over. It is more than likely that foxes and badgers employ the same method.

are formidable and strong. The cry of the dying Hedgehog when attacked by a badger is said to be heartrending.

The Hedgehog is now nocturnal in its habits, but this may be largely due to the necessities of latter-day existence. Not long ago the Hedgehog was most likely a diurnal mammal, as the water shrew still is—a fact unknown to naturalists who have not had the chance of observing animals in a wild state. In places where Hedgehogs are little disturbed they are crepuscular, and will be seen coming out to feed every evening just after sunset. There are two estates within a couple of miles of my house at Horsham where in June and July I go nearly every evening to stalk rabbits with a ·22 rifle. While returning home about a quarter to eight I invariably find one or more Hedgehogs out in the grass, commencing their evening meal. As they are unmolested they will permit me to come close to them, and I have lain down on the grass within a yard or so and closely watched their method of feeding. Unless the Hedgehog has its back towards one, in which case it is singularly unobservant, it will cease feeding when at a distance of two or three yards, raise its head in alert attention for a second, and then drop it slowly between its fore-paws, but without necessarily rolling up. If the observer sits down and waits, he will notice that after a short period the muscles of the back of the animal relax, and the head is slowly pushed forward into the normal position, when snouting for food is slowly resumed. In the particular case of the Hedgehogs mentioned above, I have often seen them stop and simply lower the head, and then recommence their search for food at once. One particularly large old male was always out and about the same place—a rough field close to a tangled 'gill.' I think he soon got to know me, as I have regularly stopped and watched him for three seasons. I have often had him walk between my legs and smell my boots after the first alarm. His food seemed to consist chiefly of beetles and other insects, and black slugs, which he procured by slowly moving along snouting in the grass. On this point Mr. Coward sends me the following note:

'In 1897 I came across a Hedgehog which was apparently eating or licking the dung of fallow deer. I looked very carefully, but could not see any insects upon the dung. I have since seen one grubbing round horse droppings in the road, but in this case came to the conclusion that the animal was after beetles or larvæ. Hedgehogs do not appear to notice the presence of a man unless they are touched; on several occasions I have surprised them in the herbage and they have continued to feed when I was standing close to them. Once I was listening to birds in Dunham Park, standing in some bushes, and a Hedgehog actually came and smelt

at my boots, and as I kept still it commenced to lick them, or at any rate wet them with its snout.'

The food of the Hedgehog consists chiefly of insects, slugs, and worms, but it will also eat frogs, young rats, mice, lizards, birds'-eggs, and young birds. Hedgehogs are also said to kill and eat snakes, both the poisonous and the harmless species. An interesting description of the manner in which the snake is killed and eaten is related by Mr. Broderip in the 'Zoological Journal' (i. 19).

'It is not so well known,' he says, 'that like the peccaries these "hedge-pigs" will devour serpents. That they will do so appears from the following interesting communication, for which I am obliged to my friend the Rev. William Buckland, Professor of Zoology in the University of Oxford and President of the Geological Society. Having occasion to suspect that Hedgehogs, occasionally at least, preyed on snakes, the Professor obtained a common snake, *Coluber natrix*, and also a Hedgehog which had lived in an undomesticated state some time in the Botanic Garden at Oxford, where it was not likely to have seen snakes, and put the animals into a box together. The Hedgehog was rolled up at their first meeting; but the snake was in continual motion, creeping round the box as if in order to make its escape. Whether or not it recognised its enemy was not apparent; it did not dart from the Hedgehog, but kept creeping gently round the box; the Hedgehog remained rolled up, and did not appear to see the snake. The Professor then laid the Hedgehog on the body of the snake, with that part of the ball where the head and tail meet downwards, and touching it. The snake proceeded to crawl; the Hedgehog started, opened slightly, and, seeing what was under it, gave the snake a sharp bite, and instantly rolled itself up again. It soon opened a second time, repeated the bite, then closed as if for defence; opened carefully a third time, and then inflicted a third bite, by which the back of the snake was broken. This done, the Hedgehog stood by the snake's side and passed the whole body of the snake successively through its jaws, cracking it, and breaking the bones at intervals of half an inch or more, by which operation the snake was rendered entirely motionless. The Hedgehog then placed itself at the tip of the snake's tail, and began to eat upwards, as one would eat a radish, without intermission, but slowly, till half the snake was devoured, when the Hedgehog ceased from mere repletion. During the following night the anterior half of the snake was also completely eaten up.'

A curious tale of how the Hedgehog kills adders, or rather forces an adder to kill itself, is described by Ferdinand Coste in 'L'Éleveur' and quoted in the 'Zoologist,' August 1887:

'Everyone knows that the Hedgehog is a sworn enemy of reptiles in general and of the viper in particular; but few, perhaps, are aware in what way he contrives to overcome so recalcitrant and dangerous an enemy and make a meal of it. My keeper was going his round this summer in a wood which is unfortunately infested with vipers, when he espied an enormous one asleep in the sun. He was on the point of killing it with a charge of shot, when he perceived a Hedgehog coming cautiously over the moss and noiselessly approaching the reptile. He then witnessed a curious sight. As soon as the Hedgehog was within reach of his prey he seized it by the tail with his teeth, and as quick as thought rolled himself into a ball. The viper, awakened by the pain, at once turned, and, perceiving his enemy, made a terrific dart at him. The Hedgehog did not wince. The viper, infuriated, extends itself, hisses, and twists with fearful contortions. In five minutes it is covered with blood, its mouth one large wound, and it lies exhausted on the ground. A few more starts, then a last convulsive agony, and it expires. When the Hedgehog perceived that it was quite dead he let go his hold, and quietly unrolled himself. He was just about to begin his meal and devour the reptile when the sight of my keeper, who had approached during the struggle, alarmed him, and he rolled himself up again until the man had retreated into the wood. The Hedgehog, then, did not exactly kill the viper, but compelled it to kill itself by darting against his sharp spines.'

Hedgehogs have also been known to attack both hares and rabbits.[1] Sir William Jardine stated that Hedgehogs will enter henroosts and steal eggs from beneath the hens, but without otherwise molesting them; but they do attack poultry, and will sometimes kill and eat them.[2] They certainly make stores of roots, vegetables, and fruit, but it is still unknown whether the Hedgehog eats these to any extent in a wild state. Mr. Tom Speedy, who is a good field naturalist, puts forward the theory that they store the fruit of the arbutus and beech mast near to the spots where they hibernate, so that these may harbour the insects on which they feed in the spring.

It appears that Hedgehogs will sometimes take to a vegetable diet, for the Rev. W. Bond, who had noticed much damage being done to his turnips, put down traps and captured twenty Hedgehogs. No further damage was done.[3] Mr. J. E. Harting, in a footnote to the same communication, points out that the oft-quoted remark of Gilbert White's that the Hedgehog will devour plantain roots has been shown to be in error; night-feeding larvæ were responsible.

[1] Cf. *Field*, 1887, p. 233. [2] *Ibid.* vol. c. p. 183; 1897, July 31. [3] *Zoologist*, 1887, p. 345.

The Hedgehog is often domesticated for the purpose of clearing kitchens of beetles, crickets, and cockroaches, and at this it is exceedingly expert. When in confinement it is very partial to milk, which predilection may in some manner account for the ancient theory that these animals will suck the udders of cows at pasture. Certainly Hedgehogs are very fond of hunting the dung and the recent 'beds' of cows for the insects they contain, but it may still be possible, as Sir Harry Johnston suggests,[1] that the sucking or licking of the cows' teats is by no means a wild supposition. Cows in full lactation often have drops of milk clinging to the udders, and a Hedgehog snouting round for insects might well come across this unexpected delicacy and lick it off. A Hedgehog tastes most things that come in its way.

The Hedgehog hides for the greater part of the day in holes, dense undergrowth, or behind rocks, emerging in the evening or after nightfall to feed. In the autumn it is often seen abroad during the day. In April, according to Mr. R. Service, the Hedgehog is often diurnal in its habits, coming abroad in the sunshine, and in July, during the heat of summer, it is frequently abroad long before sundown. On July 20, 1901, when the temperature had risen to 91°, Mr. Service saw numbers abroad by 6.30 P.M. One writer says they are extraordinarily active, and travel all night at the rate of six miles an hour. This is quite contrary to my experience. They are very slow movers, and in places where food is to be found they progress very gradually and work the ground with great care, only travelling a little faster along paths and bare places. The animals can, however, run, and move with considerable swiftness in a curious shuffling fashion. I am convinced that they have certain runs and passes which are used by them after the manner of the shrews, although they are not gregarious and migratory like those little animals. They are also subject to some disease in the autumn and spring, of which we at present know nothing, similar to that which attacks the *Soricidæ*, for we frequently find numbers dead at these seasons.

Late in November or early in December, according to the season, the Hedgehog retires to its winter quarters, where it sleeps until the following spring. Most bats wake up and move about in their *hibernacula*, and rodents create stores and only sleep intermittently, while badgers move according to temperature, so that the hibernation of these animals cannot be said to be complete; but when the Hedgehog retires to its warm couch of moss and leaves, it seldom quits it until the spring sun has sufficiently warmed the surface of the earth. The date when the Hedgehog retires is not regular, and it is much later than is the case with many other

[1] *British Mammals*, p. 58.

winter sleepers. Mr. R. Service[1] gives as an average for the last appearance November 22, taking his dates from many years' observations; but he has seen the animal abroad in December and January when the temperature was high. In the 'Irish Naturalist' (1904, pp. 84–87) Mr. C. B. Moffat supplies a table of observations on the night appearances of bats, hedgehogs, and frogs during the winter of 1901–1902. He noticed Hedgehogs on fifteen nights in November, nine in December, four in January, but not on any in February. He found no evidence that warmth had any effect in waking up the Hedgehog, but it showed itself frequently on cold and frosty nights, even in December and January. He says, 'It was almost invariably on cold nights that I met the Hedgehog.' He found that the Hedgehog was somewhat late in coming out, generally not appearing until an hour after sunset; these observations, however, refer only to winter. The *hibernacula* are usually situated in holes, stumps of trees, recesses in walls, and behind sheds in gardens. Hedgehogs will, however, on some occasions shift their winter quarters. Mr. Oxley Grabham, writing on this subject,[2] says: 'In my experience this is quite true (that they do not move in winter), for I once had, for three or four years, a score of Hedgehogs in a walled-in garden; and, whether the winter was mild or severe, they never moved when once they had taken up their winter quarters, which were always in the manure covering a strawberry bed, and in that laid at the roots of a large patch of lavender; but *audi alteram partem*: a year or two ago, some unfamiliar footprints being seen in the snow, they were tracked to a thick hedgerow, and from a mass of dead leaves *Erinaceus europæus* was unearthed in quite a lively condition; and in January I knew of a fine old Hedgehog which periodically issued forth from its lair in the bottom of a thick fence, the grass leading to the same being all trodden down and a regular track made. Sometimes it was absent from home, and at others cosily rolled up in the middle of its domicile; but I am afraid it must have resented my visits and taken up other quarters, for it is now missing.'

Like most of the *Insectivora*, the Hedgehog generally breeds twice in the year, the first litter being born in late May or June, and the second in August or September. In a well-roofed nest of any sort of dry leaves the female produces usually from five to seven young ones. At birth they are blind and covered with soft, white, flexible spines, which in the course of three weeks harden and assume the adult colouration. The period of gestation is very short, not exceeding one month. Young Hedgehogs are about three parts grown by the time winter sets in, and seem to come out of their winter sleep in very good condition.

[1] *Ann. Scot. Nat. Hist.* 1901, p. 79.

[2] *Zoologist*, 1896, pp. 76–98.

Hedgehogs have often been accused of eating their young, but this does not take place except, perhaps, in cases of domestication, when the young have been frequently looked at and interfered with. Bears nearly always eat the young which are born in confinement, and mice and rats do the same. B. D., writing in the 'Field,' gives some interesting notes on the young and also the habits of these animals:

'It is correct that they are born blind, but they are well covered at birth with soft spines, which are pale in colour, though not white. The eyes open within a week. Broken spines on the adult animal are replaced by soft white ones, which gradually harden and become coloured. Hedgehogs when kept in captivity frequently die of over-eating and want of exercise. They are very gluttonous, and when wild they cover a great amount of ground in order to satisfy their appetites. I take a tame one out into the wood to hunt for insects; the amount of activity which it displays when I turn over large stones is most amusing. Hedgehogs have several peculiar habits. They intentionally roll upon their backs instead of upon their feet; they roll themselves down a bank or over the edge of a table without hesitation. If troubled with a tickling among their spines, they spit copiously upon the place. They also rub themselves against natural objects as sheep rub against railings. When killing a slug they roll it upon the grass with their paws for some moments to remove the slime. Shrews do the same; I have seen a tame shrew dispatch a big brown slug without turning a hair of his own velvet coat. Hedgehogs eat raw meat voraciously, and would unquestionably kill chicks in a coop. But they destroy vast numbers of insects, especially grubs among the roots of grass; and the common accusation that they suck eggs is erroneous, for they cannot crack them. A rat chisels through an eggshell with his lower incisor teeth. A Hedgehog can only crunch, and the gape of his jaws will not admit an egg as large as a sparrow's. I once shut up an unhappy Hedgehog for three days with no water or food except a raw egg. It made no attempt to open it. I then gave the egg to a white rat, who had certainly never seen one before in its life. He went for it in a moment, and rolled it across the room to his box. He pushed it in front of him with his paws, like a brewer's man trundling a barrel. The result was the egg was made so sticky that I never repeated the experiment. I think there is no question who is the egg-stealer.'

The usual cry of the animal is a loud squeak, which can be heard at some distance; it is quite different from the scream uttered when in fear or pain.

Mr. R. Service, whose knowledge of the species is extensive, remarks[1] that the cry of the Hedgehog is 'a cross betwixt a cough and a snort,' which is a better description than the one given by Lydekker. Mr. Service, who has seen as many as eight out on a May evening at one time, has frequently observed the males fighting. They will 'snuffle' and circle round each other a long time before they commence hostilities—he has timed a couple for three-quarters of an hour—but when they do get to work they fight with great ferocity. There is little doubt that formerly Hedgehogs were extensively eaten both by agricultural labourers and gipsies. Nowadays the practice seems to be nearly, if not quite, extinct, and several recent writers have questioned the fact that gipsies ever ate them. The late Frank Hindes Groome, probably the greatest authority on gipsies and their ways, has, however, definitely stated the following: 'What all gipsies like are Hedgehogs and roasted potatoes. How to cook a Hedgehog. Take a stick and crawl him out, then hit him on the nose, then pitch him into the fire till his bristles be burned off. Then take a knife and scrape him nice and brown, cut open the back, wash it well, and put plenty of pepper and salt inside. When this is done the Hedgehog is ready for cooking, boiled or roasted.'[2] Mr. Groome does not say he actually saw the gipsies cooking Hedgehog, nor does Frank Buckland, who has also described the methods employed, which he obtained through conversation with a squalid old gipsy woman whom he met in the neighbourhood of Oxford. As I like to gain first-hand knowledge on most things connected with Nature, I once cooked the hind leg of a Hedgehog and tried to eat it, but without much success. It was exceedingly rank and bitter, and tasted much like the flesh of insectivorous birds. When talking with a certain Mrs. Lee, who proclaimed herself Queen of the Gipsies, in Scotland, she informed me that her clan formerly ate these animals, but that the practice was now discontinued.

Albino and partially white varieties are not very rare.[3] I have seen about twenty altogether, and have in my possession a very fine nearly white old male, which was killed at Grantham, Lincolnshire, in September 1897. Waterton, the naturalist, once had an entire family of milk-white Hedgehogs in his park at Walton, near Wakefield.

Colour variations are frequently to be found in the Hedgehog as in all

[1] *Ann. Scot. Nat. Hist.* 1901, p. 232.

[2] It will be noticed that the writer says nothing about removing the intestines, without which necessary office the flesh of mammals is always offensive.

[3] *Field*, vol. c. p. 452, and *Zoologist*, 1895, pp. 346, 347, &c.

mammals, but as yet little is understood about age variation, and Mr. Service thinks that age rather than season or sex may cause colour differences in the animal.

Mr. Thorburn's coloured plate shows admirably the peculiar slow crawling gait of the animal when ascending a bank and searching for food.

There is unfortunately but little doubt as to the carnivorous propensities of this animal; but when orders are issued for its slaughter it is well to remember that attacks on poultry and game are nearly always the sins of individual animals, and are not the practice of the whole species. Similar instances are found in the case of owls, which attack young pheasants at the coops; blackheaded gulls, which destroy young ducks; and rooks, which hunt regularly for the eggs and young of birds. Except in the case of the last-named bird, whose depredations are now increasing to an alarming extent, the mischief is generally stopped by the killing of the individual sinners, and only the ignorant, which is another name for the unobservant, will extend their anathemas and acts of retribution to a whole race of practically innocent creatures.

THE MOLES

Family *TALPIDÆ*

Genus *Talpa*

THE true Moles are a group of mammals which probably originated in the Old World, where they are now represented by eight species inhabiting Europe and Asia. They possess the large number of forty-two or forty-four teeth. The characters are found in the description of the British representative.

THE COMMON MOLE

Talpa europæa, Linnæus.

Talpa europæa, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 73 (1766); also Blasius, Macgillivray, and Bell.

Talpa vulgaris, G. Saint-Hilaire, 'Dict. Class. d'Hist. Nat.' xvi. 70; Owen, 'Brit. Foss. Mamm.' p. 19 (1846).

Local Names.—*Molde* (Old English); *Hoont*, *Woont* (Midlands); *Wont*, *Wonti*, *Want* (South and West of England); *Mouldiewarp* (earth-turner) (North of England); *Moudie*, *Moudiewort*, *Moudiewarp* (Scotland); *Famh*, *Uireach*, *Uireabh*, *Famh thalmasnn*, *Uir-fhamh* (Gaelic, West and North of Scotland); *Caochan* (the blind creature), *Criadh-luch* (the earth-mouse), *Luch-dall* (the blind mouse) (Irish—Professor Herbert Strong); *Gwadd*, *Twrchdaear* (earth-hog), *Orddodyn*, *Ylltyr* (Welsh); *Kyaghan-caochan*, *Roddan-ooirey* (earth-rat), *Lugh-ghoal* (Welsh rat) (Manx).

Professor Herbert Strong tells us[1] that *talpa* and *σπάλαξ* are derived from the root 'scalp' and signify a digger. Mouldiewarp is related to the Old German *Mold-wurf*, or the Icelandic *mold-varpa*, which means '*mouth-thrower*.'

Characters.—Body cylindrical, neck very short, and head sharp-pointed and buried in shoulders. Fore-feet broad, flat, and turned outwards, with strong

[1] *Zoologist*, 1895, p. 11.

yellowish white claws. Collar-bones are present, being short and heavy like all the bones of the fore-limbs. No external ears; eyes very minute and buried in the fur. The hair is short and like velvet; it is inserted perpendicularly in the skin, and is capable of being directed either backwards or forwards, according to the animal's movement. The colour is bluish black or sooty black, with the lower parts of a brown tinge. The cartilage of the nose is hard, with pliant muscles at the base. Length, $5\frac{1}{2}$ to 6 inches (140 to 153 mm.); tail, $1\frac{1}{5}$ to $1\frac{3}{5}$ inch (30 to 45 mm.). Dental formula: I. $\frac{6}{6}$; C. $\frac{2}{2}$; P.M. $\frac{8}{8}$; M. $\frac{6}{6}$. 'The first lower premolar is similar in appearance and function to a canine; the true canine is reduced to the size of the incisors, which are equal.'

The extent to which the Mole can see, if it sees at all, is still a matter of doubt. The fact that the eyes are not covered with a continuous membrane, as in some allied forms, gives colour to the belief that the animal is capable of perceiving light and possesses some power of sight. Mr. Lydekker points out[1] that there is sufficient proof that Moles 'are descended from animals which lived on the surface of the earth, and that their completely subterranean habits have been gradually acquired.' Saint-Hilaire[2] considered the Mole to be very short-sighted; while our most recent authority, Mr. Lionel E. Adams, in his admirable paper on this animal,[3] says that it is practically blind. Whichever solution may be correct, there is no doubt that the Mole has the power of making the hair which covers the eye to spread out and radiate so as to receive all possible light. This is probably only done when the animal is on the surface of the ground. When making experiments on the swimming powers of this animal I have noticed how quickly a Mole makes up its mind as to the direction in which it desires to proceed, and usually points at once towards the most accessible landing-place. Moreover, it is hardly possible that the Mole can cross rivers, lakes, and arms of the sea, which I believe it does, and not use its eyes to some extent, for smell alone can hardly direct it towards the desired haven. If sight were impossible it would spin round, or, at any rate, its movements would to a large extent be influenced by cross currents; this is not the case, it proceeds boldly in the desired direction after the manner of a mammal fully gifted with sight. Holding a worm in front of the nose of a Mole and passing it rapidly to and fro is no test as to the power of sight, for the strong sense of smell possessed by the Mole is sufficient to attract it towards its food. In fœtal Moles the eye is said to be more

[1] *British Mammalia*, p. 64.
[2] *Cours de l'Histoire naturelle des Mammifères*, 1829.
[3] 'A Contribution to our Knowledge of the Mole,' *Proc. Manchester Lit. Phil. Soc.* vol. 47, part ii. 1903.



THE COMMON MOLE.
Talpa Europœa, *(Life size).*

Litho. W. Greve, Berlin.

clearly developed than in adults. Mr. Carl Hess[1] is firmly of opinion that the Mole possesses normal powers of sight; his conclusion is arrived at after careful examination and experiments, and I quite agree with his views.

Female Moles possess eight teats, an unusual number considering the fact that the litters range from two to six. The mammæ are distributed over both thorax and abdomen. Until quite recently it was considered that males far exceeded females in number, but this is an error which has now been satisfactorily explained by Mr. Lionel E. Adams, who follows Saint-Hilaire in showing that the generative organs of the male and female, except during the breeding season, have a close superficial resemblance. The testes of the male are hidden, and during the greater part of the year the long clitoris of the female is very similar to the penis of the male. It is only by the middle of March that the difference of sex is apparent. Saint-Hilaire first observed this important point, but Mr. Adams has by diagrams and a fuller elucidation now finally solved the question. He considers the sexes equal in number. A parallel is found in the generative organs of the spotted hyæna (*Hyæna crocuta*) of South Africa.

Distribution.—The Common Mole ranges over the greater part of temperate Europe, except some of the large islands, but its place is taken south of the Alps by a closely allied species. Eastwards it is found in Asia, where the Altai and the Himalayas are generally considered its southern limit. Proceeding still further eastward, it occurs throughout China and Siberia as far as the Islands of Japan.

In England the Mole is so generally distributed and common that it is unnecessary to specify its distribution. In Wales it is equally abundant, even in Anglesey. Through all the cultivated districts of southern and central Scotland it is also very common, and where the mountains begin it extends its burrowing operations to the rocky uplands bordering on the rocks and heather. In Banff, Elgin, Nairn, and the low grounds of eastern Inverness, the Mole is now common, and I have seen its workings in all these counties, where, previous to 1860, it was considered rare. The same may also be said with regard to Sutherland and Caithness, where formerly it was rather scarce, but now it is found in isolated places where the ground is suitable and at a low elevation, though the Mole will ascend to an altitude of 2,000 feet or more. In Argyllshire it is locally common, especially about Loch Awe, Morven, and Appin, and is now extending westwards. Formerly the Mole was not supposed to exist in the Island of Mull, where it is now numerous. This introduction is said by Harvie-Brown and Buckley to have been

[1] *Nature*; and *Zoologist*, 1890, p. 98.

due to the animals having been brought over in a boat-load of earth from Morven, an explanation I cannot agree with. Moles are admirable swimmers, and could easily have swum across the short sea passage between the mainland and Mull. In the same way, by swimming, they probably reached the Island of Ulva, where they also exist. In all the other islands of the Outer and Inner Hebrides the Mole is at present unknown, as also in the Orkneys, Shetlands, and in Ireland.

Some writers attribute the earliest existence of this species in Britain to the beginning of the Pleistocene epoch, but there is strong evidence that it existed practically in the same form as to-day prior to the first Glacial epoch. The genus is found on the Continent as early as the Lower Miocene formation, while Moles of an allied type existed at the beginning of the Tertiary epoch.

Habits.—Aristotle seems to have been the first to describe the Mole, but centuries elapsed before any naturalist turned his attention to study the habits of this curious animal, a fact accounted for by the difficulties attending observation. It was the Frenchman Le Court who, in the year 1798, made the first scientific observations on the animal. He imparted his knowledge to Cadet de Vaux, who published in 1803 his interesting 'De la Taupe, de ses mœurs, de ses habitudes, et des moyens de la détruire,' which is for the most part a reliable record. In 1829 Geoffroy Saint-Hilaire published his 'Cours de l'Histoire Naturelle des Mammifères,' which, although copying much of Le Court's original work, supplied some admirable anatomical observations on the structure of this animal, which are now very generally accepted. Subsequently Blasius, MacGillivray, and Bell have all described the Moles, and Mr. J. E. Harting contributed a short but able paper on the animal to the 'Zoologist' for December 1887.

Notwithstanding that Mr. Lionel Adams pokes fun at the writers who have from time to time called attention to the Mole's adaptation to local environment, the fact remains that the animal is a most extraordinary example of the way in which Nature endows her children with those characteristics which will enable them to hold their own, or, in other words, how evolution has altered and perfected a creature so that it can exist in spite of the bitter struggle for existence. The shape of the cylindrical body, with its conical head and hard muzzle, is admirably suited to work through the tunnels. The long nose and sharp teeth are well adapted for seizing and holding worms and the larvæ of insects; the body is extremely pliant and capable of active progressive and retrograde movements, which are further assisted by the elasticity of the hair, which can be bent in either direction. The ears too have no external orifice, so



THE MOLE WILL SPRING OUT OF THE GROUND IN HIS EAGER PURSUIT OF A WORM.



MOLES FIGHTING.

they are not liable to injury. Thus in the Mole we see a highly specialised mammal.

The Mole is extremely sensitive to sound, and its sense of hearing is acute. The slightest sound on the surface of the earth near by causes it at once to suspend operations, when it either retreats or remains perfectly still. Once I was returning from shooting in St. Leonard's Forest, when, stopping to light my pipe, I observed the actions of a Mole working a fresh tunnel within a few feet of me in a hedgerow. The animal must have heard me at the same moment, for all movement at once ceased. Stepping back a few feet into the field, I waited for ten minutes before a gentle lifting of the earth was again perceptible, when, on firing at the spot, the Mole immediately came to the surface dead. The newly made runs were all within a couple of inches of the top of the ground. Clever dogs that are able to catch Moles act as if they were aware of the Mole's susceptibility to sound, advancing up wind upon their quarry with the utmost caution. A fox terrier in the possession of my friend Mr. R. Blake catches many Moles during the season. Having got the scent of a Mole working near the surface of the ground, the dog advances practically on tiptoe, and then makes a rush to the spot where the Mole is concealed. It brushes the earth aside with its paws and seizes its prey before it has time to retreat. Moles are not particularly silent animals, but, especially in the spring time, squeak like shrews, only in louder tones.

Few animals live at higher pressure than the Mole. It spends the greater part of its life underground ranging along its tunnels and galleries in search of food. This chiefly consists of worms, and the amount a single Mole will consume in twenty-four hours is almost incredible. It is difficult to say whether this extraordinary appetite is created by its remarkable activity or not, but all observers who have watched this animal or kept it in confinement are at once struck by the amount of food it consumes and its restless energy in the pursuit. At any rate, it seems certain that while young Moles are capable of fasting for a considerable time, adults soon die when deprived of a regular supply of food. Mr. Adams, in his interesting paper previously referred to, mentions the case of a Mole which he fed abundantly on the day of capture, but which succumbed during the night, although supplied with the third of a pint of worms, all of which it had eaten. He considers that their powers of resisting starvation vary inversely to their size. I have found the same thing in trying to keep them alive.

Anyone who keeps the Mole in captivity must be struck by the perpetual activity of the creature; it is never still for a moment. It is always scuttling about, searching for food, eating, or scratching itself. The scratching is due to the presence of a flea which, strange to say, is practically blind, as its host is supposed to be. I have noticed that worms given to captured Moles are seldom devoured entirely at one time. It gobbles a piece, about an inch, beginning at the end, and then leaves it, resuming the feast again later. This may be due to nervousness consequent on captivity and the desire to escape. When allowed its freedom in soft earth, the Mole burrows out of sight in about thirty seconds, and generally goes down deep, when it disappears. Worms come up all round the place where it has disappeared, apparently conscious of the danger of remaining below.[1]

Two Moles I kept in confinement died after living two and three days respectively. They drank much water, and both appeared active and well when I left them in the evening with what I thought was a good supply of food; but in the morning they were both stiff and cold, though most of the worms had been consumed.

Writing on the voracity of the Mole Mr. E. Alston says:[2] 'The quantity of food which it would eat in one day was astonishing; more than its own weight, I am sure. During the first three days it disposed of three or four dozen earthworms, a large frog, a quantity of raw beef, the body of one turkey-poult and part of a second, and one or two black slugs.' Small worms are often swallowed whole, the Mole eating them, as W. Thompson[3] remarks, 'as an Italian would eat macaroni.' In its fierce activity in the pursuit of worms the Mole will often spring right out of the ground to the surface, and there seize its prey and devour it.

Mr. Jess, in his 'Gleanings in Natural History,' says that he had been informed by a professional mole-catcher that the Mole often prepares a bed in the clay, which would hold about a quart, and that in this cavity it places a store of worms mutilated so as to prevent escape. On these worms the Mole is supposed to feed during the winter months. In the 'Zoologist' (1875, p. 4493) an observer offered another explanation for the use of this store—namely, that they were collected for the use of the young; he says: 'It is a round cavity, the sides of which

[1] This instinct of self-preservation on the part of worms is so well known that it is made use of everywhere by fishermen anxious to obtain a supply for bait. If a stout stick is driven into the soft earth of an herbaceous border and worked round and round in a circular manner, the worms come to the surface in crowds, and digging for them is avoided.

[2] *Zoologist*, 1865, p. 9707.

[3] *Nat. Hist. Ireland*, iv. 4

were beaten hard by the Mole, so as to prevent the worms from attempting to pierce their way. Inside this there was nearly a quart of fine worms, quite free of any admixture of soil, each worm apparently tied up in a coil or knot, yet all alive.' Mr. Lionel Adams, however, disputes this theory of storage, asserting that as the Mole is not a hibernating animal, and as flaccid worms are often found hibernating together in pockets in the earth apart from Mole runs, the whole suggestion of a collected food supply is erroneous. This accurate observer says in his paper on the Mole (p. 14): 'I assume that it is in those shafts where collections of paralysed worms have been found, though I have always found them quite empty. I have never come across these "stores of worms," which some writers aver are contrived by the Mole with *malice prepense*, but I have often found in early spring a knot of three or four worms in a semi-torpid state embedded in the solid earth of fortresses (not in the tunnels), where I imagine they had collected of their own free will; and I see nothing unusual in this, for in digging my garden I have frequently come across similar knots or bunches of pallid, sickly looking, semi-torpid worms, which I surmise hibernate together as do the frogs in the mud at the bottom of a ditch. The conclusion I have come to is that where these stores of worms have been found in "cavities" (e.g. the bolt run or the down shaft), the worms had fallen in and were unable to get out or burrow into the earth in their enfeebled torpid state.' Mr. T. Southwell [1] was one of the first to dispute the theory that mutilated worms were stored by Moles; he found, in several cases which he investigated, that the supposed wounds were merely the *clitellæ* of the worms.

Marcus Woodward records [2] that Mr. Runciman suggests that the Mole in eating worms bites them at first in such a way that the earth which they contain is ejected.

'The Mole's staple food is the earthworm, of course,' he says. 'Now the earthworm, as everybody knows, is filled from snout to tail with earth. One can reasonably conceive that earth, to the Mole, is unpalatable, indigestible. And so it is more than likely that though he crams worms into his mouth, he does so with the set purpose of getting rid of the earth within the worms.

'Whether the action shows intelligence or instinct, it is of peculiar interest, and certainly more pleasant to contemplate than the cramming theory. Having caught his worm, this is how the Mole proceeds:

'First he seizes it by the tail, off which he bites a small piece, then he turns the worm round. This is accomplished with his paws, the sides of which, while

[1] *Zoologist*, 1888, p. 21.

[2] *Daily Express*, July 27, 1903.

their palms extend towards the front, grip the worm firmly. Then the Mole, having turned the worm, draws it into his mouth with a series of short, quick jerks, at the same time moving his paws slightly forward.

'And the effect of this movement is to cause the earth to squirt out at the tail-end, the tip having been cut off purposely to give the earth free vent.

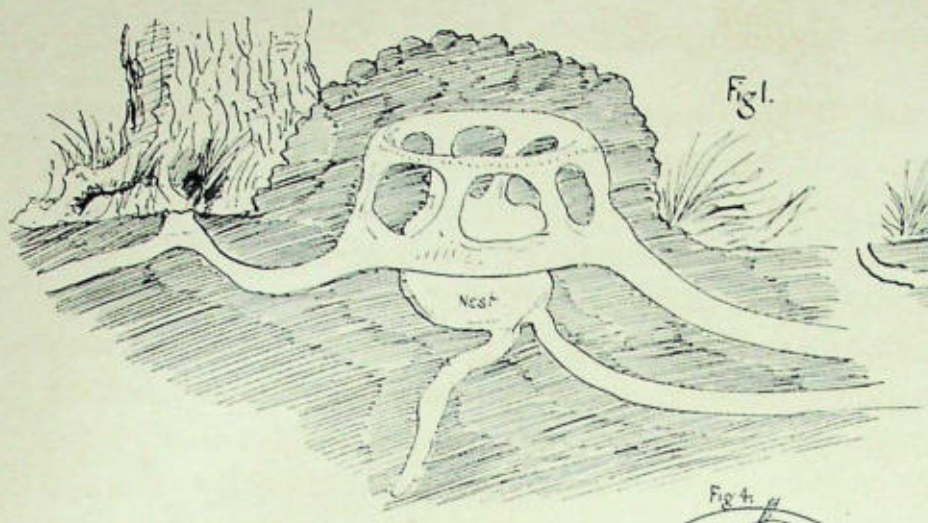
'Thus the Mole secures a clean meal, without any distasteful clay. Evidently he knows that the tail is the proper part of the worm to bite off, and that he must begin feeding at the nose to effect his purpose; for it is clear, says Mr. Runciman, from the conformation of the worm, that only in this way could the trick be done.'

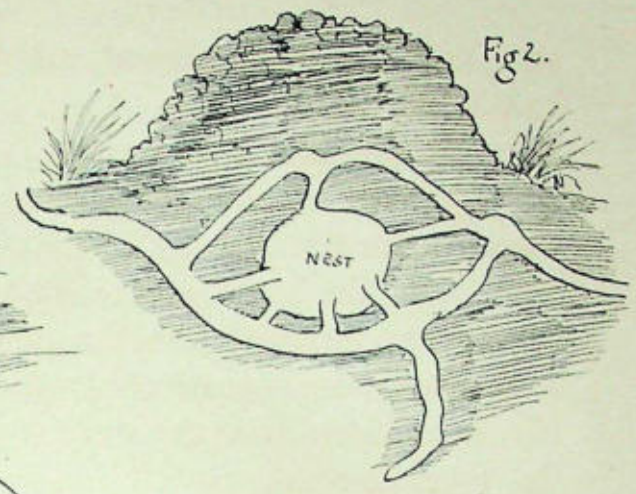
Besides worms, which are its principal food, the Mole eats lizards, frogs, larvæ, and small mammals, and birds when it can get them. When coming home one day in 1901, through Warnham Park, I observed the wing of a chaffinch sticking out of a Mole run, and on pulling it found the entire body had just been eaten. This might have been done by mice or Moles, while a weasel or stoat would certainly have eaten the bird above ground; but the whole manner in which it had been drawn underground pointed to the fact that a Mole was the aggressor. An interesting account is given[1] of a blackbird which was discovered fluttering above a Mole run; it was held in position by a Mole, which had seized its leg. Mr. C. A. Hamond's steward, who discovered the bird, took it in his hand, when the Mole at once let go its hold. The steward then replaced the bird's leg in the run, and after an interval of eight or ten minutes the Mole returned and again attempted to seize the leg.

On page 33 of his paper on the habits of the Mole Mr. L. Adams gives an interesting note sent to him by Mr. C. E. Wright, of Kettering, who is a firm believer in the Mole's destructiveness in eating partridge and pheasant eggs. Mr. Wright says his keepers have observed Moles in the act of eating them, and gives an account of how the Moles work up to the nests and 'let them down' into their runs, where the eggs are devoured. These observations are certainly interesting, but it is curious that such a habit has not been observed elsewhere.

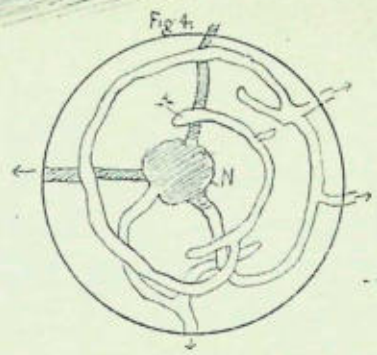
MacGillivray gives a good account of the mode of life of the Mole and the manner in which it makes its inner fortress, and adjacent galleries and mounds. He says in the 'Naturalist's Library': 'In quest of which [worms] it burrows its way in the soil, extending its subterranean excursions in proportion as its prey diminishes in number; but the excessive and unremitting labour required in this pursuit, were

[1] *Field*, February 16, 1901.



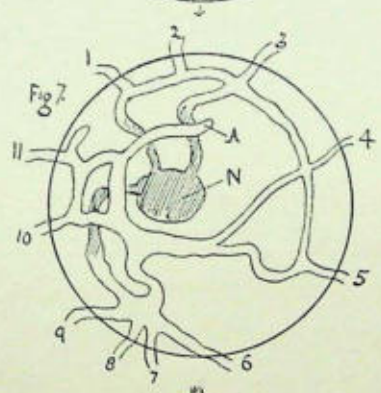


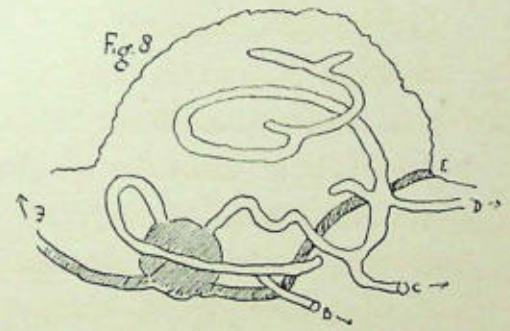


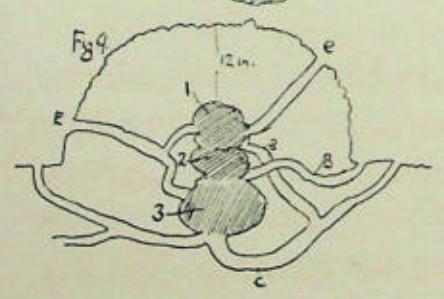


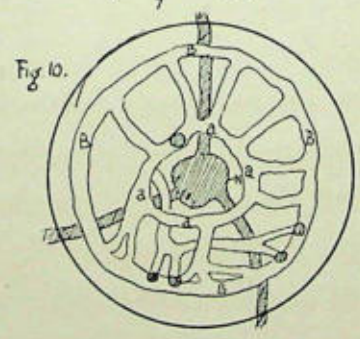


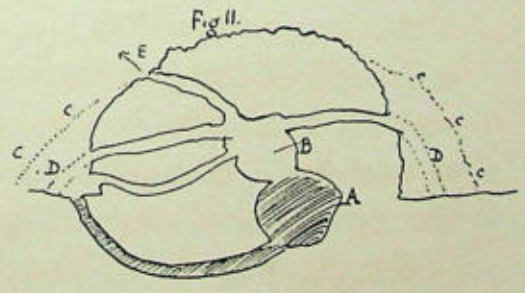












SECTIONS AND PLANS OF MOLE FORTRESSES.

FIG. 1. Fortress with complete upper gallery.

FIG. 2. Fortress of simple construction.

FIG. 3. Mole swimming.

FIG. 4. Complicated fortress with several blind terminals. A, apex of tunnels. N, nest. (After LIONEL ADAMS.)

FIG. 5. Mole eating a worm.

FIG. 6. Old nest A, and new nest B, on marshy ground. (After LIONEL ADAMS.)

FIG. 7. Complicated fortress with 11 exits. A, apex of tunnels. N, nest.

FIG. 8. Vertical plan of a fortress, showing spiral gallery and blind terminals. B C D, outlets. E F, bolt-runs. (After LIONEL ADAMS.)

FIG. 9. 1. Latest nest. A, bolt-run. 2. Previous nest. B, bolt run. 3. First nest. C, bolt-run. E, exits in floods. (After LIONEL ADAMS.)

FIG. 10. A, upper circular gallery. B, lower circular gallery. N, nest. A rare case of the spiral tunnel assuming the form of an upper circular gallery. (After LIONEL ADAMS.)

FIG. 11. Fortress in boggy low land. A, nest in heap raised above surface of ground. B, second nest made after a flood had covered the old one. C, original outline of fortress. D, original tunnel formed by heaping up the fortress. E, exit made when a second flood had surrounded the heap.

it carried on at random, is rendered unnecessary by an instinct which compels it to excavate a series of runs or galleries, along which it can walk without inconvenience, and from different points of which it proceeds, forcing its way into the hitherto unperforated soil. In forming its subterranean paths, it works with its fore-feet, which, as has been seen, are admirably adapted for scraping away the earth and throwing it backwards, propelling itself forward by its hind-feet, which are disposed in the usual manner. When it has thus excavated an extended series of walks, it can run along them to any point without difficulty, and finds security in them from the pursuit of many enemies, although man employs them as a sure means for entrapping it.'

It is during the autumn or early winter that the Mole builds its main fortress, which becomes the home until the young have left it in the following June or July.

It is almost impossible to give a certain description of the internal construction of these 'earthworks,' for they vary so greatly that hardly two are ever found alike, although a main purpose seems to run through all. They are generally about one foot in height and three feet in diameter, but sometimes larger. A reference, however, to the series of figures of these drawn by Mr. Lionel Adams, which he has kindly allowed me to copy, and others which I have myself unearthed, will give a good idea of their general construction. In his notes of these Mr. Adams gives the results of his experience as follows:

'The text-books,' he says (p. 6), 'all speak of the fortress as if it were made on a pre-arranged plan of labyrinthine escapes from enemies above and below, whereas my observations tend to show that the more or less complicated galleries are purely incidental and without any reference whatever to premeditated escapes, except in the case of the bolt run, which will be described presently. . . . But, by watching the erection of these structures from day to day, the conclusion forces itself upon one that *these galleries are the natural, incidental, and inevitable outcome of the work of excavating the nest cavity and piling up the superincumbent mound.*'

Mr. Adams then proceeds to describe in detail the building of the fortress: 'The site for the fortress having been determined, a circular cavity as a receptacle for the nest is made from two to six inches below the original surface of the ground, except in boggy soil or low-lying land liable to floods, where the nest is often above the ground level, in the centre of a heap of earth which is thrown up from converging runs (figs. 5, 6, 7). Now the easiest way to dispose of the earth when the nest cavity is being excavated is to push it upwards on to the surface, and in order to do

this a tunnel must be made. Fig. 8 shows the whole heap made entirely by this tunnel. Fig. 9 illustrates a low fortress on boggy ground, the whole heap being formed by a single tunnel (*a*) leading upwards from the nest. This nest has seven outlets just below the soil. There was no other tunnel or bolt run.

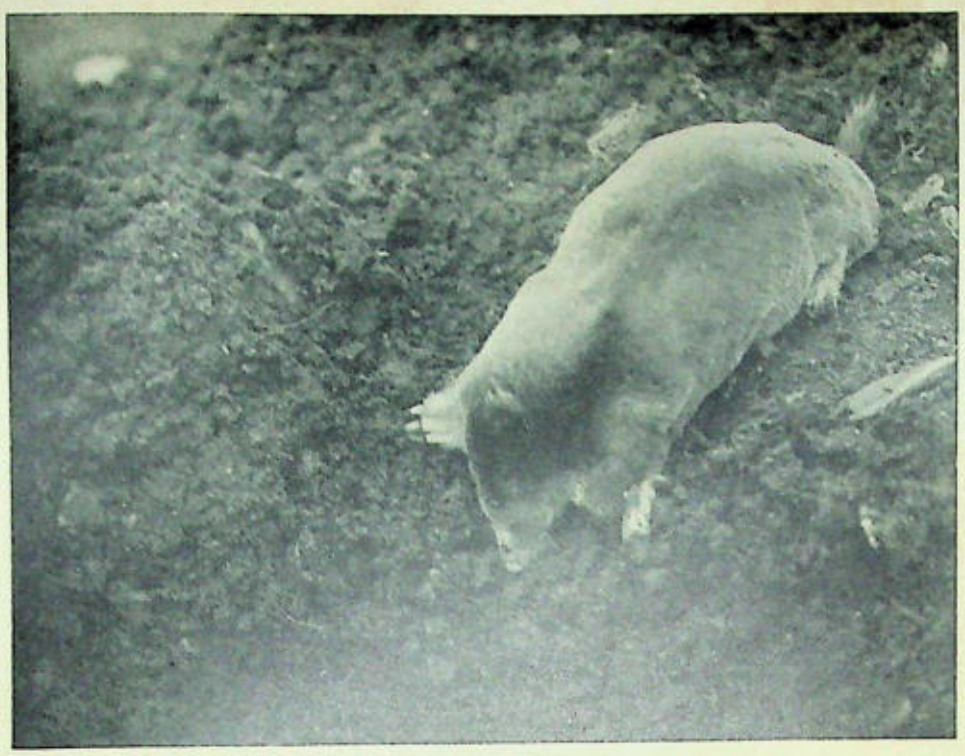
With regard to the tunnels the same author says that they are for two distinct purposes, namely (*a*) tunnels used to eject earth from the nest cavity and bolt run. These are generally corkscrew in shape and ascending from the nest, and often diverge into culs-de-sac, as shown in fig. 10; and (*b*) tunnels which are not directly connected with the nest, but which traverse the fortress from outside runs. Through these particular galleries Mr. Adams says that the Mole brings earth to heap over the nest, and that they seldom occur except in boggy land where the nest is near the surface.

At the base of nearly all the fortresses inhabited by Moles in the neighbourhood of my house I have found a number of what Mr. Adams calls up shafts, and these again at their base are often nearly or fully connected by a circular lower gallery.

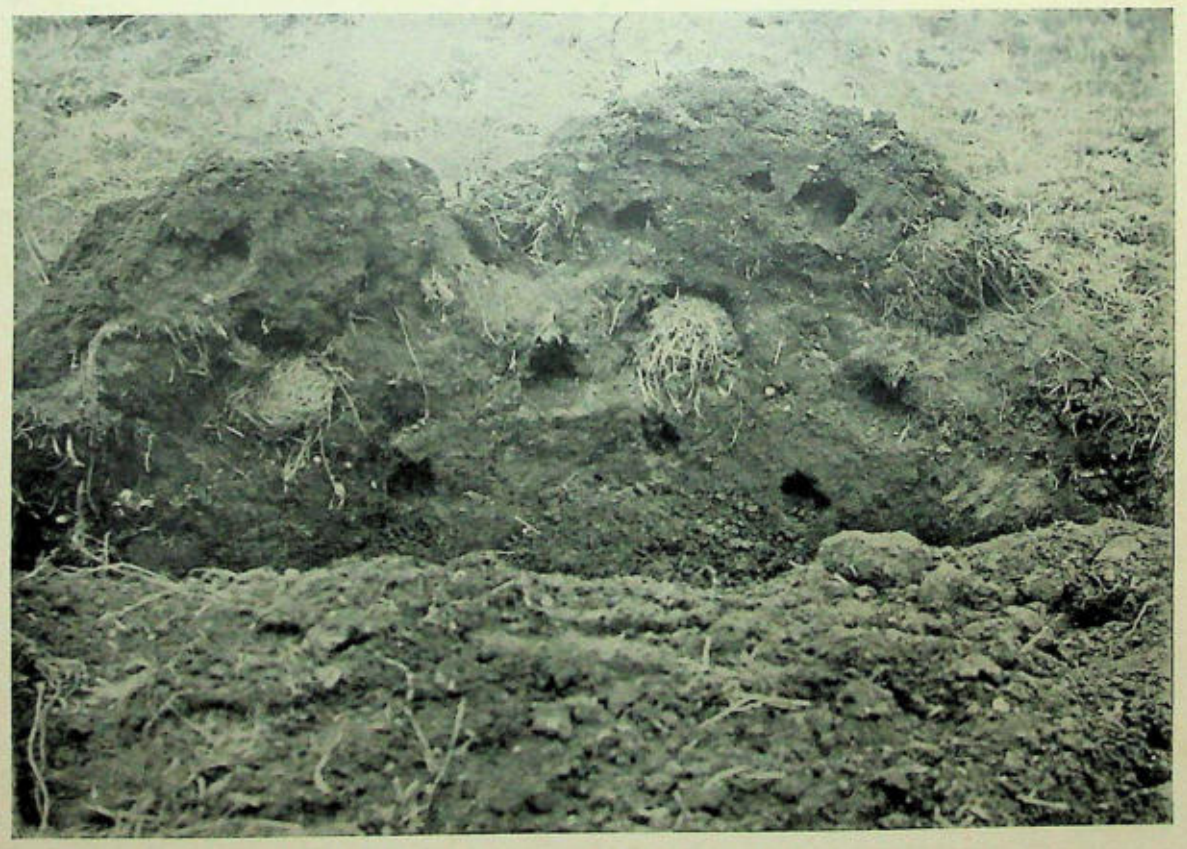
From the nest there is usually a bolt run, which at first trends downwards and then upwards to allow the female to escape when surprised. There is also often a direct down shaft, the exact purpose of which is as yet unknown. It has been suggested that it is for purposes of drainage or to provide a water supply, but Mr. Adams says that he has found them even in the hard red sandstone where such a purpose would be unnecessary. He thinks that it may be used in place of a regular bolt run.

Writing of the breeding mounds in Dorset, Rose Haig Thomas gives some interesting notes[1] on their position in marsh lands. 'The breeding mounds,' she says, 'were always isolated and at a long distance from the worm-hunting mounds, and in the twenty instances that I examined situated in a marshy meadow close to open ditches of running water. The nest—a ball formed of grass and leaves, sufficient in quantity to fill the two hands—is always on or about the level of the ground and in many cases actually rests on the water, though the centre of it is bone-dry and warm. The tunnel entrance to the nest always faces due south. Immediately above the nest and exactly beneath the centre of the dome is a much trampled hollow oval chamber, serving to keep the nest dry and warm. Eight tunnels, generally equi-distant, surround the nest and traverse the dome. I did not ascertain whether these or any of them led into the hollow chamber above the nest. In two of the nests I found three squirming blind young Moles, pink-skinned,

[1] *Field*, October 3, 1903.



THE MOLE.
Photo from life by DOUGLAS ENGLISH.



SECTION OF A DOUBLE FORTRESS WITH TWO NESTS.
Photo by DOUGLAS ENGLISH.

blotched with a few blood-red patches, and observed that their legs appeared of much greater length in proportion to the body than those of the adult. The isolation of these breeding mounds, their position in the marsh and running water, together with the fact that traps placed in runs close to the nest mounds from April 29 to May 7, with one exception, caught only females, gave me the impression that these precautions are to avoid visits from the males after the pairing season.'

Moles prefer a light dry soil, but they also work and place their fortress above stiff clay, or even hard sandstone, in fact in any ground where the soil is workable. Moles inhabit the highest wolds in Lincolnshire and Yorkshire, and I have found them a good distance up the mountains in Scotland, but the presence of rocks, marsh, and water-logged peat seems to stop them. They have, however, no objection to peat and boggy soil as long as it contains food. Mr. Adams bears testimony to the abundance of Moles in peat and boggy soils in Staffordshire, and the Mole's skill in avoiding floods. Here in West Sussex Moles are equally numerous both on the stiffest clay of the Weald and in the light soil of the forest land. On the stiff clay it is not unusual to see an area of ten acres one mass of Mole work, but without heaps. The ground is so riddled that not a square yard is devoid of tunnels only an inch or two below the surface. In the loam and sand about my house they generally work at a depth of about one to one and a half feet, and in this case their presence is shown only by the occasional mound. With regard to the strength of the Mole's burrowing powers, Mr. Adams says (p. 18):

'It is truly marvellous how runs are made at all in such difficult ground as Bunter sandstone, where the spade will hardly penetrate; yet the Mole will make his accustomed runs, and turn out among the heaps of sand stones weighing over 4 oz., which is the maximum weight of a Mole.' The same author thinks the Mole ejects the earth by using the snout and driving the earth upwards with the top of the head. This is made possible owing to his strong neck muscles.[1]

I am indebted to Mr. Coward for the following note about the workings of the Mole in Cheshire and Wales. He says:

'I never find any Mole's fortresses in this part of the country (Cheshire), and fancy they must be hidden away in the hedge banks. I have turned over scores of hills in the Dane and Goyt valley, where the animal is very abundant, without finding any trace of a nest. In the Anglesey marshes I have found

[1] A Mole which I released on the banks of a pond of hard 'puddled' clay made its way through the hardened surface and disappeared in one minute. It seemed to have some difficulty in making an entrance, but once the head and shoulders were buried it rapidly vanished from sight.

a good many, and always found them intricate and irregular, as described by my friend L. Adams. Moles swarm on Newborough Warren, a huge tract of sandhills in the south-western corner of Anglesey. Their runs are very superficial, the loose sand being raised in ridges above the tunnels. In many places there is a perfect network of runs, generally on the flat, but sometimes the tunnels ascend the dunes, being pushed through the roots of the maram grass. It is difficult to understand what they can find to eat in these sands, though there must be worms in the thin layer of turf over the more marshy spots. There were many runs in the saltings that border the Malldraeth Estuary, and here there were no heaps, for the soil is so light that it can be simply raised by the Mole as it burrows. The tunnels were about two inches below the surface, the ridges an inch to an inch and a half above. When the tide is up, many of these tunnels would be flooded, and some of them actually extended to the sands which are covered even at low tides.'

About the end of January a great development takes place in the generative organs of the male, which, culminating at the end of March, causes the Mole to go in search of a mate. At this time the males fight with one another with all the fierce energy of their race. It is no uncommon thing for a male to hunt another to the surface of the ground and there battle for supremacy and wife. In this primordial contest one is often killed, for the grip of a Mole on the throat of another is both savage and long continued. Almost all the *Insectivora* are very quarrelsome during this period. Pairing generally takes place during the latter part of March or during April, and sometimes as late as the beginning of May; and though it is possible that, like the shrews, a second litter may be born late in the year, the fact has not yet been proved. Late litters, which have been noticed in September, may be those of young Moles born late in the previous year.

The cavity containing the nest is spherical and about a foot in diameter, and in this retreat the female Mole builds her somewhat elaborate nest of grass or grass and leaves, taking the leaves that are most common in her vicinity. When handled this nest is apparently solid and compact, without any visible entrance. In this the female, after a period of gestation of about four weeks, produces her litter, which varies from two to seven in number. The young are carefully tended by the mother, and leave the nest in about five weeks.

Moles can shuffle along at a fair rate, both under and on the surface of the ground. Mr. Adams's estimate of two and a half miles an hour is correct, while

the statement by Saint-Hilaire that the animal can run as fast as a horse at its fastest trot is a purely imaginary computation.[1]

Superstition attributes to the Mole certain curative powers in the case of ague, and there are various strange theories with regard to the animal. The Rev. E. A. Woodruffe-Peacock[2] remarks that the Lincolnshire folk say the Mole leaves the ground but once a year to take a little fresh air in the daylight. In Staffordshire the Mole is supposed to possess only one drop of blood (Adams), while a very general belief prevalent from Wiltshire to Scotland is to the effect that Moles found wandering on the surface of the ground are 'moonstruck.' Pliny has given us a few curious tales of acts relating to Moles in his day. He says that Moles have undermined a town; that the magicians of Persia held them in especial reverence; that mats were made of Moles' skins just as they are the fashion to-day (1904), and that the animals may be killed by pouring 'amurca' into their holes. Virgil considered Moles to be blind, and says they are one of the farmers' pests; while, according to Professor Herbert Strong, Palladius, who probably wrote about the reign of Theodosius in the fourth century, is translated by the Early English Text Society as supplying an infallible receipt for the destruction of Moles. These quaint lines are as follows:

THE MOLDEWARP THE GREEKES THUS PURSUE:

Thai thurle a nutte, and stuffe it so withinne
With brymstoon, chaf, and cedria, thees three.
Then alle her hooles the molde is ynne
Save oon, the moste, uppe stopped must thai be.
The fyred nuttes smolder shall thorowe fle
This grettest hoole, as wol the wynde him serve
And either shall thees talpes voide or sterve.

Moles are very fair swimmers. They swim high out of the water, showing the head and back to within a short distance of the root of the tail, which is submerged; the end of the tail, however, sticks up out of the water. Progress is made at a fair rate with all the animal's accustomed energy. The action of the legs and feet is very rapid, and each movement of these is downwards and backwards in the usual fashion (see illustration from life). I believe that Moles are much better swimmers than they are generally given credit for, and are capable of crossing considerable stretches of open water when it is quite smooth. There

[1] Cf. Southwell, *Zoologist*, 1888, p. 21.

[2] *Naturalist*, September 1900.

are many instances of Moles swimming fairly long distances. L. Adams mentions an instance of a Mole being killed while swimming in a Scotch lake a hundred yards from shore, and Moles have frequently been observed to cross a river of their own accord. A Mole has been known to swim nearly across Lake Morar, a broad loch in Ross-shire, when it was intercepted after going nearly a mile and a half.[1] If the animal could do this, I fail to see why it could not reach Mull by swimming from the mainland.

Unlike the hedgehog, the Mole does not hibernate. In the coldest weather it works at a deeper level than usual. In times of snow we see the earth thrown up on the surface as at all other seasons. Moles occasionally come up and move about on the surface; this generally occurs in the spring, when they are fighting or chasing one another, or when the female is gathering materials for her nest, but it also happens in autumn.

All over the south of England farmers and countrymen will tell you they expect to see Moles moving on the surface of the ground in August and September, after an exceptionally dry summer. Drought is doubtless the cause of this. In the Weald of West Sussex, where Moles are so abundant, there is but a thin layer of loam, sometimes only a few inches above the hard clay, through which the Mole either cannot or will not burrow. When this supersoil becomes caked and hard and the worms have left it for a deeper level, the Moles must come up both to search for water and food and to shift their ground. I have frequently seen at this season runs of Moles, doubtless made at night, which were so broken on the top that the animal may be said to have been working *on* the surface. The back of the animal must at any rate have been exposed while forming them. Surface Mole runs of this description are also common in the dry ironstone of Northamptonshire.

Two or three times in the autumn I have seen Moles on the surface of the ground. I once watched one for a considerable time as it worked along the side of a bank which had recently fallen in. It appeared to be hunting for worms, and was moving its head from side to side with a peculiar jerky motion as it nosed along. Mr. Adams suggests that they may come to the surface more in June, July, and August, for at that time they are least in evidence in their subterranean life, because worms are pairing on the surface in thousands, and that they come up nightly to eat them. Moles are very fond of water, and some writers think they come out every night to bathe and drink, which may or may

[1] *Zoologist*, 1877, p. 441.

not be the case. Mr. Adams says they will come to the surface during snow; he has seen their tracks in snow. At any rate, they do come up frequently for this purpose, and at such times doubtless often become the prey of owls, in whose pellets their remains are to be found.

Blasius says that, on the Continent, birds of prey and storks will wait for the appearance of the Mole at its heap, and that the stoat, weasel, and even the adder will follow it in its runs.[1] In Britain there are but few raptorial birds left, though the common buzzard, which still lingers in Wales and the North, feeds largely upon the Mole, and is described as sometimes waiting for Moles near the molehills. Stoats are large animals to follow a Mole in its burrow, but no doubt the female weasel—the 'mouse-killer'—often does so; it has been frequently captured in traps set in the runs, and Mr. Rope,[2] Mr. H. Hardy Simpson,[3] and others bear testimony to its Mole-killing habits.[4] The statement that the viper devours the Mole is not supported by reliable evidence, neither is it at all certain that the hedgehog will eat it, though it has been said to be a regular enemy of the Mole. Mr. Adams is of opinion that herons sometimes devour Moles, and without doubt owls do so whenever they can catch the animal on the surface of the ground; the bones of Moles are not infrequent in owl pellets. The brown rat no doubt accounts for a few, and the fox and badger will also eat it; the last two creatures are said to dig young Moles out of the nest, and the badger is also said to take captured and dead Moles out of traps.

Besides the various traps that are employed for the capture of these animals—from the old-fashioned spring and noose down to the recently invented American piercer, which does away with all hand-contact—it may not be beside the point to say that Moles can easily be shot. The Mole generally gives three upheavals in creating the mound, and if you are close at hand and fire at once at the base of the molehill when the animal makes its second movement you will generally find that you have killed it. These movements are said by a writer in the 'Field' to take place regularly at 7 A.M., 11 A.M., and 3 P.M. in freshly created runs, but

[1] In Britain there is not much evidence that the viper feeds upon the Mole, but at least one case has occurred. Major Thresbie, of Barnbarroch, found three young Moles in an adder which was killed in July 1903. Service, *Ann. Scot. Nat. Hist.* April 1904, p. 67.

[2] *Zoologist*, 1887, p. 68.

[3] *Field*, May 1886.

[4] The enormous increase in Moles in the south of England, especially in Sussex, may be to some extent accounted for by the destruction of stoats and weasels. More than one writer has already suggested this explanation. Both the stoat and the weasel are excellent diggers when they wish to do so, and it is not difficult for them to smell and dig down into the already loosely built fortress, where the young Moles are an easy prey.

Moles do not create their heaps at fixed hours. The times of work in the same spot are generally about four hours apart. Many Moles sometimes use the same main road; as many as thirty-six have been trapped in one run, so that the supply of worms soon gets exhausted in a spot where many animals are frequently passing.

It will always be difficult to find agreement on such a vexed question as to whether the Mole is injurious or not. If you ask the gardener, his motto is 'Slay and spare not.' One farmer will anathematise the Mole and say it breaks the reaping machines with its abominable mounds, and damages crops by exposing their roots; while another will praise the 'little gentleman in black velvet' for his admirable surface drainage and his destruction of injurious larvæ.

All about the part of Sussex in which I live farmers are convinced of the excellent top-dressing the spreading of molehills makes in grass and park lands, for I see labourers doing this in all directions in the month of March. How long this method has been in practice is shown by Mr. J. E. Harting.[1]

'In connection with this part of the subject,' he says, 'it may be of interest to mention here the earliest notice of the Mole which I remember to have met with. It is to be found in the Roll of John Kelyng, Clerk of the Works to Dudley, Bishop of Auckland (A.D. 1476–83), wherein the following entry occurs: "1480–1. Paid to Henry Newton for spreading molehills, 8*d*." So it would seem that the practice is of some antiquity.'

There is no British mammal whose pelage is so subject to variation in colour as the Mole. Summing up the occurrences reported in the 'Zoologist' alone, Mr. Harting says[2]:

'Looking through the pages of the "Zoologist" for the last twenty years, we find the following varieties reported from time to time: Light umber-brown (1865, p. 9645); orange (1877, p. 225; 1878, pp. 22, 128); apricot (1882, p. 351); amber colour (1884, p. 271); buff (1885, p. 214); cream colour (1862, p. 7879; 1865, p. 9645; 1868, p. 1186; 1869, p. 1926; 1871, p. 2782; 1873, p. 8448; 1882, pp. 187, 263); and albino (1867, p. 702; 1868, p. 1096). Three albino Moles were captured last year in Nidderdale.[3] Pied varieties are the most uncommon of all. A piebald specimen caught near Falmouth is mentioned by Mr. Cocks in his account of the fauna of that district. White, with red throat, and black-and-white varieties are noticed by Turton in the Appendix to his "British Fauna" and by Dillwyn in his "Fauna of Swansea." Perhaps the most curious variety yet reported was one with a white head, the rest of the body being of the ordinary colour. This singular specimen was caught

[1] *Zoologist*, December 1887, p. 445. [2] *Ibid.* December 1887, p. 448. [3] *Naturalist*, 1886, p. 36.

in October 1880, upon the Dysart estate, belonging to the Earl of Rosslyn, in Fifeshire.'

Many other curious varieties have been noticed since this date, but it is worthy of note that Mr. Southwell and Mr. Service are of opinion that true albinism is rare in the Mole. Mole-catchers declare that leucotic varieties are confined and constant within certain restricted areas.

The 'Field' contains many references to white and buff and steel-coloured Moles.[1] I remember our mole-catcher at Murthly trapping, about the year 1889, a whole family of white moles, three of which are now in my possession. I have never yet seen or heard of a pure melanism of the species—that is to say, jet black without blue sheen—though doubtless such have occurred. Moles with white heads or pied varieties are rare. Mr. Adams says that baby Moles are good to eat, while adults are probably as bitter as other insectivorous animals and birds.

[1] See summary of these, July 19, 1902, vol. c. pp. 141–142.

THE SHREWS

Family *SORICIDÆ*

ALTHOUGH the popular name of Shrew-mouse is often applied to members of this family of the *Insectivora*, the Shrews have, save to the rustic mind, only a superficial resemblance to mice. The close velvety pelage, the elongated snout, and the teeth are characteristic of the family. The dentition of the Shrews differs from that of the hedgehogs and moles in many particulars; the first pair of incisors are remarkably long and have a more or less marked cusp posterior to the main portion of these massive teeth; the lower incisors project forwards in a horizontal position, are generally curved upwards at the tip and serrated on their upper border. In common with some of the marsupials, from which it has been suggested the Insectivores are descended, the Shrews have four pairs of incisors in the upper jaw, though the fourth pair is considered by some authorities to be a modified canine and the true canine a premolar. The second upper premolar is large, larger indeed than the molars.

In the extremely long narrow skulls of the Shrews the zygomatic arches are incomplete, a character which at once distinguishes them from the hedgehogs.

In their habits, with a few notable exceptions, the Shrews are terrestrial, and though the family as a whole is said to be nocturnal, the statement, so far as our British species are concerned, is too sweeping.

Shrews are found throughout Europe, temperate and tropical Asia, Africa, and North America, and are represented in many islands lying adjacent to these continents.

Genus *Sorex*

The Red-toothed Shrews are, with two exceptions, found in Europe, northern Asia, Africa north of the Sahara, and North America. In our Islands the genus is represented by two species, *S. araneus* and *S. minutus*. In *Sorex* the teeth



THE LESSER SHREW.

SOREX MINUTUS.

THE COMMON SHREW.

SOREX ARANEUS.

LIFE-SIZE.

which are tipped with red-brown, are from thirty to thirty-two in number. The ears are well developed and the tail hairy; three pairs of mammæ are present.

The Common Shrew

Sorex araneus, Linnæus.

Sorex araneus, Linn. 'Syst. Nat.' 10th and 12th eds. vol. i. p. 73 (1766); Bell, 'Brit. Quad.' p. 109; Thomas, 'Zoologist,' p. 62 (1895).

Sorex vulgaris, Linn. 'Mus. Ad. Frid.' 10 (1754); Blasius, 'Säug. Deutsch.' p. 129; Nilsson, 'Skand. Faun.' p. 75; Bell, 'Brit. Quad.' 2nd ed. p. 141 (1874).

Sorex tetragonurus, Herman, 'Obs. Zool.' 48 (1780); Jenyns, 'Mag. Zool. Bot.' ii. 24; 'Ann. Mag. Nat. Hist.' p. 417 (1838); Alston, 'Faun. Scot. Mam.' p. 9 (1880); 'P. Z. S.' 272 (1877).

Local Names.—*Shrew-mouse*, *Herdishrew*, *Nursrow* (Staffordshire and other counties); *Blind-mouse*, *Ranny* (Yorkshire and Norfolk); *Hardy Mouse* (Oxfordshire); *Nostral* (Cheshire); *Shrove-mouse*, *Rannie-mouse*, *Skrew-mouse* (Scotland); *Rone Mouse*, *Sheer-mouse* (Orkneys); *Thraw-mouse* (Aberdeenshire); *Daltag*, *Daltag-fheoir* (Gaelic); *Llyg-oden-goch* (a name which is also applied to the dormouse), and *Llyg* (mouse) (Welsh).

The nomenclature of the Common Shrew has always been a bone of contention among systematic naturalists, but Mr. Oldfield Thomas[1] has at last cleared up the difficulties. Mr. Thomas points out that the name *Sorex araneus* was given by Linnæus to our Common Shrew, and not to the Common Shrew of France and Germany, and therefore is the one which should be retained for the Common red-toothed Shrew. German and French naturalists, making a similar mistake to the one which was made about our common hare, thought that their Shrew was the one which Linnæus had described, and it has been called *Sorex* or *Crocidura aranea* (Linn.). This Shrew, however, is white-toothed (*Crocidura*), so that Linnæus's name, in both the tenth and twelfth editions of the 'Systema Naturæ,' cannot be used. Many naturalists, when the Rev. L. Jenyns pointed out the error, adopted Linnæus's name of *Sorex vulgaris*, from what Mr. Thomas describes as 'a technically untenable work'[2]; and among these we find Lydekker,[3] but he makes a further error in giving for reference 'Syst. Nat.' edit. 12. Alston[4] followed Jenyns in not venturing to alter the name given incorrectly to the white-toothed Shrew, and took the next name in priority, *Sorex tetragonurus*, Herman, and

[1] *Zoologist*, 1895, p. 62. [2] Linn. *Mus. Adolph. Frid.* 10 (1754). [3] *Brit. Mam.* p. 75.
[4] *Faun. Scot.* p. 9, 1880.

many followed this lead. Mr. Thomas claims *S. araneus* for our red-toothed Shrew, and suggests *Crocidura russula* (Herman) for the white-toothed form.

Characters.—The adult Common Shrew, on account of its greater size, cannot be confounded with the Lesser Shrew, but both have short, dense, velvety fur similar in character to that of the mole. The snout is elongated and well furnished with *vibrissæ*; the tail is considerably shorter than the head and body, a point in which it differs from its smaller relation, and is somewhat flattened. In summer the pelage is normally reddish grey on the upper surface, which deepens in autumn until it becomes dark brown in winter. In April the fur lightens, and I have seen specimens killed in Argyllshire in July which were quite chestnut. Sometimes minute grey hairs are dispersed over the whole of the upper parts. The under surface is as a rule pale grey, but like the upper pelage is subject to variation. Mr. W. Taylor remarks[1] that in Elgin the Common Shrew is much darker in spring than in summer, and that in July he has seen it as light-coloured as withered grass—an interesting point if it shows adaptation to environment.

In both the Common and Lesser Shrew the ear is specialised; the external ear is small and rounded, but the orifice is large in proportion to the head. This opening is closed by an operculum of fur, while the two internal lobes, which are heavily fringed with hair, extend upwards and help to protect the opening. The lips are pink, and the mouth is usually held slightly open, so that the tips of the red-brown incisors are exposed. On either flank there are glands, covered by rows of fairly long hair, which secrete a fluid with a musky odour, which is supposed to be a protection for the Shrew from its carnivorous enemies. Bingley calls the animal the Fetid Shrew.

The teeth, which are thirty-two in number, are typical of the genus, but are slightly different in proportion, size, and position from those of the Lesser Shrew. The first pair of incisors in the upper jaw are powerful and bifurcated; the three other pairs are similar in formation and size to the canines, which come next; behind the canines are the first pair of premolars, very small and insignificant; and then come the large second pair of premolars, which are supposed to correspond to the fourth pair in the normal series. In the lower jaw there are but two pairs of incisors, the first being large, long, and serrated; the canines are absent, and there is but one pair of premolars.

[1] *Ann. Scot. Nat. Hist.* 1900, p. 138.

Dental formula: I. $\frac{3}{4}$; C. $\frac{1}{0}$; P.M. $\frac{2}{4}$; M. $\frac{3}{3}$. The length of the head and body is from $2\frac{3}{4}$ to a little under 3 inches (70 to 75 mm.), and the tail is about $1\frac{1}{2}$ inches in length (35 mm.). Hind foot, 11 mm.

Distribution.—The Common Shrew is almost circumpolar in its distribution; its range extending from England, through Europe and northern Asia to the Pacific, while it occurs again in the North American continent.

Throughout England and Wales the Common Shrew is distributed wherever grass lands and hedgerows are found, while in Scotland its distribution is very similar to that of the Mole, although it is not found in Mull nor in any of the large islands off the western coast. Unlike the mole, however, it is numerous both in Sutherland and Caithness. The record of this species from Iona is an error, for in all the Outer and Inner Hebrides, as well as in Skye, the Lesser Shrew takes its place. Unknown in the Shetlands, the Common Shrew is thinly distributed in the Orkneys, being found in Walls and Hoy.[1]

The Common Shrew is not found in Ireland, where the Lesser Shrew is abundant. The species certainly dates from the early Pleistocene age, its remains having been found in the Norfolk forest-bed.

Habits.—Nearly every writer speaks of the Shrews as being nocturnal in their habits, whereas from general observations I am convinced that these little animals are nearly, if not quite, as active during the day as in the night. Their diminutive size, uniform colour, and their keen sense of hearing, which enables them to detect danger, are the reasons why they are so seldom observed. Shrews move about searching for insects at intervals during the day in spring and autumn, and in summer when the temperature is not too high. At night they constantly feed in the open, but it is an error to speak of Shrews as being purely nocturnal; they are both nocturnal and diurnal in their habits. I have constantly seen Shrews moving about by day, especially in spring, and once watched two males engaged in a desperate combat on a steep hedgebank, where they fought for two or three minutes, and then, locked in a deadly embrace, fell headlong into a deep ditch, on the edge of which they continued the battle. Had not one of them heard me and retreated as I advanced a step, I feel sure that one of the combatants would have been killed, so fierce was the contest.[2] One constantly hears Shrews quarrelling and fighting in their holes in spring and autumn. As an instance of

[1] *A Fauna of the Orkney Islands*, p. 64.

[2] Mr. T. A. Coward in a note to me says: 'As evidence that Shrews fight and probably kill one another, I have found dead Shrews with wounds and with fur in their mouths.'

their diurnal peregrinations I quote the following, which occurred in April 1904. My little boy Geoffrey, who is an adept at catching small mammals, set a little nipper trap in the grass within thirty yards of my study window, where there is a large colony of field voles and Shrews. The time was 10.30 A.M. At 12 he brought me a Common Shrew quite warm. It had been nibbling the cheese and had got caught. He re-set the trap, and at 2.30 brought me another Shrew, caught in the same trap in the same run. At 4.30 the trap was again sprung, but no mammal was captured, only I recognised a few hairs in the trap as those of the Common Shrew. In the month of April he has captured ten Shrews, all by day, for he takes the traps in at night, as the heavy dews rust them.

In the summer months Shrews live to a great extent in grass or dense herbage, where they form runs along which they pass regularly in search of food. They like rough dry meadows or hedgerows, gorse clumps, and piles of faggots, but will occasionally frequent marshy situations, and I have found the nest of the Shrew, in Scotland, placed in a tuft of rushes on the edge of a bog. Some small mammals which are usually to be found far from houses will occasionally take up their residence in the buildings occupied by men; but although an Indian Shrew constantly resorts to inhabited houses, it is of very rare occurrence to find a Common Shrew in such a situation in England. Mr. J. H. Gurney[1] relates how he captured one in a trap set beneath the flooring of the second storey in Northrepps Hall; the trap was baited with cheese, and the weather at that date—December 20, 1878—was exceedingly cold. I also captured a Shrew in a trap set for a house mouse in my kitchen in November 1903.

Shrews feed on slugs, earthworms, and the larvæ of many coleopterous insects. They will eat, as shown by Mr. Rope,[2] the pupæ of lepidoptera, and they frequently tunnel into drying cow-dung in search of insects. These they obtain by smelling and snouting in the herbage, and I have reason to believe that besides hunting for their food in mouse runs they also tunnel in soft ground after the manner of the Water Shrew. I have seen small runs and tunnels in the soft edges of my herbaceous border, which I feel certain were made by Common Shrews. In form these runs are miniature galleries, similar to those made by the mole when working near the surface. Like the mole, too, the Common Shrew leads 'the strenuous life'; except for short intervals of sleep, it is constantly foraging, eating, or fighting, and whatever it does it does in earnest. The energy and activity of the little creature are extraordinary. I once kept three Common Shrews for a

[1] *Zoologist*, 1879, p. 123.

[2] *Ibid.* 1886, p. 26.



COMMON SHREWS (FROM LIFE).

short time; they were constantly on the move, and at first exhibited great anxiety to escape, springing in amazing bounds about their place of confinement. They soon, however, settled down to eat, and consumed great quantities of slugs, blue-bottles, and raw meat. During an absence of an hour I found that two of my little hot-blooded gourmands had finished all the food I had left with them, which would have been quite sufficient for three mice for one day, and had just killed and were eating their third companion. I then separated the remaining two, one of which escaped, while the third apparently died of starvation during the night, although left with nearly its own weight in food. Any person who wishes to keep Shrews and moles alive will have a busy time.

In still summer evenings, when lying in the woods waiting for rabbits to come out, I occasionally catch a momentary glimpse of the restless, excitable Common Shrew. The air is perfectly still, and the hum of insect life not sufficiently loud to drown the rustle of an overturned oak leaf close to your feet. The leaf flirts up again, and I see the flash of a tiny reddish-grey form as it darts towards an old tree stump, into which it immediately vanishes. That is all some observers ever see of the Common Shrew.

April is the best month in which to observe the Common Shrew. There is not a fine evening in this month in which I cannot observe eight or ten Shrews moving about on the high hedgerows close to my house near Horsham. At several spots where the banks are fairly open and not entirely covered with herbage Shrews may be seen running over the trails originally, I fancy, the work of bank voles, and darting in and out of their holes. You first detect their presence by the rustling leaves, and then see their tiny forms darting with rapidity along the small paths, at the sides of which they explore the maze of entangled leaves. Their movements are erratic; they run and halt, dart to the right and left; indeed, it is difficult to follow every spasmodic action; their little bodies might be moved by clockwork. Sometimes they scamper wildly across the leaves themselves, and then, striking a run, at once disappear underground, only to re-appear further along the bank. To show that Shrews are not difficult to observe I may state that on April 22, 1904, I observed six Shrews in five minutes' and eighteen in half an hour's watching. This was between 5 P.M. and 5.30 P.M. For two hours after this not a Shrew was to be seen. They began to move again about 7.30. Again on April 27 I saw five Shrews in three minutes and eighteen in three-quarters of an hour. After this they retired, and did not appear again till two hours later.

From these observations we may conclude that Shrews have periods of rest and activity which are not restricted to any given time; in this respect they resemble moles.

Nearly every work dealing with British mammals has some statement similar to that found in Lydekker's 'British Mammalia,' which is as follows (pp. 77–78): 'During the winter they retire beneath the roots of trees or bushes, to the deserted holes of other small mammals, or other secure nooks, where they pass the cold months in a state of profound torpor.' According to my experience this is far from being the case, except perhaps in the most severe weather. In the mild, wet winters we so frequently experience in the south of England I have found Shrews active all through the winter. This was especially the case in the very wet winters of 1902–1903 and 1903–1904, when I trapped numbers of Shrews in every month. Moreover, when the surface of the ground is very wet I believe that Shrews search for their food below the ground and are as active as moles during mild frosts. I do not believe that they hibernate in the strict sense of the word, any more than those rodents do which have short lapses of slumber when the temperature falls considerably. Mr. Oldfield Thomas has had Common Shrews from Norway which were captured on three feet of snow, with the temperature below zero.[1]

Shrews are often to be seen abroad in February; I have caught many in my herbaceous borders, where I believe they do much good in destroying slugs. About the beginning of March they commence to fight, and any person with good hearing may hear the shrill cries of the Shrews as they battle in the undergrowth or in the ivy of the hedgerows. About the middle of April we generally find the nests of the Common Shrew placed in some hollow in a hedge, tuft of grass, or old woodpile. The nest is constructed of grass, leaves, or dead vegetable matter, well roofed in, and with an entrance at one side. When making the nest in a tussock, the female Shrew is fond of interlacing growing blades to form the dome. I have also found that Shrews frequently construct their nests entirely of oak leaves. So far we know little about the breeding habits or period of the gestation of the Common Shrew. Some authorities think that it breeds only once (in April), while others fancy it has two or three litters during the year. It is certain, however, that Shrews do breed in every month from April to November; I have frequently found their nests with young in autumn as late as October, but whether these are the second or even third families of the same animal that has

[1] Barrett-Hamilton, *Irish Naturalist*, March 1895.



COMMON SHREWS FIGHTING.



YOUNG COMMON SHREWS IN THEIR NEST—NOVEMBER.

bred once or twice already during the year, or merely the first offspring of late young born in the previous year, it is impossible to say, and evidence on this point is much to be desired. Bell's estimate of five to seven young ones at birth is correct, though I have twice seen eight, and ten are not unknown. The young are at first blind and are naked, but they grow rapidly. Their power of sight, even when full grown, seems to be but feeble.

The latest date of which I have any note when a nest containing young Shrews has been found is November 19, 1903. This family was discovered by Mr. A. Thorburn in a nest of oak leaves, situated in a rubbish heap at Hascombe, Surrey.

I have reason to believe that Shrews sometimes assemble in numbers in the autumn, and, following a main trail, migrate out of pastures where food or water has become scarce. This is without doubt the case with the Lesser Shrew, and the habit of autumnal migration is probably shared by its larger cousin. It is at this season, August and September, that we find numbers of Shrews lying dead on roads and paths.

Various explanations of this mortality have been suggested, the most common one being that carnivorous animals, nauseated by the scent of the glandular secretion, drop the Shrew after killing it. Though many animals, such as cats and dogs, will reject the Shrew after killing it, the mortality is just as great in places where neither of these animals can have been abroad. Kestrels, owls, and harriers, which all prey on Shrews, will swallow them with avidity, so the death rate, such as it is, must be due to some other, probably internal, cause. Scarcity of food may account for it, but not drought, for in places where Lesser Shrews were abundant I have found many dead while pools of water lay around in every direction. Internecine war doubtless accounts for much loss of life in the spring, but this is unlikely in the autumn, except perhaps among very late breeding individuals. An old superstition in this connection is that Shrews cannot cross a path used by man, the smell of the human foot being instantly fatal to them. This fable, ridiculous as it is, is very ancient and widespread among unsophisticated peoples.[1]

Mr. Douglas English, in a letter to me, April 1904, suggests an entirely new

[1] Mr. F. J. Jackson, the well-known hunter, and Sub-Commissioner in British East Africa, recently told me that one day when out hunting in Uganda he passed on a native footpath the dead body of a Shrew. He just observed it and passed on, but his gunbearer, a raw native, immediately called his attention to the diminutive beast, thinking he had not seen it, and remarked, 'Do you know, Master, that when that animal crosses the human spoor it dies.'

theory to explain the Shrew mortality: 'I have only once succeeded in keeping a pair alive for more than three months. These did not show much tendency to burrow, though of course they took advantage of cover. I have kept five on different occasions. Two of them died in mortal combat, and the remaining three in their beds: one during a thunderstorm, and the other two at times when the atmosphere was in an unsettled thundery state. Thunder has a very depressing effect on some men, both physically and mentally, so that the fact of these Shrews dying at such times is worthy of consideration.'

An uninjured Shrew will often sham death when taken and held in the hand, and one which I recently captured (July 1904) running on an open gravel walk went into convulsions when taken up and held in my hand. Thinking it was dead as its struggles ceased, I laid it on the grass, where, after a moment of feigned death, it sprang up and raced off with all its might.

The Shrew has a good many enemies. Dogs and cats kill them but generally spit them out, but I have seen a collie swallow them with relish. Owls, kestrels, and hen harriers will prey upon Shrews, and stoats, weasels, and moles doubtless destroy a good number and help to preserve the balance of nature.

The Common Shrew is most beneficial to the farmer and the gardener, yet in days gone by it was subject to persecution on account of its supposed venomous bite, which was said to be destructive to cattle. It was also considered to have an injurious effect on domestic animals if it simply ran over them.

The oft-quoted passage in Gilbert White's 'Selborne' (Letter xxviii.) relating to this fable and the subsequent cure by means of the application of a twig of the shrew-ash almost needs an apology for its insertion, but no passage in any work deals with the matter more fully in a short space.

'At the south corner of the *Plestor*, or area near the church, there stood, about twenty years ago, a very old grotesque hollow pollard-ash, which for ages had been looked on with no small veneration as a shrew-ash. Now a shrew-ash is an ash whose twigs or branches, when gently applied to the limbs of cattle, will immediately relieve the pains which a beast suffers from the running of a Shrew-mouse over the part affected; for it is supposed that a Shrew-mouse is of so baneful and deleterious a nature that wherever it creeps over a beast, be it horse, cow, or sheep, the suffering animal is afflicted with cruel anguish, and threatened with the loss of the use of the limb. Against this accident, to which they were continually liable, our provident forefathers always kept a shrew-ash at hand, which, when once medicated, would maintain its virtue for ever. A shrew-

ash was made thus[1]: Into the body of the tree a deep hole was bored with an auger, and a poor devoted Shrew-mouse was thrust in alive, and plugged in, no doubt with several quaint incantations long since forgotten. As the ceremonies necessary for such a consecration are no longer understood, all succession is at an end, and no such tree is known to subsist in the manor or hundred.'

Shrews are easily trapped with meat, cheese, or a piece of rabbit's liver. Mr. Coward tells me he has captured them in tooth traps baited with bread smeared with aniseed, a strange food.

White varieties of this species are not very uncommon. I have seen five or six. Shrews with white tails, white feet and legs, and white patches are not rare. Frequent reports of pied and white varieties, including true albinoes, have appeared in the pages of the 'Field,' 'Zoologist,' and other journals.

Pigmy Shrew

Sorex minutus, Linnæus.

Sorex minutus, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 73 (1766).
Sorex pygmæus, Pallas, 'Zoog. Rosso-Asiat.' i. 134 (1831); Bell, 'Brit. Quad.' 2nd ed. p. 148A (1874).
Sorex rusticus, Jenyns, 'Ann. Nat. Hist.' p. 417 (1838).
Local Names.—*Lesser Shrew* (England); *Wee Thraw, Wee Skrew-mouse* (Scotland); *Rannie-mouse, Luck-Fheoir, Luckag-Fheoir* (i.e. Grass Mouseling or Little Beast of the Grass) (Outer Hebrides and Skye).

The Gaelic name 'Daltag' is no doubt often used for the Lesser Shrew when the animal is not distinguished from the Common Shrew, and no doubt similar local names are applied in other places to the two species indiscriminately.

The Rev. L. Jenyns (Blomefield) was really the first to discover that two

[1] With regard to the practice of making shrew-ash trees, Gilbert White makes reference to Plot's *Staffordshire*, in which the author says:

'The case remains an inexplicable riddle to all those about to this very day. But methinks, to anyone that considers the superstitious custom they have in this country of making *Nursrow trees* for the cure of unaccountable swellings in their cattle, the thing should not seem strange. For to make any tree, whether oak, ash, or elm, it being indifferent which, a *Nursrow-tree*, they catch one or more of these mice (which they fancy bite their cattle, and make them swell), and having bored a hole to the centre in the body of the tree, they put the mice in, and then drive a peg in after them of the same wood, where they, starving at last, communicate forsooth such a virtue to the tree that the cattle thus swoln, being whipped with the boughs of it, presently recover; of which trees they have not so many, though so easily made, but that at some places they go eight or ten miles to procure this remedy.'

species of *Sorex*—or, as he at first called them, varieties—occurred in our Islands. He did not at once recognise that the Irish form was identical with the British form, but called it *Sorex hibernicus*, and the British species *Sorex rusticus*; later he discovered that both were the same species. In 1857 Blasius pointed out that *S. rusticus* of Jenyns was the *S. pygmæus* of Pallas; and so lately as 1895 Mr. Oldfield Thomas demonstrated[1] that it was the *Sorex minutus* of Linnæus, and that therefore this was the correct name.

Characters.—The Lesser Shrew is easily recognised from the preceding species by its smaller size, proportionately longer and narrower snout, and longer tail. With the exception of the first pair of incisors in the upper and lower jaws, the teeth are so minute that it requires a magnifying glass to detect them. The tail is well haired until August, when the covering becomes thin and worn. Length of head and body to root of tail, 46 to 50 mm.; tail, 33 to 38 mm.; hind foot, 10 mm. General colour above a rich brown, lower parts greyish white; *vibrissæ* long and abundant; the tail is dark brown above, grey below, and fringed on each side with longish whitey-grey hairs. The general pelage is more delicate and iridescent than that of the Common Shrew, and often interspersed with grey hairs.

Dental formula: I. $\frac{6}{4}$; C. $\frac{2}{0}$; P. M. $\frac{4}{2}$; M. $\frac{6}{6}$. The first upper incisors are not so long or prominent as in the Common Shrew. The minute canine in the upper jaw, which in the previous species is behind the line of the incisors, so as to be barely visible when viewed externally, is in the Lesser Shrew slightly larger proportionately, and stands in a line with the incisors; it is generally, if not always, visible. There seems to be a great uniformity in the size and pelage of this animal in all parts of Great Britain and Ireland. I can detect no varieties in a fairly large series of specimens taken in Surrey, Yorkshire, Scotland, North Uist, Skye, and Ireland. In August the upper pelage becomes a little lighter and tail hairs more uniform and sparse, but that is all. Considering the ages that Ireland has been separated from this country we might expect some slight superficial difference in the form and pelage, but there is apparently none. I have never seen a variety of this species, but Sir Douglas Brooke possesses an albino, which was obtained in Fermanagh,[2] and an albino Shrew was recorded from Limerick,[3] which, as the editor of the 'Field' points out, must have been a Lesser Shrew.

Distribution.—The Lesser Shrew is not found in North America, but its range extends from Ireland and the British Isles across Europe and northern

[1] *Zoologist*, 1895, p. 62. [2] Barrett-Hamilton, *Irish Naturalist*, March 1895. [3] *Field*, Aug. 21, 1897.

Asia, north of the Himalayas, through China and Mongolia, to the Pacific Ocean, where it also occurs in the Island of Saghalien. In England it is very generally but sparsely distributed, and though not yet recorded from every county, it will probably be found in all parts when local faunas are properly worked out. It has been most frequently noticed in the southern counties, owing to the greater number of competent observers; and it is not rare in suitable places, such as old copses and the bases of old stone walls, where it loves to make its runs. Mr. Ruskin Butterfield tells me it is sparsely distributed in the neighbourhood of Hastings and St. Leonards, Sussex, but is difficult to trap. At Horsham, in the same county, it certainly occurs, although I have as yet failed to capture a specimen. In Surrey it has been taken several times, and the specimen from which Mr. Thorburn drew his figures was captured by the side of an old church wall at Hascombe, Godalming (1903), where a small colony exists. In Hants, Dorset, and Devon it is well known but considered scarce, and it has been noted in Norfolk,[1] Suffolk,[2] Worcester, Shropshire, Berkshire, and Cambridge.[3] It has been found in Northumberland[4] as a northern limit in England, in Yorkshire on many occasions, even so far to the east as the Spurn,[5] while in the extreme west it has been taken in Anglesey[6] and Glamorganshire.[7] It is reasonable, therefore, to suppose that it occurs in all the intermediate counties, since it has recently been noticed in Nottinghamshire.[8] With regard to its distribution in the west of England, Mr. T. A. Coward kindly sent me the following note:

'The Lesser Shrew occurs in Cheshire, but it is not common. I have found the skull in owl pellets from different localities, but only in the proportion of at least one in a hundred to those of *araneus*. I also picked up one in a pellet I found on the cliff at Rhos Neigr, Anglesey. The identity of all these skulls was kindly confirmed by Mr. Oldfield Thomas. The first example identified for Cheshire was one which was captured by a cat at Rainow, near Macclesfield, on January 24, 1894. It is now at Owens College, Manchester. A female from Killencoole, which I dissected, contained four embryos in small dark green sacs. The snouts were blunt, turned over the mouth; the eyes dark rings of pigment; the toes showed in the posterior limbs; the tail long, and the vertebræ were visible. Length about 13 mm. as nearly as I could measure without breaking the embryo.'

Though it occurs in the north of England, it is considered rare. The Lesser

[1] *Zoologist*, 1897, p. 123.
[2] *Ibid.* 1903, p. 69.
[3] *Ibid.* 1900, pp. 142, 186, 421.
[4] *Ibid.* 1891, p. 264.
[5] Pocock, *ibid.* 1901, p. 388.
[6] Coward, *ibid.* 1897, p. 327.
[7] Pocock, *ibid.* 1897, p. 507.
[8] Whitaker, *Field*, April 1904.

Shrew is, however, fairly common in the south and south-west of Scotland.[1] I have failed to trace its actual range in the north of Scotland, but it occurs in Fife[2] and Elgin.[3] In Inverness—which is, I think, its known limit to the north-west—it has been recorded from the summit of Ben Nevis[4]; a cat brought a specimen, which was identified, into the observatory; though the Shrew may not have been captured on the actual summit, there is presumptive evidence that it occasionally ascends to over 4,000 feet above the sea.

In all the Outer and in some of the Inner Hebrides, as well as in Skye, the Lesser Shrew is fairly common, especially in west North Uist, where it is abundant. From east North Uist I have also received specimens captured close to Loch Maddy; it occurs, too, in Eigg, Colonsay, Mull, Iona, Tiree, and probably in Rum and Muck. In the Lews it has not yet been noted, but probably will be found existing in the grass lands about Tarbert. In the Orkneys and Shetlands the species is unknown.[5] In Ireland, where it has been found abundant in many localities, Captain Barrett-Hamilton says[6] 'it appears to be widely distributed and frequent, at least in parts of the island.'

It is quite possible, as has been suggested by Mr. Lionel Adams, that the comparative scarcity of this little animal in England, Wales, and Scotland may be due in some measure to the attacks of its larger cousin, for where the two species are known to exist together the Lesser Shrew is generally very scarce, whereas in Ireland, Skye, and the Hebrides, where the Common Shrew is absent, the Lesser Shrew is abundant.

Habits.—The general habits of this the smallest British mammal seem to be very similar to those of the Common Shrew, although its choice of habitation presents marked differences in many places in our Islands. In the northern islands of the Hebrides the Lesser Shrew lives in the perfectly open and barren wastes near the coast. Here in the coarse herbage of the 'machar' grass it uses the well-worn trails of the common field vole, and makes its tiny nest in the tufts of rushes or heather, while in the south of England it shows a marked preference for the neighbourhood of old stone walls covered with ivy.

[1] In a letter to me, May 1904, Mr. J. A. Harvie-Brown says that the distribution of the Lesser Shrew in Scotland may be described as 'universal but sporadic.' He thinks the Lesser Shrew is the relic of a 'very old fauna rather inclined to become scarcer on the mainland, but holding a premier place still in the Hebrides.' We are still without records of the species in the extreme north of Scotland, but evidence of its existence here will doubtless be forthcoming.

[2] *Ann. Scot. Nat. Hist.* 1892, p. 69. [3] *Ibid.* 1900, p. 138. [4] *Ibid.* 1897, p. 42.

[5] Mr. Alston suggests that the Shrews found in the Orkneys may prove to have been Lesser Shrews.

[6] *Irish Naturalist*, March 1895.

During a residence of two seasons in west North Uist I constantly came upon the dead bodies of these little animals in autumn. They were usually lying on the edge of some sheep or cattle track close to where their own runs were visible. One day I picked up an example lying on the seaweed just above high-water mark, and found tiny spoor in the sand close by, which seemed too small for field voles; so it is possible they may resort to the dry seaweed to search for sand-hoppers or other food. In one spot close to Balranald House I picked up, one day in 1899, three Lesser Shrews lying together, and the worn nature of the trail along which they had come seemed to give some support to the assertion of an old shepherd that the *Luckag Fheoir*, as they are called in the Hebrides, band together and migrate in a body in the autumn. When forced together and moving under the strange excitement and impulse of migration, it is likely that the hindermost Shrews would soon be in a state of starvation, as spring-buck are when on 'trek,' and many would die from this cause, since we know the necessity of a constant supply of food to the well-being of the Insectivores. Lesser Shrews also frequented the sweet grass about the roadsides of North Uist, and collies kill large numbers in their daily hunt for field voles. The latter are swallowed whole and much relished. But the Lesser Shrews are generally ejected after being bitten. I was so fortunate as to find the nest of the Lesser Shrew in North Uist in August 1899. It consisted of a small compact ball of dried grass interwoven and interlaced on the top with some of the fine rushes in which the nest was built. It contained five young ones about three parts grown. When held in the hand they appeared to be almost blind, and did not make any attempt to get away. In fact, I think the young of both this species and the Common Shrew remain in the nest or its close vicinity until quite full grown. The pelage of these immatures was slightly paler than that of an adult.

We are never likely to know very much about the inner life of this delicate little creature. Its gestation and breeding habits are probably similar to those of the Common Shrew, but observations on these points are scanty.

Genus *Neomys*

The Water Shrews

The Genus *Neomys* is represented in Britain by only one species; the characters are described below. In *Neomys* there are only thirty teeth, and not thirty-two as in *Sorex*.

The Water Shrew

Neomys fodiens, Pallas.

Sorex fodiens, Pallas, in Schreber's 'Säugethiere,' viii. 571 (1778); Gmel. ed. Linn. 'Syst. Nat.' 113; Flemming, 'Brit. Animals,' p. 8; Jenyns, 'Brit. Vert.' p. 18; Blas. 'Säug. Deut.' 120; Nilsson, 'Skand. Faun.' 37; Bell, 'Brit. Quad.' 115 (1837).
Sorex bicolor, Shaw, 'Nat. Miscell.' ii. 55 (1791).
Sorex remifer, Geoffroy, 'Ann. Mus.' xvii. 182 (1811); Bell, 'Brit. Quad.' 119 (1837).
Sorex Daubentonii, Geoffroy, 'Ann. Mus.' xvii. 182 (1811).
Sorex ciliatus, Sowerby, 'Brit. Miscell.' 103 (1805).
Neomys fodiens, Kaup. 'Entwick. Europ. Shrew.' p. 117 (1829).
Crossopus fodiens, Wagler, 'Isis,' p. 275 (1832); Bell, 'Brit. Quad.' 2nd ed. 149 (1874).
Amphisorex Pennanti, *Amphisorex Linneanus* } Gray, 'Ann. Mag. Nat. Hist.' ii. 287 (1838).
Local Names.—*Water Shrew*, *Water Shrew-mouse*, *Oared Shrew* (black variety) (England); *Water-rannie*, *White-breasted Water Shrew*, *Water Mole*, *Lavellan*[1] (Scotland); *Famhalan*[2] (Gaelic); *Famh-uisge* (Alston).

Characters.—Considerably larger and handsomer in appearance than either of the other British Shrews, the Water Shrew is a most beautiful little animal. Unlike the kindred species, which show little variation in size, adult Water Shrews vary considerably. Out of six males and females from the south of England measured in the flesh, the smallest, a female, is 3 inches (76 mm.) long, with tail 2 inches (51 mm.), and the largest, a male, is nearly 4 inches (97 mm.), with tail 2¼ inches (57 mm.). Hind feet about 23 mm.

In Scotland the Water Shrew often grows to a very large size. In a letter to me (August 1904), Mr. Harvie-Brown speaks of finding an exceptionally large specimen of the Water Shrew lying dead on a road near the Helmsdale, and

[1] Pennant.

[2] The origin of this Gaelic name is given as *Famh*, a mole, and *alan*, water; hence, the Water Mole (*A Fauna of the Outer Hebrides*, p. 15).



THE WATER-SHREW.

NEOMYS FODIENS.

LIFE-SIZE.

I have recently measured a big male in the Perth museum which exceeds five inches in length.

The colour of the upper surface is a dense black, which in certain lights has a bluish tinge. The lower parts are usually pure white; the legs and feet white, as also is the longish hair which fringes the tail and ears. The upper surface of the legs is a brownish grey or black. In many examples a dark ash grey extends over the whole of the under parts, but this colour is never so black as the upper pelage, and the line of demarcation shows distinctly. At times I have seen Water Shrews with a russet brown tinge over the dark under parts.[1] The dark forms, which are merely individual varieties, are not rare, and are found wherever the ordinary type exists. For long the dark form was thought by zoologists to be a different species, and as such, under the title of the Oared Shrew (*Sorex remifer*), it was described by Bell, Yarrell, and Pennant.

The common form is undoubtedly that with white belly and white ear tufts, and in most localities the black form is rare or does not occur at all. The following interesting note from Lieut.-Colonel E. Butler, however, shows that in at least one locality (Bury St. Edmunds, Suffolk) the black form with white ear tufts is the prevailing type. 'Water Shrews are fairly plentiful here, and I have only seen the dark form which is figured in Bell and referred to as *S. ciliatus*. This form has white ear tufts.'

The vibrissæ are black and white in colour, and abundant. The eyes are small, but brighter and evidently more frequently used than those of the other Shrews, as we should expect in an animal practically diurnal in its habits. The ears of this species are small, with large orifices, although not appearing so externally. They are furnished with the same wonderful construction found in the other Shrews, which enables them to be opened or folded inwards and covered with hair at will. When closed no earth or water can penetrate the covering. The snout is broader and stronger than in the Common Shrew, and the head and snout is used for burrowing, as in the case of the mole. The feet are large, but not so well adapted for swimming as we should expect.

The teeth, thirty in number, are very similar to those of the Common Shrew, except that there is only one premolar on each side of the upper jaw.

[1] This yellowish or russet tinge on the under pelage of the mole and the Water Shrew is, I think, gained by constant burrowing in wet soil. It is generally seen in winter, and has nothing to do with the actual colouring of the hairs as created in the epidermis. A similar external colouring is seen on the breasts of surface-feeding ducks that go to feed in salt water. In both cases the colouring is not constant.

Dental formula: I. $\frac{8}{4}$; C. $\frac{2}{0}$; P.M. $\frac{3}{3}$; M. $\frac{6}{6}$.

Distribution.—The range of the Water Shrew extends from England across Europe into Asia as far as the Altai Mountains, east of which barrier it does not seem to be known at present, though it is unlikely that the species is absent from North China and Manchuria.

Unknown in Ireland and most of the islands of the west and north of Scotland, the species is fairly common in England and Wales as well as in Scotland, where, however, it is more local. Until quite recently observers thought it necessary to note the occurrence of this species and the bank vole, wherever they were found; and consequently we have such an abundance of records for England that it is hardly necessary to particularise all the places where it has been noticed, since it may be described as common in almost any district. A few localities, however, will show its general distribution in England and Wales.

Jenyns (1835) mentions this Shrew as an inhabitant of Surrey, as also does Brewer in his list of mammals found in the neighbourhood of Reigate (1856). Smee, too, mentions it as inhabiting the Wandle. It also occurs on the Lude Brook, Redhill, Chobham, and on the Wey, at Guildford.[1] It is very common in the ditches of the Essex marshes, and is numerous in many of the slow-moving streams and backwaters of Middlesex, Surrey (especially in the Wey), Kent, and Sussex. In the last-named county I have found it common in all the pools and streams in St. Leonard's Forest, while several colonies exist at Pulborough and Crowhurst, where Mr. Ruskin Butterfield obtained the specimens figured in the coloured plate. In Hants it is common, particularly on the Christchurch Avon and in the pools of the New Forest. It is well known in Devon, Dorset, and Cornwall. It is found in suitable localities throughout the Midlands, as well as in the fen ditches of Cambridge and Norfolk, occurring close to the sea at Yarmouth.[2] The species occurs in Suffolk,[3] and I have seen it myself on the Waveney at Beccles. In Yorkshire, Lancashire, Cheshire, Derbyshire, Shropshire, Stafford, Durham, and Northumberland it is common, and doubtless it is as abundant in other counties which I have not mentioned. In the Lake District the late Rev. H. A. Macpherson considered it rare, but this can hardly be correct, for the remains have frequently been found in owl pellets in the district.

In sluggish streams in Wales it is common, and Mr. Coward has found its remains in owl pellets in Anglesey.

The range of the Water Shrew requires working up in Scotland, where but

[1] *Victoria Hist.* County of Surrey. [2] *Zoologist*, July 1898. [3] *Ibid.* October 1900.

few have been recorded. Nevertheless it is common on the Solway and 'it has been found as far north as Sutherlandshire, where it is not uncommon.'[1] It was first reported from the neighbourhood of Glasgow,[2] and I have seen it myself in a stream close to the ranges in Hamilton Park. It has been taken in North Ayrshire,[3] and indeed I believe it to be well distributed throughout southern Scotland. Alston says that both the light and dark forms 'are widely but locally distributed throughout the mainland.' The late Mr. Small, of Edinburgh, used occasionally to receive specimens from the Lothians, and Mr. Harvie-Brown states that it occurs on the upper reaches of the Carron, in Stirlingshire. I have seen the Water Shrew in Perthshire several times, and remember watching two which were playing in a burn which flows into the Tay at Dalguise. There was at one time a colony on a Tay backwater just above Dalguise bridge, where I have shot a specimen. I have seen Water Shrews in the Delvin backwaters, and on the Isla at Stobhall. I have an example of the dark form from a ditch at Loch Leven, Kinross. In Aberdeen Mr. G. Sim[4] says that both forms of the Water Shrew are equally abundant; it is well known in Banff, and has been recorded occasionally from Elgin and Nairn.[5] Capt. Brander Dunbar, of Pitgaveney, informs me that he has only twice observed the Water Shrew, and his father only once. Harvie-Brown and Buckley[6] failed to find trace of the animal in Argyll, and suggest that it may have been overlooked; this is the case, as the Water Shrew has since been recorded,[7] and not only from the mainland but also from the island of Kerrera.[8] Mr. Macleay, of Inverness, has never received an example from Inverness-shire or Ross-shire, and thinks that it is very rare in those counties. Further north still it has been found in western Ross,[9] and Pennant talks of the 'Lavellan' of Caithness, which he suggests may be the 'water mole' of the natives of Sutherland. Harvie-Brown and Buckley[10] quote an interesting letter from Mr. Reid, of Wick, in which he states that he saw several of these little animals being washed down the river on floating masses of hay and corn during a flood in October 1872. Prior to that time it had been considered rare in Caithness. Harvie-Brown found the Water Shrew in Sutherland in the limestone burns and rivers of Assynt, and saw one which had been obtained on the Inver. He also states[11] that the Water Shrew has been seen or killed at Kintradwell, Culgower in Loth, and Golspie. It is often stated that the Water Shrew does not occur on any of the

[1] Alston, *Faun. Scot.* 1880, p. 10. [2] *Mag. Nat. Hist.* vi. 512. [3] *Proc. Nat. Hist. Soc. Glas.* 1890, p. 293.
[4] *Faun. Dee*, p. 46. [5] *Ann. Scot. Nat. Hist.* 1900, p. 138. [6] *Faun. Arg. and Inn. Heb.*
[7] Campbell, *Ann. Scot. Nat. Hist.* 1892, p. 266. [8] Borrer, *ibid.* 1893, p. 111. [9] *Ibid.* 1903, p. 70.
[10] *Faun. Sutherland, Caithness, and West Cromarty*, p. 72. [11] *Loc. cit.* p. 72.

islands off the west coast of Scotland. It has, however, as I have already mentioned, been taken on Kerrera, and Alston states that it is not rare in Arran.[1] Baikie and Heddle[2] mention one which was killed in Waas, Orkney, but the existence of the Water Shrew in a wild state in either the Orkneys or Shetlands has not yet been proved.

Habits.—Most of us who live in the country and love to observe nature have at one time or another watched this beautiful little creature sporting in some 'hidden stream.' Water Shrews like to frequent the banks of backwaters, slow-moving brooks or fen ditches, and play and hunt in their clear depths. Muddy and swift-flowing rivers and streamlets are not much to their liking, probably owing to the fact that small fish and water insects do not exist there in quantity, but I have both seen the animals and observed their workings in still pools in a rushing river. Unlike the lithe movement of the otter as it enters the water, the little Water Shrew sometimes 'plops' into the pools with a certain amount of noise, careless of the consequences. Its movements, like those of all the Shrews, are typical of its gay and energetic disposition. Paddling swiftly along the surface, with nose well raised, its front paws seldom used except for turning movements, and with hind-legs working with surprising energy, it darts across the brook, anon leaping out of the water in sportive glee, now chasing a companion or skipping along the surface in exuberance of spirits. The use of the hind-legs only for the purpose of natation imparts to the body a curious swaying motion, and why the Water Shrew does not use his fore-feet more I cannot understand. It swims very high out of the water. I remember once watching three full-grown Water Shrews engaged in a game of romps one spring day in a small backwater of the Kennet at Marlborough. They swam round and round in circles, and, after diving alternately, they came to the surface and leaped into the air in a most surprising manner. Comparatively speaking, I think that a Water Shrew can leap further out of the water than any mammal except a cat. This habit of making big bounds is so characteristic of the Water Shrew that if you surprise one on land at some distance from the water, it does not, as a rule, hide in the herbage, but sets off towards the river or pond with immense leaps through the grass, which if the animal were of the size of the spring-buck would be among the marvels of animal progression. I have more than once come upon Water Shrews several yards away from the water, and have invariably seen them act in this manner. When swimming under water the animal has a curious silvery

[1] *Faun. Scot.* p. 10.

[2] *Hist. Nat. Orc.* p. 14.



Water Shrews at play

appearance, which is caused by the mass of tiny air-bubbles that surround it as it dives. When searching for food at the bottom of a stream it turns over the stones like the dipper, and in this way finds many hidden water insects and disturbs fish spawn.

In the water the principal diet of Water Shrews consists of fish and frog spawn, small fish, fresh-water molluscs, water beetles, larvæ, especially that of the caddis fly, and floating insects. They will also eat carrion and putrid fish that have been stranded.

But little notice appears to have been taken of this beautiful little animal in England till Dovaston published his interesting account at the beginning of the last century.[1] Thus he speaks of its habits:

'It dived and swam with great agility and freedom, repeatedly gliding from the bank under water, and disappearing under the mass of leaves at the bottom, doubtless in search of its insect food. It very shortly returned and entered the bank, occasionally putting its long sharp nose out of the water and paddling close to the edge. This it repeated at frequent intervals from place to place, seldom going more than two yards from the side and always returning in about half a minute. Sometimes it would run a little on the surface, and sometimes timidly and hastily come ashore, but with the greatest caution, and instantly plunge in again.'

The habit of taking small fish, especially trout and salmon, as well as of disturbing and eating the spawn of these valuable fish, is a very serious charge, which the naturalist, however zealous he may be to defend his favourites, cannot controvert. Where a colony of these little animals exists fish are sure to suffer, and in time also the angler. Mr. Meade Waldo tells me that Water Shrews are exceedingly numerous in a small stream close to his house in the New Forest, and that he has frequently seen them chasing and hunting trout up to a fair size, and we have the evidence of one of the Duke of Sutherland's keepers, as quoted by Harvie-Brown and Buckley,[2] to the effect that he shot a Water Shrew which had been eating salmon fry in a limestone burn near Inchnadamph. The same authors, however, put in a plea for the Water Shrew on account of the amount of good it does in ridding burns of a certain insect which is very destructive to small fish in Highland streams.

It must not be supposed that this animal, which is fond of playing in the water and searching there for most of its food, is purely aquatic, any more than

[1] *Lond. Mag.* xi. 219.

[2] *A Fauna of Sutherland, Caithness, and West Cromarty*, p. 73.

that because the Shrews (except this species) are little seen by day they are necessarily nocturnal. Neither point is correct, and those who have made such broad statements have had little experience in studying these animals in a wild state. The Water Shrew is a diurnal animal, and though it must be equally active at night (for its remains are frequently found in the pellets of owls), its constant desire and necessity for food cause continual activity, a state of restlessness such as we see in the mole.

In spite, however, of the diurnal habits of the Water Shrews, they are by no means easy to observe. For three days in succession I have had unusual opportunities of observing them in a stream situated in the forest near my house, and then they have totally disappeared and I have not seen them again for a year—not, indeed, until I discovered a fresh habitat. Many good observers have never seen a Water Shrew, although living within a few hundred yards of a colony all their lives. As an amusing instance of this, I was walking one day in the beautiful American garden at Leonardslea with the owner, Sir Edmund Loder, and, noting the character of the brook which ran through the valley and the still pellucid pools through which it flowed, I asked my host if he had ever seen Water Shrews there. No, he never had, and was sure if they existed he must have seen them. 'But come here,' he observed, 'here is my mole-catcher, who has been all his life trapping moles and vermin, and who is continuously at work in the forest at this pursuit.' So we interviewed Old Tom.

Yes, he knew all the little 'varmin' from hedgepigs to blindmice (Shrews), but such a beast that was black and white and lived in the ponds and streams he declared did not exist in St. Leonard's Forest. I think we both turned away with different convictions; taking a few steps forward, we came to the edge of one of the still pools in question. At that moment a small jet black spot out in the long grass about fifteen yards away from the water caught my eye. Now there is hardly anything black in nature, and if you are a hunter there is no colour which attracts you so quickly. Sir Edmund also observed it, and as we looked the Water Shrew, for such it was, heard us, and with a series of bounds made all haste for the pool, into which it plunged and at once disappeared.

'Well,' said my host, 'that is the first I ever saw in my life, which shows how easy it is to overlook a thing.'

I think that the Water Shrew seeks much of its food on land, and frequently hunts the long grass near the river and ditch banks for slugs and insects; that it burrows for worms like its cousin the mole I once had the good

fortune to witness. Having noticed several curious little tunnels driven through the mud and decayed vegetable mould at the side of a sluggish stream in St. Leonard's Forest in the summer of 1902, I went with a trowel to unearth one, in order to find where it led to, and if possible discover what animals had made it. Coming quietly over the bank, I sat down on a hillock overlooking the stream, when I noticed something pushing up the earth just below me. A winding gallery of about two feet long had been recently drilled from the water's edge, and the animal, whatever it was, was even then throwing up the earth. Each successive heave of the small excavator raised the surface of the tunnel, about an inch, the sides falling out slightly with each movement. The gallery was slowly forming under my eyes. I crept a little nearer, and in doing so must have caused some vibration of the ground, for the excavator at once suspended operations; but the next instant a Water Shrew sprang from the exit into the water, and, swimming rapidly down stream beneath the surface, disappeared into a hole in the bank. I did not disturb the works, which were evidently made primarily in search of worms, but which I found subsequently are used as retreats, and often have down shafts leading away back to the water or under the bank. Next day I went to the spot with my wife, and just as we reached it we saw a Water Shrew skip across the stream and run into one of these surface tunnels. 'Now I have you, Mr. Waterbaby,' I thought, for I was anxious to catch a specimen and if possible keep it alive. My wife guarded the exit to the water, and I began at the other end and dug up the whole gallery until I reached her; but no Water Shrew was within. It had made a small down shaft, which I afterwards found and which could be used in cases of emergency like the present. Later I cut down the bank where I had first seen the Shrew disappear, and found a very elaborate system of galleries connecting the main retreat both with the surface of the ground and the water. In the dwelling place I found, in July, the remains of the Water Shrew's nest, a compact ball of grass with a few oak leaves, very similar to the nest of the Common Shrew, only larger. The tenants must have deserted the place shortly before, as I did not see them again for another year, and then in an entirely different part of the stream.

Opportunities of studying the Shrews in a wild state are usually few and far between, and the difficulty of learning anything of their inner life is still further accentuated by the fact that it is well-nigh impossible to keep them in confinement for any length of time. Of the actual times of breeding and the gestation of this little animal we are at present uncertain. The nest of the Water Shrew

is generally found in May, and the young, from five to six, are born in that month. The young certainly play about on the surface of the ground near their upper exit hole, and, I think, leave the nest much sooner than those of the Common Shrew, which often stay at home and are fed by the parents until they are nearly full grown. The Water Shrew probably breeds at least twice in the year.

I have received a female, taken at Cranleigh in 1903, big with young on September 15. Mr. G. T. Rope also records the capture of a pregnant female on September 5, 1900.[1] From these instances we may conclude that a second litter is not impossible.

Although so much at home in the water, this Shrew seems to become quite bewildered in time of flood. During the exceptionally wet winter of 1903–1904 numbers of Water Shrews left the fen ditches of Cambridgeshire, and many were found lying dead in the open fields or seen in the terrestrial dwellings of the bank voles and wood mice. A fine example of the black variety was caught near Cambridge in a hedgerow, far from the nearest water, in a trap set for a bank vole, and sent to me. Wet and mild winter seasons seem to upset all small mammals, and to keep them constantly on the move. It seems, however, to be the regular habit of the Water Shrew to shift its ground or go for long excursions on land in the autumn. One frequently hears of individuals being picked up dead at this season far from the nearest river or pool, and they are evidently subject to the same cause of death that attacks the other Shrews. Jenyns, in his 'British Vertebrate Animals,' says: 'My specimen was taken in a cornfield at some distance from any water'; while Mr. A. Thorburn has found one dead in a cover at Hascombe more than a mile from the nearest water, and Mr. C. H. Grant[2] states that:

'During a short trip to Banstead last August, trapping small mammals, I was lucky enough to catch three Water Shrews (*Neomys fodiens*), two males and a female, two miles from water. The weather was excessively hot, and the ground like a rock. I think this is the first authentic British record of the occurrence of this Shrew at such a distance from water.'

It will be observed that all these occurrences of terrestrial wanderings have occurred in the autumn and winter.

Water Shrews are not difficult to trap. Mr. Oxley Grabham tells me that they are easily caught in a cyclone trap baited with a piece of rabbit liver and

[1] *Zoologist*, 1900, p. 477.

[2] *Ibid.* 1900, p. 142.

set under water at the mouth of their holes, but I have not been successful with this method. They will take cheese or meat, and can be caught above ground with the ordinary little nipper. If a specimen is wanted I have always found the best plan was to shoot it with a small charge.

I have neither seen nor heard of a white variety of this species, but variation in the under parts—black, grey, or even brown—is not infrequent. Mr. Norgate has seen a piebald Water Shrew[1] and Mr. Service figures a curious example of this variety in the 'Annals of Scottish Natural History' (1903, p. 65).

[1] *Zoologist*, 1879, p. 123.

Order CARNIVORA

THE FLESH-EATING MAMMALS

The Carnivora trace their evolution from the Creodont group of mammals, whose remains are first found in the Lower Eocene formation of the early Tertiary Epoch. The first types of the earliest Carnivores in many respects resembled the Marsupials, from whom, through the Insectivores, they probably descended, gradually developing into the large and formidable flesh-eating mammals with pronounced canines which existed in the Pleistocene age, when some of the most powerful and massive Carnivores existed.

The Carnivora, as they exist to-day, are divided into two large sub-orders, namely, the *Fissipedia* or separate-toed flesh-eaters, which include the Cats, Dogs, Civets, Weasels, and Bears, and the *Pinnipedia* or web-footed fish-eating mammals, which embrace the Sea-lions, Walruses, and Seals.

The leading characteristics of the order may be summed up as follows: The feet frequently possess five toes and never less than four, which are usually furnished with strong claws; the stomach is simple in construction and pear-shaped in form; while the cæcum is either absent or but slightly developed. The mammæ, which are abdominal, number from two to twelve; the clavicle is either rudimentary or absent, and the lower jaw is so articulated that only vertical biting action is possible; lateral movement, such as we find in the Ungulates and other orders, does not appear in the jaws of the Carnivores. The upper surface of the brain is strongly convoluted, an indication of greater mental power than we find in the smooth-brained Insectivores.

The teeth, which consist of the usual series, are specialised for tearing and devouring flesh, although flesh is not the only food of all the Carnivores. Three pairs of incisors are usually present in each jaw, the outer pair being the largest. The canines are generally large, and in some cases form elongated tusks; the

premolars are narrow, and in the Seals are divided into sharp longitudinal cusps for holding slippery substances. The molars are usually broad and simple, and in the case of the Bears, Badgers, and some of the Cats are unusually flattened, and adapted for crushing the food. Naturally the teeth of the *Fissipedia* differ slightly from those of the *Pinnipedia* owing to the different methods of feeding and nature of the food. The *Fissipedia* have developed out of the cheek-teeth of both jaws a pair of strong carnassial or cutting teeth. In the upper jaw it is the fourth premolar and in the lower it is the first true molar which possess sharp cutting edges, which act together like the blades of a pair of scissors. In the Seals, which feed on softer food, these teeth are not so specialised.

The terrestrial Carnivora are found all over the world, except in the island of New Guinea. In Australia, the home of the most ancient mammalian forms, the Monotremes and Marsupials, there is only one Placental Carnivore, the Dingo; it is, however, generally supposed that this animal was introduced by human agency from Asia at some remote period. The Pinnipedia are found generally in the cold waters of the northern and southern seas.

THE CATS

Family *FELIDÆ*

THIS beautiful group of the Carnivora is found inhabiting the greater part of Europe, Asia, Africa, and America. Of their first development we are not quite certain, although the earliest known remains of true Cats are found in the strata of the Middle Eocene period. They differ from the *Canidæ* or Dogs in possessing the entepicondylar foramen of the humerus, while the claws, except in the Servals and the Cheetah, are very strong, well-curved, compressed, and sharp. In all the Cats, with the exception of the Cheetah, the claws are retractile, and even in the Cheetah the exception is only partial and probably of comparatively recent specialisation. When the claws are enclosed in their sheaths their pointed tips do not get worn and blunted.

Most of the true Cats possess a soft pelage of dense light-coloured fur, which is usually ornamented with dark-coloured stripes or spots. The density of the hair varies considerably in some species which have a wide range; towards the northern limits or when the animal lives at a high altitude, and consequently is exposed to cold, the fur becomes much longer and thicker to afford better protection.

Spots and stripes have great protective value; they enable animals to hide from their enemies or to lie concealed until their prey approaches, for these markings assimilate with the light and shade of herbage and foliage. This is especially noticeable in such species as the Tiger and Leopard; the stripes of the former, in a strong sunlight, are invisible or blend with the upright herbage of a marsh or jungle, while the spots of the latter intermingle with and are similar to the dappled light of sunlit foliage. Various species, such as the Lion and the Caracal, after centuries of life in the open, are, however, losing these protective markings.



THE WILD CAT.
Felis Catus.

Litho. W. Greve, Berlin.

In the Cats the head is noticeable for its short muzzle and powerful and rounded form. The tympanic bulla is well developed and prominent.

After the three pairs of incisors and the large canines in either jaw come the premolar with the modified carnassial, which in the Cats is of peculiar construction. These flesh teeth are thus described by Lydekker[1]:

'That of the upper jaw consists of a large three-lobed external blade, and a rather small inner tubercle situated at the internal front angle of the tooth, while the opposing lower tooth is simply a cutting two-lobed blade, without any tubercular heel or ledge at its hinder extremity or any trace of a cusp on its inner border. Behind the upper flesh tooth, which is the last of the premolar series, there is a minute traversely elongated molar, which appears to be quite functionless; while in the lower jaw the flesh tooth, which is here a molar, forms the last of the whole series.'

There are five toes on the fore-feet, but the hind-feet possess only four complete toes, the first being merely a metatarsal bone of rudimentary character. In walking or running the Cats are digitigrade—that is, they tread only on the toes, which are provided underneath with soft pads which render their progress noiseless. Yet the pads on the feet, although resisting the entrance of most thorns, are not impervious to sharp substances.[2]

Most of the Cats are expert climbers, and are more or less nocturnal in their habits, sleeping the greater part of the day in trees or in some safe retreat among the rocks or undergrowth. Except Lions, which often band together in a pack to attack some large animal, the Cats do not combine and hunt down their prey after the manner of dogs and foxes, but generally kill after a careful individual stalk.

Although Africa possesses so large a number of the Cats, we find no geological evidence to prove that the *Felidæ* found origin in that country. In fact, we know very little indeed of the palæontological history of that great continent. Like many other families, its origin was probably in Persia or central Europe, and from thence it spread in all directions.

A very large Lion, known as the Cave-lion, *Felis leo* or *Felis spelæa*, was abundant in England during the Pleistocene period, and its remains are found in many parts of England. Contemporaneous with Palæolithic man it ranged as far

[1] *British Mammalia*, p. 86.

[2] I have seen in Africa the feet both of a Lion and a Leopard studded with the broken quills of the porcupine, on which both these animals feed when hungry.

north as Yorkshire and North Wales, but does not seem to have inhabited either Scotland or Ireland. Its extinction probably came about prior to the advent of Neolithic man. This Lion was in all respects similar to the Lion existing to-day in Africa, India, and the Persian Gulf, except that it must have been a larger and more powerful animal. There is undoubted evidence that the Leopard, *Felis pardus*, inhabited the south of England at the same period, as remains have been found in the caves of Dorset, Devon, and Somerset. The European Lynx, *Felis lynx*, was also an inhabitant of Britain in the Pleistocene age, and survived until *recent* times, and may even have lingered into the historic period. This species exists to-day in Germany, and was only exterminated in France in the nineteenth century.

Professor Mivart, in his interesting book on the Cat,[1] has given a very lucid exposition of Cats in general and the domestic Cat of our islands in particular. He held the view, now very properly accepted, that the domestic Cat is of Egyptian origin, and that it was not descended from the European Wild Cat. It is quite possible, however, that the early Egyptians, who were known to have held tame Cats in great veneration and to have bred large numbers, received the animals from Babylon, for recent discoveries have proved that the early Egyptians, who were supposed to have founded the first of empires with their arts of writing, drawing, architecture, and the primal laws and habits of a highly civilised people, learnt nearly if not quite the whole of their culture from the Northern Babylonians, who antedate them by at least 2,000 years. Persia and Babylon would therefore be the cradle of the race of Cats. Moreover, as regards the British domestic Cat, it was known to be rare and highly valued long after the Roman invasion, even until the Middle Ages, which would not have been the case had it been easily bred from the Wild Cat, which was a common and well-distributed animal in Britain at this time. *Felis caffra* existed in England in Pleistocene days, so that if, as seems probable, that species is the ancestor of our domestic Cat it is possible that domestication from *F. caffra* occurred in Britain as well as in the East.

[1] *The Cat: an Introduction to the Study of Back-boned Animals, especially Mammals.* By St. George Mivart, F.R.S., 1881.

Genus *Felis*

The Wild Cat

Felis catus, Linnæus.

Felis catus, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 62 (1766); Bell, 'Brit. Quad.' 2nd ed. p. 220 (1874).

Local Names.—*Wild Cat, Common Wild Cat, British Tiger* (Pennant) (England and Scotland); *Catfiadhaich, Braiene* (Gaelic); *Cath-goed* (Wales in old days).

Characters.—Although bearing a certain resemblance to fine specimens of the domestic 'tabby' Cat, the Wild Cat is easily recognised by its more powerful build, longer limbs, and short and bushy tail. The general colour of the fur, which is long and soft, is generally a yellowish grey, but in some males it is of a rich russet-brown; this colouring is most noticeable in October, when the male Wild Cat has its new winter pelage, but at the end of summer this type of pelage fades to a pale yellowish grey, while in others the legs always remain russet. Between the shoulders commences a broad and irregular black stripe, which passes down the back to the root of the tail, and from this uneven transverse bars of black diverge on both flanks, which sometimes cease on reaching the tawny chest and under parts and are sometimes extended in four to six bars across the chest. The hair on the upper chest and about the lower part of the belly is often pure white. The tail, which does not taper to a point, is encircled by nine blackish bands, the first three being the smallest,[1] and the last, which forms a dark end to the appendage, being much the broadest. Over all these black or blackish bars and bands there is a beautiful purplish sheen when the animal is in full coat. The limbs are barred with black horizontally, and have their inner surfaces yellowish grey. The under surfaces of the feet are black; the claws, yellowish grey. The vibrissæ are strong, abundant, and white in colour; the eyes, greenish yellow.

The general colour of the female is similar to that of the male, but the markings are not so strong and the colour is paler. Wild Cats vary a good deal in size. The splendid male from which Mr. Thorburn painted his coloured plate measured 3 ft. 10 in. from nose to tip of tail, and was altogether an exceptional specimen. It was killed at Kinloch Moidart, Ross-shire, in October 1899.

[1] The first three black bands on the tail are often so indistinct or so blended together that they only appear to be dark mottlings, so that it may be more correct to say that the tail is encircled by seven to nine circles of dark hair.

Bell mentions a large specimen killed at Cawdor, which measured 3 ft. 9 in. from nose to tip of tail, but full-grown males generally measure: head and body, from 22 to 26 inches; tail, 11 to 14 inches; and females, seldom more than 24 inches in head and body, and 12 inches in tail.

Dentition: I. $\frac{6}{6}$; C. $\frac{2}{2}$; P.M. $\frac{4}{4}$; M. $\frac{2}{2}$.

Distribution.—The Wild Cat is still found in Spain, France, Switzerland, Germany, Austria, Hungary, Poland, Dalmatia, Greece, and northern Turkey. Its range extends eastwards across southern Russia into the forests of northern Asia, but how far east it goes is at present undetermined. It retires swiftly before the advance of civilisation, although it is not an easy animal to trap, chiefly on account of its habit of taking 'live' game.

In the Pleistocene age the Wild Cat ranged over the whole of England and Scotland, although it did not apparently reach Ireland and the outer islands of Scotland. Its former presence in southern Britain is shown by its numerous remains in[1] the brick earths of Grays (Essex), the caves of Bleadon and Uphill (Mendips), Cresswell Crags (Derbyshire), Kent's Hole (Torquay), Ravenscliff (Glamorganshire), the Vale of Clwyd, and in a fissure in the Wealden Rocks, Ightham (Kent).

There is no evidence to show when the Wild Cat became extinct in southern and central England, but probably it lingered until the forests were destroyed to provide land for cultivation. In Wales it lingered almost to the present day, and by some it is supposed to exist still in the north of the Principality.[2] In Lincolnshire a Wild Cat was reported as having been killed so recently as 1883, and was recorded by so good a naturalist as the late John Cordeaux.[3] The place in which the animal was killed was Bullington Wood, one of the last big tracts of forest left in the county, and where the pine marten is said still to linger. No confirmation of Mr. Cordeaux's identification has since appeared, and it may have been an unusually large domestic Cat, with which the wild species has frequently been confounded, even by good observers. Many similar reports might be instanced; as, for example, the Cat killed in the Isle of Wight, recorded by Mr. Hadfield but doubted by Mr. Harding, then editor of the 'Zoologist.'[4] There is no doubt that the majority of the more recent reputed Wild Cats in England and Wales have been only feral domestic animals which have taken to a free poaching life in the woods.

[1] Lydekker, *Brit. Mammalia*, p. 90. [2] See *Zoologist*, January 1895. [3] *Ibid.* 1884, p. 380.
[4] *Ibid.* 1877, p. 338.



WILD CAT STALKING MOUNTAIN HARES.
By J. Wolf.

Certainly at no very distant date Wild Cats were found in West Lincolnshire, and were said to have survived in Yorkshire until 1840. Messrs. Clarke and Roebuck, in their 'Handbook of Yorkshire Vertebrata,' 1881, describe the animal as 'extinct, the Hambledon Hills having been its final refuge in Yorkshire. The last specimen there was trapped by Mr. John Harrison on his farm at Muston, near Hawnby, in the winter about 1840.' They add that 'there is no proof that it ever inhabited the Fells of the north-west, though in all probability it once existed there. The evidence of its former existence in South Yorkshire is confined to entries in the churchwardens' accounts at Ecclesfield of sums paid in 1589 and 1626 for the destruction of "wylde catts," and to a legend of doubtful origin of an encounter fatal to both, between a Wild Cat and a man of the family of Cresacre at Barnborough.'[1]

In the Lake District the Wild Cat appears to have lingered until 1843, when the last undoubted specimen was killed near Loweswater. The late Rev. H. A. Macpherson[2] gives us some interesting records of its previous existence in the district in 1629 and 1754, and of many instances of its capture noted in the parish records between these dates, principally concerning money given for the destruction of Wild Cats. Later, Gilpin in 1772 saw one that had just been killed, but by 1795, according to Dr. Heysham, it seems to have become extremely rare.

In the same way if churchwardens' accounts and other records are searched in any county frequent mention would be found of 'Wild Cats' during the seventeenth and eighteenth centuries, but it must be remembered that the names used in these old records were not always accurate; 'Wild Cat' was applied to martens, polecats, and domestic Cats which had run wild. Records during the nineteenth century must be treated with even greater caution, and may be freely doubted when they occur during the latter half of the last century.

Mr. J. A. Harvie-Brown, in his excellent paper on the distribution of the rarer animals of Scotland, published in the 'Zoologist' (1881, pp. 8–23), thus briefly defines the present limits of the species in Scotland: 'The Wild Cat is now extinct throughout a large portion of Scotland—viz. all south and east of a line com-

[1] With reference to this alleged fatal encounter, we find in Murray's *Handbook for Yorkshire* (1882, p. 478) a description of Barnborough church which says: 'The church itself contains the curious monuments of Percival Cresacre (living in 1455) and of his wife Alicia, died 1450. On her gravestone nine strings of beads are arranged so as to form a cross. The tomb of Percival Cresacre is between the chancel and the north chapel. His effigy in oak lies on it, and the front and sides are covered with the rosary, the favourite device of the Cresacres, and with short inscriptions. This is the Cresacre said to have been killed by the Wild Cat, and the lion at the feet of the effigy passes, in local opinion, for that animal. A Wild Cat was the crest of the Cresacres, whose interest in Barnborough passed by marriage to the family of the great Sir Thomas More.'

[2] *Fauna of Lakeland*, p. 9.

mencing, roughly speaking, at Oban, in Argyllshire, passing up the Brander Pass to Dalmally, following the boundary of Perthshire, and including Rannoch Moor; continued north-westward to the junction of the three counties of Perth, Forfar, and Aberdeen; thence across the sources of the Dee, northward to Tomintoul, in Banffshire; and, lastly, from Tomintoul to the city of Inverness. Northward and westward of this line the animal still keeps a footing in most suitable localities, finding its principal shelter in the great deer forests. Throughout the still inhabited area there are many large extents of apparently suitable country where it is very scarce, and where it would soon become extinct were these tracts not at intervals replenished from the increase in the above-named sanctuaries. Thus the low-lying country in the east of Ross-shire and the Black Isle of Cromarty, and certain parts of Caithness and Sutherland, have long been quite, or almost, unfrequented by them.'

The following summary of notes relating to the extinction of the species in the southern, eastern, and central counties of Scotland is taken from Mr. Harvie-Brown's notes and others collected by myself during the past ten years. *Berwickshire*: last seen by Mr. James Hardy near Swallow Craig, Old Cambus, on March 17, 1849.[1] *Dumfriesshire*, *Wigton*, and *Kirkcudbright*: became extinct about 1832, and common about the beginning of the last century (Harvie-Brown). It is agreed that the Wild Cat has long been extinct in the counties south of the Clyde, as we should naturally expect in a country so long reclaimed from the woods. We should like more information about the 'Wild Cat' killed in Renfrewshire on January 26, 1875.[2] *Dumbarton*: Harvie-Brown mentions the last as killed on Rossdhu in 1857, and that Mr. John Colquhoun, of Luss, recollects them as plentiful when he was a boy. In *Stirlingshire* the 'New Statistical Account' of this county reports them as extinct in 1842 in Fintry and Campsie, but still existing in Strathblane, a somewhat doubtful statement.

After the commencement of the nineteenth century the Wild Cat may be said to have been a scarce resident in the large forests of Perthshire until 1850, after which it rapidly became extinct. The three most recent records for this county among my notes, which I have kept for many years, are (1) a large female, killed by the late Duncan Dewar, formerly keeper at Remony and a good field naturalist. He trapped the Cat in Finlarig Woods in September 1859, and I saw it in his collection at Remony in 1885. After Dewar died his collection was sold, and among other specimens the Wild Cat was bought by the Perth Natural History Society,

[1] *Proc. Berw. Nat. Club*, iii. 357–359; vii. 246–250.

[2] *Ann. Scot. Nat. Hist.* 1894, p. 121.



STUDIES OF WILD CATS.

in whose museum it now rests. (2) A large male was trapped in the winter of 1870–1871 by James Pitkeathley, the keeper at Craig Vinian, Dunkeld. When my father took the shooting of Craig Vinian in 1880 I used to see Pitkeathley's children riding on the back of this perhaps the last Perthshire Wild Cat, and, mentioning the fact a few years later to Col. Drummond-Hay, he said he would like to have it for the Perth Museum, and so I helped him to procure the specimen. This Wild Cat died hard. Pitkeathley, in endeavouring to save his terrier, who was attacking the Cat in the trap, struck at the beast, only slightly wounding it, and broke the chain or peg which held the trap. The wounded Cat, finding itself released, immediately got up a tree and sulked; so, leaving his terrier to tree the fearsome beast, the old keeper ran to his home close by, where he found his gun, and returned to complete the tragedy. Pitkeathley used often to point out to me the tree where the last Perthshire Wild Cat met its end. (3) James Boath, the keeper for thirty years at Rohallion, used to tell me of the last Wild Cat he had seen; this was about the year 1870, though he could give no certain date. Others obtained between 1850 and 1864 are mentioned by Harvie-Brown, and one, about which he is rather doubtful, in the Breadalbane country in 1879.

In southern Argyll the Wild Cat is probably quite extinct, the last being killed near Kilchurn Castle, Loch Awe, in 1864, while about Inverary none has been heard of since 1828 (Harvie-Brown). From the fairly numerous notices in local journals it appears, however, to be still sparsely scattered through Ardgower, Lochiel, Sunart, and Morven. Harvie-Brown considered in 1882 that it was practically extinct in Ardnamurchan, but that it 'may still occasionally turn up'—a very correct surmise, for I have a note of a large female which was trapped in Ardnamurchan in the autumn of 1899, and which was seen by Mr. Stuart, of Kinloch-Moidart, who informed me of the occurrence. Mr. D. A. Maccoll records the capture of Wild Cats in Glenorchy,[1] and others are recorded from Argyll and Morven,[2] while Mr. Harvie-Brown himself adds one[3] so recently as 1904.

Mr. Geo. Sim, the veteran Aberdeen naturalist, in his recently published 'Fauna of Dee' (1903), says that the species has now 'scarcely a footing within Dee, unless in some of the wild solitary glens in the west of our district; but even this seems doubtful.' The last occurrences of Aberdeenshire Wild Cats, and probably the last that will be recorded, are thus given by the same author (p. 48): 'On June 17, 1875, a male Wild Cat killed in Glen Tanner passed through my hands, and was

[1] *Field*, August 5, 1899.

[2] *Ann. Scot. Nat. Hist.* 1894, p. 121.

[3] *Ibid.* 1904, p. 53.

in the possession of the late Sir W. C. Brooks. One was killed at Old Mar Lodge in 1890, and another in Glenmuick in December 1891.'

In Forfar, Kincardine, Banff, Elgin, and Nairn the Wild Cat has been practically extinct since 1850, except in the woods of Darnaway and Dalry, where local rumour said, in 1891, when I visited Darnaway, it existed, though very rare.

Although now extremely scarce, if not altogether extinct, in the central and south districts of Inverness-shire, northern and western Inverness is, with western Ross-shire, the main stronghold of the Wild Cat to-day.[1] The species is still fairly common in Arisaig, Knoydart, Lochaber, Nether Lochaber, and in Glenmoriston, Guisechan, and Balmacaan deer forests north of Loch Ness, and from these parts Mr. Macleay, in Inverness, annually receives from eight to ten specimens. No place in Great Britain has been so favoured of recent years by Wild Cats as the high grounds of the Balmacaan forests, though lately they have been much persecuted.

The fondness of Wild Cats for this place may have been due to the protection formerly afforded to the species by the Earls of Seafield, who always took much interest in them as well as keeping numbers in confinement. In 1879 my father rented a charming little place called Ghivach up in the heart of the Balmacaan forest, and on Sunday it was the custom to call on the old Earl, who took much pride in showing us his Wild Cats and their families, which were confined in stout wooden cages in the yard of Balmacaan. Eight or ten of the Cats were always kept, and they have on several occasions bred and reared their young. Since the death of two successive Earls of Seafield the place has been rented by tenants, and the Wild Cats have not been preserved in either a wild or a domesticated condition.[2] About Strontian and Malig there are still a few Wild Cats.

Probably now extinct in eastern Ross, the species becomes more numerous in the centre of the county, though even here it is scarce. Several years have elapsed since one was killed in Strathconan, Braulen, and Patt district, though it is still found in Guisechan, and on the south side of Glen Strathfarrer towards Ceannacroc and Glen Affaric. In the north-west from Garve to Ullapool it is now very rare, and I can obtain no account of a recent capture.

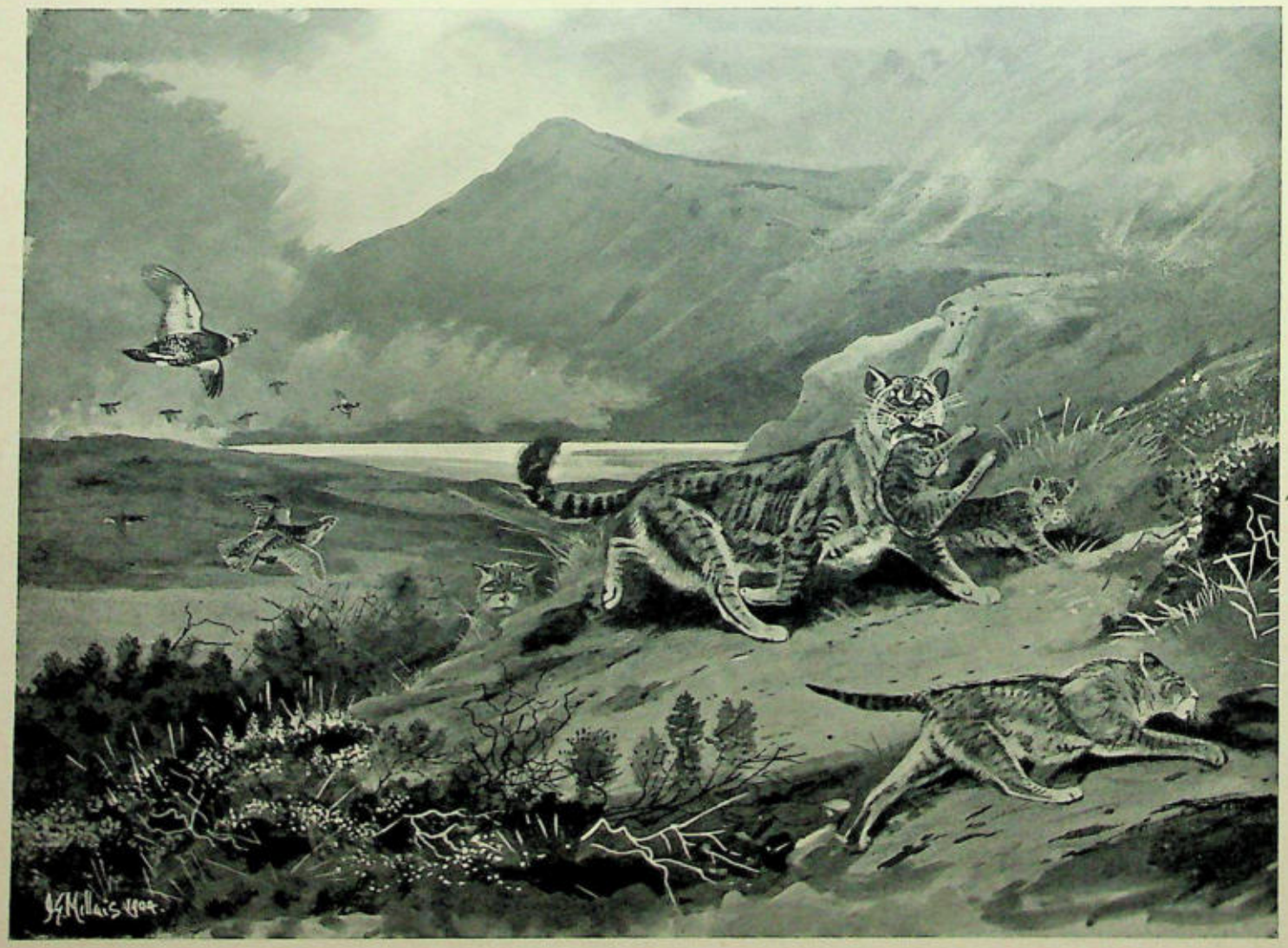
In Sutherland the Duke of Sutherland does not allow the slaughter of Wild

[1] In a letter to me, June 4, 1904, Mr. William Macleay says: 'Most of the Wild Cats I get come from Glenmoriston and Balmacaan. I believe there are more there than in the whole of the rest of Scotland. There are hardly any, as far as I can find out, in Sutherland and Caithness.'

[2] There is now (1904) one male Wild Cat in a cage at Balmacaan.



CAUGHT.



WILD CATS ON THE MOVE.

Cats to take place, and there are always some in the Dunrobin deer forest and about Gordonbush, which adjoins. Wild Cats must have been unusually numerous in this part of Sutherland at the beginning of the last century, for we read in the account by Selby, 'On the Quadrupeds and Birds inhabiting the County of Sutherland, observed there during an Excursion in the Summer of 1834,'[1] that no fewer than 901 Wild Cats, martens, and foumarts were destroyed between March 1831 and March 1834 on the Duchess-Countess of Sutherland's estates. Now nearly extinct in Assynt, and rare in the Tongue district (Harvie-Brown), Wild Cats are well on the increase in the Reay Forest, where they have been preserved by the Dukes of Westminster. In Caithness, Wild Cats have never been common, but were reported as occasional until 1845. At the present day they may be said to be non-existent, as it is some years since one was taken at Berriedale, their last stronghold, as I am informed by the Duke of Portland (1899).

Mr. E. Hamilton[2] has some interesting remarks on the former status of the Wild Cat in Scotland. He points out that there are few remains to show that it was indigenous to the country; a few traces of it are found in the shell-marl of 'comparatively recent' formation in some small lochs in Forfar, but he concludes that the animal had migrated from southern Britain. No records of Wild Cats are found in Scotch documents prior to the early part of the sixteenth century, though they occur at a much earlier date in England. He also thinks that the present Wild Cat of Scotland is not the original stock, but that it is more or less mingled with feral blood; he calls it *Felis catus ferus*.

It seems that the Wild Cat was not an inhabitant of Ireland nor the outer islands of Scotland within historic times. In Ireland it was for long reported as one of the indigenous animals until the late W. Thompson disputed its claims.[3] Since then Dr. Hamilton has conclusively proved that the animal can never have existed there,[4] and that all supposed records must be considered to be domestic Cats. The confusion may have arisen from the fact that the marten is often called 'the Wild Cat' in Ireland.

Habits.—Except in winter—when, made bold by hunger, it often approaches human habitations for the purpose of preying on fowls—the Wild Cat chooses for its home the most rocky and densely wooded portions of the north-west of Scotland. Its lair is generally situated in some fox-den beneath a gnarled old fir-stump or in a dense thicket of birch and bracken. But the home of the Wild Cat is not

[1] *Edin. New Phil. Journ.* 1836
[2] *Ann. Scot. Nat. Hist.* 1897, pp. 65–68.
[3] *Nat. Hist. of Ireland*, 1856
[4] *Zool. Soc. Proc.* 1885.

always in timbered country, though the animal frequently lives in the woods towards the upper limits of forest growth; out on the breezy open deer forest, far above the woods and scrub, it selects some safe retreat among the weathered rocks and boulders, which is not infrequently a hole deserted by a fox or badger. Where I am most intimately acquainted with this fierce but beautiful creature—in the Balmacaan and Glenmoriston district—the lairs are usually in the upland deer forests, but in the northern and western districts of Arisaig, Sunart, and Moidart stalkers have pointed out to me spots which had been formerly tenanted for years by Wild Cats which were situated among rocks within the upper forest growth.

Young Wild Cats have, however, been found in Drumnadrochet lying almost in the open in a bed of dry bracken; while instances are said to have occurred where Wild Cats have converted deserted 'hoodie' and buzzard nests into nurseries.

Emerging at dawn and before sunset, this stealthy animal creeps in and out of the forest growth and rocks, looking for its prey. When the victim is discovered it is carefully stalked by sight alone until closely approached, when the Cat rushes in with a series of immense forward bounds. So swift is this final attack that four-footed game finds it impossible to escape, even if its terror-paralysed nerves did not benumb its muscles.

During many years spent in deer stalking in the Scottish Highlands I have always made it a practice to interrogate my companions as to the habits of the rarer wild animals among which they live. To illustrate how unusual it is for the Wild Cat to be seen, and rarer still to be seen hunting, I may mention that, out of many I questioned, I found only one man who had ever observed the incident.

This individual, John Ross, stalker in Lord Lovat's deer forest, Kiltarlity, Beaufort, told me the tale one morning in 1891, as we spied for roe, and I thought it so interesting that I wrote it down at the time.

'It will be about twenty-five years ago (1866) that early one morning in June I was looking over my beat to see what deer were on the ground, when I saw the sun shining on something brown on the open hillside about 300 yards below me by the edge of a clump of bracken. Thinking it was a hare I was about to pass on when the creature moved, and I saw it could not be a hare from its slow gliding movement. So I sat down and put the glass on it, and saw that it was a large Wild Cat. At first it kept slowly moving along on the edge of the ferns, but just inside, and when he crossed the least open space he took two or three

swift paces, just as a tame Cat does in stalking a sparrow. For some time I could not see what he was after, but by and by a rabbit came out into the open about three hundred yards ahead of the Cat, and commenced feeding. As the Cat advanced nearer and nearer the rabbit kept moving out to where the grass was better, and each time he ran the Cat made a little run too, as if anxious to get betwixt him and his line of retreat. In a very short time the Cat disappeared just as he reached the rabbit-run, and as both animals were now within the field of my glass I could watch the action of both. All of a sudden the rabbit, which was perhaps twenty yards out in the open, dropped his ears, half squatted, and then began running aimlessly about in circles. I could not hear his screams of fear, but could distinctly see his mouth open and that he was calling in terror. At the same moment the Wild Cat, with all his hair bristling, burst from the ferns, and, making three or four tremendous bounds four or five feet into the air, and going at great speed, sprang on the back of the rabbit, who seemed paralysed and unable to move further. The Cat then seemed to give the rabbit a bite or two on the neck, upon which it lay quite still. He then raised his head and looked carefully all round and licked his lips, after which he licked the head and throat of the rabbit all over, taking the blood. He then picked up the rabbit and started off, so I stood up and cried out, when he looked up the hill a minute, and, dropping the rabbit, galloped off into a birch wood. The place was close to my home, so I went in and got a trap which I set over the disembowelled rabbit. But the Cat never returned. I think he had got a fright when seeing me.'

This mode of attack of the British Wild Cat exactly coincides with the usual method employed by all the smaller members of the *Felidæ*, including the cheetah. They stalk carefully to within a short distance, and then put on a tremendous speed, at the same time making their advance as formidable and surprising as possible. In the Canadian forests I have seen the whole tragedy of the lynx taking the varying hare written on the snow as plainly as if one had been there to witness it.

The Wild Cat probably stalks birds in exactly the same fashion except that he knocks them down with his paw as they rise. Wild Cats are said to make a loud screaming noise, which causes game in their vicinity to squat, and so become an easy prey.

Mr. Alfred Heneage Cocks, who has written many excellent papers on British animals in the 'Zoologist,' began keeping British animals in confinement in 1869, and since then he has studied most of our native mammals in captivity, and has

been successful in breeding many of the rarer species. Not the least interesting of his discoveries is the exact period of gestation of the Wild Cat. 'That is usually,' he says in a letter to me, 'sixty-eight days; last season (1903) after sixty-six days my old female had four kittens, which is the largest number I have bred in a litter; and it would seem very likely that a large litter may be dropped a little quicker than a small number, but I do not know if this has been observed in the case of wild animals generally. The kittens of Wild Cats are decidedly, even considerably, bigger than those of domestic Cats.'

Again, in a letter dated April 17, 1904, Mr. Cocks says: 'My present old female Wild Cat, which came from Balmacaan, produced three kittens yesterday, April 16, after a gestation of sixty-five days; I put her with the male on February 10, and saw them pairing on the 17th of that month. They probably paired again on the 20th, and certainly on the morning of the 21st. The following day I took her away from the male.'

Mr. Cocks has written notes on the gestation of the Wild Cat which will be found in the 'Zoologist' for 1876 and 1881 (page 307). In 1875 he first got Wild Cats to breed, and also in the three following years, two or three kittens being born in each litter. Since then he has been successful in rearing young Wild Cats almost every year. In 1903 he succeeded in obtaining some pretty hybrids between a male Wild Cat and a female domestic Persian Cat, and again in April 1904 between a Wild Cat male and a female Abyssinian Cat. Crosses between the two, however, had been previously bred by Mr. Pusey, of Pusey House, Berks.[1]

It is not certain whether Wild Cats have one or two litters in the year. The young are usually born in May, two to five in number, and after the milk stage are fed by the parents on young rabbits, birds, and other animals. They accompany the mother until about September, when they are able to hunt for themselves. The probability is that Wild Cats breed only once in the twelvemonth, but I have seen young animals killed in Scotland in October which certainly could not have been more than forty days old. These must have been dropped as late as the end of August or the beginning of September.

Writing on this point Mr. Cocks informs me: 'I have received Wild Cats barely full grown at such times as would lead me to suppose that they were born rather later than May, but hardly so late as September; the latest of these, which I noted on receipt, was probably barely six months old on February 15. It was therefore probably born about the latter part of August, but may not have been born until

[1] *Zoologist*, 1881, p. 307.



WILD CATS.

September. In captivity I have never observed a female Wild Cat come in season during the summer, but am not prepared to deny that they may do so occasionally; but if so, I wonder it has always escaped my notice. Many years when, owing to the death of the young or the fact that the pair had not bred together in the spring, I have kept a male and female together all summer, they have showed no inclination to breed.'

The Wild Cat has ever been unpopular among farmers and game preservers, from the fact that it will kill any living thing up to the size of a well-grown lamb or roe fawn. Mountain hares, rabbits, grouse, and young black-grouse seem to be its favourite prey, but it will eat almost any flesh, fish, or carrion provided it is not putrid. In America the Wild Cat (*Lynx ruffus*) is said to be fond of catnip, and will roll over in it in order to get the scent on its fur; it will also eat the blossom and leaves. The Wild Cat is not, like the puma and the wolf, a wasteful slaughterer, killing more than it can devour; but will occasionally, if it gets the chance, slay a number of fowls and carry each off separately, storing them under some tree stump or rock, to be devoured at leisure. In the winter Wild Cats are great wanderers, and travel far from their regular haunts in search of food. During the course of these winter raids they are particularly aggressive in attacking henroosts; they will cross mountain ranges, broad rivers, and arms of the sea, for all Cats are fine and bold swimmers. The Wild Cat has many habits in common with its domestic cousin, and is said to watch patiently for hours for the exit of a squirrel or rabbit from his retreat.

Although to a large extent arboreal in its habits, the Wild Cat on the Continent of Europe takes most of its food on the ground, and resorts to trees only to sleep or bask in the sun at midday, or for a retreat when alarmed. It is a savage fighter when cornered, and will do much damage to any small dog that attacks it. Even a man armed with a stout stick does not always find it easy to kill a trapped Wild Cat, so agile are its movements.

In captivity the Wild Cat is a most unsatisfactory pet, owing to its savage and intractable disposition. It never becomes docile, even to those who feed it, and a 'growling swear' is the usual reply to a proffered advance. Lynxes, leopards, and lions may all become amenable to discipline, but the Wild Cat always has his back to the wall, ears down, eyes glittering, and paws ready to strike. Well-named, it is the real untamed and untameable savage.

We have to thank the British sportsmen who love to stalk the stag for a good many things. To lovers of nature not the least important is the protection

in Scotland of the great herds of deer and the wild creatures which live among them. All the 'vermin,' or creatures which were considered destructive in the days when grouse, blackgame, hares, and ptarmigan were the sole objects of the chase, are now no longer in the black list. The fox, the Wild Cat, and the golden eagle play their part in keeping down grouse, hares, and rabbits, animals undesirable in a deer forest; so the enemies of yesterday are the friends of to-day, to those at any rate who have control over their foresters and watchers.

Many proprietors do see that their wishes are carried out in this respect, but others, who are merely tenants and are only in residence for a short season, do not and cannot prevent their keepers from killing Wild Cats whenever the opportunity offers. Is not a good specimen of the Wild Cat worth a sovereign in the stuffers' shops of Inverness, Perth, and London, and is Donald ever averse from putting that sovereign in his pocket, since he has always done so and regarded vermin as his perquisite from the days of his youth? I think not.

THE HYÆNAS

Family *HYÆNIDÆ*

A SPECIES of Hyæna, *Hyæna spelæa*, closely allied to *Hyæna crocuta*, the Spotted Hyæna of South Africa, must have been very abundant in some parts of England in Pleistocene times, judging from the quantities of bones and teeth in certain ossiferous caves, notably that of Kirkdale, in the Vale of Pickering. Dr. Buckland, who did so much for British palæontology, was the first to make known to the world the early existence of these animals; the result of his researches in the Kirkdale cave are described at length in Sir Richard Owen's book, 'British Fossil Mammals and Birds' (pp. 140–146). Remains of the Pleistocene Hyæna have also been found at Lawford, near Rugby, as cited by Baron Cuvier; in a fissure of the Aymestry limestone, as noticed by Murchison in his work 'The Silurian System'; in the till of the beach at Walton on the Naze, Essex; in the brick earth at Erith; in a corresponding formation that traverses the limestone near Maidstone; in the cavernous fissures of the limestone quarries at Oreston; and at Durdham-Down, near Bristol (Owen).

In the Pleistocene age these animals must have lived in numbers in such caves as those of Kirkdale, Oreston, and Kent's Hole, Torquay; for with their own remains are found associated masses of broken bones of all the large pachyderms and other creatures, which they doubtless carried to their retreats for consumption.

Biologically the Hyænas must be placed next to the cats, owing to the resemblance of their flesh teeth. 'Thus,' says Mr. Lydekker,[1] 'in place of having but two premolar teeth in each jaw in front of the flesh teeth, the Hyænas have three of these teeth in both the upper and the lower jaw between the flesh tooth and the canine tooth. Moreover, these premolar teeth, in place of being much

[1] The *Royal Natural History*, p. 485.

compressed from side to side like those of the cats, have nearly conical and very tall crowns. . . . These strong conical premolar teeth, which are strengthened by small fore-and-aft tubercles at the base, form crushing instruments of immense power; and it is due to these teeth, aided by the flesh teeth and the tusks, that a Hyæna is able to crunch in its jaws the shin-bone of an ox almost as readily as a dog can break that of a fowl. Indeed no carnivorous animal has jaws and teeth which can be compared for strength and bone-crushing power with those of the Hyæna.'

No remains of this progenitor of the Spotted Hyæna (*Hyæna crocuta*) have been found in either Scotland or Ireland. One could hardly indeed have expected it to exist in these countries, for although found in forests of Mashonaland and the densely timbered regions of Central Africa, it is, properly speaking, a beast of the plains and the open country. It is therefore reasonable to presume that it either became extinct in England before the final retreat of the ice, or moved southward before the complete isolation of Great Britain.

The finding of a single lower jaw, in a cave in Glamorgan, of an animal which is said to have resembled *Lycaon pictus*, the hunting dog, is hardly conclusive of the existence of the genus in Britain.

THE DOGS

Family *CANIDÆ*

Genus *Canis*. THE TRUE DOGS.

Dogs are easily distinguished from cats by their long pointed muzzles and the greater number and different forms of the teeth. Moreover—unlike that of the cat—the cæcum, or blind appendage to the intestine, is long and folded over upon itself. The toes are equal in number to those of the cats, but the claws are not hooked, retractile, or capable of any holding power. The pads are much harder, hairless, and capable of greater durability on rough surfaces, as we should expect in a perfectly digitigrade animal fitted to perform long journeys at a swift pace. The limbs are relatively long, as is also the skull, which possesses a peculiar characteristic in the tympanic bulla, which is inflated and bladderlike, though not divided into two separate cavities by a complete septum.

This marked difference between Dogs and cats is not, however, found in the Hyænas.

The Dogs generally possess forty-two teeth, made up as follows. I. $\frac{6}{6}$; C. $\frac{2}{2}$; P.M. $\frac{8}{8}$; M. $\frac{4}{6}$.

The *Canidæ* embrace the Wolves, Jackals, Foxes, and the various species of wild and domestic Dogs. The general colour varies from grey to black or deep red. The extremities are often darker than the rest of the pelage, and the under parts, such as the belly and inside of the legs, are frequently much lighter in tone. Nearly all the species are, however, subject to individual variation, the red species often showing black forms. Seasonal change, too, is sometimes extreme, as in the case of the Arctic Fox, whose blue pelage becomes pure white in winter. In all species there is a tendency for the coat to become lighter during the winter months.

Although possessed of fine powers of both sight and hearing, the *Canidæ*

usually hunt in a pack by scent alone. Some species, such as the wild Dogs, pack at all seasons, but Wolves and Coyotes only during the winter months, when food is scarce. Foxes hunt singly as a rule. They find their game by nose, and then either take it by surprise or chase it down. Most of the species frequent the deserted burrows of other animals during the breeding season, rarely excavating their own.[1]

The Dogs are more widely distributed over the world than any family of the Carnivora. The majority are found inhabiting the Northern Hemisphere; they are, however, numerous in the colder regions of South America, as well as the tropical plains of Africa and India, while in Australia the sole representative is the Dingo. Except in a domesticated condition they are absent from the Pacific Islands, as also from New Guinea, Ceylon, and Madagascar.

Dogs kill and devour other mammals, also birds and fish, and they will all eat molluscs and crustaceans.

The various species of domestic Dogs have in many cases been so altered in form and habit by long usage as pets, or as aids to hunting, that all knowledge of their origin is lost in the mystery of the vanished ages. Dogs were kept as household favourites and for the chase in the days of the Babylonian empire, about 4,000 years B.C.—the earliest stage of civilisation of which we have any precise information. Pictures of the first domestic Dogs bear little resemblance to the wolf-like Dogs of our Northern Hemisphere, and we shall, in all probability, ever be without knowledge of the origin of the Greyhounds, Lap-dogs, and true Hounds.[2] There seems little doubt, however, that the various Spitzes, Collies, Elk Hounds, and Esquimaux Dogs came from a common stock which was probably the Wolf itself, as Esquimaux Dogs show no antipathy to the wild Wolf nor the Wolf to them. Indeed, the Labrador Esquimaux constantly cross their Dogs with the wild Wolf to maintain the stamina. The Indian Dogs of North America also closely resemble the Coyote or Prairie Wolf. Blyth was struck with the resemblance of the Pariah Dogs of India to the Wolf of that country, and other instances of this relationship are well known. It is not, however, within my purpose to give a history of our domesticated species of Dogs. For that I must refer such of my readers as are interested in the subject to the writings of

[1] As instancing wild traits among domestic animals, a pure-bred Irish terrier bitch belonging to my neighbour, Mr. J. P. Hornung, always leaves the house when about to pup, and, digging for herself a large earth in some secluded part of the garden, produces her young there. Though usually a good-tempered animal, she allows no one to approach her den for some days after the birth has taken place, becoming to all intents and purposes a wild animal for a period.

[2] Dogs of all these types, closely resembling those still extant, were kept by the early Egyptians.

Bartlett, Darwin, Harting, Fitzinger, or to Lydekker, whose concise account in the 'Royal Natural History,' pp. 510–516, is excellent.

The Wolf

Canis lupus, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 58 (1766).

Characters.—Size, large. Length of head and body, 3½ to 4 feet; tail, 18 to 20 inches. Fur, under pile dark grey. General external surface, rufous or yellowish grey, frequently interspersed with black hairs; under parts yellowish white, or pure white in northern examples, but great individual variations occur in both light and dark types. The limbs are generally fawn colour. The skull is furnished with air-cells in the forehead, and the bony crest of the skull is longer and higher than in most of the dogs, while the canine teeth are more strongly developed.

Distribution.—The Wolf is generally distributed over the greater part of Europe. Although now become somewhat scarce in France, it is still fairly plentiful in Germany, Bohemia, and Austria, all the Turkish dependencies, and the Caucasus. Northwards it is common in Norway and Sweden in spite of relentless warfare on the part of the inhabitants, and it occurs throughout Russia and Asia north of the Himalayas. It is also very abundant in Siberia and Mongolia, where it reaches its finest development, and may be found in North America, from Alaska to Labrador, and British Columbia to the Island of Newfoundland.

In Great Britain and Ireland the Wolf was numerous in the Pleistocene age, its earliest known remains having been found in the Norfolk 'forest bed,' which belongs to the first portion of this period. Early remains of the Wolf also occur in nearly all the caverns and brick earths of England, and have been found in Scotland (the Pentland Hills) and in Ireland (Shandon).

The history of the animal in Great Britain is somewhat incomplete, though one would think that ancient chroniclers could hardly fail to take notice of a beast so destructive to life and property, and one which was a constant menace at their very doors. Frequent references to the Wolf occur in all the earliest minstrelsy of England and Scotland. In England we have considerable information about them in Camden's 'Britannia,' William of Malmesbury's 'Hist. Reg. Anglorum,' lib. ii., 'The Book of St. Albans' (1486), the early laws promulgated by early Saxon kings, Manwood's 'Forest Laws,' and latterly in Blaine's 'Encyclopedia of Rural Sports' (1858).

In Scotland frequent notices of the Wolf are found in the songs of early bards, in Holinshed's 'Chronicles of Scotland' (1577), in Innes' 'Scotland in the Middle Ages,' in Sobieski Stuart's 'Lays of the Deer Forest,' in Pinkerton's 'History of England,' in Chambers's 'Caledonia,' and in the 'Statistical Account of Scotland' (1792, vol. ii.); but in Ireland the literature of the subject is less abundant. Giraldus Cambrensis wrote about Wolf-hunting in that country in 1185–6. After this a big gap occurs until we read of the chase of the Wolf with Irish Wolf-hounds, as described by Campion in his 'History of Ireland' (1570), and by George Turberville in his 'Booke of Hunting' (1575). Various State Papers and the journals of distinguished travellers in Ireland at the beginning of the seventeenth century refer to the destruction wrought by these noxious beasts and the means of destroying them. In 1611 (*temp.* James I.) an Act was passed for killing 'Wolves and other Vermin.' Wolves then gradually disappeared, and in the early part of the eighteenth century became extinct in Ireland.

All these records and many others too numerous to mention have been ably summarised by Strutt in 'Sports and Pastimes of the People of England,' by Robert Fittis in 'Sports and Pastimes of Scotland' (1891), and, lastly, by J. E. Harting in 'British Animals extinct in Historic Times' (1880). The student, therefore, who wishes for a detailed account of the Wolf in Great Britain must consult these works, especially the last-named, which is by far the best and most accurate account of such animals as the bear, the Wolf, the beaver, and the wild boar—all of which have perished with the advance of civilisation in these Islands.

The reader who desires only a succinct account of the Wolf in Great Britain may perhaps be satisfied with the following extracts, mainly drawn from old histories and the writings of the three last-named experts in the literature of sport and zoology. Any such account must necessarily be a compilation, as indeed are, more or less, the three books here referred to, being themselves carefully prepared records after much research. I must therefore first express my indebtedness to the authors of these excellent volumes, which have added so materially to our knowledge of our vanished wild creatures.

England.—Professor Boyd Dawkins in his paper 'On the Distribution of the British Post-Glacial Mammals'[1] gives a list of the various counties in which undoubted remains of the Wolf have been found in England and Wales. Thirteen different counties are enumerated, namely, Berks, Derbyshire, Devonshire, Glam-

[1] *Quarterly Jour. Geol. Soc.* 1869, xxv. 192.



THE WOLF.

organshire, Gloucestershire, Kent, Essex, Norfolk, Oxfordshire, Somersetshire, Sussex, Wilts, Yorkshire; the most numerous finds having occurred in Glamorgan cave deposits.

From the earliest historic records of such writers as Dio Nicæus and Strabo we learn that prior to the Roman occupation the ancient Britons, especially of the northern forests, were a savage people much addicted to hunting, and the possessors of excellent dogs, which were in great request on the Continent. Mr. Harting tells us (p. 121) that Mempricius or Memprys, one of the immediate descendants of Brutus, who reigned until B.C. 980, 'fell a victim in that year to the wolves which he delighted to pursue, and was unfortunately devoured by them.' Wolves were abundant when the Romans arrived in Britain, and this people being purely a race of warriors, says Strutt, paid no attention to hunting, but allowed the natives a free use of the forests where they had always been accustomed to hunt. Even before the landing of the Normans, the Anglo-Saxon noblemen had begun to appreciate the chase, the enjoyment of which was no doubt enhanced by regard to the destruction of dangerous beasts, or the necessity of procuring fresh meat. We read in the earliest chronicles of the Anglo-Saxon period that noblemen were expected to excel in hunting as a natural part of their education, and Asser, as quoted by Harting, in his 'Life of Alfred the Great' (p. 122) bears testimony to the great Saxon king's prowess at an early age.

At this early date Wolves were so abundant and so exceptionally dangerous in the winter season that the month of January was set apart especially for hunting them, and from that circumstance was called *Wolfmonat* or Wolf month. According to Bracton's 'De legibus et consuetudinibus Angliæ' (1569) and other writers an outlaw of this period was commonly known as 'Wolfs-head' (Wulves-heofod), that is, a man with a price set upon his head like a Wolf, and liable to be killed 'on sight.'

Wolves were so abundant in the wilds of England in the time of Athelstan, that retreats were made in various places for the protection of travellers, and Camden tells us in his 'Britannia'[1] these were called Hospitals or Spittals, and Mr. Harting (p. 128) mentions a farm in Yorkshire which stands on the site of one of these retreats and is still called Spittal Farm.[2]

Edgar is said to have made an attempt to stamp out Wolves by imposing an annual fine of three hundred Wolf skins on the Welsh King Ludwall, and historians, notably Holinshed, seem to have been satisfied that he had destroyed

[1] Tit. *Yorkshire*, ii. 902.

[2] An estate near Lincoln, owned by my friend Mr. Ruston, is also known as 'Spittal.'

by this means the whole of these ferocious beasts in the island. As the slaughter only existed over a limited area, and we are told by William of Malmesbury[1] that the levy was only paid for three years and ceased in the fourth, the measure can have been a very temporary success.

It is, however, agreed by Welsh historians that great destruction took place among the Wolves in Wales, owing to the tax imposed on the Prince of North Wales, which lasted for a space estimated at thirty-two years—from Athelstan to Edgar, and even after this date the Welsh Princes continued to pay this tribute to the English Kings till the death of Harold. In England King Edgar employed various means to reduce the number of Wolves. 'He attempted to effect it,' says Pennant,[2] 'by commuting the punishments for certain crimes into the acceptance of a number of Wolves' tongues from each criminal; in Wales by converting a tax of gold and silver into an annual tribute of three hundred Wolves' heads. Notwithstanding his endeavours, however, and the assertions of some writers to the contrary, his scheme proved abortive.'

A little later (1016) we read in Manwood's 'Forest Laws' that, according to the law of Canute the Dane, foxes and Wolves not being reckoned 'beasts of the forest or of venery' could be killed without license, and that the slaying of these noxious beasts, even within the royal hunting enclosure, would not be regarded as a very serious offence.

Passing on to the Norman Conquest (1066), Mr. Harting points to the 'Carmen de Bello Hastingensi' by Guido, Bishop of Amiens, in which it is related that William the Conqueror left the dead bodies of the English lying on the battlefield to be eaten by 'worms, wolves, birds, and dogs.'

William Rufus (1087–1100) and his brother Henry I. (1100–1135) were both passionately addicted to the chase, and in the reign of the latter compensation was provided through a forest law to anyone injured in a Wolf-hunt. Throughout the great forests of England Wolves abounded in the following great tracts of woodland, until the reign of Henry VI. The New Forest (Hants), Savernake Forest (Wilts), Richmond Forest (Yorks), Blackburn and Bowland Forest (Lancs), St. Leonard's and Ashdown Forest (Sussex), Sherwood Forest (Notts), the Forest of the Peak (Derbyshire), and the Forest of Riddlesdale (Northumberland). These great unreclaimed tracts were all, during this period, of much greater extent and density than they are to-day, and offered a comparatively secure retreat to many beasts of prey before the days of accurate guns and deadly poison.

[1] *Hist. Reg. Anglorum*, lib. ii. cap. 8.

[2] *Brit. Zoology*, i. 88.

In most early works there are constant references to Wolves in the reigns of Richard I. and King John (1209); and Henry III. (1216–1272), recognising the necessity of keeping down Wolves, made small grants of land 'to various individuals upon the express condition of their taking measures to destroy these animals wherever they could be found' (Harting).

Camden in his 'Britannia' also tells us (p. 325) that in the reign of Edward I. (1272–1307) various tenants in the county of Northampton held lands on condition that they kept hounds for the purpose of destroying Wolves, and the practice of keeping wolf-dogs (*canes luporarios*) and relentlessly pursuing the animal continued through the reigns of the Edwards, Richard II., Henry IV., Henry V., and Henry VI., when the Wolf seems to have gradually become scarce.

In the 'Book of St. Albans' (1486) the Wolf is included among the beasts of the chase, the season for hunting it being between December 25 and March 25, while woodcuts of the early fifteenth century give pictures of Wolf-hunting as conducted at that time. About this date, however, the deforesting of England had proceeded to a considerable extent, and as the numbers of hunters among the English squires and private persons had also greatly increased, the knell of the Wolf in England was sounded. The species was supposed to have become extinct between the years 1485 and 1509, in the reign of Henry VII., but in all probability a few lingered on in the most inaccessible portions of the country for some time beyond this date. The forests of Lancashire and the wolds of Yorkshire seem to have been the last retreats of the Wolf in England.

It is natural that an animal at one time so abundant and so notable should leave its name in many spots in England that were once famous as the scene of some stirring conflict or favourite retreat. Mr. J. E. Harting gives many such instances in his interesting book (p. 154), enumerating amongst them the following well-known places: Wolmer, i.e. Wolvemere; Wolfscote (Derbyshire); Wolfhamcote (Warwickshire); Wolfer-low (Hereford); Wolfs Castle (Pembroke); Wolf-pits (Radnorshire); Wolfscrag (Sussex), a name also common in Scotland; Wolfenden and Wolfstones (Lancashire).

Scotland.—If we are to accept the testimony of Hector Boece, Dornadilla,[1] a certain Scottish king who lived two centuries before the Christian era, created hunting laws and ordained that he who killed a Wolf should have an ox for his

[1] Called Dorvadil, the fourth king of the Scots, by Holinshed, who in his *Chronicles of Scotland*, 1577, p. 63, accepts as genuine the writings of Hector Boece.

pains. 'This beast indeed,' says Boece, 'the Scottish men, even from the beginning, used to pursue in all they might desire, because the same is such an enemy to cattle, wherein consisted the chief portion of all their wealth and substance.'

Ederus, too, a successor of the last-mentioned king, and contemporary with Julius Cæsar, had 'chief delight altogether in hunting and keeping of hounds and greyhounds, to chase and pursue wild beasts, and mainly the wolf, the herdman's foe.' Ferquhard II., the Scottish tyrant, is said to have died from the bite of a Wolf, while he was hunting in A.D. 664. Fittis, in his 'Sports and Pastimes of Scotland,' tells us (p. 36) that in 1010, 'when Malcolm II. was returning from Mortlach in Moray, where he had gained a signal victory over the Danish invaders, he was attacked and chased by an immense wolf in Stochet forest. He might have fallen a prey had not a son of Donald of the Isles flown to his assistance. The young Islesman, wrapping his plaid around his left arm and hand, thrust the muffled hand into the "gaunt grey" brute's mouth, while at the same time he stabbed it to death with his dirk; for which good service he was awarded with the Aberdeenshire lands of Skene.'

The same author, who has closely studied the history of the Wolf in Scotland, says (p. 36): 'On the Border in the twelfth century the monks of Melrose were accustomed to trap the wolves on their Eskdale lands, but were prohibited from hunting the hart and hind, the boar and the roe, and also from hawking, which rights were reserved by the feudal baron who granted the Abbey the pasturage of Eskdale. But in a following age the monks acquired the whole game-rights which had been so reserved. In 1263 the royal park at Stirling was repaired, and a new one formed; and twenty years afterwards, in addition to two park-keepers, there was "a hunter of wolves" at Stirling.'[1]

In 1427, during the reign of James I. of Scotland, the legislature made urgent cause to stop the Wolf plague which then existed in Scotland. The law itself said: 'That ilk baron within his barony in gangand time of the year sall chase and seek the quhelpes of Wolves and gar slay them. And the Baron sall give to the man that slays the Woolfe in his barony and brings the baron the head, twa shillings. And when the baron ordains to hunt and chase the Woolfe the tenants sall rise with the baron. And that the barons hunt in their baronies and chase the Woolfes four times a year, and als oft as onie Woolfe beis seen within the barony. And that na man seek the Woolfe with schott, but allanerly in the time of hunting them.' The duty of summoning the people for a Wolf-

[1] Innes' *Sketches of Early Scotch History*, p. 103; and *Scotland in the Middle Ages*, p. 125.

hunt devolved upon the 'schireffs' or 'bailyis,' three times a year, between St. Mark's Day (April 25) and Lammas (August 1), for, as the Act states, 'that is the tyme of their quhelpes.' The penalty for disregarding this summons was 'ane wedder,' 'quhatever he be that rysse not.' On the other hand, it was enacted that whoever slew a Wolf 'sall haif of ilk householder of that parochin that the Woolfe is slayne within, a penny.'

In the days of James II. (1457) it was enacted by Parliament that 'for the destruction of wolves, in ilk country where any is, the Sheriff or the Bailie of that country shall gather the country folk three times in the year betwixt St. Mark's Day and Lammas [April 25 and August 1], for that is the time of the whelps. And whatever he be that rises not with the Sheriff, Bailie, or Baron, within, himself shall pay unforgiven a wedder, as is contained in the auld Act made thereupon. And he that slays a wolf at any time, he shall have of ilk householder of that parish that the wolf is slain within, a penny. And if any wolf happens to come in the country that wit [intelligence] be got of, the country shall be ready, and ilk householder to hunt them, under the pain aforesaid. And he that slays a wolf shall bring the head to the Sheriff, Bailie, or Baron, and he shall be debtor to the slayer for the sum foresaid. And whatsoever he be that slays a wolf, and brings the head to the Sheriff, Lord, Bailie, or Baron, he shall have six pennies.'

The brothers Sobieski Stuart in their interesting and romantic book, 'The Lays of the Deer Forest' (vol. ii. p. 230), tell us that 'In some active instances these statutes might have cleared local districts, and a remarkable example of success was given by a woman—Lady Margaret Lyon, Baroness to Hugh, third Lord Lovat. This lady, having been brought up in the low country, at a distance from the wolves, was probably the more affected by their neighbourhood, and caused them to be so vigorously pursued in the Aird that they were exterminated out of their principal hold in that range. According to the Wardlaw MS.,[1] "she was a stout bold woman, a great huntress; she would have travelled in our hills afoot and perhaps out-wearied footmen. She purged Mount Caplach of the wolves. There is a seat there called Ellig-na-Banitearn. She lived in Phoppachy, near the sea, in a stank-house [a house surrounded by a moat], the vestige whereof remains to this very day." Mount Caplach is the highest range of the Aird, running parallel to the Beauly Firth, behind Moniach and Lentron. Though the

[1] *Laws of the Parliament of Scotland*, folio, 1781, pp. 18, 19. Also Glendook's *Scots Acts*, 7 James I. c. 104, and 14 James II. c. 88.

place of the lady's seat is now forgotten, its existence is still remembered, and said to have been at a pass where she sat when the woods were driven for the wolves, not only to see them killed, but to shoot at them with her own arrows. The period of her repression of the wolves is indicated by the succession of her husband to the Lordship of Lovat, which was in 1450, and it is therefore probable that the "purging" of Mount Caplach was begun soon after that date. Such partial expulsions, however, had little effect upon the general head of wolves, which, fostered by the great Highland forests, increased at intervals to an alarming extent.'

Notices of Wolves during the reigns of James III. and IV. are scarce, beyond occasional references in State papers. Fittis says (p. 39) that in the old Litany of Dunkeld, about the date 1490, occurs the prayer 'From caterans and robbers, from wolves and all wild beasts, Lord deliver us,' which shows the dread in which Wolves were held; but the brothers Stuart say that in the time of James V. the Wolves' numbers were formidable, owing to the 'clouds of forests.' Boece too, in his history published in 1526, tells us that in the reign of James V. 'Wolves are right noisome to the tame bestial in all parts of Scotland, except a part thereof named Glenmore, in which the tame bestial gets little damage of wild bestial, especially of foxes.'

To appreciate properly the difficulty which the early Highlanders experienced in ridding their country of the plague of Wolves, we must consider for a moment what the nature of the Highlands was in the days of James V, and the numerous tracts which these 'clouds of forests' covered. The greater part of Perthshire, Argyllshire, Inverness, Ross, and Cromarty, was one continuous mass of Scotch fir and birch, with a few oaks in the valleys. Clearings and open hill ground occurred at intervals in the main valleys, but these were not of such extent as to render them immune from attack, and the Wolves could easily come to the edge of the timber close at hand, harry the cattle, and then retreat to the cover. Robert Lindsay, in his 'Chronicles of Scotland' (vol. ii. p. 346), says the Earl of Athole entertained King James to a great hunt which lasted three days, and that as the result of a great drive there were slain 'Threttie scoir of hart and hynd, with other small beasties, such as roe and roebuck, woulff, fox, and Wild Cattis.'

The Wolf plague in Scotland is said to have reached its height in the reign of Mary Queen of Scots, and to have spread unexampled devastation in the country. 'The Wolves' remarks Fittis (p. 40) 'when pinched with hunger, ransacked churchyards, like the ghouls of Arabian romance, feasting on the newly buried corpses which they unearthed. Along the tract of Ederachillis, on the north-west coast of Suther-

landshire, the inhabitants were constrained to transfer the burial of their dead to the adjacent rocky islet of Handa, in the sea, where the restless surge, breaking against the precipitous cliffs, preserved the inviolability of the humble sepulchres.'

I visited Handa some years ago, and was shown some stones which were said by the people to be the remains of the old graveyard.[1] Mrs. D. Ogilvy in her 'Book of Highland Minstrelsy' (p. 251) gives some charming lines describing the ancient custom.

To Handa's isle we go,
  Our graveyard in the deep,
Where the tombs stand all arow,
  Safe in that rocky keep;
And never a foot of man or brute
  Disturbs our kinsmen's sleep.

On Ederachillis' shore
  The grey wolf lies in wait—
Woe to the broken door,
  Woe to the loosened gate,
And the groping wretch whom sleety fogs
  On the trackless moor belate.

The lean and hungry wolf,
  With his fangs so sharp and white,
His starveling body pinched
  By the frost of a northern night,
And his pitiless eyes that scare the dark
  With their green and threatening light.

He climbeth the guarding dyke,
  He leapeth the hurdle bars,
He steals the sheep from the pen,
  And the fish from the boat-house spars;
And he digs the dead from out the sod,
  And gnaws them under the stars.

Thus every grave we dug
  The hungry wolf uptore,
And every morn the sod
  Was strewn with bones and gore;
Our mother-earth had denied us rest
  On Ederachillis' shore.

To Handa's isle we go,
  Encircled by the sea;
A swimmer stout and strong
  The grey wolf need to be,
And a cragsman bold to scale the rocks
  If he follow where we flee.

To Handa's isle we sail,
  Whose blood-red cliffs arise
Six hundred feet above the deep
  And stain the lurid skies;
Where the mainland foliage never blooms,
  And the sea-mist never dries.

Push off for the sea-dashed grave,
  The wolf may lurk at home,
May prowl in the Diri Moir
  Till nightfall bids him roam;
But the grave is void in the mountain kirk,
  And the dead hath crossed the foam.

William Barclay, who accompanied Mary Queen of Scots to a great drive in the forest of Athole in 1563, gives us an interesting account of the hunt at which he was present. Five Wolves were killed on this occasion as the result of an immense drive of two thousand Highlanders moving the whole of the woods of Athole, Mar, Badenoch, Moray, and the surrounding country. On this occasion the Queen herself gave orders to slip the fiercest of the dogs at a Wolf which she saw.

[1] Green Island, Loch Awe, and an island in Loch Maree, Ross-shire, are said to have been used for a similar purpose.

About this time, Hospitals, or Spittals, i.e. retreats from wolves, for both men and cattle, were said to have come into use in Scottish highlands, and were often situated at the heads of lonely glens, but they were probably of much earlier date. Hence we get such names as the 'Spittal of Glenshee.' Camden, too, bears testimony to the numbers and ferocity of Wolves still inhabiting Scotland in the reign of James VI. (1577). 'The country' (Strathnavern), he says, 'hath little cause to brag of its fertility. By reason of the sharpness of the air it is very thinly inhabited, and thereupon extremely infested with the fiercest of wolves, which, to the great damage of the country, not only furiously set upon cattle, but even upon the owners themselves, to the manifest danger of their lives. In so much that not only in this, but in many other parts of Scotland, the sheriffs and respective inhabitants are bound by Act of Parliament, in their several sheriffdoms, to go a-hunting thrice every year to destroy the wolves and their whelps.'

The oppressive scourge and continued depredations on the part of Wolves caused severe measures to be taken for their extirpation in the latter part of the sixteenth and early in the seventeenth century. It was decided to fire the timber and drive the pests into the open, where they could be more easily run down.

'Extensive forests,' says Fittis (p. 44), 'in Rannoch and Lochaber, and other quarters were burned down to prevent harbourage of the ravagers; and so heavy was the slaughter of the latter that only a comparatively few stragglers were left skulking in the Highland wastes—the breed, however, not becoming extinct for nearly the next two centuries . . . . That there were Wolves in the wilds of Braemar, in the early part of the seventeenth century, is attested by John Taylor, the Water Poet, who says he saw them during his memorable visit to that region in 1618. "I was the space of twelve days," he writes, "before I saw either house, cornfield, or habitation for any creature, but deer, wild horses, wolves, and such-like creatures, which made me doubt that I should never see a house again.[1]"'

Until 1621 Wolves still held their own in the wilds of Sutherland, but they must then have become scarce, as we read that for one Wolf killed at this date the sum of 6*l.* 13*s.* 4*d.* was granted. Writing in 1684 Sir Robert Sibbald speaks of the Wolf as extinct.

Various authorities give the date of the killing of the last Scottish Wolf. Pennant and other writers describe one killed by Sir Ewan Cameron of Lochiel in 1680, but this was not the final extinction of the race in Scotland, but only

[1] 'The Pennyles Pilgrimage' (*Old Book Collectors' Miscellany*), p. 50.

the last Wolf known to have inhabited Lochaber and the surrounding country.[1] In Banff the last Wolf is said to have been slain in 1644.[2] The writer, however, adds that Wolves survived for some time after this date. Fittis says that another Wolf, the last in Forfarshire, was killed in 1680, whilst Sinclair in his 'Statistical Account of Scotland' (vol. xxi. p. 447) says that in the middle of the seventeenth century 'two Wolves, *the last seen in Scotland*, were chased from the wood of Trowan (near Glen Turret, Perthshire) and followed by their pursuers into the Highlands, where they were killed.'

'Some traditionary notices there are' says Harting (p. 175) 'of the last Wolves seen in Sutherlandshire, consisting of four old ones and some whelps which were killed about the same time at three different places—at Auchumore in Assgut, in Halladale and in Glen Loth—widely distant from each other, and as late as between the years 1690 and 1700.' Of the slaying of the Loth Wolves an interesting account is given by Scrope in his 'Days of Deer Stalking' (p. 374).

The Sobieski Stuarts, who were constantly hunting deer in the northern forests and in close touch with the peasantry from 1850 to 1860, have preserved many interesting facts and traditions relating to northern wild animals and sport with the deerhound and the rifle. In their 'Lays of the Deer Forest' they say 'Every district has its last Wolf, and there were probably several which were later than that killed by Sir Ewan Cameron.' The 'last' of Strath Glass was killed at Guisachan, 'at no distant date'; the 'last' of Glen Urchard (Urquhart) on the east side of the valley between Loch Leiter (Loch Letter) and Shengly; while the 'last' of the Findhorn district was killed so recently as 1743, by MacQueen of Pall-a-chrocain, a celebrated 'carnach' of that part of the country. The Stuarts give a long and interesting account of the death of this Wolf, and how the MacIntosh of Moy gave MacQueen for his prowess 'the land called Seaxachan—for meat to his dogs.'

Tradition says that the Wolf survived in Scotland until 1848, but we have no actual evidence to support this statement.

As in the case of England, places which were in days gone by famous for Wolves still retain the names which were assigned to them, such names as

[1] Referring to this specimen, Mr. Harting has an interesting footnote in his article on 'The Wolf' in *British Animals extinct within Historic Times*. He says that in the sale catalogue of the London Museum, the contents of which were disposed of in April 1818, there is the following entry: 'Lot 832. Wolf—a noble animal in a large glass case. The last Wolf killed in Scotland, by Sir E. Cameron.'

[2] *Statistical Account of Perthshire*, p. 731.

Wolf's den, Wolfcleugh, and Wolf's burn, being common in Scotland. Mr. Harting also gives others, such as Wolfstan (East Lothian), Craigmaddie, i.e. the rock of the wolf (Stirlingshire), Wolflee and Wolf-hope (Roxburgh). Captain Gordon informs me that Old Maud in Aberdeenshire is a corruption from Ault-Mhadh (the home of the Wolf).

Ireland.—Records of the Wolf in Ireland are far less numerous than in England and Scotland. This is easily accounted for by the savage condition of the island until comparatively recent times, the constant wars, and the natural paucity of travellers, well-educated and observant, who could write at leisure on the country and the condition of the people at different ages.

In the Pleistocene age Wolves were exceedingly abundant in Ireland, and must have had glorious times amongst the great herds of gigantic Fallow-deer and Reindeer. In those days Ireland had no Cave-lions or Hyænas to prey upon the large and doubtless easily captured ruminating animals, so the Wolves hunted and killed as they lusted, and fed and bred in large numbers. Some naturalists are inclined to think that the herds of *Megaceros* found lying together in the shell-marl of the extinct lakes were drowned, being driven thither by packs of Wolves, but it is just as likely that the destruction of these great creatures was due to terror caused by the action of the second Ice-sheet itself rather than to any local hunting.[1]

Giraldus Cambrensis, an interesting chronicler of events, who visited Ireland in 1183, and again in 1185–6, has left in 'Topographia Hiberniæ' (lib. ii.) some account of the wild animals then existing in Ireland. Wolves are mentioned by him as whelping there in December 'either in consequence of the great mildness of the climate, or rather in token of the evils of treasure and rapine.' Ranulphus Higden, as quoted by Mr. Harting (pp. 186–7), speaks through his interpreter John Trevisa (1357–1387) of the 'grete plente . . . of Wolfes' in Ireland at that time. Coming down to the end of the Middle Ages, Camden in vol. ii. of his 'Britannia,' Holinshed in his 'Description of Ireland' (1586), and Campion in his 'History of Ireland' (1570), all speak of Wolves in Ireland and of the prevalence of hunting them with Greyhounds or Wolf-dogs of great size and strength, till the end of the sixteenth century. State papers and other sources of information also bear testimony to this abundance of Wolves in the wild parts of the country, *malgré* the ordinances which were constantly issued to encourage their destruction.

[1] From Loch Gur (Limerick) alone hundreds of heads and skeletons have been unearthed, and on none of their bones (so I am informed by those who have unearthed the skeletons) are there any signs of the teeth of predatory animals.

Later, as we read in the Carew MSS. vol. dcxxxix., James I. introduced a Bill in the Irish Parliament, 1611, for the killing of Wolves and other vermin, but the Bill did not become law owing to the possibility of assemblages of the people for the purpose of insurrection, under the guise of hunting. So the incursions and attacks of Wolves on the herds of the people continued until the time of Cromwell, who, viewing the exportation of Wolfhounds from Ireland as a serious matter, introduced first a Bill prohibiting the 'transporting of Wolfe-Dogges' (1652), and a year later an Order in Council whereby the 'Commanders-in-Chief and Commissioners of the Revenue' were enjoined to take every means in their power to destroy the 'pests' (Wolves). Six pounds was granted for the head of every bitch Wolf, of every dog five pounds, of every cub shifting for himself forty shillings, and of every suckling cub ten shillings. Doubtless this Order met with some success, yet we learn in the 'Travels of the Grand Duke Cosmo III. in England' (1669), as quoted by Mr. Harting (p. 197), that Wolves were still common in Ireland at that date, whilst in O'Flaherty's work[1] we read that regular Wolf-hunters were appointed in various districts to check the scourge.

The beginning of the eighteenth century seems to have heralded the doom of the Wolf in Ireland. The great forests of Carlow and Wicklow still held a few, as well as the wilds of Connaught and Donegal, but their end could not long be delayed. Sir John Sinclair speaks of the last Wolf being killed in Ireland in 1709,[2] and Smith in his 'Ancient and Modern State of the County of Kerry' (1756) tells of their disappearance in that county 'about the year 1710.' They are supposed to have existed in Wexford until 1730–40, and Mr. H. D. Richardson, a writer quoted by Mr. Harting, says in the 'Irish Penny Journal,' 1841, 'it is asserted by many persons of weight and veracity that a Wolf was killed in the Wicklow Mountains so recently as 1770.' Mr. Harting also furnishes a final note on the Wolf in Ireland, saying (p. 204) 'it seems plain that Wolves existed in Kildare during the first quarter of the eighteenth century, and perhaps as late as 1821.'

The Wolf is now gone from our islands, and few will, I think, regret his absence, except perchance enthusiasts, who suggest that they should be re-introduced and their depredations paid for 'out of the rates'! Preying as this pernicious creature did, not only on the main asset of the country people, and occasionally, when driven by hunger, on the natives themselves, my own feeling is that his absence is better than his company. As an instance of the destruction wrought by a pair of

[1] Hardiman's ed. 1846.

[2] *Statistical Account of Scotland*, xii. 447.

Wolves, I may cite the case of two of these beasts which came in the winter of 1898 into the Tunsdalen in North Trondhjem, a tract of elk forest which I rented in Norway in 1899. In 1897–8 elk were numerous here, but when I arrived and examined the ground I found it trodden with the trails of a family of Wolves, which had apparently killed or driven out the whole of the great deer from the valley and the surrounding district. There were four carcases of adult elk, which they had killed the previous spring and summer, and the Wolves had made to these regular beaten tracks, until the whole of the carcases except the heads and the main bones were devoured. The trails all converged to one point, a great cairn of boulders situated high up on the edge of the fjeld, above the timber line. Here I found the den of the Wolves and the spot in which the female had whelped. The entrance was a mass of small bones, in which I recognised the remains of capercailzie, dalripa, fjel-ripa, elk and reindeer, together with the feet of a pony. Having eaten out this valley, they proceeded westwards to the neighbourhood of Trones, where one of them was seen, and shortly afterwards poisoned.

Although illegal in many countries, there is no method of destroying Wolves like the use of strychnine. Between the years 1886 and 1895 Wolves were very abundant in Newfoundland, and a friend of mine in authority in that island issued quantities of strychnine to the men employed in making the railway, and to the guides and trappers of the districts through which it passed. Thus hundreds of Wolves met their death, and in a very short time the local race was practically exterminated, but the destruction caused among dogs and foxes, whose skins were valuable and who wandered away and were lost after taking the poison, led to trouble, and the practice had to be discontinued.

Even in such wild countries as northern Canada, where Wolves often pack, it is extremely rare to hear of men being attacked by them. A curious instance, however, came under my notice when hunting moose in Ontario in 1902. In the previous autumn an American was hunting in company with two Indians in the neighbourhood of Lake Kippawa. They had killed a moose, cut it into pieces, and hung them on poles outside the camp, when one of the Indians, bent on a steak, went to the larder to appease his appetite. He had hardly disappeared from the camp fire into the surrounding darkness when cries for help were heard, accompanied by sounds of a severe struggle. The other Indian at once rushed to the rescue, and only after a long struggle succeeded in freeing his companion from the jaws of a hungry Wolf, who had come still earlier to the meat and been interrupted at his meal. The Indian that was thus attacked was carried into Mattawa,

where he was found to be permanently injured, the sinews of the thighs having been torn apart.

The hunting of the Wolf is still a favourite pastime with the Russian nobility, who employ the beautiful Borzois dog to run them down. My brother, the late Sir Everett Millais, who was much interested in dogs, witnessed the chase of the Wolf with these hounds, when the guest of the Grand Duke Michael. On that occasion foxhounds were employed to find the Wolf and set it afoot. The quarry was then driven into the open, where one or more pairs of Borzois were stationed in leash in charge of an attendant, at a likely breaking-out place. The huntsman and guests were mounted, and on the signal being given to let go, the hounds chased the Wolf and ran into him after a short course, the dog alone seizing the Wolf and holding him by the throat until the huntsman dismounted and killed him with a knife-thrust. The Borzois are very carefully trained and highly esteemed, but out of hundreds of these hounds only very few have the courage to tackle a Wolf singlehanded.

Genus *Vulpes*

The Fox

Canis vulpes, Linnæus.

Canis vulpes, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 59 (1766).
Canis alopex, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 59 (1766).
Vulpes vulgaris, Brisson, 'Reg. Anim.' p. 239. 5; Bell, 'Brit. Quad.' p. 252 (1837).
Vulpes montanus, Blyth, 'Jour. Asiat. Soc. Bengal,' xi. 589.
Vulpes flavescens, Gray, 'Ann. Mag. Nat. Hist.' xi. 18 (1843).
Vulpes alopex, Blandford, 'Proc. Zool. Soc.' p. 635 (1887).
Local Names.—*The Fox*, *the Common Fox* (England, Scotland, and Ireland); *Tod* (Scotland); *Sionnach*, *Medadh-ruadh*, *Balgaire* (Gaelic); *Lawarn* (Old Cornish); *Llwynog* (Wales); *Renard* (France); *Fuchs* (Germany); *Volpe* (Italy); *Vos* (Holland); *Räef* (Sweden); *Ræf*, *Rødræf* (Norway).

In the north of England and south Scotland the smaller race of Foxes inhabiting the lowlands is known as the 'Terrier' Fox, while the larger race dwelling in the mountains is called the 'Greyhound' Fox.

Characters.—More slender in frame and possessing somewhat shorter limbs, the Foxes differ slightly from the true dogs and wolves. The skull varies in the absence of air-cells in the forehead, and in the form of the bone at the back of

the eye socket, which is concave instead of being convex. A well-grown British dog Fox measures about thirty-two inches from the nose to the root of the tail, and the tail about eighteen inches; but some examples, especially hill Foxes from Scotland, exceed these measurements by several inches. Forty-two inches from nose to tail root, and twenty-two inches to the end of the longest hairs of the tail, are about the maximum. Female Foxes or Vixens generally measure four or five inches less than males. The muzzle of the Fox is sharply pointed, the head rounded, and the ears large, pricked, and triangular in shape. The body is long, but the limbs are shorter in proportion than in the wolves. The tail is long and bushy. The eyes are set obliquely in the head; the pupils are elliptical.

Commenting on the difference between the true dogs and the Foxes, Mr. E. T. Bennett[1] says, in reference to the form of the eyes: 'However great the intensity of light to which they may be exposed, the iris uniformly contracts around the pupil in the form of a circle; while in the Foxes, if observed during the day, or under the influence of a strong light, it is seen to close in a vertical direction, the pupils assuming the figure of a section of a double convex lens. The object of this provision is evidently to exclude the rays of light in a much greater degree than would be compatible with the structure of a circular pupil, and it is consequently found only in those nocturnal animals in which the faculty of vision is capable of being exercised through the medium of a comparatively small proportion of light.'

The general colour of the upper parts is yellowish-red or yellow-brown, the whole being interspersed with long yellowish hairs, these being most abundant on the rump and withers. The tail is reddish-yellow and often covered with black hairs, which in some males form a black circlet within a few inches of the end, which is, however, generally pure white. The ears are black on the upper surface, and the orifices filled with long white hairs. The lips are white; a band of black extends from the eye to the mouth, broadening in the region of the vibrissæ, which are abundant and black.

The under parts and inner sides of the limbs are either grey or white, according to type, for Foxes present two very well marked forms—a dark and a light type. Both types, however, generally exhibit white cheeks and lips. The lower parts of the limbs are black, varying a good deal in individuals. The black on the extremities is also variable, both in extent and pattern. The irides are red and the claws light brown.

[1] *Delineations of the Menagerie of the Zoological Society.*



THE FOX IN MOVEMENT.

The pelage of the female Fox is less abundant, and not so bright in colour as in the male. This is most noticeable in the tail, which is often dull in colour, much mottled with black and frequently possesses only a slightly perceptible white tip; in many cases the end is yellow or blackish.

The winter pelage of mountain Foxes in Scotland is often very grey when viewed in certain lights, but bright red and yellow forms occur locally throughout that country, as they do in England, Wales, and Ireland.

It may, however, be taken as a broad rule that the large dark and grey forms are found inhabiting the mountains, whilst the smaller red and pale types frequent the valleys and the plains.

Such large numbers of foreign Foxes have been imported into the Midland counties of England, that it is impossible to say what is the true type, though I believe that every variety of both light and dark types was to be found in our Islands long before Fox-hunting became general and a constant supply of Foxes from abroad became necessary. In Warwickshire alone Foxes have been introduced in large numbers from Scotland, Ireland, France, Germany, Hungary, Sweden, and even Russia.[1]

Dark varieties are by no means uncommon, and we frequently see old 'dogs' with smoke-coloured under parts and a blackish 'tag' to the end of the brush. There seems to be, too, a great tendency among Foxes towards melanism; almost completely black Foxes have occurred in this country, though but rarely. A Fox with blackish under parts was reported by the late R. F. Tomes as having occurred in Warwickshire. A black Fox is recorded from the New Forest,[2] and other varieties were mentioned in the same volume.[3] In 1903 a completely black Fox with a white 'tag' was seen several times in Leicestershire but was not killed.

Pied varieties of the Fox are not rare, and occasionally a pure white Fox has been killed. One was taken in 1887 in West Somerset by the Taunton Vale hounds, while others have been reported in the pages of the 'Field' and 'Zoologist.'

Young Foxes are quite different in colour from their parents. The general colour is at first brown or brown-grey; when the 'puppy' coat is shed, the cubs

[1] It is quite an education in Fox pelage to visit the Natural History establishment of Mr. Spicer of Leamington, who, with Mr. Quatremain, is quite the best modeller of British mammals in our islands. Here, in the spring of 1903, I saw over one hundred Fox masks, presenting every type of light and dark pelage.

[2] *Zoologist*, 1890, p. 17.

[3] Aplin, p. 97.

are, by September, yellow-brown, and it is not until the following spring that they assume the full colour of the adults.

Like many other species of the Carnivora the Fox possesses a somewhat large scent gland situated beneath the tail, which secrets a foul-smelling sebaceous matter. The strong odour imparted by this gland is communicated to both the excreta and the urine, and renders all places inhabited by the animal offensive. When angry or frightened, the Fox can create a smell which some dogs do no care to pass, although it is not nearly so overpowering as that made by many of the weasels or the skunk.[1] To some this mephitic smell is not unpleasant; Linnæus speaks of it as an 'ambrosial odour,' while Schreber, though considering it to be disagreeable, calls it a 'violaceous scent.'

The average weight of a dog Fox is from fifteen to twenty pounds, that of a Vixen from ten to fifteen pounds, though it is common to find dog Foxes inhabiting mountainous country, more especially the Highlands of Scotland, considerably heavier. The largest dog Fox I have seen was shot by Capt. Ormonde at Balnespick, Inverness-shire, at a grouse drive at which I was present, in November 1891. I weighed it the same evening and it turned the scale at twenty-four pounds. Foxes of twenty-two and twenty-three pounds are not very rare. Writing on this subject in the 'Field' (Feb. 1, 1902) R. B. L. says that an 'old Welsh hunter' chronicled one killed by terriers, near Beddgelert, which weighed twenty-nine pounds; it was sent to be 'set up' by Shaw, the well-known taxidermist of Shrewsbury. The most interesting items, however, come from Cumberland and Westmorland. In 1899 a terrier called 'Corby,' belonging to Lord Decies, which ran with the Ullswater hounds, went to ground in some rocks near the lake. When dug out it was found to have killed three huge dog Foxes, which weighed altogether sixty-two pounds. Possibly they were more or less suffocated in the narrow part of the earth to which the game little dog had driven them. Joe Bowman, so long and favourably known in connection with the same hounds, and who, as an authority on these 'mountain' Foxes, stands almost alone, wrote that a majority of the Foxes he found when hunting on Crossfell weighed from nineteen to twenty pounds in weight; one which his hounds killed after a two and a half hours' run weighed eighteen pounds; no doubt it had lost enormously in weight during the chase. The

[1] In a dairy on my brother's ranch in Wyoming, I noticed that the milk tasted strongly of skunk, and on inquiry found that a skunk had inadvertently been killed there by a dog eighteen months previously. The skunk knows the power of its weapons so well that it will hardly get out of the way of a rider on horseback.



THE FOX.

CANIS VULPES.

biggest he ever killed was on the Crossfell range of hills; it scaled twenty-three pounds. All these heavy Foxes were dogs, the Vixens being very much smaller.

Welsh mountain Foxes seem to average the same as elsewhere, but a writer in the 'Field' (Feb. 19, 1900) gives the enormous weight of twenty-nine pounds to a dog Fox, which he had himself seen; probably this was the animal referred to above. It is affirmed that Foxes of thirty pounds weight have been killed in Scotland. Further particulars regarding the weight of Foxes will be found in the 'Field.'[1]

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

Distribution.—The Common Fox extends over the whole of northern and central Europe, whilst the southern European form can hardly be said to differ specially, although possessing, as a rule, darker under parts. The so-called black-bellied race of southern Europe is not black but merely dark grey, similar to the form sometimes met with both in England and Russia. Ranging eastwards, the Fox shows a greater tendency towards a larger and yellower type when we reach Central Asia, Mongolia, and the Altai. A more specialised grey form (winter pelage) occurs in the Himalayas, and a very pale form inhabits Egypt, where the sandy deserts are the home of isabelline forms. In China and Manchuria the Fox resembles the heavily furred and richly marked Fox of the New World. In North America the Fox differs but little from the common European form found in northern Scandinavia; in its northern range, throughout the Canadian North-West, the Hudson Bay country, Labrador, and Newfoundland, it is very subject to dark varieties, and occasionally to melanism. These varieties are known as the Cross Fox, the Silver Fox, and Black Fox. The Black Fox always retains the snow-white tip to the tail. In North America the Red Fox ranges from the Arctic Circle as far south as Georgia, where other sub-species take its place.

In England the Fox is one of the oldest of our mammalian inhabitants. Its fossilised bones have been found in the Red Crag of Newbourne, which belongs to the latter part of the Pleiocene period, and from this time through the Pleistocene age its remains are abundant in the brick-earths and caverns, and so on through the recent formations of the peat to historic times. But for its popularity as a beast of the chase, the Fox would long since have shared the treatment meted out to the marten and the wild cat, on account of its destructive habits, but happily for itself this beautiful and clever rascal is now common in all parts of Britain, and will probably continue to be so, unless the forests grow again, and all men become either Radicals or pheasant preservers.

[1] Vol. xcv. pp. 101, 160, 191, 224, 254, 266, 369.

There are no very early remains of the Fox in Ireland, and its appearance in that island is generally supposed to be contemporaneous with other large mammals of the Pleistocene age, bones having been found in caverns of this period. Abundant in the wilds of Ireland, Thompson, writing more than fifty years ago, says that the Fox is found in all suitable localities throughout the island, being especially numerous in the mountains in the south of the county of Down. It is also found in the island of Achill.

In Scotland the Fox has not been found in a fossilised state, although it may yet be discovered to have lived there in the Pleistocene age. The earliest Scotch literature, however, mentions the Fox. At the present day it is generally well distributed throughout the mainland of the north, and was common until recently in all districts in spite of the incessant warfare waged against it. Now, however, it is preserved to a great extent in the Lowlands where hunting takes place, in such counties as those lying adjacent to the Forth and the Clyde, and Ayrshire. It is locally common or scarce according to the vigilance, or otherwise, of game-keepers in charge of Highland grouse moors, and is common in all the grassy deer forests of the north and west. Through the exercise of great care and the unceasing trapping of 'vermin,' Foxes have been almost exterminated from some large districts in Scotland where the grouse is the most important creature, but this, on the other hand, is quite counterbalanced by the great increase of Foxes in deer forests. Foxes form a very constant source of help as well as emolument to Donald the deer-stalker, and it is greatly to his advantage to preserve them, both from the fact that they keep down mountain hares, grouse, and ptarmigan, all of which are detrimental to the deer-stalker, and that a sovereign can usually be obtained from some English master of hounds for a well-grown cub in the autumn. Nowadays if you walk round to the back of almost any forester's house in the autumn you will hear the chink of a chain, and see the unmistakeable brush of 'Tod' as he steals into his barrel.

So the balance of Nature is being maintained: Reynard is slain on the grouse moor and the sheep-farm, but holds his own away up amongst those great masses of rocks where man seldom goes, or down in the tangled woods of birch and fir where his presence is scarcely suspected.

In the Orkneys and Shetlands the Fox is unknown. It is also absent from the outer and inner chain of islands of the west coast of Scotland, excepting Skye, where it has always been indigenous. We should naturally expect the Fox to occur in Mull, an island lying so close to the mainland; and rumour says that

it was once common there, though there is little to support the statement. Doubtless individuals have reached Mull by swimming. Certainly Foxes were included in the list of vermin to be destroyed on the estates of Torosay and Lochbuie, by Maclaine of Lochbuie, in 1825; five shillings was the reward for a Fox head. But this is not direct evidence that the animal actually occurred in Mull in a wild state.

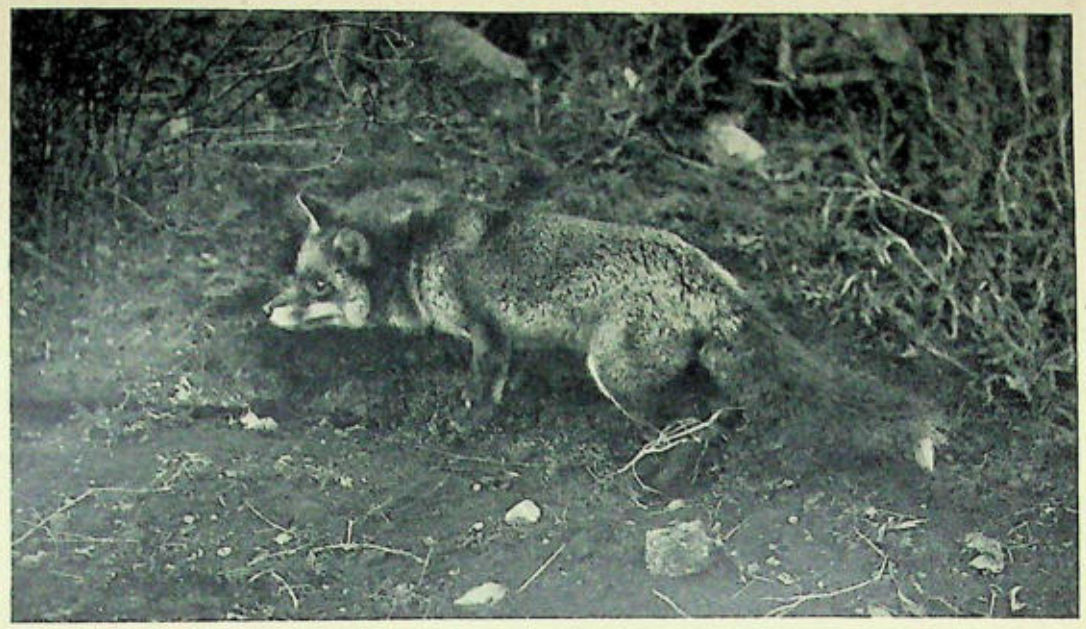
Habits.—The unwritten law is often the strongest and most zealously kept, and all over England, South Scotland, and Ireland the protection afforded to the Fox on account of its excellence as a beast of the chase is so universal that instead of being even rarer than the marten or the wild cat it is a common animal. Certainly the Fox would be quite extinct in all the lowlands of the kingdom were it not for hunting men, for it is a much easier beast to trap, poison, or shoot than the two above-mentioned animals. It would long since have followed the wolf and the boar in England but for the squire and the landed proprietor. Much the same conditions prevail in Ireland, with the additional support of the great mass of the peasantry, in whom sport is innate, added to the love and business of breeding horses which are intimately connected with the sport, which is their especial delight. In the Lowlands of Scotland the Fox finds lukewarm support, while in the Highlands it is persecuted or fostered, for reasons already dealt with. Thus to the people of Britain, Reynard is on the whole a special favourite, being as he is the very essence of conservatism, and the emblem of much that is good and healthy in our national life. To kill a Fox otherwise than with hounds, except in the hills of Scotland and Wales, where it is a curse to the sheep-owners, is nothing less than a crime in the eyes of all good sportsmen. It is a pity the same consideration is not shown to the wild cat, the marten, and more especially the otter.

For the greater part of the year the dog Fox may be said to be a solitary animal, only going about with his mate at certain seasons. Even the Vixen hunts alone as soon as the cubs are able to take care of themselves, although in heavy soils several Foxes may be found lying up by day in the same gorse or cover. On light and sandy soils the Fox will sometimes dig out a burrow for itself, returning year after year to the same retreat or appropriating the deserted 'set' of a badger or any dry hole in a tree-bottom, wall, or among rocks. A common place for an earth is an old rabbit-burrow, situated on a sandy bank; this the Fox by slight alterations and improvements will render

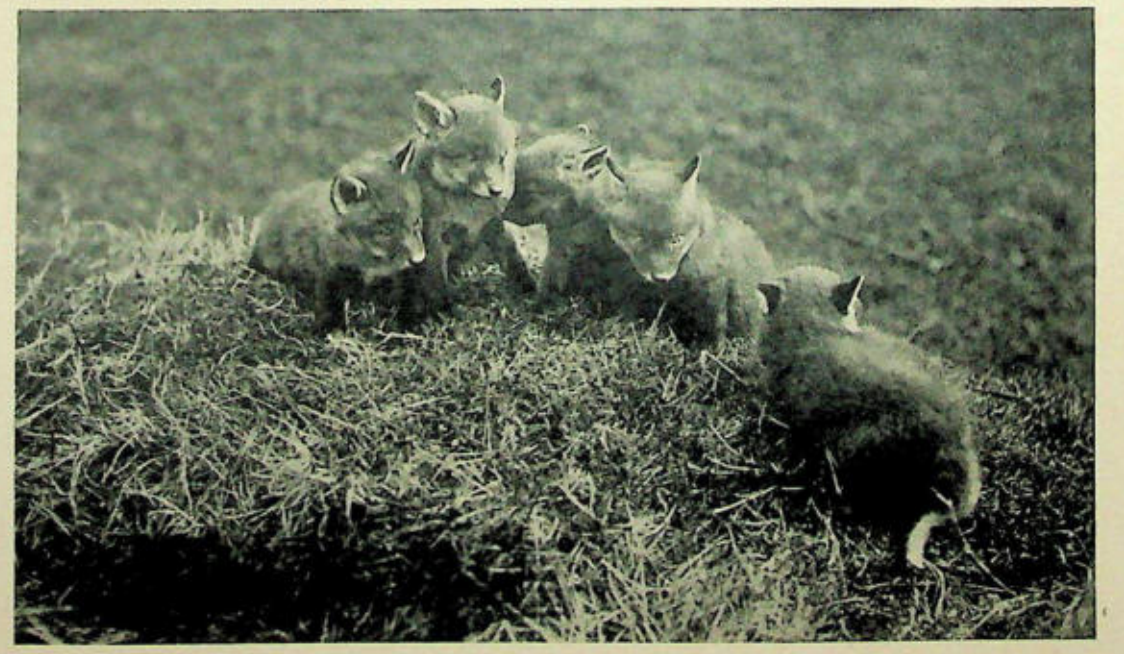
suitable for its dwelling-place. Often the Fox changes its home, and the badgers returning to their former quarters get blamed for having evicted the more important animal. Badgers are, however, among the most harmless and least quarrelsome of creatures, and in this case are only the scapegoat of certain huntsmen, who must attach the absence of Foxes to some cause. Moreover, there are dozens of cases where Foxes and badgers have been found dwelling together in perfect harmony, and many instances of Foxes living in large warrens of rabbits which they are too cunning to molest. Vixens, too, often move their cubs when they are half-grown, and take them to a considerable distance, hiding them temporarily in piles of faggots or holes in trees so as to be near their regular hunting grounds. This is evidently labour-saving, for then the mother has not to carry large supplies of food to her family from great distances. An instance of this occurred this spring (1904) within a few hundred yards of my house. At the beginning of May a Vixen brought her cubs from some other part of St. Leonard's Forest and took up her abode in a large pile of faggots. She remained here for a fortnight, capturing a large number of rats and a few rabbits, which were littered about in all directions near the retreat. By the end of May the same Vixen had removed her family to a bank half a mile to the east, where she stayed with them for another fortnight. She has now left this part of the forest, and is doubtless working another beat. So it is hardly fair to blame badgers when Foxes disappear from some well-known earth.

Foxes breed in the winter, at which time several dog Foxes may be found in attendance on a Vixen. At this season too the female makes a yapping cry to attract the male; the dog Fox will 'bark' in winter as well as in spring, and may often be heard on still nights, although it is, as a rule, a silent animal.

The young are usually born, after a gestation of two months, about the end of March or beginning of April, although instances of litters occurring as early as January are not unknown in the south of England. The young, from three to seven in number, are at first blind, and remain so for nine or ten days. They are suckled by the Vixen for about a month, when she brings them rats or anything that can easily be broken up by their juvenile teeth. If she is disturbed at this season she will move her cubs one by one to another retreat, and seldom goes far from the earth until they are able to follow her. Young Foxes remain with the mother until September, when, their education being more or less complete, they shift for themselves, but still meet at night in the same wood or gorse cover. They cannot be said to be full-grown until they are eighteen or twenty months old.







FOXES.

From Photos by C. REID.

With reference to the Fox's mode of entering the earth Mr. T. A. Coward sends me the following note:

'In 1887 a keeper at Plumbley, Cheshire, showed me a Fox-earth, and pointed out that the Fox when entering the burrow walks with one foot on each side, thus leaving a ridge down the centre of the burrow. There certainly was a ridge of sand, but I will not be sure that this is the regular habit. The same man showed me a huge earth which he had dug out; while digging he fell through, and declared that his head was level with the surrounding ground when he fell in.'

The food of the Fox is very varied. In fact it will eat almost anything in the way of flesh, fish, crabs and molluscs, whether fresh or putrid. On the low grounds of Britain the chief food of the Fox is the rabbit, and if these are in abundance it may be taken as a general rule that it does little destruction to other game, except occasionally picking up a sitting hen pheasant or young pheasant sleeping in the grass. It is quite possible to have both Foxes and pheasants, provided there is a good supply of rabbits and rats on an estate. This is a *sine qua non*, as the following incident will show. I enjoyed an excellent day's pheasant-shooting (second time over) with Mr. Bevil Stanier at Peplow in Shropshire, in December 1901. We killed about three hundred pheasants, and left about an equal number of wild birds, five hundred having been killed in the first shoot over the home coverts. There was also a good sprinkling of rabbits. The following year Foxes were scarce in the neighbourhood, so Mr. Stanier, with praiseworthy sportsmanship, turned down seven vixen Foxes. Five of these had litters. The rabbits having been nearly exterminated owing to complaints on the part of the farmers, the Foxes were forced to live entirely on the young pheasants, which suffered to an unusual extent. With other guns, Mr. Stanier kindly asked me to the first shoot in November 1902. With difficulty we got thirty-five pheasants, nearly the whole of the stock having been killed by the Foxes in September, when the young birds were sleeping out in the grass, a foolish habit of young pheasants in dry seasons before they begin to fly up to roost. One man thoroughly enjoyed his day's shooting, and that was Mr. Bibby, the Master of the Shropshire Hounds.

That the Fox is a most wasteful slaughterer, and will occasionally prefer killing pheasants to rabbits, I know from experience. As in every case of what may be called unusual criminality, however, these instances can be explained by the somewhat abnormal tastes of isolated individuals. A Fox broke into Denne Park pheasantry, which is situated in a great rabbit district, and in one night

killed forty-five young pheasants, not one of which he carried off, whilst an even more glaring case occurred in the summer of 1904 near Horsham. I went over one day in the month of May to Leonardslee, and was told to inspect the larder. Its general appearance was similar to a very fair morning's shoot in December. Fifty-one adult pheasants were hanging there, all apparently well shot through the head. It looked as if Sir Edmund Loder and the Bisley eight had been doing a little rifle practice out of season. Such a flagrant breach of the game laws seemed to be inexcusable, but after all no man had been the culprit. It was the work of one Vixen the night before. Sir Edmund has a large enclosure for wild animals, surrounded by a wire fence seven feet high. This generally stops Foxes, but on this occasion the daring robber had leapt the fence and had then scaled the inner enclosure, a nine-foot wire fence which was considered quite impregnable. In this were the imprisoned pheasants, but somehow she had managed to scramble up, and once inside had soon completed her work of destruction. Next morning the cubs were found sitting outside the outer barrier, and they were removed to a distance, but this did not prevent the daring mother from entering the preserve on the following day and slaying a magnificent bronze-wing turkey, which Sir Edmund had just received from the Duke of Bedford, and finding and killing a much-valued Aoudad kid, the only one ever born at Leonardslee.

When the Vixen has cubs she is a wonderful hunter, and will 'stick at nowt.' Her foraging capacity is remarkable, and in this she often does a great deal of good. Vast numbers of rats and field voles are destroyed by Foxes, and these constitute their favourite food at certain seasons and places. During the great vole plague in the south of Scotland (1892) Foxes killed immense numbers of these troublesome little beasts. The method of the Vixen was to bite several, drop them, and afterwards collect all she could hold in her mouth and bear them to her young. Foxes will do the same with rats when they meet with a good supply. During a great rat plague in Sussex in 1902, a Vixen which had an earth near the Rookery, Dorking, used to journey daily to the neighbourhood of Bearhurst, near Kingsfold, Sussex, a distance of about seven miles, and kill as many rats as she could. These she would carry home, holding five or six at a time in her mouth. Arthur Hopkins, the gamekeeper, who told me of the circumstance, said that he found a pile of twenty rats by the side of a bank at Bearhurst one day, and could not understand who had destroyed them, since he had charge of the beat. Returning home the same evening he saw the Vixen with her

mouth full of rats moving away in the direction of Dorking. After this she came daily after rats, although rabbits were abundant.

As an instance of the Fox's predilection for rats, Captain Arthur Smith, the well-known rider, tells me that a friend of his in Leicestershire so fully recognises the Fox's taste for rats that it is only necessary to shoot a few of the rodents and scatter them about in his covers to be sure of finding a Fox or Foxes there on the following days. When food is abundant the Fox will often bury what he kills and return later, sometimes bringing a friend with him to sup.[1]

The above cases all point to the fact that many Foxes exhibit special tastes for certain kinds of food, and once they have mastered the easiest method of obtaining it, they prey largely on that particular delicacy. It is only too well known that certain Foxes are experienced chicken-stealers, whilst others have a taste exclusively for tame ducks. One Fox of my acquaintance in Dorsetshire made a speciality of ornamental water-fowl, and as these of course were pinioned he swept the entire stock from the district. He killed a number of Canadian geese, and carried them off. Sir Harry Johnston says that the Fox attacks even larger game, namely swans[2]; a mere in the New Forest known to him was depleted of these birds. A Fox, too, in Norway has been seen to attack and destroy a wild swan which he caught on the ice.

The sins of the Fox in the lowlands are, however, only venial ones. It is at the mercy of the people, and where it does damage to farmers it is generally in a hunting country, where the nearest Master of Hounds has to pay and look pleasant.

On the other hand, in the hills of Scotland Reynard is still the master of the situation, although destroyed without compassion on the great sheep-farms of the north. Here the Fox inflicts great damage on the herds by destroying young lambs in the spring. It is still the same there, in many parts, as when Ossian sang, and as when in England the early kings granted lands to certain persons on the understanding that they would keep dogs specially for the purpose of keeping down the wolves and Foxes.

In the pursuit of game the Fox exercises a certain cunning not necessarily peculiar to itself—for the great cats and many raptorial birds do the same—by hunting at a distance from the neighbourhood of its home. Perhaps it reasons that by so doing it both conceals its retreat and insures popularity among its immediate neighbours. Just as the most cunning old stags frequent a copse nearest to the stalker's hut, so the Vixen often makes her earth in close proximity

[1] See *Zoologist*, 1885, p 164.

[2] *Brit. Mammals*, p. 125.

to, if not actually in, buildings where men are living. Mr. Harting gives two good instances of this in his short article on the Fox in the 'Zoologist' (September 1891, pp. 321–334).

'A remarkable illustration of this occurred in Shropshire in 1881. On May 13 in that year Mr. Charles Nock, of Norton House, Shifnal, wrote that an old dog Fox, the Vixen, and three cubs about three months old, had that day been unearthed in his poultry-yard. They were thirty-eight yards from the house door and twenty-two yards from the poultry-house, and though ducks and fowls were all round and about the den, not one was killed or molested.'

A somewhat similar case was reported in August 1887 by Mr. B. Morris, of Bucklers, Great Tey, Essex, of a Fox which had its earth in an old haulm wall in a roadside farmyard.

'At Tey Brook,' he says, 'there has been for many years one of the strongest Foxes' earths in the East Essex Hunt, and the Foxes have always been well cared for; but for some reason the Vixen took a fancy to this old haulm wall in the bullock-yard, and there this year (1887) had her cubs; the wall has been made thirty years or more. It is situate within twenty yards of a high road much frequented, and the farm men are constantly in and out, it being one of the regular farmyards on the homestead. A few weeks back, when the cubs were young, a man at plough close by saw the old Vixen leave the kennel in the wall and go to a rabbit hole, scrape four or five young ones out, and carry them all at once to the cubs; she did not in the least mind the man.'

On the Border farms, and in the North generally, it is the exception for the Fox to kill lambs on its own ground.

Sir Harry Johnston says in his 'British Mammals' (p. 125) that Foxes are so bold in winter in the Island of Achill that they descend from the mountains and carry off geese and young pigs, and that they even go so far as to kill the foals of the hill ponies in summer. In Scotland Foxes are said to hunt the seashore for dead fish, crabs, &c., but I have never met with anyone who has actually seen them doing so, although they will eat fish greedily, fresh or stale. Nor is it certain that they will eat fruit or vegetable matter in a wild state in this country at least, whatever may be the tastes of Foxes in Palestine and elsewhere. A tame Fox which I kept for some time would eat vegetables when mixed up with gravy and meat, but refused strawberries and cherries.

All things considered the rabbit is the favourite food of the Fox, and nine Foxes out of ten live almost entirely on them, varied only with such birds, frogs,

and rats as they may pick up casually. In the spring they will dig out young rabbits, and old ones too, but their usual method may be described in the following instance which my wife and I witnessed at St. John's Wood near Spilsby, one summer evening in 1894. We were crossing a stile when a large dog Fox sprang out of the cover about two hundred yards away. We had just time to conceal ourselves, when the Fox, after looking round carefully for a minute or two, commenced hunting in the rough grass. In method his actions were very like a setter. The head and brush were held in one straight line, and the movements of cantering were easy and noiseless. After circling and working each part of the ground, he stood on point to a rabbit. Remaining for a moment stationary, I could then see his body working slightly in a back and forward movement, as if collecting for a forward rush. At this moment the rabbit started for the cover, about twenty yards away, and was immediately followed by the Fox, almost touching his little white tail. The movement of the two seemed to be that of one animal, but the rabbit gained the ditch of the cover only just in time, when the Fox stopped, threw up his brush and head, and looked round as much as to say, 'Not much of a rabbit anyhow, I think.' He commenced hunting again at once, beginning close to the spot from which the quarry had been started. Not a minute elapsed before he got the wind of another rabbit, drew up, and came to a stand over his victim as before. Again the rabbit rose, and both raced for the cover as before. When the Fox reached over to snap his victim, the rabbit jinked beautifully, and instead of entering his sanctuary at once came racing along the covert side towards us. His quick manœuvre had perhaps given him two or three yards grace, and this distance the Fox now sought to diminish with all possible speed. It was a race for life in which the rabbit won again; for just as the Fox was about to seize him, a second turn allowed a dive into the brambles of the covert, and Bunny had saved his life. After this second failure Reynard seemed put out, or was not hungry, for, trotting slowly into the wood, he disappeared.

The above scene will hardly agree with Mr. Harting's account of a Vixen foraging, but both methods are employed by Foxes; the different styles of capture are doubtless tried when rabbits are abundant or otherwise. Describing a Vixen hunting rabbits, the above writer says[1]: 'It is seldom that she pounces upon them from some ambush, nor does she more often attempt to run one down. On the contrary, she shows herself in good time, that her prospective prey may

[1] *Zoologist*, 1891, p. 330.

have ample opportunity of seeing her. On her first appearance some of the rabbits will probably scuttle away for some distance before sitting on their hind legs to have another look; others will squat close to the ground. Judging by the Vixen's plans—the dog seldom does any foraging, except for himself—one would think that she had never seen the rabbits. She will roll on her back, play with her brush, trot in a circle, and regularly cheat the bunnies that she has no design upon them. When they have become reassured and begun to feed again, she is among them with a bound, and secures enough for herself and family.'

A Fox generally kills a rabbit by crushing it sharply at the back of the neck. When about to feed upon it, he first bites off its head and then skins it, making use of both teeth and feet in the process.

Foxes have often been found dwelling in the same warren as rabbits, and have been bolted under these circumstances by a ferret; instances are given in the 'Field' (Nov. 13 and 20, 1886). Sometimes the Fox has resented such an insult and killed the ferret.[1] That the Fox has no fear of the family of Mustelids is also shown in the case of one that was observed to stalk and kill a stoat.[2] A Fox has also been seen to chase and attack a cat.[3]

In the foregoing pages I have dealt principally with the English Fox, or Fox of the lowlands. Away up north, in the mists of the deer forest and in the shaggy woods below, there dwells another type of Fox, a strong and hardy fellow whose life is more strenuous owing to the activity necessitated by the comparative scarcity of food. No warrens of rabbits or fat ducks and poultry are his for the mere effort of a short preamble, and, though mountain hares are sometimes plentiful and easily caught, most of his captures are, at any rate in winter, the result of miles and miles of trotting through the wastes of snow. Even these hill Foxes may be divided into two classes: those which hunt the moor edges and live in the great woods, and those which dwell far up amongst the rocks of the higher mountains, above all else but the occasional badger, the ptarmigan, and in autumn the stag. The first-named subsists largely by winding, stalking, and rushing in on the blue hares and the grouse, with such other birds and beasts as the varying seasons throw in his way. The true hill variety, the Fox of the 'tops,' also kills numbers of hares, but his chief food on the higher ranges is the ptarmigan,[4]

[1] See *Field*, March 14 and April 4, 1885, also September 21, 1901.

[2] *Ibid.* September 7, 1901.

[3] *Ibid.* p. 893, 1902.

[4] James McColl, stalker on the Glenkinglass beat, Black Mount, told me that his collie one day ran after and caught, after a very short chase, a hill Fox on the top of Clashven. The surprising inactivity of Reynard was due to his having recently dined off three whole ptarmigan, the wing feathers of which he had also swallowed.

and he seldom descends, even at the breeding season, to the domains of the wood Fox, preferring rather the snowy corries of his semi-arctic home far from human habitations, even in times of storm when deer are forced to the glens and are as tame as domestic cattle. In the spring this child of the mist will wander great distances to neighbouring sheep-farms, and take his toll from the lambs, or feed on the remains of those killed by ravens and eagles. The deer, too, which die in numbers in March and April in overstocked and badly managed forests, are a constant food supply at this season. These hill Foxes are exceedingly shy and cunning, especially when approaching a dead carcase. I have seen the paths of Foxes, beaten in the snow around a dead hind, that looked as if scores of these little scavengers had been travelling round and round the kill, and yet the carcase was not touched. The tracks were made probably by a single pair of Foxes 'trying the wind' for several days ere they would approach. Foresters have frequently told me that Foxes will not touch a dead deer until three days have elapsed, and that they circle round it for hours to see if man approaches, a fact which somewhat contradicts Sir Edwin Landseer's beautiful picture of the Fox and dead stags, known as 'Morning.' In spring the Vixen enlarges some hole in a peat hag, in which she deposits her cubs, but often moves them when they are a few weeks old to some large cairn, the deserted home of a badger or high-dwelling rabbit. At this season the hill Vixen does most damage, and is singularly expert in snapping hen grouse from their nests, to say nothing of the number of birds she mouths and misses, and which never return to the nests. As many as twenty brace of grouse, hares, rabbits, and two lambs have been found at the den of a single hill Fox, and the stench of some of these places, which I have examined, was overpowering. On several occasions, when deer-stalking, I have come on the hill Fox taking his midday siesta, curled up on some airy tussock of grass or heather on the sunny side of the hill. Once in the Clashven beat of the forest of the Black Mount, I was descending a very steep corrie to come in on a fine dark stag we had been manœuvring with all day, when within four hundred yards of our quarry we espied Reynard sitting up on his haunches and regarding the monarch of the glen with equal interest. Whilst making a detour to avoid disturbing the sharper-sighted animal, a golden eagle came sailing along the hillside and pitched within a hundred yards of the rocks on which we had suddenly thrown ourselves. On looking up I then enjoyed the unusual spectacle of a stag, a Fox, and a golden eagle, three of the most interesting Highland creatures, all within a short distance at the same

time. The eagle soon passed on, hunting the hillside for ptarmigan, and, avoiding the Fox, which fortunately ran uphill, I killed my stag. I have twice seen a Fox actually hunting ptarmigan. Once he had the bird fluttering in his mouth when I noticed the covey rising suddenly from the hillside opposite. On the second occasion the Fox was working the ground in the usual setter fashion, and though I watched him for a long time, he did not find his game before he disappeared. At another time I was out one October day shooting old cock grouse on the hills above Amulree in Perthshire, when I had a splendid view of a hill Fox on the hunt. I was seated on a rock surveying the valley of the 'Sma' glen' when he came trotting up the hills from the direction of Corriemuckloch House, following an old sheep track, and it seemed as if his line would bring him close to my station. However, when about three hundred yards distant he suddenly stopped and pointed. Then he drew up wind amongst a heap of stones and crept ever so slowly round each obstacle. A sudden rush and a spring in the air, and a grouse was fluttering in his mouth; he bore it away along the hillside in triumph.

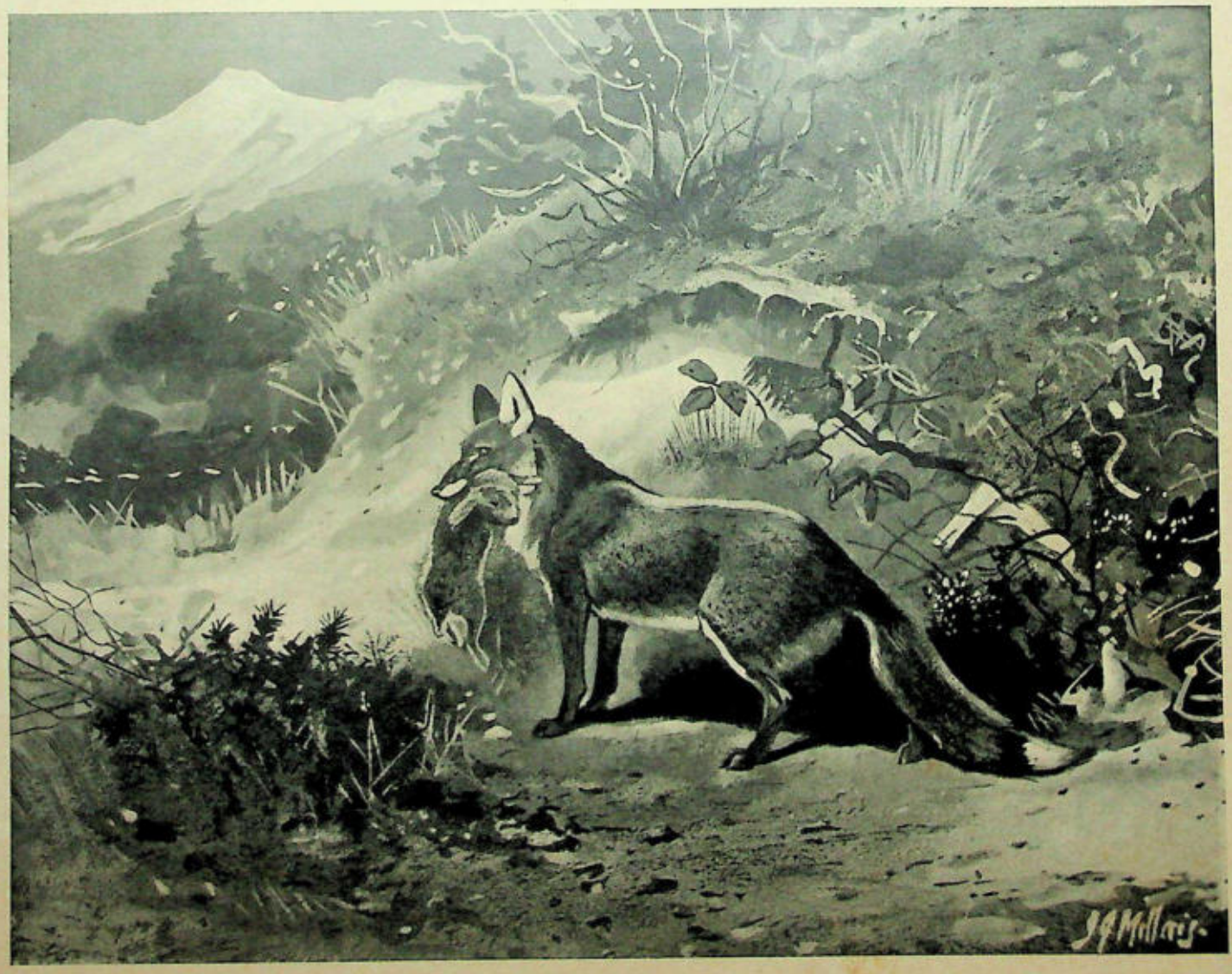
I have often seen hill Foxes in Scotland when driving the woods in winter, and have seen many meet their fate, both at grouse drives and covert shoots, at the hands of men who would not have killed a Fox in England for all the world: a fact of which they are always careful to inform you.

As it is impossible to hunt the hill Fox in the southern sense, and he is a beast destructive to game of greater importance locally, every man's hand is against him, and he has to take his place with the other 'vermin' of the North. His death is usually accomplished by trapping, driving the woods, or an attack with terriers, and in the spring by shooting. I have been present at several of these summary executions, and have often been struck by the small size and the great pluck of the little terriers employed in ousting the Fox. The small dog seldom gets hurt and generally manages to conquer his larger antagonist. This is the favourite method employed in deer forests, for the cubs can often be saved and are subsequently valuable to Donald. In trapping, the ordinary gin is usually employed and has to be set with great care and cunning, for the hill Fox that has once sprung a trap is more than careful ever afterwards. Another common method of trapping Foxes in the north is thus well described by H. M. in the 'Field' (May 23, 1903).

'A turf plot is constructed early in the season in some fairly deep water-hole or peat moss, and left for some time without any bait or trap. It should



STUDIES OF FOXES.
By J. Wolf.



FORAGING.

not be on flat ground, but, if possible, near a ridge, because the Fox prefers to prowl along the tops sooner than trust himself on the level. Later a bait is placed at the end of the pier, and guarded by a trap so placed that in order to get at the bait the Fox must spring it. The pier must be narrow, not much wider than the jaws of the trap when set. The bait should be firmly pegged down; the trapper, after this, should never go near the place except to renew the bait, but should inspect it constantly from a distance with his glass. The pier should be about four feet in length, running out into the water, so that the Fox cannot reach the bait from the edge, but only by going on to the pier. Now see what happens when he goes into the trap. The pier being narrow he loses his balance at once, and is drowned in a short time. There are other methods of trapping, but this is the most effective, as there is very little risk of his leaving a foot and escaping, which often happens with the older methods of trapping in springs and juniper bushes. A hare makes a very good bait, but a sheep's entrails is even better, although it does not last so long.'[1]

It is hardly necessary to enter upon the vexed question of Foxes or pheasants or the views of the shooting and the hunting man, beyond saying that certain counties where grass and open lands exist are eminently suitable for Fox-hunting, while woodland districts with arable lands between are properly the province of the game preserver. When, however, the two overlap or adjoin, there are bound to be differences of opinion between keepers who desire to show a good head of game to their masters and Masters of Hounds who wish to preserve Foxes. Doubtless both, being prejudiced, fail in tact and management, and so troubles and quarrels arise. I was once at a shooting party in Cambridgeshire when two Foxes came galloping over a turnip-field towards me; they passed within a few yards, just as my host, whom I imagined to be a keen follower of the Fox as well as a shooter, came rushing from his place shouting to me to shoot the Foxes: a suggestion I ignored. This behaviour seemed inexplicable, but it turned out that the Master of a neighbouring pack had drawn his best cover in the previous year the day before shooting, and without letting him know that he was coming with the hounds. Of course there was a great row, which was only settled at the instance of friends on both sides. Worse was to happen, however. In the following year my friend W. was absent in the south of France, and the letter which the Master of Hounds addressed to him, only a day or two before the time he wished

[1] In Cumberland and Westmorland traps built of masonry in the form of the old 'bottle pit' were much in use in the eighteenth century. A live hen was the bait, and the Fox once in could not jump out again.

to draw the cover, did not reach its destination. Without receiving any answer the woods were drawn, and the birds were scattered far and wide. Mr. W. was perfectly livid with rage when he returned home, and swore he would give up hunting and shoot every Fox ever afterwards. This is merely a glaring instance of want of tact on the part of a Master of Hounds, and few retain their position who do such things. Nowadays, even with all things in his favour, a Master of Foxhounds has to be a perfect genius in the gentle art of soothing the easily offended, for farmers are not what they used to be; they shoot more and hunt less; whilst the man with the poultry-bill, formed of real or imaginary losses, threatens to become an ogre of the most appalling dimensions.

I must relate one tale which my readers may find amusing. Apropos of the unsavoury subject of shooting Foxes, I was actually present, even standing beside a Master of Foxhounds, when he shot a Fox. I need scarcely say that the crime was quite unintentional, but the story got about, and probably sticks to the poor man to this day.

In 1884 I was a happy-go-lucky young fellow at Trinity College, Cambridge, where although by courtesy called a student, I fear the gun played a more important part in my education than the book. At this time, too, I was honoured with the friendship of the late Prince Albert Victor, whose shooting arrangements I used to manage, and with whom I enjoyed many a delightful day in the covers and fields of the Eastern counties. One day 'Johnny' Perkins, the Master of Downing, a famous Cambridge character and a friend of mine, asked if I thought the Prince would care for a day's shooting at Borley Wood. On asking his Highness he kindly consented, and we looked forward to a great day amongst the pheasants, hares, and rabbits with which Borley Wood was said to be swarming. A special train was ordered at 9 o'clock, and punctually at that hour I awoke and looked at my watch. It was a bit late certainly, but some circumstances might have delayed the start, so I flung on my clothes, seized my guns and cartridges, and calling a cab, went for the station at a speed that would have meant a summons if we had met a policeman. Arrived at the station, instead of anathemas, I was glad to discern that I was a person of considerable importance. The station-master and four or five other officials were standing in the doorway with their hats off, and regarding my advent with a respect that I felt was hardly my due under the circumstances. At this time, in personal appearance I must have been very like the Prince, because on several occasions I found myself mistaken for him, but I had gone half way up the exceedingly long platform of Cambridge



Spoiling the beat

before it dawned upon me that an error was being made, and so confided my suspicions to one of the station officials; he nearly had a fit when he discovered his mistake. The Prince had been quietly seated waiting patiently in the carriage for half an hour, but forgave me when he heard the story, which was received with roars of laughter.

Just before lunch we were lined on a broad ride. On my right was C., a Master of Hounds. He was an excellent fellow, very short-sighted, wore spectacles, but notwithstanding was a fair shot. Rabbits and hares were popping about in dozens in front, when a Fox passed immediately before me, moving towards my neighbour. The unlucky beast was still within my view when C. fired, and the Fox dropped dead. I ran towards my unfortunate friend, saying, 'Do you know what you have done? You've killed a Fox!' 'Good heavens, is it possible? I thought it was a hare,' he exclaimed in anguish, and we ran into the wood together. Poor C. seemed overcome and unable to think, so I seized the Fox, ran to the end of the ride, jumped into the covert side ditch, and hid it in the brambles. So far all seemed well, for no other person had noticed the incident except the Prince, who was in fits of laughter. However, he promised secrecy, so things were not so bad after all. The morning's shooting was finished, so lunch was taken in the wood at that spot, and all passed off pleasantly. C. too was beginning to recover from the horrors of the last beat when an abominable retriever, whom no one had noticed sniffing about, suddenly appeared, tearing out of the ditch the carcase of the murdered Fox. It was an awful moment, when even fibs of the most flagrant order were perhaps permissible. Such thoughts had just entered my mind, when C. like a noble fellow spoke up and made a clean breast of his sin, was humbled but forgiven after an inordinate amount of chaff. Of course the story got about, and he doubtless suffers for it to this day.

Not the least curious episode of this day's shooting was the mistake of the head keeper, who made the common fault of congealing all his pheasants into the final bouquet when darkness had already set in. We killed about two hundred pheasants at this last stand. 'I will pick them all up early to-morrow,' said this inexperienced individual, anxious to finish and pay off his beaters. But before that time arrived two of the beaters who had heard the remark had decided to act on their own account. They came in the night with a cart, lifted all the fallen game, and doubtless declared a handsome dividend in Cambridge market on the following day. They were never caught.

Apropos of shooting Foxes, it was amusing to listen to the hunting men in Sussex during the seasons of 1899 and 1900, when alternately west and east Sussex Foxes were plagued with mange. All agreed that every mangy Fox *must* be shot on sight to stamp out the disease. Every host who had both Foxes and pheasants carefully instructed his guns to shoot the diseased animals, saying that he certainly intended to do so himself. However, when it came to the point not a single person, much less the man who gave the order, would lift a gun to Reynard, so the disease had to die out of its own accord. I was amused one day, shooting with Captain W. near East Grinstead. He called out to me to shoot a mangy Fox that was approaching my stand. Of course I neglected the admonition, and he roundly abused me, saying that an opportunity had been lost. In the next beat the same Fox came up within ten yards of mine host, and they looked each other 'full in the eye'—and nothing happened. After the drive the gallant captain boldly denied having seen anything resembling a Fox and assured me that I had been mistaken. He confessed afterwards, however, that when he saw the Fox standing looking at him 'so miserably' he had not the heart to take its life. There are several instances of Foxes having been shot when running before the hounds, and such an one occurred in 1901 near West Grinstead, when a Brighton butcher, who rented an acre or two of cover, slew the pursued one as it galloped past him in the wood.

Many instances of the daring of the Fox in picking up shot game, whilst guns were going off all round, have occurred, and I once witnessed such an incident at West Grinstead in November 1897, at a shoot belonging to Mr. Fred. Godman. We had finished a large wood, the last pheasant coming over Colonel Lyon, who hit it very hard. The bird sailed on about three hundred yards, and as it was about to alight in a small strip that was to be the next beat, it soared up slightly and fell dead in the cover. The place was marked, and beaters told to pick up the fallen bird as they came along. Mr. Godman then placed three guns at the end of the strip, of which I was one, and the drive had hardly commenced, and several shots were actually being fired, when a vixen Fox came out of the cover carrying in her mouth the identical hen pheasant which we had seen fall. She stood a minute as Foxes always do, as if to take in the situation, and then started off at full gallop, going past my neighbour, who at that moment fired at a cock pheasant over his head. This was a little too much for the nerves of 'Volpone,' who, apparently afflicted with a guilty conscience, dropped her captive and made off at full speed. A Fox has been known

on different occasions to pick up a hare, a woodcock, a partridge, and a pheasant, and carry it away from the midst of a party of shooters.[1]

Foxes are very playful animals, and even in a wild state they have been known to play with a dog[2]; an instance is related in the 'Field' (May 3, 1902) of a Fox and a leveret having been seen playing together at Brimpsfield, Gloucestershire. Foxes fight fiercely, generally in the winter when striving for the attentions of the Vixen. A fierce fight is described in the 'Field' (Feb. 15, 1902), in which the combatants allowed themselves to be struck several times by a man with a stick without letting go.

Foxes do not make interesting pets, not to speak of their disagreeable odour, and never show any attachment to their masters beyond recognising the person who feeds them and allowing him to handle them. It requires something more than an ordinary love of wild animals to keep a tame Fox in one's bedroom, as a friend of mine near Fort George in Scotland used always to do. He said that it would do all sorts of interesting things when they were alone together, but personally I never saw anything but 'The eyes of Pauguk looking' on him 'from the darkness.'

I have kept two Foxes, one for a couple of months and another for a short time, and got less insight into their habits than those of any other animal in captivity. Mr. Harting, however, says that when allowed the free use of a walled garden they make interesting pets.[3]

Foxes are as subject to hydrophobia as dogs; as shown by the biting of Lord Doneraile and his coachman by a mad Fox. Both went immediately to the Pasteur Institute, but only his lordship survived.

Interesting examples of the sagacity of the Fox are almost too numerous to mention, but a few well-authenticated instances of its remarkable nerve and intelligence may not be out of place, for it is its very absence of flurry and its cool deliberation in the presence of danger that endear the Fox to most of us, and

[1] See *Field*, January 9, 1904; and *Sporting and Dramatic News*, November 12, 1881, &c.

[2] I have not entered into the question of hybrids between the dog and the Fox, because there is no perfectly authenticated example in existence. Long ago Daniels (*Field Sports*, p. 167) states that 'it is a practice in many places in the north of England, to tie up a bitch that is in season, where she may be visited by a Fox; the fruits of the connexion are sufficiently obvious by most, if not all, the Whelps bearing a strong resemblance to the Fox in the sharp nose, prick ears, long body, and short legs, and these *Hybrids* are much estimated for their handiness in driving cattle.' Such general statements are, however, of no real value. It is possible that hybrids of the two species have occurred, for there is a specimen in the Worcester Museum which both Mr. De Winton and Mr. Pocock, who have examined it, believe to be a genuine hybrid between a dog and a Fox. Sporting papers are full of so-called hybrids, but actual scientific evidence is scarce.

[3] *Zoologist*, 1891, p. 321.

render its escape in the moments of peril quite acceptable to those whose amusement it is to compass its destruction. An old dog Fox that lived in a cover at Baconsland near Partridge Green, Sussex, came out, and, threading his way through the whole of the members of the Crawley and Horsham Hunt, closely pursued by the pack, made his way in and out of the horsemen to a high bank on the other side of a field, and tried one after the other every rabbit-hole in the whole length of a bank, all of which had, of course, been stopped. During this movement he never lost his head for an instant, but kept dodging the hounds all the time, just stopping and trying the holes with his foot to see if there was a chance of entry. Being unsuccessful, he again went through the ordeal of passing through the horsemen, whilst two or three of the hounds were within a yard or two of his brush all the time, and so travelled back safely into the cover from which he had been disturbed. Here he again tried his home earths, and, satisfied that speed alone would serve for a time, took his 'field' to another cover, where he put up a 'mangy' fox, and, doubling, returned to live another day. Dr. Juckes, of Horsham, a keen follower of the above hounds, who witnessed the incident, said that he had never seen a Fox keep his head more beautifully in trying circumstances.

Almost superhuman intelligence is often attributed to the Fox in his efforts to elude his pursuers; the following incident, were it not quoted from the lips of the famous Tom Firr, would seem to be well-nigh incredible. The incident is told by the editor of the 'County Gentleman.'[1]

'After a "blazing" twenty-five minutes the Quorn hunted their Fox into a spinney, and it looked long odds on their killing him there. Still, one of the field galloped on to the end of the cover on the chance of viewing him away, and to his great surprise saw Reynard, just beyond the spinney, rolling over and over at the bottom of a manure heap before going on. When hounds reached the spot they threw up their heads—and well they might. Undoubtedly the tactics of this wily Fox, with a view to destroying his scent, would have been successful had the occurrence been unobserved; but he had shot his bolt; hounds were lifted across the next field, and, getting a view, they soon converted him into a "hundred tatters of brown."'

Foxes have often been known to jump on to the top of a wall, run some distance, and then double back again, and in so doing, and in swimming down stream, or wading through shallows, they seem to recognise the necessity of

[1] *Daily Mail*, January 28, 1904.

'killing' their own scent. Foxes, too, have frequently taken refuge in trees,[1] while drains are a favourite resort in times of trouble. An instance is given in the 'Field' (January 2, 1886) of a Fox taking to the sea. He was chased to Balverhythe from Hollington Church Wood by the East Sussex hounds, and, after lying on the beach for some time, took to the water and swam nearly a mile before being overtaken by a boat and killed. Mr. Harting in his article on the Fox[2] gives two interesting instances of Fox cunning in the presence of danger. 'In the Vine Country,' he says (p. 327), 'a Fox was accustomed to run the same line time after time, and eluded the hounds by jumping first on the top of a pleached fence, thence to a wall, and thence to the roof of an uninhabited cottage, by the chimney of which he lay down out of sight. One of the most curious devices for self-preservation was shown by a Fox in the Fitzwilliam country. This Fox, after changing his direction several times and vainly seeking shelter in a bed of rushes, made straight for the railway, and lay down in the permanent way. The rapid approach of a train necessitated the withdrawal of the hounds, but the Fox maintained his position until the train was close to him, when he got up and made good his escape. Unless he was in a manner conscious of the fact that the huntsman's prudence would not allow the hounds to remain on the line, it is difficult to understand what could have prompted him to remain in a position not unattended with danger.'[3]

Endless are the curious places in which the Fox has taken refuge as a last resource; on one of the few occasions on which I have enjoyed Fox-hunting,

[1] 'Where the Fox fails,' says the editor of the *County Gentleman* (*Daily Mail*, January 28, 1904), 'in his cunning is generally in his want of originality. There was one old depredator whose raids upon the local poultry had gained him unenviable notoriety. He was always found in the same covert, always gave the same run, and was invariably lost at a park wall some three miles away. Casts were made to right and left, "furrard" and back—always without avail. At last his stratagem was found out. Some one stationed near the spot saw him jump on the wall, run along it for a distance of at least a hundred and fifty yards, then spring on to the overhanging branch of a tree, and disappear down the hollow trunk. But he played the trick once too often! By the way, in the Duke of Beaufort's country, and that of Lord Fitzhardinge as well, I believe, some of the Foxes are noted for their arboreal proclivities. Many a good run this season has begun with the dislodgment of a Fox from his lofty perch, though I have not heard of anyone finding four Foxes in trees in one day of late, such as once happened in the Badminton country. Arboreal Foxes, of course, are by no means confined to the West of England. I have heard of three being found in one tree in Mr. Fernie's country, "squatting like monkeys in the thicker branches," and in the Meynell Hunt a woodman who once climbed up a spruce fir tree is said to have found a Fox in a sort of "den," so pleached and interwoven with branches as to make a capital place for him to eat and sleep in unmolested. Needless to add, the hounds had drawn that cover blank several times during the season!'

[2] *Zoologist*, September 1891.

[3] *Field*, January 2, 1886.

I saw the Southwold Hounds kill their Fox in the infant school at Spilsby after a capital run of an hour and a half. There are instances of Foxes hiding in chimneys and even kitchen stoves, but perhaps two of the most remarkable instances are given by the hunting editor of the 'County Gentleman' in the 'Daily Mail,' January 28, 1904.

'One of the strangest asylums ever hit upon by a Fox was in the Warwickshire country. He had been hunted into the Ragley stableyard, and the hounds evinced the greatest desire to get on the roof. Some of them at the back of the building succeeded in doing so, but the Master called them off, fearing that they might fall into the yard and be killed. A thorough search was made inside the building to no purpose, and they gave him up as lost. It subsequently transpired that the crafty Fox had made his way along the roof as far as the stable clock, among the works of which he ensconced himself.

'Foxes have their friends, of course, as well as their enemies, and the bedraggled one that jumped into the old market-woman's cart, and, hidden beneath the good lady's ample skirts, was driven out of harm's way, must have felt a qualm of conscience when next he pillaged his neighbour's hen-roost. Even the Quorn were once robbed of the "final fruits of victory" by a similar display of feminine compassion. They had run a sinking Fox to the grounds of a country house, and naturally all the maids trooped out to "see the sight." The whipper-in came galloping up, and, doffing his cap to the (very pretty) lady's maid, inquired, "Have you seen the Fox, Miss?" "Yes, I have." "Where's he gone; quick, Miss, please." "Shan't tell. You've runned him enough, he's tired. Go and get another." And, spite of pleas and protestations, the Hunt eventually had to!'

In many instances the Fox has accepted a sanctuary, not necessarily chosen with forethought, but simply as a *dernier ressort* on the principle of 'any port in a storm.' A Fox hard pressed by hounds recently found refuge in a woman's arms at Newport Pagnell, whilst another hotly pursued by the pack dashed into Brompton Astley Church in the middle of service, where amidst a scene of confusion and noise it was despatched. Not long ago a Fox found itself mixed up in a football match taking place on the Corporation Ground at Dover, and many other strange adventures on the part of Reynard could be cited.

Hunting.—The earliest Scottish literature mentions the Fox, and subsequent chronicles and reports of the state of the country throughout the historic period constantly mention 'Tod' and his destructiveness to lambs and poultry. Con-

sequently as a noxious animal he was hunted and killed by various methods. Thus, Roderick Dhu is made to say

> Though the beast of game
> The privilege of chase may claim,
> Though space and law the stag we lend,
> Ere hound we slip, or bow we bend,
> Who ever reck'd, where, how, or when,
> The prowling fox was trapp'd or slain?

Scarcely placed in the same category as the wolf, for whose extirpation royal statutes were issued, the Fox was nevertheless considered sufficiently objectionable to be hunted in some cases under compulsion. 'For example,' says Fittis, in his 'Sports and Pastimes of Scotland' (p. 72), 'the Register of Tacks of the Abbey of Cupar-Angus, which had extensive domains in Glenisla, contains leases, dated between 1539 and 1559, in which the larger tacksmen were severally held bound to maintain and feed "a leash of good hounds, with a couple of raches [sleuth-dogs] for tod [Fox] and wolf, and shall be ready at all times when we [the abbot and convent] charge them to pass with us or our baillies to the hunts"; and the smaller tenants were in like manner bound to keep "one hound for tod and wolf."'[1]

Hector Boece, in his History, tells a marvellous story of how the inhabitants of Glenmore (in the shires of Inverness and Moray) protected their fowls against the wily plunderers. 'The wolves,' he says, 'are right noisome to the tame bestial in all parts of Scotland, except one part thereof, named Glenmore; in which the tame bestial get little damage of wild bestial, especially of tods. For each house nourishes a young tod certain days, and mixes the flesh thereof after it be slain with such meat as they give to their fowls or other small beasts, and so many as eat of this meat are preserved two months after from any damage by the tods, for tods will taste of no flesh that tastes of their own kind, and be there but one beast or fowl that has not tasted of this meat, the tod will chase it out among a thousand.'[2]

The chase of the Fox in the hills of Scotland is mentioned in the 'Black Book of Taymouth,' in a letter dated 1631, from the Earl of Mar to his cousin

[1] *Rental Book of the Cistercian Abbey of Cupar-Angus* (Grampian Club), ii. 107, 141, 176, 251, 262.

[2] An ancient English superstition was that if the farmyard cocks were ornamented with necklaces of Fox-fur, such hens as they trod would be immune from the attacks of Foxes. The reason given being that Reynard is too 'gallant' to touch anything smelling of his own kind.

Sir Colin Campbell of Glenshurchag, in which he says, 'I think my greatest sport shall be in hunting of the Fox,' and asks for a 'couple of good earth dogs.'

Captain Burt, writing of Fox-hunting as he saw it in the beginning of the eighteenth century, says: 'There are numbers of Foxes, but they take to the mountains, which are rocky, and sometimes inaccessible to the dogs, of which several have been lost by falling from precipices in the pursuit; for the Fox in his flight takes the most dangerous way. But when we happen to kill one of them, it is carried home, through the blessings of the people, like a dangerous captive in a Roman triumph.'

After the Highlanders were disarmed in 1725, one of their chief complaints was that they were deprived of the means of destroying such noxious animals as Foxes and wild cats, which did them 'much more hurt in their poultry, &c., than they yield them profit by their furs; and the eagles do them more mischief than both the others together.'[1] But in this it seems that the wily Highlanders hoaxed the captain, for they only delivered up their inferior weapons, carefully concealing the others for a future rising.

About 1750 the 'Carnach,' or professional Fox and badger hunter, came into existence in Scotland, and these men became a class paid to exterminate such vermin. The hunters received a fixed salary. In Skye the head of a Fox was worth a guinea to the slayer, and the 'Statistical Account of Scotland' conducted by Sir John Sinclair gives details of the working of this system. For instance, in Lochgoilhead and Kilmorich several parishes joined together in supporting a paid hunter of Foxes. Every tacksman and tenant was obliged to entertain him and his dogs a certain number of nights in the year, according to the extent of their lands. In Lochlee, Forfarshire, poison was used by the hunters in the following manner: 'Being done in the winter season by dragging a piece of salted fish well spiced with powdered *nux vomica* along a hillside, and leaving it near water. If the Fox comes upon the track, he soon finds the bait, eats it, drinks, and expires instantly. The only difficulty lies in finding open water in time of a severe storm, and without this the *nux vomica* does not kill.'

In the parish of Golspie, Sutherland, a more general system prevailed, for anyone could become a Fox-hunter, and a sum of 100*l.* annually was set apart for the payment of successful hunters. Five shillings was paid for a Fox, 2*s.* 6*d.* for a Cub, and every Vixen in milk 20*s.*, the dead animals having to be seen by a justice of the peace or minister of the parish.

[1] *Letters of Captain Burt*, i. 138, and ii. 70.

Dr. Charles Rogers in 'Scotland, Social and Domestic' (p. 172) tells us something of the manner in which the Fox was hunted, and how gatherings for this purpose were convened. 'Several days,' he says, 'were occupied annually in the pursuit of the Fox, when the entire inhabitants of the district turned out. In Forfarshire these gatherings were convened by the parish beadle while the congregation left church. An ancestor of the writer heard a beadle in Strathmore summon a dispersing congregation to attend at the hunting-field in these words :—

Ilka man and mither's son,
Come hunt the tod on Tuesday.'

An excellent account of Fox-hunting as practised in the Highlands at the beginning of the nineteenth century is given by a Perthshire poet, Alexander Campbell, in his stirring poem, 'The Grampians Desolate,'[1] who thus describes the chase amid the wild hills of the North in a manner worthy of the English poet Somerville.

The hunter to the upland wilds is come,
A welcome guest—each *botham* is his home;
His hounds and terriers keen, a yelping train,
The mountain echoes now salute again.
Far out of view, among the airy peaks
The wily prowler into covert sneaks;
The wary cubs alarm'd instinctive creep
Hard after, scarcely breathing, silence keep.
Ere peep of dawn, all, ready for the sport,
Forth from the *airidh* to the wilds resort;
And hunters, hounds, and shepherds' dogs rove wide
From knoll to knoll, from hill to mountain's side;
The heath-cock shakes his wing—'tis dawn of day—
Halloo! the hunt is up—away—away!
He breaks full speed away—swift, swift he flies!
The yell of opening hounds ascends the skies;
Away, away o'er many a shaggy steep,
Fox, hounds and huntsmen swift as lightning sweep;
Beyond the midway far, where cliffs meet sky,
See the sly villain, doubling oft on high,—
The pealing pack at fault, impatient, keen,
Range o'er the mountain's brow,—unheard, unseen
The hunters follow, darting swift along,
And fearless bound the craggy wilds among;
From bending heights they far beneath the eye,
Deep in the vale below, the thief descry.
Huzza! again the hounds have gained the scent!
Unheeding danger, on their prey intent,
They dash midst cliffy windings, shelving rocks,
And rouse the peaceful herds and roving flocks:
The timid mountain-hare, the roe, the hind
Start from their shelter, secret haunts to find.
Ye harmless tenants of these mountains wild,
They thirst not for your blood—ye meek! ye mild!
Your crafty neighbour of the cavern-rock,
The foe bloodthirsty of the harmless flock,
The canine rangers, full of vengeful fire,
Fain would him worry in instinctive ire.
Lo, now close in upon his utmost speed,
The sanguine pack to mouth him now proceed;
Without a groan the hardened culprit dies,
The hills resound the hunters' joyous cries!
They pause—and panting dogs stretched on the heath
Repose the while, and soon regain their breath;
And on a dark-brown knoll all now recline,
A homely feast is spread, on which they dine;

[1] Edinburgh, 1804.

Heart-cheering whisky, oat-cake, goat's-milk cheese,
(High cheer that might an ancient hero please)
Compose the hearty meal—they rest the while;
Anon to urge anew the pleasing toil,
The huntsman gives the word, and up all spring!
And to their holla mountain echoes ring—
The game is up again—full speed they fly—
Ere nightfall, hunted down, more prowlers die.

'Four years after the issue of Campbell's quarto,' says Fittis in his 'Sports and Pastimes of Scotland' (p. 79), 'an extraordinarily protracted Fox-chase came off in the Highlands. The story goes that on June 8, 1808, a Fox and a hound, trotting at a slow pace, were observed coming southwards along the highway above Dunkeld, in Perthshire, the Fox about fifty yards ahead, but both animals so fatigued as not to be able to gain on each other. A countryman on the road easily caught the Fox alive, and took both it and the dog to a gentleman's house near by, where poor Reynard drew his last breath through sheer exhaustion. It was afterwards ascertained,' says the narrator, 'that the hound belonged to the Duke of Gordon, and that the Fox was started on the morning of the King's birthday (June 4) on the top of those hills called Mona-liadh, which separate Badenoch from Fort Augustus. From this it appeared that the chase lasted four days, and that the distance travelled, from the place where the Fox was unkennelled to the spot where it was caught, without making any allowance for doubles, crosses, and tergiversations, and as the crow flies, exceeded seventy miles.'[1]

It was not until the end of the eighteenth century that the first pack of Fox-hounds was formed in Scotland to hunt in the English fashion.[2] Other southern counties followed suit, but the nature of the land is such that the sport can never be so widespread as it is in England and Ireland.

In England, until the eighteenth century the Fox seems to have been hunted much as he is to-day in the mountainous districts of Scotland, where following the chase with the horse is more or less impossible. There is no record of English Fox-hunting in its present sense until 1730, when Thomas Fownes of Stapleton, Dorset, is supposed to have established the first pack of steady hounds. Until the Restoration of Charles II. England was so covered with forest that the Fox was still 'vermin' and a beast whose death was desired on account of the damage wrought to lambs and domestic poultry. In early days many persons held grants of land for service in destroying wolves, Foxes, badgers, and wild cats, and were obliged to keep hounds specially entered for the chase of the various species. Then Reynard met his death ignobly in his earth, wherever found. Until 1600 hounds used in the chase of 'the Fox, the hare, the wolf, hart, buck,

[1] Daniel's *Rural Sports*, iv. 662.

[2] Col. Babington, *Records of the Fife Foxhounds*, Edin. 1883.

badger, otter, polecat, lopstart (stoat), weasel, conie, etc.' were designated by Harrison (who wrote about England in 1577–87) as 'Harriers,' and we do not find mention of Foxhounds until 1678, when the Marquis of Worcester, in writing to the Marchioness, says 'he wishes he had Foxhounds to spare, as the Prince of Orange is mighty desirous to get a good pack, and has asked for some.'[1] Somerville, in his charming poem of 'The Chase' (Book iii.), describes Fox-hunting in the days of George II. (1735), but it is certain that riding to Fox-hounds was practised in various parts of England at the close of the seventeenth century.[2]

Excellent accounts of Fox-hunting as practised to-day are found in various modern works, and it would be out of place here to do more than mention one or two points which bear on the natural history of the Fox in his relations to the chase.

Foxes have, like nearly all other wild animals, a fine bump of locality, and are rarely at fault in making their 'point' even after repeated turns. A Fox living in a gorse cover in the lowlands will often potter about, for he knows only his immediate vicinity well, and will not run like a hill Fox, which is accustomed to perform long journeys in quest of food. Consequently a 'bag' Fox from Scotland often gives a pack a more sporting run than a Fox indigenous to the place. However, this is not always so, for locally bred Foxes have taken hounds immense runs and returned the same night to the point where they were found. A Fox that had somehow lost his brush, and was consequently well known, was hunted from Graylands, Horsham, by the Crawley and Horsham Hounds, nearly to Brighton, where it was lost. At four the next morning the keeper at Gray-lands found poor Reynard lying dead outside his 'stopped' earth. This Fox must have run altogether without a break about seventy miles. Mr. Harting[3] gives another instance of a similar character. 'A Fox,' he says, 'has been known to return seventy miles to his "earth," and this not once but three times. He was caught in Yorkshire, and sent into Lancashire to be hunted by the hounds of the late Mr. Fitzherbert Brockholes, of Claughton Hall, Garstang, and his identity was established by his having been marked in the ear by the Fox-catcher. This story I had from my friend Captain F. H. Salvin, who was living in Yorkshire at the time, and was well acquainted with Mr. Brockholes, who gave him all the details.' It seems to be a constant practice of the Fox, however tired, to return homewards

[1] *Historical MSS. Commission*, 12*th Rep.* Appendix ix. p. 67. [2] See *The Gentleman's Recreation*, 1686.
[3] *Zoologist*, 1891, p. 329.

immediately he has eluded the hounds, and many a Fox-hunter thrown out of the run has met the beaten and bedraggled Fox returning to his earth by another route.

Great numbers of Foxes are killed annually by Foxhounds in England, but the supply is almost invariably equal to the demand, except in woodland counties and districts bordering on towns, where the shooting and the hunting man clash. One hundred Foxes are often killed in one season by a pack of hounds, and in the season 1903–1904 the Duke of Beaufort's Hounds, hunting on 186 occasions, killed 136 brace of Foxes, while 33 brace were run to ground. This is believed to be the largest number killed in England by one pack in a single season.

In parts of England where game is scarce and Foxes are abundant, as in the Midlands, the carnivorous Fox must subsist on something of a fleshy nature, so immense destruction is created in the poultry-yards and among the chickens that roost out at night. Recently farmers in Worcestershire have written to the newspapers saying that fowl-rearing has become quite impossible owing to the destruction by Foxes, and it has been estimated by a competent authority that hunting men pay at least 50,000*l.* annually as compensation for nearly half a million head of poultry slain by Foxes. Many packs have to pay 1,000*l.* annually, and if claims are questioned it leads to ill-feeling between the Master and the farmers, a thing to be avoided under any circumstances in these days of Radical independence. So the Master has to submit to a certain amount of imposition, although one or two, notably Lord Fitzhardinge in Warwickshire, have openly protested against some of these claims. The slaughter of chickens is, however, largely due to the carelessness of the farmers themselves in not providing safe sleeping accommodation for their fowls, for one farmer in Warwickshire, who keeps some six hundred head of poultry, and shuts them in at night in properly constructed wooden houses on wheels, has lost only one chicken in the course of many years.

As a long-suffering poultry-fund secretary has remarked, 'It would require the income of a Rothschild to settle every poultry claim in its entirety.' So a fixed charge exists in most of the Hunts. The poultry-fund secretary is constantly reminded, too, of the discriminative taste of Reynard in selecting only valuable prize-winners, when as a matter of fact some ordinary hen valued at 2*s.* 6*d.* has met its death. In the words of Miss Somerville

> P is the price of the aged old hin
> That's ate by the Fox over 'n' over agin.

To be bombarded with the decomposing carcases of decapitated ducks and disembowelled hens at all hours of the day is, to say the least of it, unpleasant, and probably prompted the indignant remark of the M.F.H. to a farmer who had applied to him for compensation for a calf that Foxes were supposed to have devoured, 'Now, mind in future to keep the door-latch down, or you will certainly lose your cow.'

Hunted Foxes sometimes attack poultry, but such occurrences are rare, though they have been noted on several occasions. They may either instance the animal's coolness in moments of danger, or be due to sudden rage or recklessness. The hunting editor of the 'County Gentleman' gives some good examples of this, as well as the curious case of guinea-fowl combining to chase a hunted Fox.

'One of those rare instances,' he says,[1] 'of a hunted Fox attacking poultry has just been reported by a gentleman who is well known both in literary and sporting circles. He was at home watching some favourite Minorcas in a paddock when a Fox suddenly appeared and dashed right through them, snapping at the cock, and actually biting a pullet through the neck and killing her. What, he asks, could be the motive of a hunted Fox in killing poultry in this manner? He himself ascribes it to blind and vindictive rage, and he may be right.

'Such occurrences, though rare, are not unheard-of, and the incident will recall one of similar nature which happened in the lifetime of "Parson Jack" Russell. That prince of sportsmen was hunting a Fox one day when he heard the piercing screams of a woman evidently in dire distress. Galloping to the spot, he was greeted with the agonising story: "Oh, Mr. Russell, that there Fox hath tookt away our little specklety hen. I seed un snap un up, and away to go, I did!" "Then I'll kill him and give you another hen," shouted "the Parson" as he hastened on. And he carried out his promise, for, after crossing the Barle and ringing round, hounds killed not long afterwards, nor far from the spot where the "accident" occurred. It was only at the very last moment that the rapacious Fox dropped the carcase of the "poor little specklety hen," which was picked up by the disconsolate old woman.

'But it is very seldom that a Fox is so reckless when hounds are on his line; indeed, I have known instances of the contempt which poultry have for a hunted Fox. That guinea-fowl should join in the pursuit of Reynard seems almost too good to be true. But it is a fact, and I well recollect the event,

[1] *Daily Mail*, February 2, 1904.

which happened at the opening meet of the Tivyside Foxhounds a season or two ago.

'One of the many Foxes on foot at Noyadd Trefawr, after he had "done a lot of work and was getting his back up," came round over the lawn in front of the house, where a large flock of guinea-fowl had collected. When the terror of the hen-roosts appeared upon the scene, instead of the birds being frightened, the old cock seemed to give the word of command, and at him they flew! Every single bird chased him out of the place, pecking at him so long as they could keep near him, and the poor Fox seemed as disconcerted as though he had been surrounded by the hounds (which he very shortly afterwards was, as a matter of fact).'

THE BEARS

Family *URSIDÆ*

THE Bears are supposed to have originated in northern India, their descent being traced from a common stock first found in the Upper Miocene strata. In Europe their remains are not found in earlier deposits than those of the Upper Pleistocene, but they are very abundant in the caves of England, France, Germany, Belgium, Poland, Algeria, the Caucasus, and the Balkan Peninsula, which contain the remains of various large mammals that existed in the Pleistocene age.

Bears are of a more primitive type than dogs. They are plantigrade, possess five completely formed toes on each foot, and are specialised by such points as the long penial bone of the genital organs, the small tail, and the absence of a cæcum and entepicondylar foramen in the humerus.

The *Ursidæ* possess the same number of teeth as the *Canidæ*, but the two first premolars in both jaws exhibit a tendency to disappear in ancient forms, though present and weak in all types of modern Bears. The canines are very strong, and the true molars are broad with tubercular crowns. Female Bears are furnished with three pairs of teats.

When we know more about the various types of the European Brown Bear, *Ursus arctos*, I believe it will be found that from Norway to Kamschatka there is only one species. No terrestrial mammal varies so greatly, both in size and pelage, as this animal. Between Brown Bears killed in eastern Norway and those of western Sweden there is a perceptible difference in colour, whilst in the Bears of Russia, especially those of the eastern districts, there is a further and much greater difference in size. I have lately seen two immense Bears belonging to the Russian Embassy in London, which measure nearly nine feet in length and are almost black in colour. No naturalist could differentiate these from Californian

Grizzlies, if we ignore the trifling difference of black instead of bone-coloured claws, which is said to be the distinguishing feature of the latter. And so on through Siberia and Mongolia to Kamschatka, where the Brown Bear achieves its greatest size, being a huge beast, scarcely if at all inferior to the Cave Bear (*Ursus spelæus*) of Pleistocene times. Coming to the American continent, we have the recently named Kadiak Bear, the largest of the American Brown Bears, which occasionally reaches twelve feet.[1] The same may be said of all the American species of Grizzlies, which indeed are to the broad-minded naturalist only slightly different local types inhabiting comparatively small areas. If the student is in doubt about the close connection of the various types of *Ursus arctos*, let him spend an hour in any of the great fur emporiums of Victoria or in the Hudson Bay depots of the Canadian north-west; and his doubts will be speedily set at rest. Here in November he may see laid out before his eyes the skins of adult Bears of nearly every size from six to eleven feet, and of every colour from jet black to a silvery-grey white.

Colour has nothing to do with the determination of species in this case, for female Brown Bears with the characteristic pale yellow shoulder-stripe followed by silvery-white, cinnamon, or black cubs have been frequently seen and killed, and often the same Bear is found with young of two different colours. Nor are slight local differences, such as uniformly coloured claws as in the Californian Grizzly, long legs as in the Kadiak Bear, or short legs as in the Barren-Ground Bear of Richardson, sufficient to authorise separation of species. In fact, the Brown Bear is the only animal of the species to be found within the whole round of the Northern Hemisphere.

The Cave Bear

Ursus spelæus, Blumenbach and Cuvier

This, the greatest of the Bears which inhabited the earth from the end of the Pleiocene period and through the Pleistocene age—the contemporary of palæolithic man—is specialised by the absence of certain premolar teeth in each jaw. Moreover, the lower jaw is considerably more powerful than that of modern Bears, and the diastemata between the teeth are more extended, whilst the forehead is

[1] Several American Bears of over 12 feet are on record, and one of 13 feet. All these are, however, surpassed by a 'Grizzly' killed near Delta, Colorado, U.S.A. He is said to have weighed 1,200 lbs., and to have measured 14 feet from tip of nose to end of tail; breadth of head, 22 inches. His skin is now on exhibition at the World's Fair, St. Louis, 1904.

higher and the whole skull more massive; the zygomatic arches, too, are wider and shorter than in existing Bears, with the possible exception of individual examples such as the Great Brown Bear recently found inhabiting the Kamschatkan Peninsula. The Great Cave Bear was, in fact, the largest development of the predatory carnivora that the world has ever seen.

The individual characters of *Ursus spelæus*, and its comparison with existing Bears, have been pointed out by Rosenmuller, Schmerling, Goldfuss, Cuvier, and M. de Blainville,[1] but the best account will be found in Sir Richard Owen's 'British Fossil Mammals and Birds' (pp. 86–108), to whose writings I must refer my readers for further details. Remains of this animal have been discovered in France, Germany, Belgium, Italy, Algeria, and south Russia; and in England Owen gives the following localities: Kirkdale (Yorkshire), Durdham Down near Bristol, Paviland (Glamorganshire), Oreston (Devonshire), Clacton (Essex), Tewkesbury deposits (Warwickshire), and Kent's Hole, Torquay (Devonshire), as places where many relics of this Bear have been discovered.

Ursus priscus, Goldfuss

This animal, as described by Goldfuss and Cuvier, we are invited to accept as a type of prehistoric Bear by such great authorities as the late Sir Richard Owen and Dr. Buckland. Taking for example a complete skull found at Gailenreuth and now in the Natural History Museum, Owen points out the specific characters of the species. He says[2]: 'The contour of the skull of the *Ursus priscus* is less elevated than in the Brown [Bear] or alpine variety, and the flattened forehead passes into the nose with a less sensible concavity than in the skull of the Fen Bear. The coronoid process of the lower jaw is rather broader and higher, and the interval between the ante-penultimate molar and the canine tooth is longer.' The differences, however, are scarcely more strongly marked than those existing between local forms of Brown Bears now living; and the claims of *Ursus priscus* as a distinct species are not very strong.

Owen gives Kent's Hole and Oreston, near Plymouth, as caves in which remains have been found.

Professor Leith Adams[3] makes the following remarks on this Bear: 'The

[1] De Blainville says that the Great Cave Bear differs in no respect in its osteology or dentition from *Ursus arctos* and *Ursus priscus*.

[2] *Brit. Fossil Mammals and Birds*, pp. 82–83.

[3] *Zoologist*, April 1877, pp. 125, 126.

Ursus priscus was the giant of all. Although not rare in England, it appears to have been common in southern France and in the Pyrenees, judging from the quantities of bones discovered in caves. It would appear that, irrespective of larger dimensions, this Great Cave Bear was distinct from the Grizzly, *or else an unusual variation* in regard to bulk and certain osteological characters pertaining to the Grizzly Bear of Ancient Britain. Compared individually, the Brown, Grizzly, and Cave Bears stood in much the same relative height as the Shetland pony, the Galloway, and the dray-horse.'

Judging from the condition of the bones and skulls which have been unearthed, it is more than probable that the Great Cave Bears were the first to disappear, and were in turn followed by the so-called British Grizzly, which was common in Ireland, and the Brown Bear, which survived in England and Scotland, but not in Ireland, down to historic times. All these three types certainly existed in England long after its separation from the Continent, and then each in turn disappeared, either from failure of food or destruction by human agency. 'That man,' says Professor Leith Adams, in the above-quoted article, 'played a considerable part in exterminating the Bear tribe is proved by the arrows, spears, and hatchets of stone which have been discovered in several caverns,[1] either overlying the remains in question or associated with them. But although man contributed to the extinction of many species, it is probable that these wild beasts enjoyed a long freedom before he appeared on the scene. How the thick hides were pierced by arrows or spear-points made of stone, and how man with such weapons could have held his own against powerful and ferocious Bears, seems a mystery when we think of the ferocity of the degenerate descendants of these animals.[2] It is, moreover, a curious coincidence, not easily explained, that, whilst the tiger and lion are daily destroying human beings, we find no indications of man amongst the gnawed bones so plentifully distributed throughout the ancient caverns and dens of the Post-Glacial epoch. The only explanation would seem to be that the larger carnivorous quadrupeds found ample subsistence among the lower animals during the cave period without preying on the lords of creation.

[1] A footnote by the editor of the *Zoologist*, Mr. J. E. Harting, says: 'Amongst others may be mentioned Kent's Cavern; Brixham Cave, Devonshire; Long Cave and Wokey Hole, Cheddar, Somersetshire.'

[2] I think Prof. Leith Adams is in error as to the extreme ferocity of the Brown Bear. A certain Grizzly Bear hunter in Colorado, who has probably killed more Bears in his life than any living man, has described them as 'about as dangerous as a pig,' and has never been attacked by one. But this is far too sweeping a statement. Certainly all Bears are dangerous when cornered or when accompanied by cubs.

The Brown Bear

Ursus arctos, Linnæus.

That the Brown Bear was exceedingly numerous in Great Britain during the Pleistocene age there is no reason to doubt. Bones of these animals have been found in abundance in Kent's Hole at Torquay, and in many other places in England, as well as in Scotland and Ireland.

The existence and gradual disappearance of Bears in Great Britain may be summed up in the words of Sir Richard Owen.[1] 'In conclusion, it may be stated on the evidence at present acquired that the period of the existence of the Ursine genus in this island has extended from the Middle or Miocene Tertiary formations through the older and newer Pleiocene, and that the genus surviving, or under a new specific form reappearing after the epoch of the deposition and dispersion of those enormous, unstratified, superficial accumulations of marine and freshwater shingle and gravel called drift and diluvium, has been continued during the formation of vast fens and turbaries upon the present surface of the island, and until the multiplication and advancement of the human race introduced a new cause of extermination, under the powerful influence of which the Bear was finally swept away from the indigenous fauna of Great Britain.'

The historic evidence as to the existence of the Brown Bear in England, Scotland, and Ireland is clear enough, as I shall now endeavour to show.

England.—Here we know that the Brown Bear survived the second Glacial period and the Ice which destroyed so many of the large Carnivores. An almost perfect skull from Manea Fen, Cambridgeshire, is figured by Sir Richard Owen in his 'British Fossil Mammals and Birds' (p. 77). It was taken from the marl just below the peat, showing the existence of the animal at no very distant date prior to recent times. Professor Boyd Dawkins[2] and Professor Leith Adams[3] also bear testimony to the fact that the Brown Bear survived the second age of Ice down to the historical period.

Professor Boyd Dawkins, in the article above referred to, gives an example of the contemporaneous existence of Neolithic man and the Brown Bear, showing that in the exploration of the Victoria Cave near Settle relics in the shape of rude implements were found associated with the bones of Bears which had been

[1] *Brit. Fossil Mammals and Birds*, pp. 106–107.
[2] *Pop. Sci. Review*, 1861, p. 247.
[3] *Zoologist*, 1877, p. 125.

broken during a feast, and that these bones and implements were lying mixed up with the remains of the red deer, horse, and Celtic shorthorn.

Coming to the time of the Roman occupation, Mr. Harting, in his 'British Mammals extinct within Historic Times' (p. 12), says: 'In the collection of bones from the refuse heaps round Colchester made by Dr. Bree, the remains of this animal were found along with those of the badger, wolf, Celtic shorthorn, and goat. Professor Boyd Dawkins has also met with it in a similar "refuse heap" at Richmond in Yorkshire, which is probably of Roman origin.

In the Welsh Triads we are told that the 'Kymry, or Celtic tribe, first inhabited Britain; and that before them there were only Bears, wolves, beavers, and oxen with high prominences.' Pennant too[1] says that many places in Wales still retain the name of Penarth (the Bear's head), which affords some evidence of the former existence of the species. Mr. Harting also informs us that an old Welsh manuscript on British laws and customs contains statutes and regulations relating to hunting, in which the Bear was reckoned among the beasts of the chase, and that its flesh was esteemed as equal to that of the hare and the wild boar.

The writings of Archbishop Egbert and entries in 'Domesday Book' mention Bears as existing in England in the tenth century; and after the occupation of the Romans, Caledonian Bears seem to have been well known. Many were sent to Rome and used for the cruel exhibitions in the arena, as described by Martial. Camden also, quoting Plutarch, tells us 'that they transported Bears from Britain to Rome, where they held them in great admiration.'

Professor Boyd Dawkins, in his book on 'Cave Hunting' (p. 75), thinks that Bears were extinct in Britain probably before the tenth century, though they survived in Scotland until a somewhat later date.

Scotland.—Considering that Bears were probably common in the great forests of Caledonia in prehistoric times, it is strange that their remains, in either a fossil or a recent condition, should be so extremely rare as they are in Scotland. Indeed, there seems to be only one record of such a find—that of the skull and rib of a Bear which were found lying in the peat moss just over shell-marl, a recent formation, at Shaws in Dumfriesshire. The remains were those of a very large animal, and were in a semi-fossil condition.[2]

In prehistoric days the great Caledonian Forest stretched almost without interruption north of the Forth and the Clyde to Sutherland, and south of the Clyde in South Lanark, while another great mass of woods covered the whole

[1] *Brit. Zoology*, i. 91.

[2] Dr. J. A. Smith in *Proc. Soc. Antiq. Scotland*, xiii. 360, 1879.



The Brown Bear

From an adult male killed by the Author in Namdalen, Norway, Sept 1870

country southwards, through Cadzow right over the borders into Northumberland. Here the blue-painted Pict, as Fittis[1] says, 'could vary his fierce contest against the masters of the world with scarce lesser war against Bears, wolves, boars, and the wild white cattle, whose chase was the most exciting and perilous of all.'

The popularity of the 'Caledonian Bear' in Rome during the days of the occupation of Great Britain by the southern warriors has already been touched upon. We learn also from writers of the sixteenth century that Bears were numerous in Scotland in ancient times, though the exact date of their extinction is not mentioned.

Camden in his 'Britannia' (vol. ii. p. 293), speaking of a part of the Caledonian Forest, says, 'This Athole is a country fruitful enough, having wooded vallies, where once the Caledonian Forest (dreadful for its dark intricate windings and for its dens of Bears, and its huge wild thick-maned bulls) extended itself far and near in these parts.' In remote districts of the Highlands tradition tells of the former existence of great fearsome beasts, which might or might not be Bears. Stuart, too, and later on Harting and Fittis, point to Gaelic words such as *Magh-ghamhainn* (lit. the Paw-calf), and the names of places, such as *Ruigh-na-beiste* (lit. the monster's slope), and *Loch-na-beiste* (lit. the lake of the monster), as confirmatory evidence, but it seems to me that these names do not necessarily refer to the Bears at all; in fact, the last-named title is not rarely applied to sea lochs, which the common and grey seal were, and are still, in the habit of visiting. The word *beist* is still applied by the Gaelic-speaking people to the two species of seals commonly met with on the west coast of Scotland. Thus the grey seal is known as *Ta-beist* (water-monster) and *Danich-beist*, and the common seal simply as *beast* or *beist*. So these traditional names are scarcely evidence of the former existence of the Brown Bear.

Bell, in his 'British Quadrupeds,' says that Bears may have existed in Scotland as late as the year 1073, though tradition, which is all we have to go upon, gives the latest date as 1057.[2]

Writing on fables connected with the Bear as met with in Scotland, Fittis

[1] *Sports and Pastimes of Scotland*, p. 11.

[2] In the churchyard of Meigle, Forfarshire, there is a stone on whose face is engraved a chariot drawn by a horse. Underneath is a spirited hunting scene of a man shooting an arrow at a great beast, which is sculptured in the act of biting off the head of another man. The model of the monster is certainly a good representation of a Bear, and might easily have been intended to represent a hunting scene of the period (circ. Roman occupation). Tradition says that the stone was erected by an early Thane of Glamis when Scotland was one great forest.

says in the 'Sports and Pastimes of Scotland' (p. 13): 'The surname of the Clan Forbes is said to have arisen in connection with the chase of the Bear. An Irish chieftain, Ochonchar, came to Scotland, and hearing that a district in Aberdeenshire was ravaged by a Bear he went thither, tracked the destroyer to its lair, and was successful in putting it to death, for which exploit he was rewarded with lands, and the title of *Forbear* or *Forbeist* was given him, while he was also granted three Bears' heads as an armorial cognizance, which has ever since been borne by his descendants. Another version of the legend is to the effect that the hero killed the Bear to obtain the hand of a beautiful heiress, named Bess or Elizabeth, and on accomplishing his object he assumed the name of "For Bess." A third version relates that a boar, not a Bear, having devoured nine young women at a spring in the parish of Auchindoir, Aberdeenshire, it was "slain by a young man of the name of Forbes, the lover of one of the young women, and a stone with a boar's head cut on it was set up to preserve the remembrance of his gallantry and courage. The stone" continues the Old Statistical writer, "was removed by Lord Forbes to his house of Putachie; and it is from this circumstance that a boar's head is quartered in the arms of the family"—a mistake, the Forbes arms *being three bears' heads*. The spring where the tragedy happened was thenceforth known as the "Nine Maidens' Well." Ochonchar's slaughter of the Bear is assigned to the eleventh century, the year 1057; but the Brown Bear must have become extinct in Scotland considerably earlier than that date.'

Ireland.—Thompson, in his 'Natural History of Ireland' (vol. iv. p. 33), states that he is unaware of any evidence to show that the Brown Bear was ever indigenous to Ireland. Traditions of its former existence, and an Irish name similar to the Gaelic one, '*Math-ghamhainn*,' are put in evidence, but these cannot be accepted as conclusive, since no remains of Bears of a date subsequent to the Pleistocene age have been found in that country.

Dr. R. Ball,[1] Sir William Wilde,[2] Scott, and Dr. Carter are all very doubtful as to whether the remains of prehistoric Bears found in Ireland are those of *Ursus arctos*. Dr. Leith Adams, however, stated very definitely, in 'Recent and Extinct Irish Mammals,'[3] that with one possible exception—that of a skull from Co. Kildare—all the Ursine remains which he had examined from deposits and caves in Leitrim, Longford, Westmeath, King's County, Kildare, Waterford, and

[1] *Proc. Royal Irish Acad.* iv. 416, 1850. [2] *Ibid.* vii. 192, 1862.
[3] *Proc. Royal Dub. Soc.* 1878.

Limerick belong to *Ursus fossilis* (i.e. *priscus*) and that this species was probably the progenitor of *Ursus ferox*, or the so-called British Grizzly Bear.

This last-named type of Brown Bear certainly died out before the historic period, but that it was in any degree different from *Ursus arctos* is still open to question. Personally, I think that if ursine remains of the recent and the historic period were more plentiful than they are in England and Scotland, where numbers of the Brown Bear survived the second Glacial epoch, we should find many skulls of Bears as large as, and in no way differing from, *Ursus priscus*.

The length of an adult specimen of the European Brown Bear varies from six to nine feet, Pyrenean and Alpine specimens being the smallest, and eastern Russian the largest. The colour varies enormously from yellow white to black, but the commonest type is a warm brown with darker tints, with a pale straw-coloured stripe extending downwards across the shoulders. The old male figured in the photogravure and shot by myself in Namdalen in 1899 is a typical European Bear. It measured just seven feet from nose to end of tail, being a foot shorter than a very large almost black male killed in the previous winter near the same place (Trones). Eight feet is about the maximum length of a Norwegian Bear, and these individuals probably closely resemble the Brown Bear which existed in England in former days.

It is beyond the bounds of this work to give a detailed account of an animal not now inhabiting our islands. For these particulars I must refer my readers to works of a more general character.

Hunting the Brown Bear is a most exciting sport. I once ran and walked from seven in the morning till nine at night after a wounded Bear, and then darkness coming on my hunter and I were forced to abandon the chase. We had, curiously enough, stopped within two hundred yards of the spot where the Bear fell exhausted; the poor beast was found shortly afterwards by a woodman, and I was fortunately able to recover the skin before it was spoilt.

On another occasion my brother and I had a most exciting hunt in the Rockies after a huge Grizzly—so big a brute that I am afraid to say what its dimensions were. We both hit the beast hard, and after various exciting incidents it retreated into a great willow-swamp, where we followed it—for myself, I must confess, with considerable misgivings; but when one's companions show a disposition to do foolish things one must now and then follow suit. We did not find 'Old Ephraim' however, which was perhaps fortunate for us.

PINNIPEDIA[1]

THE WALRUSES

Family *TRICHECHIDÆ*

THE Walruses differ somewhat from both the eared seals, *Otariidæ*, and the true seals, *Phocidæ*, and yet maintain certain characteristics of both families. While possessing hind-flippers which bend forward under the body like those of the eared seals, they do not show any external ears, and in this resemble the true seals. In one marked respect they differ from either genus, namely in their dentition, which is coarser and more simply formed, whilst the upper canines are greatly developed; so much so as to form long tusks. The single existing genus embraces only one species, although American naturalists have endeavoured to obtain specific rank for the Walrus of the Pacific, whose differences are only external, principally in the longer and thinner tusks.

THE WALRUS

Odobænus rosmarus, Linnæus.

Trichechus[2] *rosmarus*, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 49 (1766).
Rosmarus arcticus, Pallas, 'Zoog. Rosso-Asiat.' i. 269 (1811).
Odobænus rosmarus, Allen, 'North Amer. Pinn.' p. 23 (1880).

Local Names.—*Sea-horse*, *Sea-cow* (English and American sealers); *Hvalross*, *Harvhest*, *Hvalruus* (Swedish, Danish and Norwegian); *Morse*, *Vache marine* (French); *Wallross*, *Meerpferd* (German); *Morsk* (Lapp); *Awuk* (Greenland Eskimo).

Characters.—The size of the Walrus is sometimes very great, reaching in some males to 15 feet (Fleming). Usually they are from 10 to 12 feet, and weigh

[1] I have not been able to prepare the *Mustelidæ* in time to insert them in their proper place, which should be after the *Ursidæ*

[2] The generic name *Trichechus* has been rejected, for it has been pointed out by Mr. Allen and Mr. Oldfield Thomas that it was based upon the manatee.



THE WALRUS.

TRICHECHUS ROSMARUS.

Printed in Vienna.

from 1,500 to 3,000 lbs.,[1] but Lamont gives it as his opinion that large bulls must weigh as much as 5,000 lbs. Lamont gives the length of a very large and fat cow as 11 ft. 5 in.,[2] whilst 10 feet may be taken as the length of the average female. Four mammæ are found in the female, about 15 inches apart. The head is rounded and the eyes comparatively small; the muzzle short, very wide, and furnished with abundant bristles. The skin is thick and covered with short brown-grey or greenish-yellow hair, which in old males completely disappears. The tail is small and rudimental. The toes of the fore-feet, five in number, are of nearly equal length, while in the hind-flippers the fifth digit is somewhat the largest, and is furnished with a large nail like those on the fore-feet. The webs of the hind-feet project beyond the toes when the animal is at rest. The adult Walrus generally possesses eighteen teeth, but sometimes the number is twenty or twenty-two. The cheek teeth are usually reduced to three pairs of premolars in each jaw, but occasionally there is a minute fourth premolar in each jaw and a rudimentary molar in the upper jaw. A single pair of incisors exist, and the canines of the lower jaw are similar in size to the premolars, which are crowned simply and are single-rooted. The upper canines are enormously developed, and are huge external tusks. Dentition: I. $\frac{2}{0}$; C. $\frac{2}{2}$; P.M. $\frac{6}{6}$ or $\frac{8}{6}$; M. $\frac{0}{0}$ or $\frac{2}{0}$.

Lamont says that the canine tusks vary much in size and shape according to the age and sex of the animal. 'Cow tusks,' he says, 'will average fully as long as bulls', from being less liable to be broken, but they are seldom more than twenty inches long and three pounds each in weight. They are generally set much closer together than the bull's tusks, sometimes overlapping at the points.' Good male tusks are about twenty-four inches and weigh four pounds each. A photograph of an unusually fine skull and tusks, in the collection of Sir Edmund Loder, is given. Wiegmann describes the milk teeth as being thirty-six in number; three pairs of incisors being present in each jaw.

Distribution.—Like the Greenland, the ringed, and the hooded seal, the Walrus is an inhabitant of the Polar regions. Formerly exceedingly abundant as far south as the Magdalen Islands and the Gulf of St. Lawrence on the American side,[3] and Bear Island and the coast of Finmark on the European coast, it has

[1] Two thousand two hundred and fifty pounds is the weight of an adult male as given by Dr. Gilpin, and Mr. F. G. Jackson gives the weight of a full-grown bull at 2,000 lbs.

[2] *Yachting in the Arctic Seas*, p. 77.

[3] The southern limit on the western side is now the coast of Labrador. A few are killed every winter as far south as Hopedale. The spring seal-hunters occasionally kill them on the broken ice north-east of Newfoundland, and in 1886 a large male was killed not far from Halifax, Nova Scotia, and brought in, in a fresh condition, to that port.

gradually through persecutions been driven further and further up into the Polar coasts, till in some of its favourite homes, such as the seas about Spitzbergen, it is almost threatened with extinction.

There is little doubt that the Walrus inhabits the whole of the Polar seas of the Northern Hemisphere. It is still fairly abundant in western Greenland, and has been seen as far north on the eastern coast of the New World as explorers have penetrated. It is found about the Liverpool coast of east Greenland, as I was informed by Mr. Fries, who sent two ships there in 1899, and occasionally is seen off the west coast of Iceland. Spitzbergen and Nova Zembla were ever its favourite resorts, and notwithstanding the continual persecution by Norwegian and Russian Walrus-sloops, it is still fairly numerous far to the east of Spitzbergen. Walruses were seen by the Swedish North-East Passage Expedition of 1878 as far east as the mouth of the Jenesei, and we know from the accounts of recent travellers that the Tuckches of Behring Straits live largely on these animals, and that they are also found in some numbers on the Alaskan coast.

Formerly when Walruses were plentiful at Spitzbergen, as they were so recently as 1860, we might expect an occasional straggler to visit the coast of Great Britain. But every year makes this chance more remote, so that the great 'sea-horse' has really but poor claims to be regarded as a British mammal; and still less is there a chance of seeing a British specimen in any of our museums, although it has without doubt occurred on our shores on several occasions during the past century.

The first undoubted instance which is recorded is the example which was shot on the rock of Caolas Stocknis at the entrance of Loch Stocknis, Harris, N.B., in the year 1817. This animal was seen and examined in the flesh by the naturalist MacGillivray.[1] It was over ten feet in length, according to Fleming. The occurrence of this large animal is still spoken of in the village of Obbe, Harris, where in 1897 I met men who spoke of their fathers as having seen the monster. Hamilton, in his 'British Quadrupeds' (p. 223), says that an individual was killed in Orkney in 1825, which he himself saw. It 'was about ten feet in length,' with head 13½ inches long. The tusks were only 8½ inches exposed, so that the animal cannot have been an adult. Writing in 1837, Dr. Edmondston, in his paper on the seals of Shetland, says that an adult Walrus was killed near the island of Fetlar in the summer of 1815, and that another was seen a few days afterwards not far from the same place. Buckley and Evans[2] mention two other instances

[1] *Edin. Phil. Journ.* 1820, ii. 387.

[2] *A Fauna of the Shetland Islands*, 1899.



SKULL OF MALE WALRUS.
From a specimen in the collection of Sir E. Loder.
Length of exposed tusks 27 inches.



WALRUSES AT HOME.

of the Walrus having been seen in Shetland, and at Hillswick in 1902 I heard that a Walrus had been killed there at the beginning of the last century, but I could get no further particulars.

In the Orkneys the Walrus has without doubt been seen several times. Baikie and Heddle say that one was killed in Eday in 1825, and Professor Heddle of St. Andrews told Mr. Harvie-Brown that he himself saw an adult and a young Walrus in 1849 or 1850 off the coast of the parish of Walls. Harvie-Brown and Buckley give other instances of its reported occurrence in Orkney.[1] Recently Major-General Kinloch has sent me word that a Walrus was seen several times in the northern islands of Orkney during the autumn of 1902. In addition to the Hebrides specimen already alluded to, another Walrus was killed in April 1841 on the East Haskeir, near Harris, by Captain MacDonald, R.N.,[2] and in Harvie-Brown and Buckley's 'Fauna of the Outer Hebrides' there is the following passage:—'Captain MacDonald of Waternish, Skye—perhaps one of our most experienced seal-shooters and otter-hunters in Scotland—told Harvie-Brown that a Walrus was distinctly seen two years ago (1877) close to the point of rock near Stein. It was afterwards seen off the coast of Sleat, in Skye, and fired at by a keeper, who correctly described the animal.'

In Ireland there is no record of a Walrus having been taken, but Mr. Charles Akroyd, who is well acquainted with seals, told me that he saw a large Walrus in the summer of 1897 off the mouth of the Shannon. The sea was perfectly still, and the Walrus came close to the yacht and could be plainly seen.

Habits.—The Walrus was known to the dwellers in northern Europe at an early period in history. A famous Norman named Othere, according to Von Baer, in one of his voyages beyond the North Cape seems to have met with herds of these animals and killed a few, some of the tusks of which he is said to have given to King Alfred[3] about the year 890. From this date there is a chain of evidence of the existence of the animal. The Finns hunted the Walrus on the coast of Finmark as early as 890; Walrus tusks were an article of trade with the Tartars in the twelfth century, and nearly all early Scandinavian writers speaking of northern travels mention the remarkable and fearsome beast.

Naturally many distorted and quaint descriptions of the animal were given by

[1] *Fauna of the Orkney Islands.*

[2] Dr. R. Brown in the *Annals and Magazine of Natural History*, 1871. Dr. Brown (*Proc. Zool. Soc.* 1868) mentions two others he had heard of, one in Orkney in 1857, and the other reported by fishermen about the same time.

[3] *Hakluyt's Voyages*, i. 5.

early writers such as Gesner (1558) and Olaus Magnus (1555), and the pictures given by those writers of *Rosmarus* and *Vacca marina* are exceedingly quaint. They represent strange vertebrates with fish tails and wings, in two cases having heads and tusks like pigs, and in the third a badly drawn Walrus head. The first accurate picture was drawn from life of a young animal which, with the stuffed skin of its mother, arrived in Holland in 1612, and was published by Hessel Gerard.[1] This picture was copied in scores of books, but no good pictures of the animal appeared until Wolf and Sclater's 'Zoological Sketches' were published in 1861. In this work there is a good drawing by Wolf of a young animal then living in the Garden of the Zoological Society.[2]

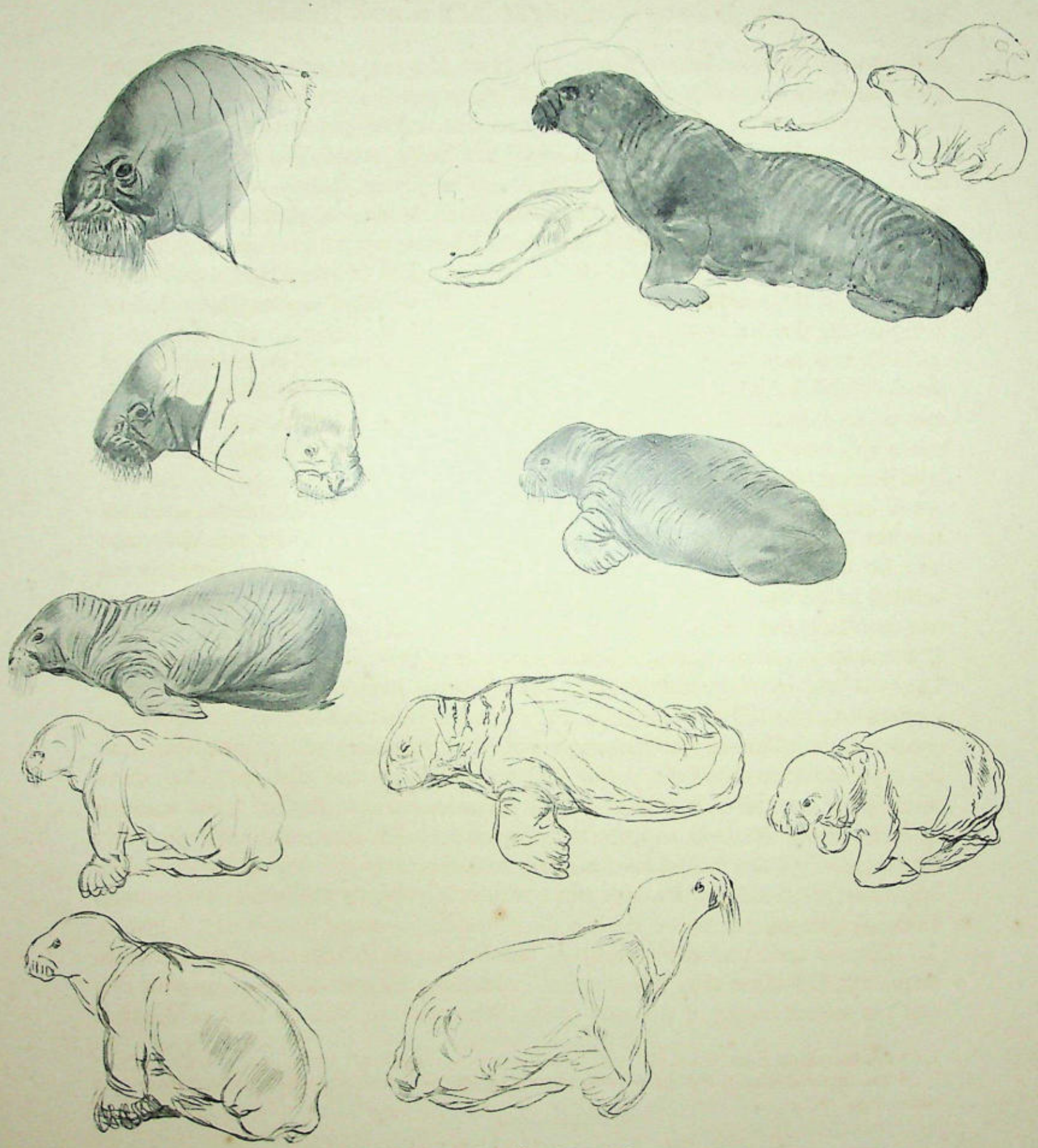
We now have many excellent accounts of the Walrus and its habits, notably the delightful book by Mr. Lamont entitled 'Seasons with the Sea-Horses.' In the case of an animal whose appearance off the British coasts has been so infrequent, and which seems unlikely to visit our shores again, it is only necessary to give a brief account of its habits.

Walruses are gregarious, but like to live apart from the northern seals. They love the ice floes floating in the neighbourhood of rock-shores, and are rarely seen very far to sea. They huddle together on cakes of ice, where they lie sleeping and basking in the sun. In May and June the females give birth to a single young one, at which time they repair to the land, and sometimes go without food for a fortnight or three weeks. Immediately after this the sexes *breed* together. They are said by some authors to be monogamous, but this point requires further confirmation, as it is exceedingly unlikely that they differ in habits from the polygamous seals. The females undergo a period of pregnancy of nearly one year and are supposed to suckle their young for two years, so that not less than three years elapse between each birth. In July the sexes separate, but are found together again in mixed herds in August and September. Dr. Kane says that Walruses have breathing-holes in the ice like seals, and that they live among much thicker ice. The same author also says that they will sleep in the water between the fields of drift ice.

Lamont speaks of the roaring of the Walrus as being heard several miles away, and Dr. Kane says the sound is 'something between the mooing of a cow and the deepest baying of a mastiff: very round and full, with its bark or detached

[1] See Allen, *North Amer. Pinn.* p. 96.

[2] The original sketches by Wolf (here figured) of this young Walrus are now in my possession. Mr. Thorburn has a similar series.



STUDIES OF A YOUNG WALRUS.
From life, by J. WOLF.

notes repeated rather quickly seven times in succession.' Like nearly every other animal, unless molested the Walrus is of an inoffensive disposition, but when attacked it is a fierce and at times dangerous antagonist. A strong mutual sympathy as well as great affection for their young cause these animals to act in concert both in attack and in defence, and it is no wonder that the aspect of a herd of these fierce-visaged sea monsters caused such consternation in the minds of the early voyagers. In the graphic words of Mr. Lamont :—'The upper lip of the Walrus is thickly set with strong, transparent, bristly hairs, about six (sixteen?) inches long, and as thick as a crow-quill; and this terrific moustache, together with his long white tusks and fierce-looking, blood-shot eyes, give *Rosmarus trichechus* altogether a most unearthly and demoniacal appearance as he rears his head above the waves.'

A most interesting account of the habits of the Walrus as noted by Herr Muller appeared in the 'Dansk Iagttidindi' in 1900. This has been translated by the well-known writer on Scandinavian subjects 'Snowfly' of the 'Field' (Dec. 8, 1900) and is worth quoting. The observations recorded were taken in north-west Greenland in the summer of 1899.

With regard to the general habits of the animals Herr Muller says:

'Along by Kigtlorsalik and out in the channel were also many Walrus, and I think that altogether there must have been at least a hundred and fifty. All forenoon I did nothing but study the Walrus through my glass, and was able to observe very clearly all their movements and proceedings. Those on the islet consisted for the most part of young males and of females with young, of which some were very small. I saw only one large male, but he was a real veteran, with mighty tusks and throat almost white with age. In the water, on the other hand, there were many old males with huge tusks. When one Walrus was disturbed in its sleep by another knocking up against it, it would raise the fore-part of its body with an angry trumpet-like roar, three or four times repeated, which reminded one somewhat of the baying of a hound, and caught at the disturber of its peace with its teeth. If he could not get at that particular animal, he went for the back of the one nearest him, which again passed the compliment on to his neighbour, and so on until there was a general uproar. As there were always animals wishing to ascend and secure a good place, and one or more which had been disturbed in their slumbers, there was an incessant growling which was almost deafening. About one fourth of the creatures had from one to four wounds in the back, from which blood flowed in streams, without their being apparently in the least

inconvenienced; it did not even prevent their sleeping. Sometimes two, lying with their heads against one another, would raise themselves at the same time on their fore-paws, and, repeatedly growling, would threaten one another with their teeth, all the time holding their heads very high in the air. They seldom, however, got so far as seizing one another, but, as a rule, they both appeared to lie quietly down again. Similar, too, was the behaviour of the old males in the water. When they came too near one another they would raise themselves high above the surface with mighty roars, as if they would attack one another; but this they seldom did, and both would disappear under water. The roar which they most frequently uttered sounded like "Oh! Oh! Oh!" repeated rapidly, and was very loud and ear-piercing, reminding one somewhat of a trumpet-call; sometimes it resembled exactly the grunting of an old boar, but was much louder; while now and again a very deep roar was heard, probably emanating from one of the old males, which sounded like that of a bull, only much louder and more resonant. I also several times heard a fourth and very peculiar note, which so resembled a steam whistle, being ear-piercing and prolonged, that, if heard in a fog at sea, one would feel certain there was a steamer in the neighbourhood. I heard it from animals both in the water and on shore, but could not ascertain whether males or females uttered it, or what it signified.'

Herr Muller also gives a pleasant picture of the domestic relations of the species.

'While the larger animals, especially the young males, were somewhat intolerant towards one another, the small ones seemed quite secure, and I did not see any of them clutched at. They scrambled quite unconcernedly over their elders without the latter taking any notice, and generally ended by going to rest on their mother's back. Thus I noticed quite a little one creep under the head of the old bull, and he, disturbed in his slumbers, immediately rose with a roar prepared to strike out; but when he saw that it was only a youngster he at once quietly lay down again. The mothers appeared to entertain great affection for their young, and looked carefully after them. If any of the other Walrus came too near a little one, it promptly received a blow from the mother. Nearly at the top of the islet there was a ledge about three feet or four feet high, and upon it a female had stretched herself. Her young one, however, was so small that it could not, in spite of repeated attempts, get there. It could just manage to place its forearms on the ledge, and thus draw itself up so far as to rest its chest there; but it could not obtain a purchase from behind, and so hung with its hind-quarters in the air.

When tired of holding on it fell off backwards again. The little creature, however, was indefatigable, tried again and again (at least ten times), and made the most violent efforts, but without success. During the whole performance the mother looked on from where she lay on the ledge, and appeared to be encouraging her offspring, but when she saw that it could not get up and continued to cry (which I could see through the glass, but could not hear, as its voice was drowned by the roars of the other animals), she descended from her hardly earned position, which was at once occupied by another Walrus, lay down by the side of the little one, and gave it suck.'

Owing to its slowness or ignorance of human character, the Walrus is easily shot, or harpooned first and then shot as it rises to the surface. When found on land it is practically helpless and easily slaughtered. According to Lovel Shuldam,[1] as many as fifteen or sixteen hundred have been killed in a single attack by men on the Magdalen Islands, and Lamont mentions nine hundred killed in a single day (August 1852) by two ships' crews from English ships at Spitzbergen. Yet in the water the Walrus is sometimes a formidable antagonist, for many Esquimaux have been killed by them.

The food of the Walrus consists largely of molluscs, which it digs from the sea bottom with its tusks. It also takes fish, and Mr. Robert Brown says it will eat the flesh torn from dead whales. Land-worms, *algæ*, starfish, cockles, and clams are also said to form part of its diet. Like the sea-lions, the Walruses swallow quantities of small stones and gravel, which they are in the habit of casting up near their breathing-holes.

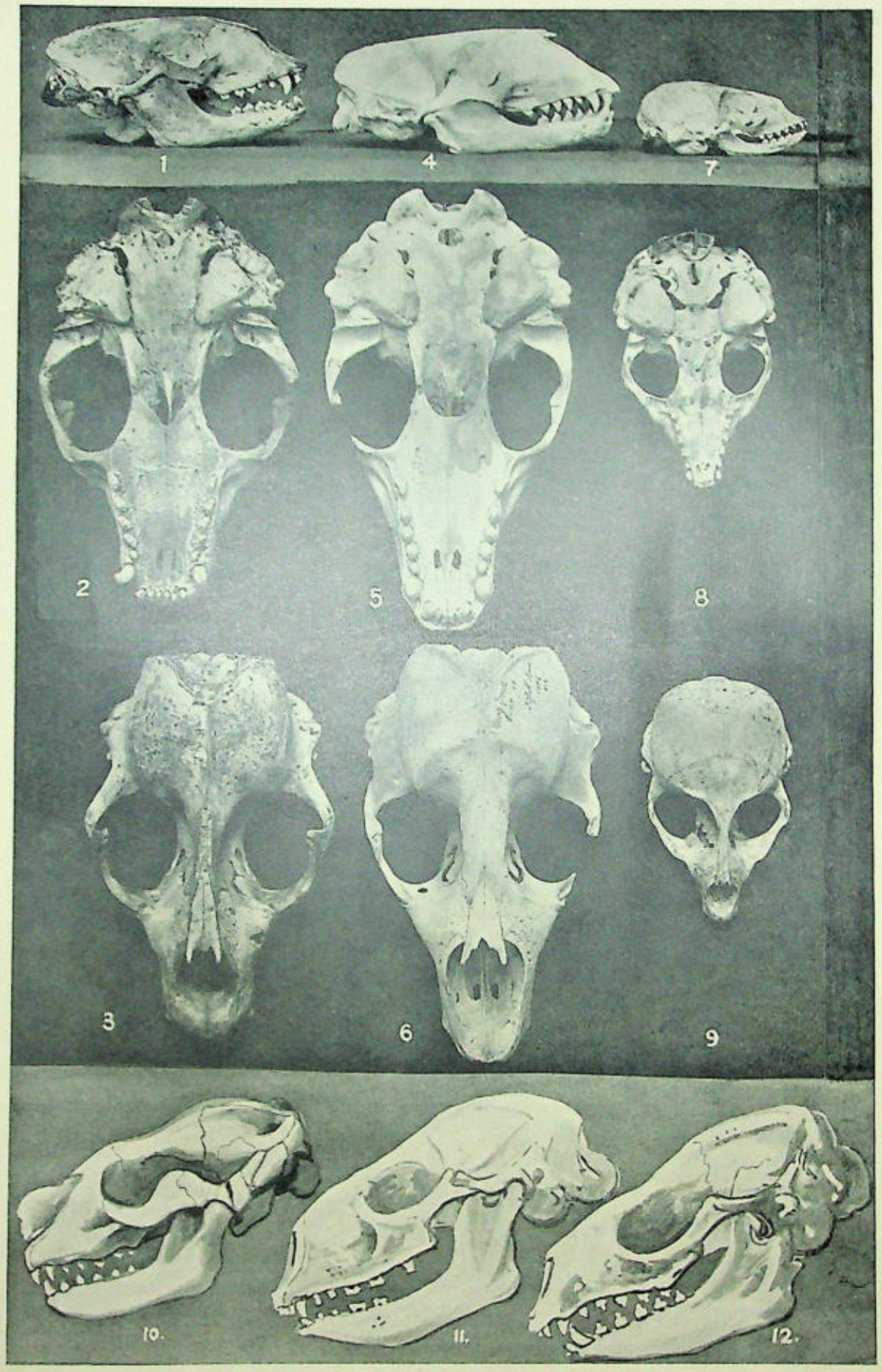
I will conclude these short notes on the Walrus by describing a hunting adventure recently told to me by Lord David Kennedy, who was Mr. Lamont's comrade in two of his northern trips to Spitzbergen after the Walrus:

'Our usual plan to kill the big bulls was to creep up as close as possible to the sleeping herd, and then the harpooner in the bows would transfix the best animal with his harpoon at short range. On being struck the Walrus at once dived off the ice into the sea and we had a few moments of intense excitement, for the wounded beast followed one of two courses: he either went off at full speed, dragging the boat after him, or went straight to the bottom and "sounded." After finding that both these manœuvres were unavailing to shake off the line, the males nearly always came to the surface and charged the boat, when straight and quick shooting was the order of the day. One day when Lamont

[1] *Phil. Trans.* lxv. 1775.

was aboard I heard Walrus roaring close at hand, and foolishly thought it would be an interesting experiment to try to spear two bulls at once, as Lamont's and my harpooners were rival throwers. We went off from the yacht and got well up to our game, and both the harpooners rising at once transfixed the two biggest bulls in the herd. Generally the speared Walrus makes off, towing the boat, but in this case we got into fearful trouble, for one made off as hard as he could, and the other sounded immediately below the boat. A scene of indescribable confusion followed, and the lines becoming entangled the boat was upset and we were all thrown into the sea. Apart from the risk of being attacked by the exasperated herd we had no little difficulty in getting clear of the floating tackle and were in danger of being caught under the boat, which was dragged this way and that like a perch-float. Some of the men, however, got out on the ice and two on the keel of the boat, whence they dragged me out of the water. Meanwhile I had managed to keep my rifle above the water. This was very fortunate, for I had hardly climbed in a sitting position when one of the big bulls came up within ten yards and charged the boat. A shot through the head, however, stopped him, when he was immediately followed by the second animal that had been harpooned, and him, too, I luckily succeeded in stopping. It was a long time before we got the boat righted, and so, nearly frozen and perished with cold, we made the yacht in safety after one of the most unpleasant experiences I ever remember.'[1]

[1] In these days, when ladies and boys in their teens are dubbed great big-game hunters after having shot two or three tigers from machans or the safe howdah of an elephant, it is refreshing to look back on the genuine deeds of skill and daring performed by some of the old hunters like Lord David Kennedy, who really took their lives in their hands in encounters with dangerous beasts. Lord David in some ten years in India killed no fewer than fifty-six tigers. These were all shot 'on foot' with old-fashioned muzzle-loaders, with which few would care to trust themselves to-day.



SKULLS OF BRITISH SEALS.

1, 2, 3. Common Seal, Adult Male. 4, 5, 6. Grey Seal, Half-grown Male. 7, 8, 9. Ringed Seal, Immature Female.
10. Hooded Seal, Adult Male. 11. Bearded Seal, Adult Male. 12. Harp Seal, Adult Male.

THE TRUE SEALS

Family PHOCIDÆ

ALTHOUGH closely allied to the terrestrial Carnivora, the true Seals possess no flesh-teeth, and both pairs of limbs, instead of being suitable for use on land, are modified so as to form flippers which are well adapted for aquatic locomotion. Hence the Seals are known as *Carnivora Pinnipedia*, or flesh-eating mammals with fin-like feet.

Such well-known creatures as Seals require little general description beyond saying that their forms are massive and conical in shape, whilst the limbs are short and specialised. Each extremity possesses five toes connected by webs of skin, and, unlike the land flesh-eaters, the first and fifth toes are generally longer than the three middle ones. The tail is short and thick. In the case of the true Seals the passage to the internal auditory organs opens direct upon the side of the head.

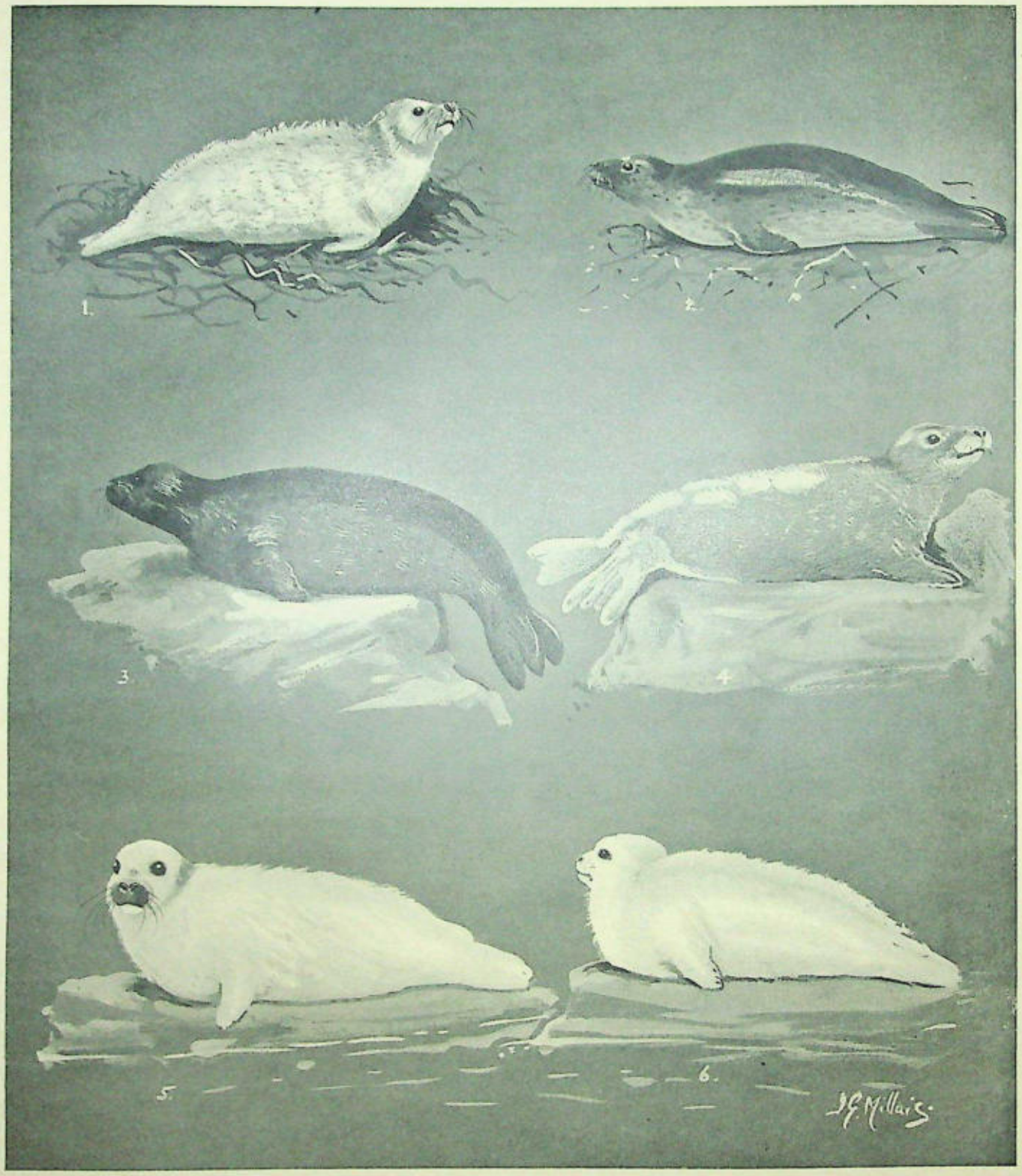
The British Seals include six species embraced in four different genera: first, *Halichœrus*, the Grey Seal; second, *Phoca*, which includes the Common Seal, the Ringed Seal, and the Harp Seal; third, *Erignathus*, the Bearded Seal; and fourth, *Cystophora*, the Hooded Seal. Of these the Common and the Grey Seal are resident in numbers on certain parts of the British coasts, while the others may be termed rare visitors to our shores from the Arctic regions. The Bearded Seal has least claim to be regarded as a British Mammal, as it has occurred only once in Britain.

With regard to the skulls and teeth of these animals I have taken advantage of the excellent descriptions of Dr. Edmondston and Mr. Allen, illustrating these with photographs of the skulls taken in various positions.

Dr. Edmondston thus criticises and explains the main differences between our two best-known Seals. I have, however, substituted the word *grypus* for *barbata* wherever such occurs. 'The cranial cavity,' he says, 'is smaller in proportion to

the size of the animal and to the bones of the face in *grypus* than in the Small Seal; the bones generally are thicker and coarser; the ridges and prominences for attachment of muscles more projecting. The cranial cavity is wider behind in the *grypus*, swelling more laterally in the *vitulina*; the distance from the frontal bone to the end of the jaw much greater in the *grypus* than in the *vitulina*. In the former species considerable differences exist in size, general form, and in the development of particular parts in the crania of different individuals—hardly any two being alike. The jaw of the male is longer than that of the female; and the bones of the nose are broader, coarser, and more arched. The external aperture of the nasal bones is in this species much greater than in the other. In the teeth of the *grypus*, also, much diversity exists. In some specimens the molars are very wide asunder, in others almost in contact. The tubercles on them are in some very distinct, in others the central one only remains, giving the grinders the appearance of a row of small canines. In one example of an adult cranium in my possession there are only four molars on each side of the lower jaw, and most obviously there never have been more. In colour the teeth are yellow; in substance soft, like the ivory of the walrus. This seems to account for their being, comparatively with those of the *vitulina*, so much worn and smoothed, and so varied in different crania. The fangs of the canines are premorse, and not deep in the sockets. The teeth of the *vitulina* are pearly, enamelled, very hard, and splintery; the canine fangs conical, long, and penetrating deep into the alveoli. As the *grypus* feeds chiefly on the larger and cartilaginous fish, the molars may require to be formed somewhat like the canines, for the purpose of giving a firmer hold; while the *vitulina*, feeding principally on the osseous fish, and possibly now and then on *crustacea*, needs this structure less, but more facility of mastication.'

According to Mr. Allen, the skulls of the Ringed Seal vary considerably in both structure and proportion, but he gives an average length of 186 mm. and breadth of about 115 mm. for old males, and for females a length of 168 mm. and breadth of 108 mm. As regards his elaborate description of the teeth, I fear it is somewhat confusing and not of much use to the general student, as it is practically impossible to identify this species by the teeth alone, owing to their great variability both in size and in the number and shape of the accessory cusps. Sometimes the third and fourth upper molars are three-pointed, while in others they are two-pointed, and in one skull he examined 'all are three-pointed, including even the first. The lower molars are less subject to variation in respect



THE YOUNG OF BRITISH SEALS.

1. Grey Seal, 2 days old. 2. Common Seal, fœtal, just before birth. 3. Hooded Seal, about 1 week old.
4. Bearded Seal, about 1 week old. 5. Harp Seal, 1 day old. 6. Ringed Seal, 1 day old.

to the number of points, they being almost invariably four-pointed, except the first, which is usually three-pointed.' Being so nearly allied to the Common Seal, whose teeth also present a similar irregularity, no sound conclusion can be arrived at by a comparison of their teeth; but the skulls of adult *fœtida* are never so massive as those of *vitulina*, and there is a much larger and broader brain cavity in proportion, in the case of the smaller Seal, as will be seen from the photographs. The jaw, too, as well as the teeth of the Ringed Seal are also of more delicate construction. Of the skulls of the Harp Seal, Allen states that 'female skulls appear rarely to exceed, or even quite attain, a length of 200 mm., while old males range from about 210 mm. to 228 mm.' As regards the teeth he says, 'Here the age and sexual variations appear to be strictly parallel with those already described in *Phoca fœtida*.' The variations are also less marked. The teeth of the Greenland Seal are similar in position and delicacy of construction to those of the Ringed Seal. They are well separated by diastemata, and not crowded together as in the Common Seal.

Though ill adapted for progress on land, the Seals can nevertheless move at a fair rate over a tolerably even surface by throwing themselves forward in repeated plunges, the front and hinder part of the lower body resting alternately on the ground. Yet no animals, not even 'the bat in its aerial flight, the mole in its subterranean excavations, and the horse and the stag in their swift terrestrial course,' as Bell aptly says, exhibit a more perfect adaptation of form and structure to the exigencies of their aquatic life than do these animals. Their close hair and reserve of blubber meet like an impervious armour the loss of heat which may ensue from changes of temperature or scarcity of food. The nostrils too are another powerful provision of nature, preventing as they do any entrance of water when the animal is submerged; and the peculiar structure of the eye by which the vision is adapted, so as to pierce the gloom of the ocean depths, is another marvel of creation. The whiskers, armed with sensitive nerves, warn the creature of the proximity of obstacles.

The Grey Seal.

Halichœrus grypus, Fabricius.

Phoca grypus, Fabricius, 'Skriv. af Nat. Selksk.' i. 167 (1791).
Halichœrus griseus, Nilsson, 'Faun. Skand.' i. 377 (1820).
Phoca gryphus, Fischer, 'Synops. Mamm.' p. 239 (1829).
Halichœrus gryphus, Bell, 'Brit. Quad.' p. 278 (1837); 2nd ed. p. 262 (1874).
Halichœrus grypus, Gray, 'Cat. Seals and Whales Brit. Mus.' p. 34 (1866); Allen, 'Mem. True Seals North Pac.' ('Bull. Amer. Mus. Nat. Hist.' Dec. 1902).

Local Names.—*Grey Seal, Great Grey Seal, Big Seal* (English); *Great Selkie, Ocean Seal, Atlantic Seal* (Scottish); *Ta-beist* (water beast), *Danich beist* (Mull, Coll, and Colonsay, West of Scotland); *Haaf-fish, Great Selkie, Orkennie* (Orcadian and Shetlandic); *Tapvaist, Rōn Mohr, Ron Haisgeir, Cullach, Cullach Cuain* (Hebridean); *Ut-Selur, Wetrar-Selur* (Icelandic); *Grauer Seehund* (German); *Krumsunde de Sæl* (Danish); *Graasælen, Graa-hafs skälen, Grå Siäl, Grå Skål, Stokkobbe* (Swedish and Norwegian); *Kut* (the Baltic Provinces); *Grand Phoque* (French); *Square Phripper, Square Phipper, Square Flipper* (Newfoundland); *Horse-head* (Gulf of St. Lawrence and Anticosti); *Apa* (Labrador Esquimaux).

External Characters.—There is no European mammal, exclusive of the whales, whose pelages and life history are so little known as the Grey Seal. If we look through the past history of the animal we find only endless confusion with another large Pinniped, namely the Bearded Seal, *Erignathus barbatus*, to which the Grey Seal certainly bears a somewhat similar appearance in the adult state. After various accounts suggestive of its rank, Fabricius in 1791 gave the first systematic name to the Grey Seal, and pointed out many of its main characteristics; but even after this date little was known of it, and to this day such experienced and practical men as the Dundee and Newfoundland Seal captains fail to recognise any difference between the large ice Seal and the dweller on the rocks. Both species are known to them as the *Square Phripper* or *Square Flipper*. But even with all the strides that have taken place in modern zoology, we find on turning to recent literature but few references to the Grey Seal, but little of its habits, and practically nothing as to its pelage, growth, and the more interesting points of its life history.

Dr. Edmondston gave us an admirable little paper in the 'Seals of the Shetland Islands' in 1837, and Mr. Robert Collett has written a good account of the breeding habits of the species, taken from observations in the Fro and the Vigten Islands in Norway, and published in the 'Zool. Soc. Proceedings,' 1881, but Mr. Allen in

such an authoritative work as 'Pinnipeds of North America' confesses that he is only able to describe the species from two skulls and skins, whilst his general descriptions are taken from the writings of many who knew the animal only slightly or from hearsay. European museums, too, even our own admirable collection, seem to suffer from a lack of specimens, and without the examination of a very large series it is impossible to describe accurately this interesting animal.

It is this difficulty of obtaining skins and the fact that the animal must be hunted in dangerous and exposed situations that have caused our want of knowledge. Some years ago when I commenced to study the Seals inhabiting our coasts, I saw how necessary it was to obtain a large series of skins and skulls before expressing any opinion; but now after several expeditions to nearly all the British haunts of this animal and the examination of over a hundred and fifty skins I am able to come to some definite conclusions with regard to the pelage and gradual life-growth.

In the first place there is no mammal not subject to a very wide distribution, such as *Ursus arctos*, which evinces so many types of pelage and intermediate forms, and this is all the more remarkable because all these various colourings and modulations are found in a single colony of animals inhabiting one group of rocks. These types are as follows:

Adult Males

Four distinct types are found, as well as every intermediate form between them, that is to say, specimens may occur which are composite of two, three, or even four types.

1. *The Black Male.*—Hair all over body very dark ash-grey and sometimes jet-black. Commencing at the angle of the jaw and extending round sides of neck are certain bands of longer hair usually darker than the rest of the pelage and often curling.[1] In this type the under parts are generally slightly lighter with a brownish tinge, and the whole crown of the head light grey. I have, however, seen two complete melanic forms which were quite black all over. The black type is somewhat rare and occurs in about one in twenty individuals.

[1] When in full coat in October the old males frequently grow hair on the neck which is much longer than the pelage on the rest of the body, and in the case of the light grey males these ridges of hair are often long lines of black which, as Edmondston has already noted, gives the animal the appearance, when rearing his head out of the water, as if several small ropes encircled the throat.

2. *The Light Grey Male.* — This form usually has dun-coloured under parts and flipper-pits. All the upper portions are a pale grey, and black 'ropes' of curling hair partially encircle the neck and extend as far as the shoulders. Crown of the head silvery grey, and muzzle slightly darker. An uncommon type.

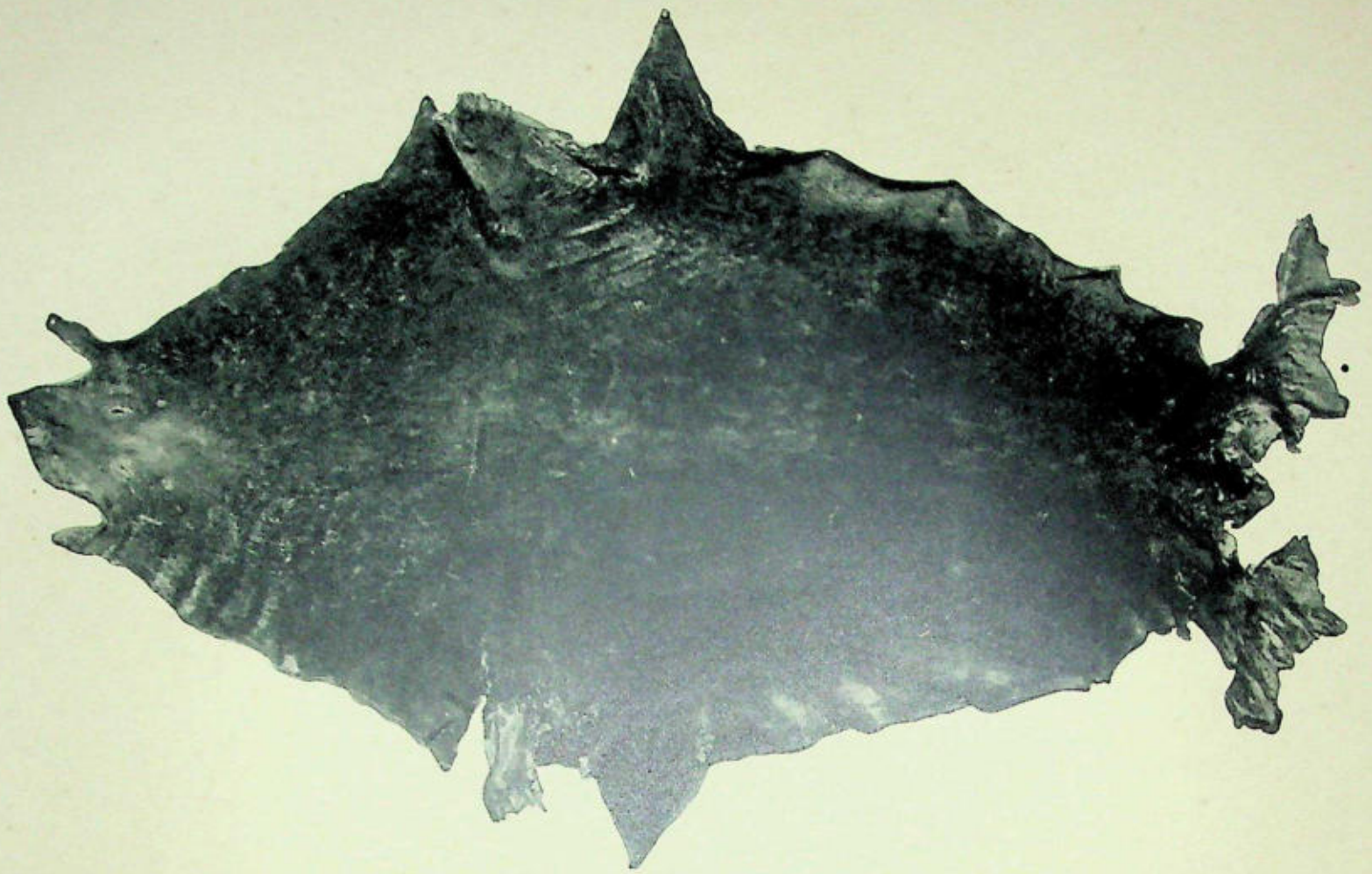
3. *The Blotched Male.*—This is practically a composite form between the two preceding, but the belly is generally a white ground with heavy grey and black blotches superimposed. The upper surface is light grey with large dark blotches of blackish grey. Crown of head pale silvery grey and muzzle brownish black. Occasionally this type has dun marking on the belly and flipper-pits. A common type.

4. *The Grey Spotted Male.*—This pronounced type has a strong line of demarcation between the upper parts, which are a pure grey, and the throat and belly, which are pure white. Over the whole of the upper and lower portions of the pelage are scattered a number of large black spots. A few small spots are sometimes seen on the sides of the head, the muzzle, and the flippers. Crown of head pale grey. This is by far the commonest type of adult male and quite sixty per cent. belong to this form. The 'rope'-like markings on the neck are seldom seen in this type.

Although I have never yet seen a specimen I have strong reasons for believing that sometimes silvery grey-white adult males may occur. These are probably not albinoes but simply extremely light-coloured examples of the light type on which there are no spots, and have been seen lying on rocks with sun playing on them. Mr. Sutherland, the keeper at Kintradwell, Sutherland, who has seen and shot many Grey Seals, stated in a letter to me that he had twice seen a big male that was pure white, and for two seasons a big white male has frequented the outer skerries near Belmullet, and been seen several times by Philip Lovell, the 'king' of Innishkeara, who has lived amongst these Seals all his life.

The pelage in the adult, both male and female, is short and somewhat rigid. In the late summer and autumn it is rather sparse but is close and pretty thick from February to May, when it is in best condition. Mr. Allen and others who have since quoted from his writings say that the hair is often recurved at the tips, but this is not my experience, except in stuffed specimens subjected to artificial heat.

The skin of the adult male emits a pungent odour resembling coal-tar, and



THE GREY SEAL.

The Black Adult Male. Length 9 feet 2 inches. Shetlands.



THE GREY SEAL.

The Spotted Adult Male. Length 9 feet 3 inches. Coll, Hebrides.

Scale of Feet

0 1 2 3 4 5 6 7 8 9 10 ¼ ½



THE GREY SEAL.

The Blotched Adult Male. Length 9 feet 6 inches. Shetlands.



THE GREY SEAL.

The Grey Adult Male. Length 9 feet 3 inches. Shetlands.

(Same scale as opposite figures.)

this scent is strongly retained after curing, as is the case with petrels, etc. In the females this odour is scarcely noticeable, and is nearly lost after death.

Adult females are represented by two distinct types, the light and the dark form. They are much paler in colour than the males, and vary less in their pelage.

1. *The Light Grey Female.*—Quite ninety-five per cent. of female Grey Seals conform to this pelage. A pure bluish grey is found over all the upper parts, while a pure white hair covers the belly and throat, a few black spots are generally seen on the shoulders and fore-flippers, and the lower throat is well marked with black spots. When in full coat these females possess a beautiful silvery sheen over the whole coat, which, taking on the lights of the surrounding sea and sky, gives to the pelage an iridescence of many hues. The crown of the head, although a very pale grey, as well as the flanks are especially bright, and at a distance the Seal looks silvery white.[1]

2. *The Dark Spotted Female.*—I have never seen a 'black' female, although I have reason to believe that such have occurred. The common type of dark female had the usual demarcation of grey upper parts and whitish under parts, but the whole is so suffused with ashy grey and black spots and blotches that the whole pelage appears to be blackish grey. The muzzle is dark, and the crown as usual pale grey.

If there is one external characteristic which marks out the Grey Seal for superficial identification, it is the pale grey crown of the head. This feature is present in nearly every example of both male and female of whatever type, and I have been able with certainty to identify this Seal, even when swimming in the sea at a distance of half a mile, from the Common Seal, whose head always looks black, bullety, and glistening.

In adults the mystacial bristles are abundant, and very stiff and curiously crenulated, which gives to certain old males a rather 'walrusy' look. The snout is unusually elongated, especially in the old male, while the muzzle is very broad and fleshy, with the nose aquiline. These characters are more subdued in the female, and her eyes have a more benevolent expression. The eyes of the old male are somewhat sunk, and when angered he has, like the big carnivora, a most

[1] The variation of the colour in a single specimen of the Grey Seal is most remarkable when the light strikes it in different ways. An adult female lying on a rock with the sun directly overhead looked almost silvery white; in a side light sea-green; and, afterwards in a room without the influence of outdoor effects, a pure grey. The reader must therefore feel some sympathy with the artist who has to reproduce such chameleon-like changes in the coat of a single animal.

ferocious expression. In the fore-feet the first two toes are of equal length and have large nails, while the hind-feet are deeply emarginated, the outer toes forming long fingers and possessing only small nails. In very old males these nails become almost completely worn away, and the animals do not seem capable of renewing them. The length of adult males varies from 7½ to 10 feet. From the measurements taken by myself of twenty-seven adult males I find 8 feet to 8 ft. 6 in. to be the common length; 9 ft. 6 in. is the largest animal I have handled, but I have little doubt that monsters of 10 feet and even over are sometimes to be found, and think that I once shot and lost one as large as this. The statement that males of 12 and 13 feet have been captured must be accepted with reservation, and it must be recollected that the usual sportsman measures his Seal from the nose to the end of the hind-flippers, and not from the nose to the end of the tail, as he should do. The adult males vary a good deal in weight, as some of them are long, lanky-looking creatures, and others very short for their size and thickset.

A big male shot by Sir Reginald Cathcart on South Uist weighed 50 stones, and in the 'Vertebrate Fauna of Argyll and the Inner Hebrides' Harvie-Brown and Buckley state: 'Mr. Henry Evans records the weight of one he killed at 48 stones, and he has known them to reach 9 feet in length. We ourselves, we believe, have seen specimens exceeding this size in the Outer Hebrides. One shot by Mr. M'Neill, Jun., of Canada, as he assured us, weighed 45 stones 5 lbs., and was the largest ever seen or recorded there (1881).'

Dr. Edmondston, who had a long experience of these Seals in Shetland, gives the weight as 630 lbs. The largest male he examined was '8 feet from the muzzle to end of tail; girth round the shoulders 6 feet. The hide weighed 55 lbs.; the blubber 145 lbs.; weight of the whole body 6 cwt.'; while Mr. Collett states that a 'full-grown male Grey Seal weighs from 250 to 290 kilogrammes, and contains blubber of the weight of 70 or 90 kilogrammes, a few extremely large ones perhaps reaching 100 kilogrammes. The females weigh from 180 to 250 kilogrammes; as a rule about 220. During the pairing time the males lose from 50 to 70 kilogrammes. The female, the blubber of which, so to speak, is transferred through the milk to the pups, loses much less, or from 30 to 50 kilogrammes. They do not regain their good condition before the summer.'[1]

An adult female shot by myself at Langasgeir, North Uist, in August 1898,

[1] I do not think that this is quite correct, as three adults examined in March and April were extremely fat.



THE GREY SEAL.

Halichœrus Grypus, (*types of adult males*).

Litho. W. Greve, Berlin

weighed exactly 21 stones 8 lbs. on some sheep scales whose accuracy I had previously tested. Length from nose to end of tail, 6 ft. 1 in.; length from nose to end of hind-flippers, 7 ft. 1 in.; circumference immediately behind the fore-flippers, 4 ft. 7 in. The usual length of adult females is from 5½ to 6½ feet. Mr. Ball, writing to Professor Bell in 1837, describes how he captured an old female near Howth. The skeleton measured 7 ft. 2 in.,[1] and the estimated weight was over 500 lbs. I should imagine this to be the maximum size of females. Another old female which I shot lying on some rocks near the Holm of Gloup, Yell, Shetland, in August 1901, measured 6 ft. and 6 ft. 11 in. to end of flippers. I had no means of weighing the specimen accurately, as I had in the first case, but I should say it was about 20 stones.

The young are at first pure white, with sometimes a few dark hairs on the top of the head, the coat being smooth and silky, but in a few days it becomes creamy-coloured and woolly. At the end of a week it is dull yellow, with more blackish hairs on the head, and blotched with pale grey on the nape. When first born the hair is very white and silky but soon grows rapidly and slightly curls as it turns yellow. About six weeks after birth this coat is shed and gives place to a shorter and closer covering of yellow interspersed with grey and black. Some examples are also green and some reddish with a faint dappling of dark markings on the back.

Pure melanisms of this Seal must sometimes occur, but are without doubt of great rarity. One undoubted instance of a baby Grey Seal black from the birth has come under my notice. Major-General Sir John MacNeill and two other men who are well acquainted with this Seal in its feral state were rowing past a small island on the west coast of Scotland when they passed close to thirteen Grey Seals' pups about three weeks old. One of these was jet-black all over. All the young animals were plainly seen by the occupants of the boat, who saw that they were of equal size and as yet too small to take to the water.[2]

As the young of each sex grows it gradually conforms to the type of coat

[1] This measurement is evidently taken from the nose to the end of the hind-flipper.

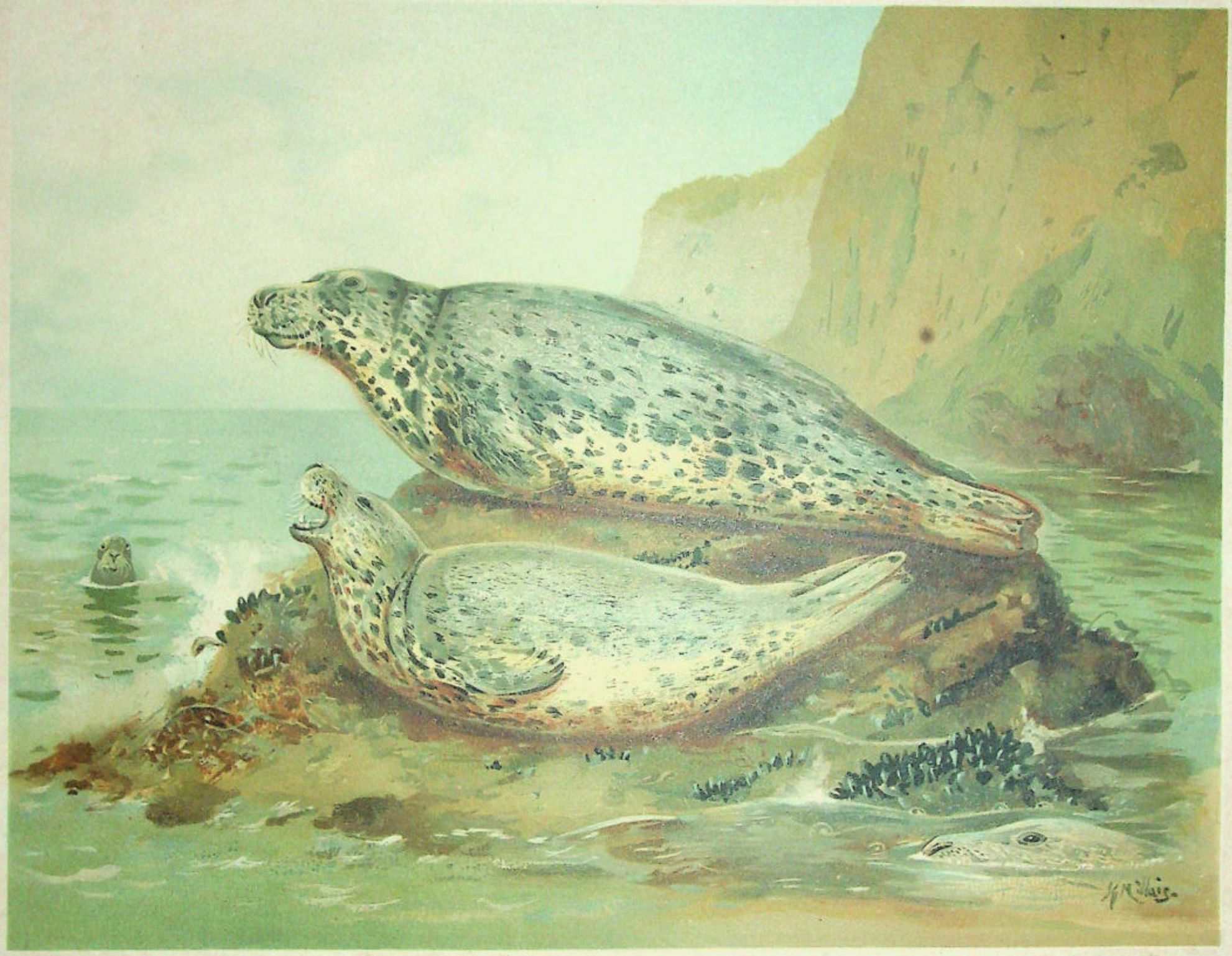
[2] The reader, if a scientific naturalist, will at once put the question, 'How do you know that the regular black form, for it is a regular type of this Seal, is not always black from the birth, like this melanic pup?' It is certainly a natural supposition, for without doubt this abnormal juvenile would have become a pure black adult; but on the other hand I must put forward my opinion that the black males must, almost without exception, have been once *white* pups, for I have seen two skins five and eight months old, of youngsters actually in a state of change from the light second youthful coat to the black adult. Moreover, such a thing as a black baby *grypus* of a few weeks old has only once been heard of in the big haunts of the Grey Seal, where hundreds of pups were annually slaughtered, and where adult males of the black type occur about one in every twenty specimens.

which it will eventually assume. But the Grey Seal grows much more slowly than the Common or the Greenland Seal, and it is two years old before it attains a growth of 4 feet 6 inches.

When the young Grey Seal is twenty-eight weeks old its pelage begins to fade rapidly, till by the beginning of April it is often of a uniform pale straw-colour with the back spottings of undetermined brown. At this stage it loses its second coat of hair, and the third pelage commences to appear. This third pelage is more pronounced in colour and gives indications of the coat that the animal will eventually assume when adult, but the old hair often changes to most extraordinary colours just before shedding. I have seen immatures seventeen months old with hairs of russet, dark brown, green, yellow, blue-grey without spots, blue-grey heavily spotted with black, neutral tint, and creamy-white. The commonest type, however, of both males and females at this age is pale grey back, turning darker towards the crown, yellow under parts and muzzle and flippers, and with dark grey spots on the back. Such a variety of tints is not to be found in any animal except *Ursus arctos*. On reaching the third pelage most of these strange colour tints vanish, and we find the young Grey Seal, about 4 ft. 6 in. in length and 90 to 100 lbs. in weight, exhibiting the dappled grey black or light grey types of adult males and females respectively, although not yet in perfect completeness.

At one year old the young Grey Seal when in third pelage generally possesses white under parts with black spots, but has gained little in size after the moult to the fourth pelage. However, when the types become still more pronounced they progress quickly, so that at two years the length of males is usually about 5 ft. 6 in., and weight from 12 to 14 stones. In each succeeding year additional weight is put on. At three years males measure 6 feet and over, and I do not think they are fully adult until the fifth year, at which age they are capable of entering the breeding grounds and asserting their sex. The adults allow no immatures except those of one year old to come close to the rocks on which the females pup; even these youngsters do not land until the breeding season is over.

The dental formula is: I. $\frac{6}{4}$; C. $\frac{2}{2}$; P.M. $\frac{6}{6}$; M. $\frac{4}{4}$. In the Grey Seal the toes of the hind-flippers are nearly of the same length; the first and fifth digits are only slightly longer than the intermediate ones. The skull of *Halichœrus* differs in many particulars from that of *Phoca*. The molar teeth in the upper jaw are conical, but in the lower jaw they have a slight notch at the base. The



Litho. W. Greve, Berlin.

THE GREY SEAL.

Halichœrus Grypus, (*adult male and female*).

second and third in the upper jaw, and the second, third, and fourth in the lower jaw have two connate roots, the rest of the cheek teeth are single-rooted.

General History and Geographical Distribution.—It seems somewhat strange that the identification of this interesting species as a British mammal should have been so long deferred. Until 1837 a single large specimen of a Seal in the British Museum had been described as *Phoca barbata*, and it was only through the exhibition of crania of *Halichœrus grypus* by Mr. Ball at a meeting of the British Association that Professor Nilsson, who was present, was able to identify the species. The Grey Seal was always more or less abundant on the south and west coasts of Ireland, so it is remarkable that no one had previously noticed the difference between this species and *P. vitulina*.[1]

The earliest notice of the existence of the Grey Seal is that of Cneiff, who, writing in 1759, mentions in his account of the Seal fisheries of the Gulf of Bothnia certain Grey Seals as of a distinct species; on this information is based 'Der graue Seehund' of Schreber, and probably the 'Grå Siäl' of Linnæus. There is every probability, however, that the Icelanders had used their name of Ut-Selur for the Grey Seal at a much earlier date, although we do not find mention of its existence until the end of the eighteenth century, when Olafsen speaks of the animal, and gives a good account of its habits. Later Hallgrimsson proves its identity with the *Phoca grypus* of Fabricius.

Fabricius gave the first systematic name to the Grey Seal in 1791. Nilsson seems to have rediscovered the animal in 1820, naming it *Halichœrus griseus*. It was after this date that so much confusion took place among British authors between this animal and the Bearded Seal. Now we know better; and it is extremely doubtful if the Bearded Seal has ever occurred more than once in Britain, so all references to this animal must be taken to refer to the Grey Seal.

The Grey Seal has a rather limited distribution; it is found throughout the North Atlantic, but is most abundant on the eastern side, where it is confined to certain areas. On the coasts of the New World it moves as far south, according to Mr. Allen, as Sable Island, Nova Scotia. Seal-men in St. John's, Newfoundland, speak of it as rare along the Labrador coast and in the Straits of Belle Isle, through which thousands of Seals pass every spring. A few are,

[1] Equal credit should, I think, be given to Dr. Laurence Edmondston, who in his paper on the *Seals of the Shetland Isles*, published in 1837, did so much to prove that only two Seals inhabited the British Islands, and these notes were written without a knowledge of Mr. Ball's and Prof. Nilsson's conclusions.

however, taken on the ice or in the Seal frames—traps set principally along the Labrador coast to catch *P. vitulina*. My friend Mr. Hesketh Prichard visited Labrador in September 1903, and as he sailed north made inquiries and examined the skins of Seals, with which he is well acquainted. After a month spent with the Esquimaux near Davis Inlet, his conclusions as to the distribution of this animal on those coasts are as follows:

'The Grey Seal (*H. grypus*) occurs in small numbers along the coast of Labrador. The Eskimo have a special name for this Seal, *apa*, but as far as I could learn know little of its breeding-places. I have myself seen a Grey Seal at the mouth of a river that empties itself into the western extremity of Jack Lane's Bay. This bay is about twenty miles from Davis Inlet. There is no doubt that the less accurate of the Eskimo hunters often confound this Seal with the "Square Flipper" or Bearded Seal, for which, however, the Eskimo name is *ukjuk*, the young being called *terrigluk*. The testimony of the Eskimo as to its northern range is as follows. Those whom I questioned told me that it ranged as far north as they themselves had been, i.e. to Okkak, about 58° north lat. This was the furthest point at which they had killed the Grey Seal, but they declared it was to be met with further north, some said in greater numbers. They gave no opinion on the flesh of this Seal, but waxed eloquent concerning the skins, which are more prized by them than those of any other species of Seal for making tents. A trapper, Samuel Bloomfield, told me that among the white settlers the Grey Seal was known as the *hodge*, and was very rare. He had killed specimens in Jack Lane's Bay, one in November some years ago.'

As to Newfoundland, I have, after some trouble, traced the distribution of the species round that island. It is only a rare visitor to the south, west, and south-eastern bays of the island, but becomes numerous up in the north-east, about White Bay. This is due to the presence of a large colony which breeds on the most isolated of the Groais Islands (called in Newfoundland the Grey Islands). I think the reader would have smiled if he had seen the author of this volume sitting on the shore of Conception Bay one frosty morning in October, and arguing with two Roman Catholic priests and seven fishermen Seal-hunters about the breeding season of the Grey Seal. These two holy fathers lived on the shores of White Bay, and assured me by all the saints that they had taken newly born 'Square Flippers' off the ice in spring, and had killed the mothers. I laughed at this, and they appealed to the Seal-hunters, who at once sided with the priests, and doubtless regarded me as an ignoramus about Seals.

It is wonderful how unobservant men can be about animals, even when these live at their very doors. They could not recognise any difference between the two species, the Grey and the Bearded Seal.

The Grey Seal is supposed by various writers to visit West Greenland, but its presence there is not yet substantially confirmed.[1] From what the master of a Norwegian brig, who has twice visited East Greenland after polar bear and musk-ox, told me, a few of these Seals follow the herds of Harp Seals to the coast of East Greenland during the summer. These are probably immatures or wanderers from the Icelandic colonies on the coasts of Westland or the Bredebugt where they have long been known to breed. My guide in Iceland in 1892, Thorgrimmer Gudmandsen, also mentioned a series of skerries lying close to the shore about sixty miles north-west of Reikavick frequented by the 'Ut-sel' (Grey Seal).

The Grey Seal frequents the Faroes and breeds in many of the sea-caves on the west side. The late Herr Muller, the Sysselmund of the Faroes, who probably knew more about the natural history of these islands than any other man, could not tell me of any regular rock haunt where the species was gregarious.

How far north and east along the coasts of Scandinavia and Russia the Grey Seal ranges is not known, but being a purely rock-loving species it is not likely that its visits extend to Spitzbergen or the Russian Islands. Collett mentions that it is found all along the coast of Norway[2] from latitude 58° to 70°; but Tromso, where it was observed by Lillieborg in 1848, is probably its northern limit. Mr. Hans Waag who lives in the Lofodens tells me that it constantly visits those islands and Mr. Robert Collett has given[3] a long and interesting account of the breeding of these animals on the Fro Islands at the mouth of the Trondhjeim Fjord. He also mentions the Vigten Islands on the borders of Helgeland as another station. In winter the Grey Seal visits the Cattegat, the Baltic (where it is said to breed at Gotska Sanden), and the Gulf of Bothnia; it has been taken so far south as the coast of Germany.

[1] The utmost confusion still exists amongst Sealmen, even such experienced men as the old Newfoundland captains. Captains Blandford and Jackman have both assured me of the abundance of the Square Flipper (in this case the Grey Seal of Newfoundland) along the west coast of Greenland, as far north as Davis Straits. They say it frequents the ice floes, and places its young on the ice in spring. Their observations plainly refer to the Bearded Seal. 'Square Flipper' is the name used for both species in Newfoundland and Labrador, and they are there considered by all except a very few to be the same animal.

[2] Two good specimens of adult males, of about 8 feet in length, and in the grey and black spotted coat, are in the museum at Bergen. They were both taken on the Island of Hitteren.

[3] *Proceedings Zool. Soc.* 1881, pp. 380–387.

In England the Grey Seal has been met with in a few localities; it has occurred, as a straggler, in the Channel, having been found in the Channel Islands, on the Eddystone, and on the coasts of the Isle of Wight and Sussex.[1] Of the Grey Seals at Scilly, Mr. T. A. Dorrien-Smith kindly sends me the following note, May 14, 1902. 'Undoubtedly the Grey Seal exists at Scilly, and in considerable numbers: I have seen as many as twelve on a rock together, and twenty or thirty in one small group of islands at the same time. The largest we have killed weighed 672 lbs., just 6 cwt., but I have often seen them up to 5 cwt. We seldom shoot more than two or three in the year, but I sometimes take the young ones in the autumn and give their skins in the form of cartridge bags to my friends. Seal Island in Scilly is so called because of a curiously shaped rock on the top of this island which resembles a Seal when first disturbed, head and tail up on the look out. There are, however, a good many Seals generally to be seen in its vicinity.' The Seals in Scilly are not allowed to be shot; Mr. Dorrien-Smith strictly preserves them there.

By the kind invitation of Mr. Dorrien-Smith I visited Scilly at the beginning of May 1903, and during successive days my host took me in his steam launch to most of the islands frequented by Grey Seal. Rosvean and Rosvear, high rocky islands exposed to the full force of the Atlantic storms, are of course their favourite haunt, and though they may leave the vicinity of other Seal islands in quest of moving fish, the Grey Seals are always to be found about these exposed rocks. Being anxious to obtain an adult male in the black pelage, I went to Rosvean on a fine sunny day (May 12), and almost as soon as I commenced to spy—it being dead low water—I saw a big grey male high up on an isolated rock at the west end of Rosvean. The stalk was rather an arduous one, as these western islands are cut into immense boulders each as large as a good-sized house, and intersected by sea channels. You have no sooner got over one house than you must descend to cross a river, and then the river may be too wide, so you have to go all the way back again and signal your boatman to help you over the difficulty. Three times I thus required the assistance of the boat, and each time I feared the big Seal would see us as we rounded a corner in view. But, to make a long story short, I eventually got within a hundred yards of the Seal, to be greeted with sounds like several cows mooing on my left hand. Looking carefully over the low cliff I saw five other big male Grey Seals lying on a low sloping rock only about three feet above the water's edge. One of these seemed to me to

[1] *Zoologist*, 1899, p. 320.

be jet-black, the blackest example I have ever seen, and needless to relate, I much desired his skin. But it was not to be. The bullet hit him through the neck, and he lay perfectly still, at which I naturally concluded he was quite dead. Rising to my feet, I immediately ran to the top of the island and signalled the boatman to come at once. It so chanced that from this high point I could see the whole scene, and to my consternation I saw my *grypus* recovering rapidly and trying to roll over. At the risk of breaking my legs I now hastened back to the point of firing and put two other bullets in the beast as he rolled over in the water and became motionless in death. The current drifted him about ten yards, and he sank just as the energetic boatman appeared to gather the prize. It was one of the many disappointments every hunter of Seals must put up with, but it was particularly hard to lose an example of the rare black type, this being the third I had shot at and lost.[1] Other Seals appeared after the shots, some big fellows coming within a few yards of me, but one could not see bottom, so I refrained from firing. Altogether I counted eleven adult Seals at this point. Mr. Dorrien-Smith says there are usually about this number at most seasons, but they undergo a considerable increase in August, gathering for the breeding season in September. Going back in low spirits an immature Grey Seal came up over a shallow sea channel about thirty yards from the boat, so I put a bullet through his neck. He floated well, although in a considerable wash, but 'Jack' the Scillian easily recovered him. He was a nice specimen in the eight months coat, but hardly compensated for the loss of the black bull.

Another day was spent searching the eastern islands for Grey Seals, but without success. Although there are usually a fair number scattered about the outer group we saw only one, an adult female.

The Grey Seal is undoubtedly the Seal of Scilly, and not the Common Seal, as has been stated in many books. Mr. Dorrien-Smith is not sure that he has ever seen the latter in Scilly.

Proceeding northwards, the next breeding station of the Grey Seal is said to be certain caves on the north coast of Cornwall. But this requires confirmation, and I doubt if it is there as a resident. Certainly of late years several white pups of the Grey Seal have been taken on the Cornish coast, but there is no evidence to show that these youngsters had not been driven from Scilly by the first equinoctial gales.

The Grey Seal has been taken at Colchester in Essex,[2] on several occasions

[1] Mr. Dorrien-Smith has never seen a specimen of the black type in Scilly.

[2] *Ann. Mag. Nat. Hist.* 1841.

on the Norfolk coast and in the Wash;[1] in 1882 a young female was shot on Breydon Water. Graves, in his 'History of Cleveland' (Yorkshire), includes the 'Great Seal' as well as the Common Seal in his list of mammals of the county, and Mr. Lofthouse says that it was seen off Teesmouth in 1871 and 1883. These, no doubt, as well as one which was obtained at Berwick-on-Tweed and identified by Professor W. E. Clarke,[2] were stragglers from the Farne Islands, off the coast of Northumberland, where the Grey Seal still breeds.

So early as 1826 Mr. Selby refers to the colony of 'Great Seals' on the Farnes and calls them *Phoca barbata*, and as such they were described by both Bell and Jenyns. However, in 1841 Selby corrected his mistake, and by obtaining freshly killed heads he discovered that the Seals were *Halichœrus griseus* (*grypus*).[3] An old resident informed him that in the year 1772 seventy-two young Seals were killed by him, and that once he had captured fourteen old ones on the Crimston.

Although the Grey Seals on the Farnes are seldom shot they do not appear to be increasing in number. They generally pup on a small island known as the Crimston Rock, and Mr. Lee, who visited the island in November 1900, saw eight or nine adults round the place and captured a recently born young one on the rock itself. Mr. Lee describes the Crimston as being a typical *grypus* haunt, namely, a low-lying skerry along which a heavy boiling tide runs, into which the Seals roll at the first alarm. In such places it is hopeless to shoot the Seal, as it invariably sinks and is lost.

Mr. Selby, who made repeated visits to the Farne Islands for the purpose of studying these animals, says, 'The Great Seal seldom wanders to any great distance from the Farne Islands, as it is only occasionally seen as far north as Berwick Bay, and off Dunstanborough and Coquet Island to the south.'

The coast of Pembrokeshire has long been known as the haunt of the Grey Seal, and certain caves in the neighbourhood of Newport and Fishguard are still frequented by it. Some fifteen years ago Lord David Kennedy shot and recovered seven of these Seals in this locality, and in previous years he had killed a few of them, but had never seen a male that exceeded eight feet.

[1] See *Zoologist*, 1882, p. 187; 1890, p. 432; 1891, p. 299; 1894, p. 81.

[2] *Ann. Scot. Nat. Hist.* 1893, p. 180.

[3] 'Observations on the Great Seal of the Farn Islands, showing it to be the *Halichœrus griseus*, Nilss., and not the *Phoca barbata*.' By P. S. Selby, Esq., *Annals and Mag. Nat. Hist.* 1841, vol. vi. pp. 462–466.

Colonel L'Estrange, who has for many years resided near the same ground, also states that he never saw a big male killed there.

The dead body of the Grey Seal has been found on the shore of Carnarvonshire at Afon Wen,[1] and at Rhos Neigr in Anglesey. It has been seen at least once in the Isle of Man,[2] where it is possible, as also on some of the rock-bound shores of North Wales, a few may come more frequently than is imagined. A specimen is preserved in Liverpool which was captured in the Canada Dock in that city in the winter of 1860–61.[3]

The Grey Seal must therefore be considered a rare animal in England, but in Scotland it is more numerous, in spite of the constant persecution that has attended the annual gathering on the outlying skerries and rocks where they breed.

The Outer Hebrides, chiefly South Uist, North Uist with its adjacent islands of the Monachs, Haskeir, the small islands of the Sound of Harris, South Harris, and the Lews have for centuries been famous as the resorts of these big Seals, and as far back as history relates we have accounts and traditions of the annual slaughter that took place every September and October on the principal breeding grounds. The chief of these Seal homes is Haskeir, a large rocky island lying some nine miles due west of the village of Tigyarey in North Uist. During a residence of two seasons I spent much time, with the help of the Rev. John Macdonald, the minister of West North Uist, an able Gaelic scholar, in unravelling the legendary lore attaching to these Seals.

There appears to have been a Clan MacOdrum[4] intimately connected with these Seals which was supposed to have certain affinities to them. Doubtless the superstition originated from the similarity of expression which the big Seals have to man, and the guilty feeling engendered by the after effects of the annual slaughter. The Rev. J. Macdonald in his little book on the Uist bards says, 'The connection of the Seal with the remains of Norse mythology in Uist is clearly seen in this fact, that at the time of the annual visit to the Seal Rock—Bualadh na Squeire (Haskeir) a horse-racing was held in the district, and there are many still living who remember it,[5] which was called an Odaidh. There can be little doubt that this function was the survival of a pagan festival in honour of the Scandinavian

[1] *Zoologist*, 1897, p. 141. [2] *Ibid.* 1899, p. 131. [3] *Liv. Mar. Biol. Comm.* report ii. p. 136.

[4] Originally Clann Odain (Odin) and then Mhic Odam, easily transformed to MacOdrum.

[5] A very old man from Tigyarey pointed out to me the actual spot where the old horse-racing used to take place in his youth—a long open stretch of flat ground to the north of the bog of Hogary.

god Odin, who was so much connected with the district,[1] and that its observance was continued as a propitiation for the slaughter of the Seals. Thus do heathen customs and traditions continue after ages of Christian culture, and after they have lost all meaning to those who observe them.'

There are still a few of the old Clan MacOdrum left in the villages of West North Uist, and one of their most famous bards came of this family. He was known as John MacCodrum of the Seals, and in connection with the superstition an old crofter solemnly assured me that a certain woman of the clan was seized with violent pains at the time of the annual Seal-hunt, out of sympathy, it was supposed, with her suffering relatives.

The MacCodrums (*Clann 'e Odrum nan Ron*), who were also called the *Seal-eaters*, were supposed to consume certain parts of the big Seal, for reasons which I failed to discover; but I had ample proof of the fact that these people still carry the idea into practice, for one evening while I was skinning a large Grey Seal which I had just shot I suddenly became aware of a very old woman in a mutch peering at me in the gloaming. In her hands she held a large plate, so I asked her what I could do for her. She said she would like to have the fore-paws of the Seal, which I gave to her, for she said her people had lived on Seal for centuries. She departed with many reiterated thanks. About an hour afterwards, just as I was finishing my somewhat greasy task, another old woman appeared and asked for the fore-paws. On being told that they were gone she appeared much disappointed, and refused my offer of the hind-flippers, which she said were of no use to her. I heard afterwards that the first woman, although she had married into another family, was of the Clan MacCodrum.

I may state as a further curious circumstance that I had shot four Common Seals in the previous week and yet neither of these women had asked for pieces, and in the following year after shooting three big male Common Seals, for which there was no demand as an article of food, I killed a half-grown Grey Seal on Haskeir, and the next morning an old woman hurried up to Balranald and asked for the fore-paws. I was away shooting snipe at the time, and the carcase had been thrown on the ash-heap after the skin had been removed, so I fear she went without her dinner of Seal.[2]

[1] The Point of Grimish, opposite Haskeir, has several places called by such names as Odin's Leap and Odin's Castle.

[2] 'In Shetland even,' says Dr. Edmondston, writing in 1837, 'I know some people still alive who regularly ate the flesh of Seals, but the practice is now totally disused. In the Faroe Isles they are still occasionally salted and eaten; and I believe the Icelanders continue to pay to their remains this last sad tribute of respect.'

After the annual Seal-hunt the Uist crofters say that an old female *Ron Mor* used to appear in the villages and lament the loss of her relatives in the following pathetic refrain:

Hoo i ho-o! Hi-o-hao!
Ho i ho-o! Hi-o-hao!
Ho i ho-o! Hi-o-hao!
Cha robh mise m'onar an raoir.

The peculiar dignity and aspect of the old male Grey Seal, so superior to all other animals with which the fishermen of these northern seas were acquainted, as well as the strangely melancholy character of his voice, naturally made him a favourite theme of Scandinavian folklore. The main idea which runs through the superstitions is that the *grypus* is either a human soul or a fallen angel in a state of reincarnation, and that some fearful retribution[1] will fall upon the man who molests it. As, however, the natives have always been keen at the annual massacre of the innocents, it is difficult to believe that they have much faith in their own superstitions.

Mr. George Sinclair, a correspondent of Karl Blind, informed him that 'sea monsters are for the most part called *Finns* in Shetland. They have the power to take the shape of any marine animal, as also of human beings. They are wont to *pursue boats at sea*, and it was dangerous in the extreme *to say anything against them*. I have heard that *silver money was thrown overboard to them* to prevent their doing damage to the boat. In the Seal form they came ashore every winter night to dance on the sands. They would then cast off their skins, and act *just like men and women*. They could not, however, return to the sea without their skins—they were *simply human* beings, as an old song says:

I am a man upo' the land;
I am a selkie i' da sea;
And whin I'm far fa every strand,
My dwelling is in Shoöl Skerry.'

The above quotation from Tudor, 'The Orkneys and Shetlands' (pp. 167, 168), plainly refers to the Grey Seal and some of the superstitions attaching to it. Some of these 'Finn' women are said to have been captured and married by Shetlanders, and to this day there are amongst the islanders individuals who pride themselves on being descended from a 'Finn' woman. In 'A Description of the Isles

[1] When I have shot a Seal on an outer island of the west coast, the boatmen have always been anxious to make for the coast at once, for they say that the blood of the Seal raises the surf.

of Orkney,' written by the Rev. James Wallace, minister of Kirkwall (1688), we read that Finmen were occasionally seen in the northern isles. Brand too in his 'Brief Description of Orkney, Zetland etc.' (1701) refers to them and reckons they came from Finland, whilst other writers give Bergen and Davis Straits as their home. Naturally all these references allude to the visits of Esquimaux in their kayaks, and the capture of the women after putting off their 'Seal skin' doubtless refers to their having abandoned their skin boats for a short time. Endless confusion therefore arose in the minds of the impressionable islanders between these little roving people of the sea, who were always described as being human in all respects but for their webbed hands, and the human-looking Grey Seal 'whose dwelling was on Shoöl Skerry' (Suliskerry). Just as there are Shetland families who trace their descent from mermen or mermaids, so there are several old Welsh families who have similar traditions. In Ireland examples are found in families of the O'Flaherty, O'Sullivan, and MacNamara,[1] whilst the Irish clan of Coneely is said to be directly descended from a *Seal-woman*.[2]

In the Isle of Man are similar instances, and in the tale of Macphail of Colonsay 'The Mermaid of Corryvreckan' is not the only Hebridean example.

While we are on the subject of the superstitions regarding Seals it may be as well to compare the views of the more highly emotional western Irish with those of the Scotch. These romantic people are naturally prone to regard the Grey Seal with greater reverence than the more phlegmatic northmen of Celtic or Scandinavian origin. Their tales about the Seals are often wondrous compositions of impossible romanticism or poetic beauty, and while they are shy of displaying their innermost thoughts before the stranger they nevertheless cherish as something real the distorted imaginings of their own impressionable natures.

One of the most popular beliefs that prevails all along the west coast of Ireland is that, while any man may kill the big Seals in the water or out on the open rocks, no one must attack them in their sea burrows. If any should do so a certain dread woman who has issued an edict in favour of the Seals will immediately 'turn the stone' (i.e. slay) the adventurer. Men, they say, who have been rash enough to follow their game into the bowels of the earth have never seen the light again. As illustrating the Seal's love of music there is another pretty story to the effect that every evening the fairies come to play to them after dusk, and it is not uncommon to meet with west coast dwellers who have heard it or, with an incomprehensible sense of bathos, have hurled rocks over the cliffs

[1] *Contemporary Review*, August 1881.

[2] MacRitchie, *The Testimony of Tradition*, p. 15.

'to stap the row.' On Tory Island (N.W. Ireland) there is the tale of a poor blighted woman who, sick of the world and its cruelty, went down into a Seals' cave and gave her child to the Seals. She herself in watching for her mermaid daughter to come out was supposed to have been shot by one of the local hunters, and the whole legend is worked into a charming story by Mr. R. W. K. Edwards.[1]

With regard to the uses of the oil, flesh, and blubber of the Seals, Pinkerton in his 'Collection of Voyages and Travels' says[2]:

'The natives (of the Island of Harris) salt the Seals with the ashes of burnt sea-ware, and say they are good food. The vulgar eat them commonly in the spring-time, with a long pointed stick instead of a fork, to prevent the strong smell which their hands would otherwise have for several hours after. The flesh and broth of fresh young Seals is by experience known to be pectoral; the meat is astringent, and used as an effectual remedy against diarrhœa and dysenterea.

'The liver of a Seal being dried and pulverised, and afterwards a little of it drunk with milk, aqua-vitæ, or red wine, is also good against fluxes. . . . The Seal, though esteemed fit only for the vulgar, is also eaten by persons of distinction, though under a different name, to wit, ham. This, I have been assured of by good hands, and thus we see that the generality of men are as much led by fancy as judgement in their palates, as well as in other things. The popish vulgar, in the Islands to the southward from this, eat these Seals in Lent instead of fish.'

To-day the oil of Seals is much used for dressing harness and also as a tonic for cattle in the spring. In the north of the Shetlands, too, I have seen several men going about in slippers made from the skin of the adult Seal. These slippers, for outdoor use, were exactly the same in form as the shark-skin coverings I have seen worn by both the Icelanders and the Faroese.

Martin in his 'Description of the Western Islands of Scotland' published in 1716 gives the first fairly accurate account of a *grypus* slaughter.

'On the western coast of this island (Harris) lies the rock Eansmil,[3] about a quarter of a mile in circumference, and still famous for the yearly fishing of Seals there, in the end of October. This rock belongs to the farmers of the

[1] *The Mermaid of Inish-Vig*, by R. W. K. Edwards. [2] Vol. iii. pp. 395, 596.

[3] Now called Cousamill. I visited Cousamill four times during 1899 and 1900, and only once saw Grey Seals there—two hoary old males which watched me from the boiling tide that runs past the southern end of the island. Grey Seals ceased to breed on Cousamill about ten years ago.

next adjacent islands. . . . These farmers man their boats with a competent number fit for the business, and they always embark with a contrary wind, for their security against being driven away by the ocean, and likewise to prevent them from being discovered by the Seals who are apt to smell the scent of them and presently run to sea. When the crew is quietly landed, they surround the passes and then the signal for the general attack is given from the boat and so they beat them down with big staves. The Seals on this onset make towards the sea with all speed, and often force their passage over the necks of the stoutest assailants, who aim always at the foreheads of the Seals, giving many blows before they are killed; . . . and if they get hold of the staff with their teeth, they carry it along to sea with them. Those that are in the boat shoot at them as they run to sea, but few are catched that way. The natives told me that several of the biggest Seals lose their lives by endeavouring to save their young ones, whom they tumble before them towards the sea. I was told also, that three hundred and twenty Seals, young and old, have been killed at one time in this place.'

Until 1858 there was an annual battue at Haskeir, but this was stopped by Sir J. Orde, and his son Sir Arthur has also done all in his power to check the indiscriminate slaughter of the Seals. Of late years about one hundred are as many as have been killed on this rock in one season, but since 1870 there has been a marked decrease in the number of the animals and the boats that go to hunt them. On the best authority, however, I know that three boats took twenty-two young and old Seals there in 1897, and fifteen in 1898; two boats going from Hogarey, one from Tigyarey, and one from the Monachs. In 1897 a boat from the Lews came to raid the Haskeir Seals, but meeting with bad weather was driven to Skye, and the daring occupants narrowly escaped with their lives, for the seas of the Hebrides are dangerous when the west wind gets up. In the Sound of Harris between South Harris and North Uist, where there are great numbers of Common Seal, there is one small island which has always been known as *Scuir-nan-Tapvaist* (the rock of the great water beast). This skerry has always been frequented by a pair or more of Grey Seals. Colonel Percy, for long the tenant of South Harris, killed a big male there about the year 1890, and in 1900 Mr. Chapman killed one of the pair that frequented the place. Recently I hear another big male has joined the deserted female.

To the north of the Hebrides are other well-known resorts of the Grey Seal, such as North Ronay, Gaskeir, and Gloraig-su-Taransay, near the Lews; whilst

until recently the chief home of the species in the north was Sulisgeir,[1] which lies forty-three miles north-west of the Butt of Lewis.

To this wild place expeditions used to go annually from Ness in the Lews and Loch Eriboll in Sutherland, and there is little doubt that great numbers of Seals were annually killed by these hardy fishermen. Harvie-Brown and Buckley[2] say that 320 are said to have been killed in 1882, and 360 in October 1883, but add that these figures are not altogether reliable. The same authors state that in 1883 107 were killed on North Ronay, and 30 in 1882 on Sulisgeir. Suliskerry was also a favourite haunt until recently, but the Northern Lights Commission have now placed a lighthouse on the skerry, so that the Grey Seal no longer frequents the island in any numbers, though a few lie round the rocks in summer and autumn; my old friend, Captain John Linklater, of Stromness, writes, 'Doubtless due to a homing instinct a few Grey Seals still come to their old resort at the skerry and occasionally land there. I go every winter to spend a few weeks with the lighthouse keeper, and have shot one Seal, a big female. Last autumn (1900) the keeper killed two big males there, eight and nine feet long, and I saw their skins.'

In the summer of 1889, being anxious to see the Stack and Skerry and if possible obtain a Grey Seal, I started from Stromness in an open herring-boat. When about twenty miles off Hoy it began to blow. When we reached the skerry it was quite impossible to land; we had a rough experience until, sleepless and devoid of comforts, we beat a retreat to the Orkneys.

A few Grey Seals wander along the coast-line of the Inner Hebrides, especially when the weather has been too much for them outside. I have reason to believe that they permanently reside at the Treshnish Islands off Mull. Specimens have been killed on Coll, Canna, and Colonsay where there is a colony, and there are always a few about the Kyle of Tongue to the north as well as on a rock to the west of Jura. The Grey Seals doubtless occasionally breed far in among the Inner Hebrides, but not in any sea caves on the coast of this part of the mainland; the Summer Isles, off Loch Broom, and the Seal Island, off the mouth of the Naver in Sutherland, are other northern spots that they visit. Beyond the wild north-west coast of Scotland a few probably breed in the caves near Cape Wrath where I have seen them, and also near Dunnet and Duncansby Heads. From this north-easterly point of Scotland down as far as Golspie on the

[1] 'The rock of the gannets,' so called from its being a great breeding station of these birds.

[2] *A Fauna of the Outer Hebrides*, p. 25.

Sutherland coast there are always a few Grey Seals to be found at all seasons. Mr. Houston of Kintradwell, who has shot many, tells me they were formerly very abundant, breeding on the sandy beaches far in the rocky caverns where man could seldom reach them. Now, however, they are much scarcer.

After the most careful inquiries I cannot ascertain that the Grey Seal is residential in any locality between Golspie and the Farne Islands in England, but I have discovered that there is in winter a most distinct annual southern migration of these Seals down the east coast of Scotland, from Wick to the Firth of Tay, and a return migration in the spring. Apparently the adults do not come so far south as the immatures, for large *grypus* have only once or twice been seen in the estuary of the Tay, and, so far as I am aware, never have been killed there, while half-grown Grey Seals are frequent among the large numbers of *vitulina* which haunt this Firth and are seen at all seasons. Mr. James McNicol, who shoots Seals in the Tay estuary on behalf of the Salmon Commissioners, has only once seen an exceptionally large Seal. He killed a finely marked immature male, 6 ft. 1 in., above Dundee bridge in June 1901, and I identified the skin as that of the Grey Seal. Large Seals have been seen travelling southwards along the Sutherland coast after the breeding season, but they probably keep well out to sea during the winter months, and approach the Sutherland coast again in April. Here many large Grey Seals have been shot by that good old sportsman Mr. Houston and his keeper, generally in the months of May and June,[1] after which they become scarce, only the regular residents being seen. About June they are sometimes seen off Wick by the men in the herring fleet, and I have seen a photograph of a fine big male shot by a coastguardsman near that place. A few of these Seals always stop about Dunnet Head, and certainly a few are permanent about the Pentland Skerries. In the Orkneys and Shetlands I have visited nearly every known resort of the Grey Seal and have been at some labour to collect information as to their distribution in these northern isles.

First as to the Orkneys. Mr. Charles Akroyd, who has spent many seasons fishing from his yacht in these waters and knows Seals well, tells me that year after year he has seen a pair of old and very large *grypus* frequenting a certain cave in South Ronaldshay. The west face of Hoy is the first coastline frequented by the species; there are always a good number breeding in its rocky caverns. During the exceptionally severe winter of 1894 the carcases of over twenty big Grey Seals

[1] The Grey Seals lie up regularly at this season on certain rocks on the Sutherland coast, notably Lothbeg Point.

were washed ashore after the January gales, and the same thing occurred in the winter of 1889–1890, proving that even the breaker-loving *grypus* cannot stand a series of gales which force them on to an ironbound coast and cause a scarcity of food. All through the more sheltered parts of the inner islands and the east side of Orkney the Grey Seal is only noticed as an occasional straggler, but there are always a few immatures frequenting the inner skerries of Damsey, Enghallow, the Ting, and the Kalk. My old friend Mr. Sidney Steel killed a fine young male 6 feet in length on Damsey in August 1899; he also found a dead adult male lying on the same island. In a letter to me, written in August 1899, describing his hunt after Seals he says: 'The next day as it was blowing a gale I took the rifle and had a walk along the shore by Costa Head. Then I really believed about the Great Grey Seals. I saw a beast in the surf as big as a cow, but in such a hopeless position that I did not fire at him . . . On my last day sailing home from Gairsay I looked ahead with my glasses and saw what I thought was an upturned boat. My steersman said it was a dead whale, but when we came near I saw to my surprise that it was an immense Seal as big as a walrus. It was much larger than the specimen we saw in the Natural History Museum. I measured it as well as I could, and it was as nearly as possible 12 feet to the end of the flippers. Unfortunately its head was destroyed. The coat that was dry above water was the colour of a silver grey rabbit and about an inch long, but the whole was in a rotten condition and impossible to preserve.'

Mr. P. D. Malloch who accompanied Mr. Steel also shot a young female (figured) on Enghallow in the same month, and saw a big male. Yet adult males and females are distinctly rare in these more sheltered waters, for Mr. Alfred Leask of Kirkwall, who has hunted Seals for years in the East Orkneys, told me that he had never shot a mature Grey Seal.

Messrs Harvie-Brown and Buckley, writing[1] in 1891, think that the Grey Seals breed in Sanday. Without doubt they did so in former times, but I could obtain no information that they had done so within recent years. The late Mr. Harvey used regularly to shoot Grey Seals there, but his measurements both of this Seal and of *P. vitulina*, as quoted tentatively by the above-mentioned authors, are quite inaccurate. At present the best known home of the Grey Seal in the Orkneys is the Seal Skerry, lying off the north end of the island of North Ronaldshay, where they are strictly preserved by the owner of the island, Mr. Traill.

[1] *A Fauna of the Orkney Islands.*

Most of the regular resorts of the Grey Seal in the Shetlands are inaccessible, and others can be visited only in the very calmest weather. All along the west side the sea cuts long narrow creeks and caves in the rocks, and at the upper end of these are sand and gravel beaches unseen by human eye. The Grey Seal dive in and enter by some submarine opening which is never exposed, even at the lowest spring tides. In 1901 I made a circuit of the Shetlands for the purpose of ascertaining the correct distribution of the animal. Fortunately I had fine weather, and was able to reach some of the most outlandish corners. I shot a fine adult male Grey Seal at the Ramna Stacks, and an adult female near the Holm o' Gloup.

A few Grey Seals are still found on the west coast of the Shetland Islands from Fitful Head to Muckle Flugga. In most cases these are isolated pairs of adult males breeding in the caves, whilst the immatures, which are strenuously expelled from the breeding grounds by the adults, lead a roving life and occasionally consort with the big herds of *vitulina* which frequent Quendale, Fitful Head, Rona's Hill, the West Noups (Yell), and the islands in the Sound of Yell. The only places where the Grey Seal may be said to exist in small colonies are the isolated and exposed Gruney,[1] one of the Ramna Stacks at the northern extremity of the mainland, and the Ve skerries, four miles out in the Atlantic, west of Papa Stour. A favourite haunt, owing to its wild and well-nigh inaccessible position and its deep-mouthed caverns, is the west side of the island of Muckle Rooe,[2] where a few of these great Seals may generally be seen playing in the breaking surf. It is rare for the adult Grey Seal to frequent any of the more sheltered holms during the breeding season, and yet I have heard of instances when single female 'Haaf-fish' have retired to such places as the Sound of Yell, and dropped their white pups in the same spot year after year. On two such places, Brother Isle and Sliga Skerry, the young have frequently been taken and the old ones clubbed. In 1904 I saw two adults and eight immatures on Muckla Skerry, seven miles west of the Island of Whalsay.

The great rock chamber of Uyea is another home of the Grey Seal, and sometimes quite a number breed there, as it is inaccessible after the month of August. The island of Uyea at the north-west corner of the mainland possesses a remarkable cavern, into which the sea flows and which it is possible to reach with a boat only on rare occasions. It was my good fortune in August 1901 to

[1] Lit. The Green Island.

[2] Lit. The Big Red Island.

inspect this wonderful place. On such a day as occurs but once in the year I got round from Sand Voe in a small boat and reached the narrow entrance with great open walls of rock towering three hundred feet above. Jim Harrison, my boatman, told me to land and if possible creep round an almost sheer wall of rock, on which I could barely keep my feet from slipping, and then work on into the interior. Presently I found myself entering a great and silent chamber exactly like the space beneath the dome of St. Paul's, yet open to the sky at the top. There was something so grand and impressive about this natural church formed by no mean hands of earth, that I felt it would be almost sacrilege to fire my rifle there; but there was no occasion, for no *grypus* was at home. Only one black old *vitulina* lay on the high altar at the end. He gazed at me a moment with his big liquid eyes in silent protest at this invasion of his sanctuary and then slipped quietly into the water; swimming past within a few yards he vanished at the entrance of the great cave. Mr. Burgess of North Haa, who used sometimes to take a shot at a Seal, told me that he had more than once seen the 'monsters' lying up in the great cave of Uyea and had on one occasion put three bullets into one before it moved for the sea. One man, Dan Williamson by name, a noted climber, had more than once descended the precipice which formed three sides of this wonderful cavern, and although he asserted that it was extremely difficult, nevertheless volunteered to send up by rope the skin of any Seal I might shoot from the top of the cliff. But I had no desire to put his bravery to such a test, especially as he assured me that he could never learn to swim ten yards, he was 'that feared o' the watter.'

The great cave of Uyea and the precipice at the back of Rona's Hill will never be seen, save by very few, until the ocean itself is harnessed and the winds of the west have ceased to blow. And thank Heaven for that! These magnificent walls, the great sanctuary of the Common Seal, can never be invaded and made a 'place of interest' to the tourist, or the shambles of the Cockney sportsman.

About fifty years ago the isolated island lying off the extreme north point of Yell, known as Gloup Holm, was a favourite resort of the Grey Seal. Numbers came here every year, the females giving birth to their young in the caves of the western and southern cliffs; later, when the young were older, they would ascend the high rocks, and the few inhabitants beside the Voe o' Gloup could see the baby Seals white as lambs upon the spray-splashed rocks. In course of time, however, the excellent ling and haddock grounds about a mile to the north of the

Voe became more generally known, and many Shetlanders remained at Gloup, taking up crofts in the vicinity.

About the year 1870 there was a considerable population there who regularly made annual excursions to the Holm to club the big Seals and take their young. About this date the Grey Seals on the Holm were nearly exterminated, and the few that were left soon abandoned the place and took refuge in the caves to the west, known as the West Noups. The Seals now secured peace, but their persecutors met with misfortune. Shortly after the Seals had left the Holm there occurred one of those appalling disasters, so usual in the history of our northern isles and of so little moment to newspaper readers in the south, in which almost the entire male population of Gloup perished on the cruel rocks of Unst and Yell in one summer afternoon. The only exceptions were the occupants of two boats which bravely weathered the storm instead of attempting to run for home. From that dreadful day Gloup and its people have not yet recovered, and there are now but three or four scattered little crofts. So the Seals have peace, and there is a good prospect that the *grypus* will presently return again to its old haunts.

On the Grey Seals of Unst we have the admirable paper[1] written by Dr. Laurence Edmondston in 1837; his account of the Grey Seals that frequented the neighbourhood of his home at Balta Sound is certainly an excellent and accurate series of observations on this interesting animal. It was written by a man who was both a sportsman and a very accurate observer, and subsequent writers would have done well to quote more freely from his experiences instead of relying on the statements of hearsay and armchair naturalists.[2] From Dr. Edmondston's account there seems to be no skerry about Unst where these Seals congregate, as I have reason to believe they used formerly to do on the Muckle Flugga. Edmondston considered these Seals, which frequent the wilder caves of the north and west of the island, to be monogamous, but I have entered into this question later. The Grey Seal is only rarely seen resting ashore in Shetland, except in such favourite resorts as the rocks at the south end of Gruney and the west face of the Ve Skerries. This is probably as much due to the absence of favourable landing places up which they can climb as to their own

[1] *Observations on the Distinctions, History, and Hunting of Seals in the Shetland Islands.*

[2] Except as regards his description of the pelage, which he evidently took from an individual specimen, such statements as that the animals become darker as they grow older, and the general confusion with *P. barbata*, all his field notes are admirable. It must be remembered, too, they were written at a time when no one seemed to know anything about this Seal and its habits.

natural preference for the water. Where such points of rest and security exist they will go ashore almost every fine day at low water, or shortly after the tide has commenced to flow.

In Ireland the species has a more extended and continuous range than is the case in either England or Scotland. It is found practically the whole way from Waterford and Cork round the west side up to Malin Head in Donegal, the most northerly point of the island. The first field notes on this British species came from the pen of Mr. Ball, who supplied Professor Bell with many interesting notes published in 1837.[1] He studied these Seals on the coasts of Cork and Waterford, where they were more numerous than they are to-day. In Kerry they frequent sea caves and are still fairly numerous, as also about the Aran Islands. In Connemara there are several islands inhabited by the Grey Seal, and the islands off Clew Bay are favourite resorts, whilst from Achill to Belmullet there is a chain of rocks and skerries eminently suited to the requirements of this species; these are annually, especially during the breeding season, visited by numbers of *grypus*. All along the rough coast of Sligo and Donegal are numerous Seal caves, near which the Great Seals may be seen disporting themselves in thundering breakers. No one but members of the Irish Constabulary would think of firing at them under these circumstances, for even if killed they are never recovered.[2]

There is one stronghold of the Grey Seal in Ireland which is probably at the present day the most frequented of all British localities, on account of its inaccessibility. There the animals come fishing in *shallow* water, and if killed can nearly always be recovered. My friend Mr. Hesketh Prichard collected five out of six which he shot in the spring of 1902.

I have gone at some length into the distribution of the Grey Seal in our islands, chiefly for the reason that the general localities are but little known, and to show that the animal is much commoner than it is usually supposed to be. Nearly all these haunts are difficult and dangerous places to those who are not thoroughly conversant with the sea, and in some instances, as Mr. Harvie-Brown pertinently states, molesters of the Grey Seal are as likely to lose their own lives as to take those of the Seals. There are many other places frequented by the animal known to me which I have not mentioned for obvious reasons, and which I hope will

[1] *British Quadrupeds*, pp. 279–283.

[2] The establishment of little police posts on the coast and small islands of the West of Ireland has been most detrimental to the Grey Seal, who in some of their old favourite haunts get no peace. Men with rifles having nothing to do will shoot at anything, and so the unfortunate *grypus* gets peppered whenever he shows his nose in the surf.

not be discovered by mere casual sportsmen who have no interest in preserving the animals and only shoot for the purpose of killing, or are ignorant of the difficulties of securing a specimen.

Habits.—The Grey Seal spends much more time in the water than the Common Seal; and although possessing a greater abundance of curiosity it is more suspicious of going ashore than the smaller species, and is seldom seen on the rocks except in late spring or early autumn and during the breeding season in October. It probably lives a more or less stationary life, its short migrations being the result of an irregular food supply; it must, however, be remembered that many Grey Seals are met with at a considerable distance from the land. Common Seals, where they are undisturbed and food is abundant, will frequent the same rocks year after year in winter and summer, unless these stations are unusually exposed and the Seals are driven by hard weather to seek shelter in quieter waters; even then they travel only a few miles. The Grey Seal, having the same strong homing instinct, is, after its immature stages, not much of a wanderer.

The Grey Seals are as a rule both gregarious and polygamous, but they show a disposition to remain in pairs and to be monogamous where there are no outlying skerries suitable to their habits and they live in caverns. When three or four pairs live together in a cave during the breeding season their domestic life is hardly harmonious. The males are constantly quarrelling and fighting, and I fancy that it is a question of the strongest male being the master and monopolising the harem, and that properly speaking the species is not monogamous at all. When a single pair occupies a cave the advent of a second male means a struggle for supremacy; the winner becomes master of cave and wife.

A few Grey Seals are always more or less stationary about the skerries or islands where they breed, and this is the case in all the regular resorts of the animal that I have visited. About the middle of August there is a perceptible increase in the number of the Seals at the stations, and the old males begin to show signs of the approaching rutting season in their rough treatment of any immature male that may be rash enough to attempt to land near the females.[1] Every week more and more seem to come in from north and south, and doubtless others from the deep sea; herring fishers, both in the Orkneys and Shetlands,

[1] I have noticed that the old males only make an exception with the ten-month old pups, who may be seen playing with each other like little puppy dogs amongst the older Seals, but I never saw one of these juveniles ashore at this season, a least not in company with big adults.

have told me that they often see 'Haaf-fish,' generally big males, fifty and sixty miles out to sea, apparently fishing alongside.

By the middle of September the first young Grey Seals are generally to be seen, and these are deposited either on the beaches of the sea caverns or upon the open rocks of the outer and sometimes inner skerries where they often betray their presence by their loud cries. In Scotland the pups are usually born during the last week in September, and sometimes as late as the middle of October, but in a certain cave on the Welsh coast they have been noticed as early as September 10, while a young one which I took from the body of an adult female which I shot in North Uist on August 28 was quite ready for delivery.

At the birth of her young the female Grey Seal exhibits more cunning than any of the other Seals in preserving and concealing her offspring. In this act she clearly demonstrates the close kinship of the species to the terrestrial mammals. Speaking of this animal's anatomy, Mr. Lydekker has already expressed such a view, but he has not noted this fact, which is one of zoological interest. Where Great Seals find no isolated islands surrounded for the most part by heavy tides and boiling surf, they retreat to main coasts and deposit their young in almost equally inaccessible places, namely the sea-washed cavern beaches, sometimes far up in and under the land, such as exist on east and north-west Sutherland, the west of Ireland, west of Orkneys and Shetlands. Centuries of persecution, however, have not yet taught the Grey Seal that their island homes, such as those in the Inner and Outer Hebrides, the Scillys, the Farne and certain islands in Orkneys and Shetlands, are not immune from the attacks of man even at the most tempestuous seasons.

The young Seals do not move much during the first three weeks of their life, which is passed on land. They lie in some crack or crevice near the water where their mother has deposited them, and spend most of their time in sleeping, only waking up at intervals to receive nourishment. During these first days of their lives, if the sea is rough and they happen to fall into the water, they are generally drowned, and have not the same affinity to this, their natural element, as pups of the Common Seal, who will follow their mothers at once.[1] They are however by no means averse from paddling and splashing about in fresh-water puddles, which are known among the Hebrideans and Orcadians as 'Seal pools'; such places occur on all the well-known Grey Seal resorts, like Haskeir, Suliskerry,

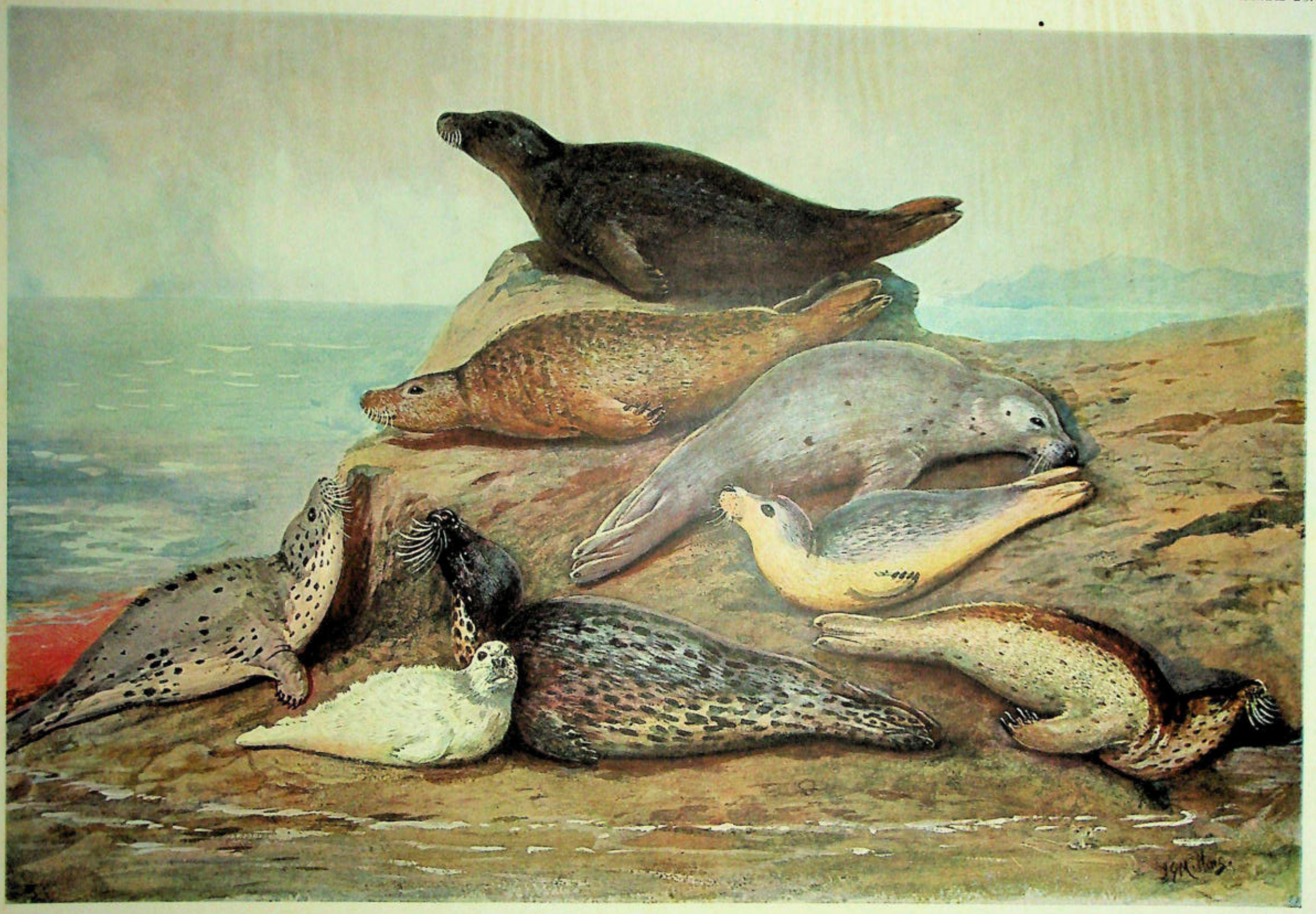
[1] For this reason Mr. Lydekker attributes to the Grey Seal a comparatively recent descent from some extinct land carnivore.

North Ronay, and the Seal Skerry in North Ronaldshay. The young Seal while in its woolly coat never enters the sea voluntarily, yet sometimes it is forced to do so by the presence of man, and under these circumstances it keeps close to the home rocks, swimming by its mother's side. Mr. Collett says that the young are sensitive to hail-storms and ice on the pools and will take to the sea in cold weather, finding it warmer than the land at such a time. When first born the young have practically no blubber, but so rich is the mother's milk that when three weeks old the pup is a round ball of oily fat; consequently it is at this season that the Seal-hunts used to take place. A young Grey Seal of this age has been known to weigh as much as sixty kilogrammes. With the appearance of the new coat comes a fresh phase in its existence, for the pups now take more readily to the water and are gradully weaned. When the young one is left more to its own devices it soon loses the greater part of the fat it has acquired, and if shot in the water is so thin that it generally sinks at once.

In its more youthful stages the Grey Seal is quite as active on land as the Common Seal, and in fact until it is more than half grown. But with increasing age, the portly figure becomes more and more unwieldy. The adult of this species seem to labour considerably in ascending rocks, and when perched on a small perpendicular rock, where I have several times seen big males left by the tide, they show the marked disinclination to move of a thoroughly cumbersome animal.[1] When in their second coat the young Grey Seals ascend to the very top of Haskeir, and have been seen by men in boats like a small flock of sheep moving to and fro on the grass ridges some two hundred feet above the sea. A boatman named James Harrison who lives on the hill at Sand Voe, Shetland, his house being situated half a mile from the end of the Voe, told me that, one winter morning in 1899, on opening his cottage door he was confronted by a young Grey Seal. Harrison's son took it to sea and set it afloat; by the next morning it was back again at the Croft and was again returned to its natural element. It is doubtful if the young of the Common Seal ever wander so far on land as this. Lloyd[2] tells of a wonderful land journey performed by a young Grey Seal which took to the land and then wandered through the forest past several villages, over a frozen river and a large lake on the ice, and again entering the forest was finally killed in a village, after travelling over about

[1] A very old male shot by Mr. John Henderson of Speggie, near Fitful Head, in March 1900, was lying on a tiny rock in the ocean, off which it seemed unable to throw itself.

[2] *The Game-birds and Wild-fowl of Sweden and Norway*, 1867, p. 403.



THE GREY SEAL.

HALICHŒRUS GRYPUS.

IMMATURES.

Printed in Vienna.

thirty English miles of country. The ground was covered with snow, and this doubtless facilitated the movements of the animal.

On the larger rocks frequented by the Grey Seal a state of polygamy prevails. The big males drive all the younger ones away and take to themselves as many as four or five females apiece. During the day they swim about together, and it is doubtful if the males eat much during the actual breeding season. At night they all lie up together on the rocks and constant growling and quarrelling goes on till morning breaks. If the day is wet or cold they once more take to the sea. Copulation takes place in the water and is performed after the manner of other four-footed animals. No mutual fidelity exists, although the males are exceedingly jealous; fierce fights frequently take place in which some of the combatants are fearfully bitten and torn about the head and neck, and the wounds inflicted are as bad as could be made by a tiger. The first time I ever saw a lot of big males together—it was on Little Haskeir—I witnessed a bit of a scrimmage which I shall describe later; as also the wounds inflicted on a young black male which I shot on Big Haskeir. After the rutting season there is hardly a big male skin that is not considerably lacerated; and the Grey Seals will not lie up and settle down comfortably together, as I have seen Common Seals do almost immediately after fighting.

In Scotland, in the annual Seal-hunts, when numbers were done to death, both old and young were always killed with a short sealing club of heavy wood about two feet long. Guns were rarely used, though they are in Norway. The man who could run smartly over the slippery rocks and dispatch the big male with a couple of blows of his club was always the local hero of the village. One old Hogary man told me that a particularly large male, which he was anxious to kill, came rushing down the steep pass he was guarding on the east side of Haskeir and, stopping when it reached him, seized his club in its teeth before he could strike. It dragged him head over heels into the sea, from which he was rescued only after a severe ducking.

Edmondston quaintly quotes some stirring episodes of Seal-hunting. 'In the dusk of the evening, a man thus engaged in an attack upon a few females who were lying at some little distance from the water, in making a blow at one of them slipped his foot and fell; the Seal, anxious to get to the sea, sledged herself over him; four or five others rapidly followed in her wake over the body of the prostrate *Homo Sapiens*, before he, oppressed by these nightmares, and petrified with terror, could elevate his *frons divina*. But his fears were ground-

less, the Seals had other "fish to fry"; escape, not combat, was their object, for they never attack man but when opposed in their retreat to the water, and this our hero was railwise facilitating rather than obstructing. A curious anecdote was related to me in Faroe of a native Waterton assailing on the rocks a male of the Great Seal, but, not being able to detain him, he actually got astride on his back, endeavouring to behead him at the gallop, and slipped out of the stirrups hardly in time to allow his *Barb*, mortally wounded, to take his leap, all alone, into the water.'

After the breeding season the immatures keep together in small parties and live on or near exposed skerries, but many come into more sheltered sounds and bays to fish, going back frequently to the outer rocks or dwelling with the herds of *vitulina*. Most of the adults, too, leave their home and spend the winter at sea, and are seldom seen on the rocks until late in the following spring.

The Grey Seal delights in the wildest and most exposed situations of the northern coasts. Nowhere is the sea too rough or the breakers too wild, but he loves to calmly survey the striving elements with philosophic calmness. His home is

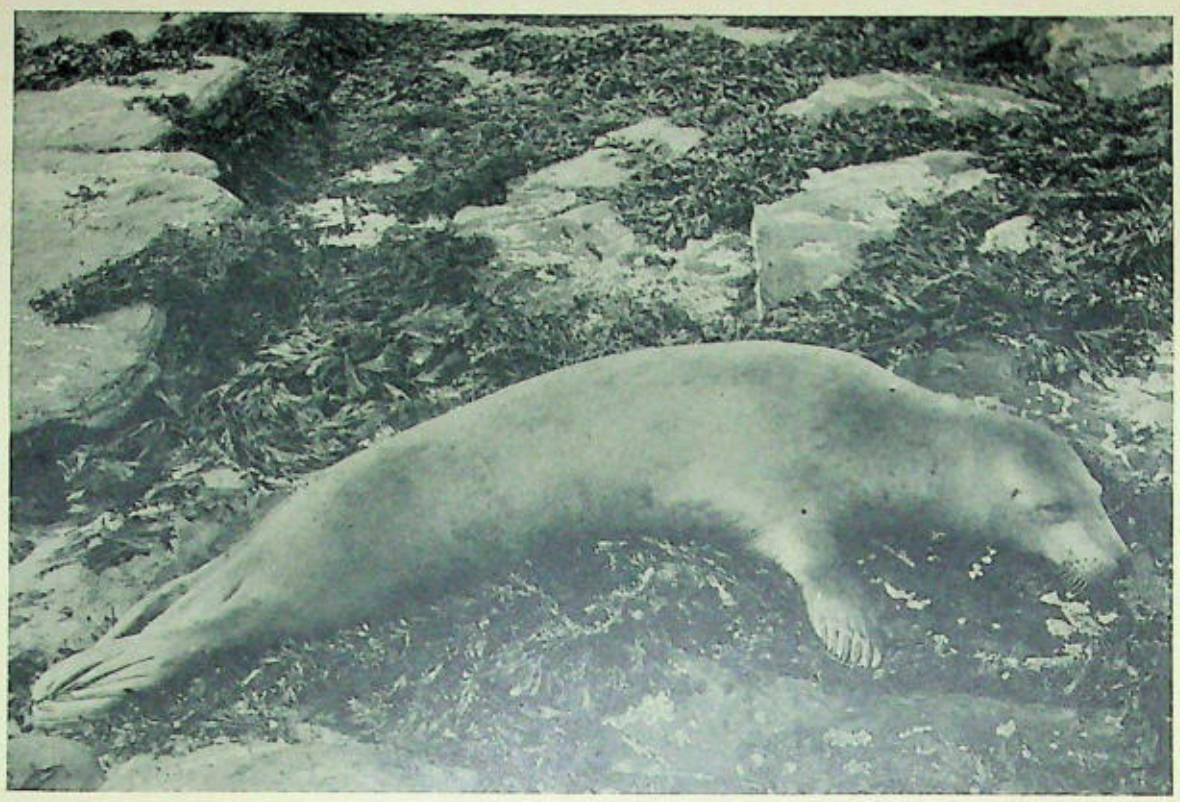
> Where the northern Ocean in vast whirls
> Boils round the naked, melancholy Isles
> Of farthest Thule; and the Atlantic surge
> Pours in among the stormy Hebrides.

He does not like a great wave to smash on his head, but sinks at once just as it is about to overwhelm him, only to reappear again in the same spot without concern. A favourite place for a *grypus* is always the apex or point of an outlying skerry where two tides meet in a swirling 'Jabble.'[1]

Here in the same spot he will pass hours, rising and sinking to the bottom where he rests and rolls on his back, sometimes staying below for as long as fifteen minutes. Except when actually on feed and cruising against the tide or round the rocks for food he will thus remain stationary at a fixed point, and under such circumstances will permit the close approach of man. It is, however, quite useless as well as unsportsmanlike to shoot one in such a position, as he is almost certain to be lost—the broken water causing his heavy body to sink at once.

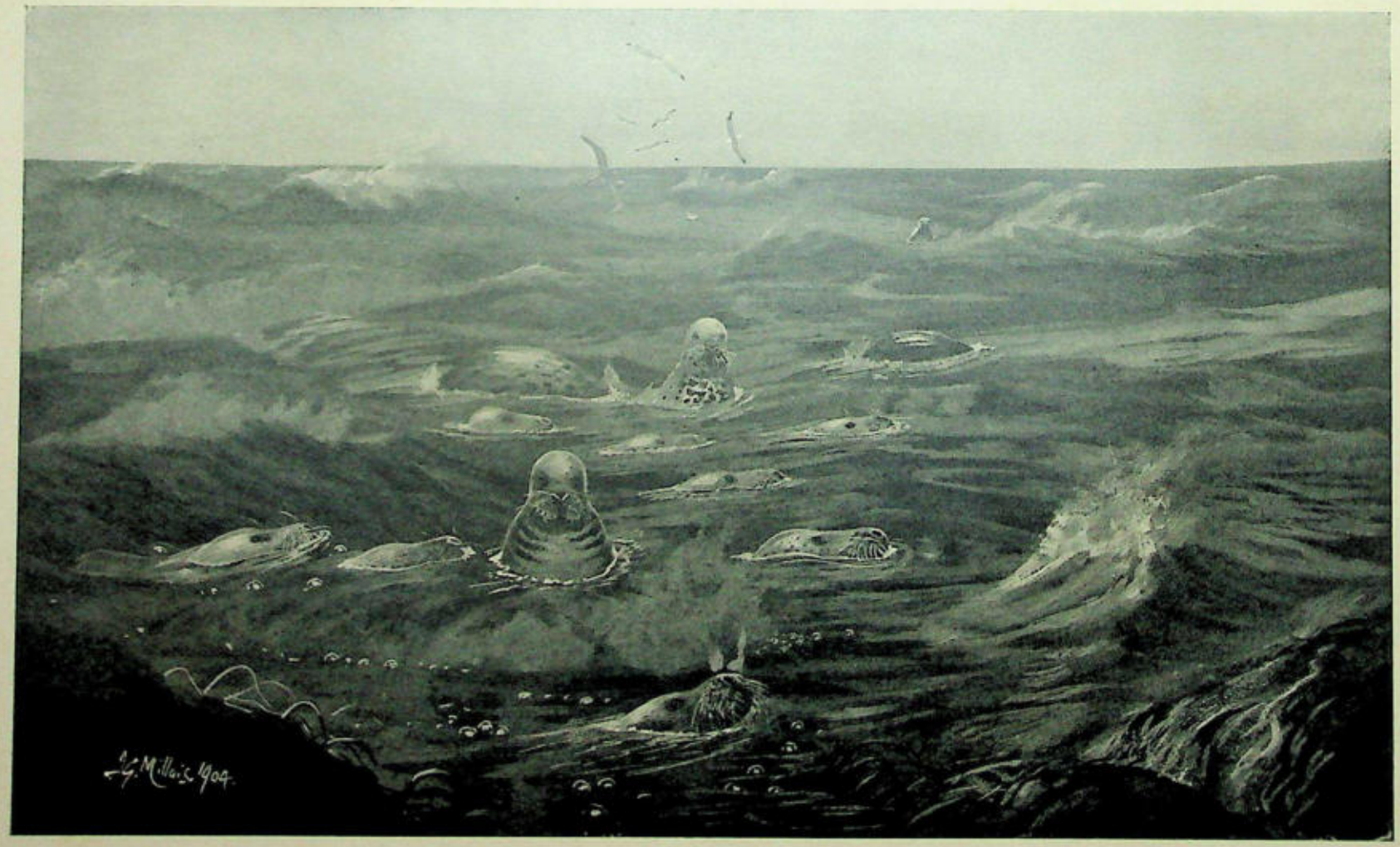
It is only after a prolonged gale that the large *grypus* will leave their chosen resorts and come into comparative shelter. This, I fancy, is not so much for the

[1] An expressive Orcadian word, used to denote the meeting of cross currents in a lumpy sea.



IMMATURE FEMALE GREY SEAL.

2 years. Enghallow, Orkney. From a photo by P. O. Malloch.



GREY SEALS ALARMED AND MOVING AWAY IN A HERD.

reason that they become tired of battling with the elements as that fish in heavy weather move either into deep water or more sheltered firths and sounds and so the big Seal has to follow them or starve. The females are always the first to seek such retreats, and it is not uncommon to find one associating the whole winter with a herd of Common Seals. On the other hand, however, the Grey Seal never permits the Common Seal to come near his regular breeding haunts.

From its heavy and somewhat clumsy build and consequent inactivity in making quick turns the Grey Seal is obliged to live on fish that swim slowly and are easily caught. Its favourite prey is the halibut, but it also catches quantities of rock-cod, which it secures by driving them into the holes and blind alleys of the sunken rocks; it will also eat conger, lump-fish, toad-fish, ling, and scaithe.[1]

For the purpose of catching fish Grey Seals descend to a considerable depth, for ling and halibut are generally found at a depth of from 60 to 100 fathoms. Round Haskeir, where I have seen them fishing, the depth is very great, in fact the boatmen say that it has never been fathomed. The Seals here probably feed on rock-cod, which swim at various depths. Nearly all Seals play with their prey after having caught and disabled it, and the Grey Seal, like others, holds it firmly in the fore-paws and tears off strips of the skin with the teeth. It then bites off chunks and swallows the food, smacking its lips with apparent relish. Fish are generally devoured under water, but occasionally a Seal may be seen wrestling on the surface with some large victim which it has difficulty in conquering. Dr. Edmondston says that in confinement the Grey Seal will eat flesh, but it is doubtful if either this species or the Common Seal ever takes sea-birds off the surface of the water, as the Greenland Seal is known to do. Neither of our native Seals feeds on land, but will do so in confinement.

A remarkable instance of the boldness of a Grey Seal was related to me by Mrs. Boscawen. She was fishing one day off Rosvean, Scilly, when on hauling in a good-sized pollack, a full-grown Grey Seal that had been cruising close by deliberately came and took the fish off the line within a yard or two of the boat; a few minutes later another fish was hooked on the spinner, when the Seal again came and tore it away. On both occasions the Seal was plainly seen in the act of taking the fish.

[1] Doubtless this Seal at times takes both salmon and sea-trout. Mr. Haldane, who lives on the east coast of North Mayen, near Ollaberry, Shetland, told me in 1901 that whenever the sea-trout were running up a small river near his house a very big 'Haaf-fish' would appear and destroy all chance of sport. The Seal fished for hours close to the mouth of the burn, so he was doubtless after the trout, and Mr. Haldane was at last obliged to shoot to drive him away.

Apart from the difference of size, it is easy to distinguish this species from *vitulina* by the form of the head when the animals are in the water. The Common Seal's head has a round bullety appearance, with a short nose and muzzle. It is a very wet-looking glistening head, and when excited by curiosity it is raised out of the water as far as the neck. The old male Grey Seal does not often raise the whole head out of the water, but swims with only the upper face and head exposed, watching an intruder suspiciously with his savage eyes. The long pointer-like face, Roman nose, and large fleshy lips are his most noticeable features, and his head always appears grey or white on the surface, especially if the sun is shining. The female in appearance resembles the male in the water, but she raises her head more frequently; the back of the head has a somewhat conical aspect.

Anyone well acquainted with the two species can also easily recognise them by the way in which they dive. The Common Seal usually just raises its head and then *sinks down*, rolling over after it is under the water, whilst the Grey Seals, both young and old, roll over on the surface like the porpoise, showing all the back in doing so. This is a general rule, but I have often seen Common Seals, especially large males, roll over like Greys, and Grey Seals, when shot at and very frightened, sink at once without rolling.

In swimming, the action of the Grey Seal is easy and graceful; as a rule it does not proceed against the current so fast as the Common Seal, but takes longer dives. When moving slowly on the surface they use their fore-paws to give direction, and scull with the fore-limbs in all turning movements, but underneath the water all the true Seals proceed in the same manner by making body wriggles like a fish and keeping the fore-paws close to the sides and the hind ones held close together with fingers closed. I do not think that their powers of sight are remarkable, but their hearing and sense of smell are well developed, though not quite so well as in a stag or a wild sheep; it is not always hopeless to try to approach a Seal from the windward side. This, however, depends much on the proportion of alarm to which they have been subjected. On the few occasions on which I have seen several Grey Seals lying up on a rock I have not observed a sentinel posted, as I have often seen in the case of the Common Seal. When lying up ashore Grey Seals are more heavy and less suspicious than the Common species. Except when angry, when they growl like bears, the cry of the Grey Seal is a melancholy sound like the words 'Ha-ii' or 'Hoo,' not unlike a dog's howl or the mooing of a cow. Immatures make a loud hiss when surprised or frightened.

Speaking of the cries of an immature Grey Seal kept in confinement by



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GREY SEAL.

(Halichœrus grypus.)

1. Adult female of the commonest type. Connemara. March. Length nose to tail, 6 feet.

2. Three-quarter grown male often dark marbled type. Connemara. March. Length nose to tail, 6 feet 1 inch.

3. Immature male of the black brown type, age 2 years. Haskeir, Outer Hebrides. September. Length nose to tail, 4 feet 8 inches.

Mr. Alfred Cocks of Great Marlow, Mr. Wilfred Webb says[1]: 'The Grey Seal when visited by the writer seemed rather to resent the intrusion, and uttered cries in which a likeness could be traced to those uttered by a cat, a dog, and a child. At night, however, when waiting his turn while other animals were being fed, the Seal changed his tone, his cries becoming more and more plaintive each time his cage was passed by.'

A common method used by both the Common and the Grey Seal to communicate the presence of certain danger is for one Seal in the herd that are gazing fixedly at a man to raise himself suddenly and bring down one of his flippers on the surface of the water with a loud smack. This is a signal immediately understood and acted upon by every member of the herd, for in an instant where there were heads a moment before there are only as many jets of water, flung upwards by the diving Seals.

Though other naturalists have domesticated the Grey Seal and believe it to be more morose and unintellectual than the Common Seal, Dr. Edmondston was of opinion that the two species were very similar in all points. Intelligence and disposition were more the attributes of the individual than of the whole species. In his paper on the Seals of the Shetland Isles he gives some interesting notes about two young Grey Seals which are well worth quoting:

'By far the most interesting one I ever had was a young male of the *barbata* [*grypus*] species; he was taken by myself from a cave when only a few hours old, and in a day or two became as attached as a dog to me. The varied movements and sounds by which he expressed delight at my presence and regret at my absence were most affecting; these sounds were as like as possible to the inarticulate tones of the human voice. I know no animal capable of displaying more affection than he did, and his temper was the gentlest imaginable. I kept him for four or five weeks, feeding him entirely on milk warm from the cow; in my temporary absence butter-milk was given to him, and he died soon after. Another was a female, also of the Great Seal species, which we captured in a cave when about six weeks old in October 1830. This individual would never allow herself to be handled but by the person who chiefly had the charge of her, yet even she soon became comparatively familiar. It was amusing to see how readily she ascended the stairs, which she often did, intent, as it seemed, on examining every room in the house; on showing towards her signs of displeasure and correction, she descended more rapidly and safely than her awkwardness seemed to promise.

[1] *Field*, November 1, 1899.

She was fed from the first on fresh fish alone, and grew and fattened considerably. We had her carried down daily in a hand-barrow to the seaside, where an old excavation admitting the salt water was abundantly roomy and deep for her recreation and our observation. After sporting and diving for some time she would come ashore, and seemed perfectly to understand the use of the barrow. Often she tried to waddle from the house to the water, or from the latter to her apartment, but finding this fatiguing, and seeing preparations by her chairmen, she would of her own accord mount her palanquin and thus be carried as composedly as any Hindoo princess. By degrees we ventured to let her go fairly into the sea, and she regularly returned after a short interval; but one day during a thick fall of snow she was imprudently let off as usual, and, being decoyed some distance out of sight of the shore by some wild ones which happened to be in the bay at the time, she either could not find her way back or voluntarily decamped. She was, we understood, killed very shortly after in a neighbouring inlet. We had kept her about six months, and every moment she was becoming more familiar; we had dubbed her Finna, and she seemed to know her name. . . .

'The younger Seals are the more easy to tame, but the more difficult to rear; under a month old they must be fed, and especially the *barbata* [*grypus*], almost entirely on milk, and that of the cow seems hardly to agree with them.[1] Perhaps their being suckled by a sow fed chiefly on fish, the giving them occasionally a little salt water, and then by degrees inducing them to eat fish, might be the best mode until they attained the age of being sustained on fish alone. In the *grypus* to ensure rapid taming it appears to be necessary to capture them before the period of casting the fœtal hair, analogous to what I have observed in the case of the young of water-birds before getting their first feathers, and when they are entirely covered with the egg down. These changes seem connected with a great development of the wild habits, and attachment to and knowledge of the localities where they have first seen the light. As the *grypus* until this period is in reality a land animal, the chief difficulty we have to surmount with it is in the quality of the milk to be given it. The *vitulina* is essentially an inhabitant of the water from its birth, yet the care of the mother is perhaps for weeks necessary to judge how long and how often it should be on

[1] The first young Grey Seal obtained by Mr. Alfred Cocks soon died after being fed on pure cow's milk. A second individual, however, was successfully reared on fish jelly and Mellin's Food, and lived for more than three years. According to Mr. Cocks's experience he is of opinion that the temperature of the milk secreted by female Seals is considerably higher than that of other, purely terrestrial, mammals.

land, and this we can hardly expect to imitate. In the young of this species a few days old which we have tried to rear, a want of knowledge of this kind of management may have led to failure. I have not attempted to rear them at a greater age.'

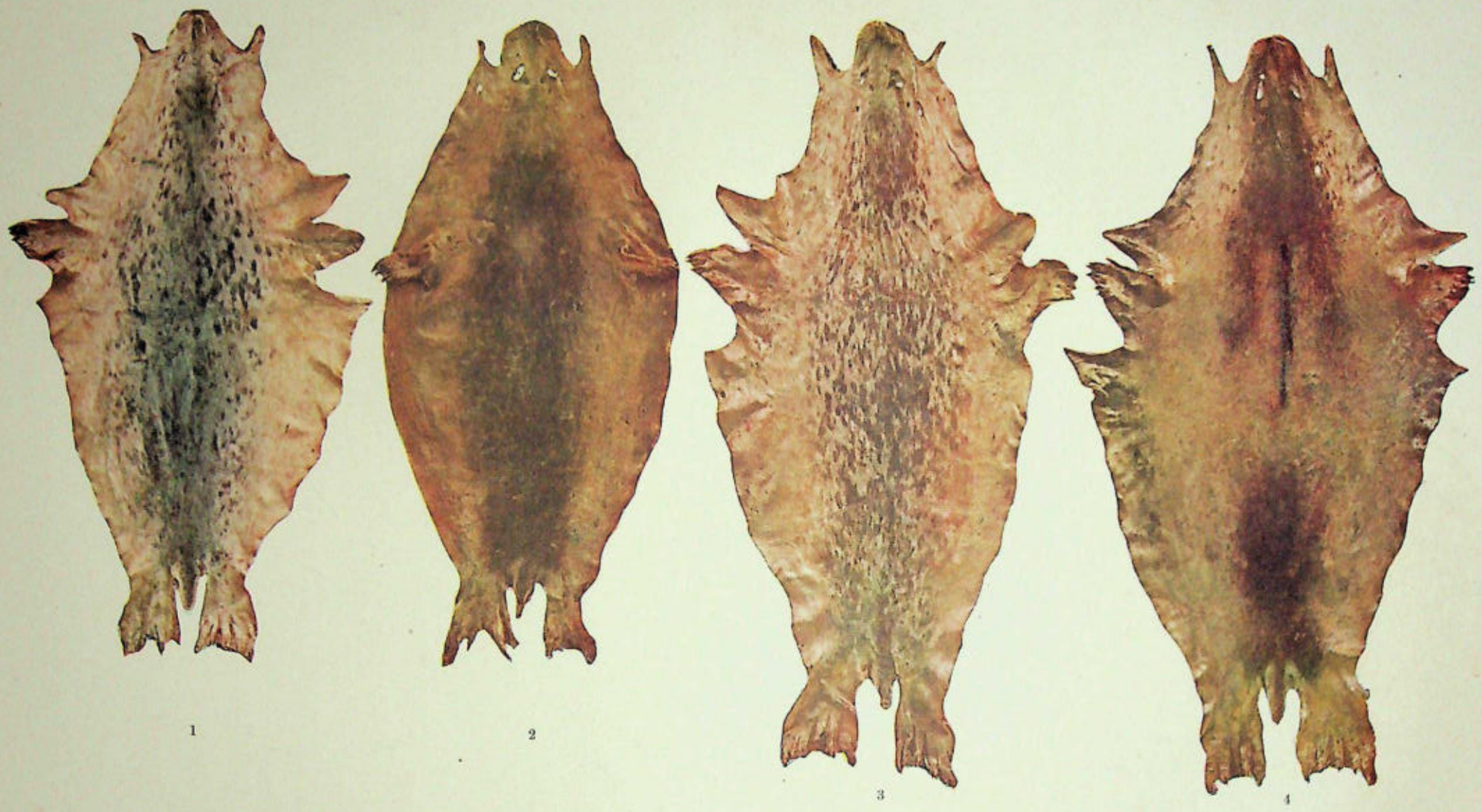
Modes of Capture and Hunting.—It is seldom that the adults are surprised ashore and clubbed except in the breeding season, but the immatures, which keep much together and lie up on the skerries in the winter months, are often attacked and killed in this manner; this is especially so on the Irish coast, where the boatmen are extraordinarily skilful in their little flimsy 'curraghs,' and will even dash in on an incoming roller and land boat and all beside the sleeping Seals. Of course this is a matter of perfect timing, for if they were caught on the back wash by the next roller the boat would be filled and sunk. Formerly both in the south and west of Ireland and in the Shetlands a strong net was employed to take the old Grey Seals when they were in the caves with their young. Often the water at the entrance of these caves or *Hellyers*,[1] as they are called in the northern isles, is quite shallow; the net is dropped across the entrance and the inmates alarmed. I have not witnessed this mode of capture, and from what I could learn it is now rarely practised except in Unst. Dr. Edmondston gives a vivid description of what he himself many times took part in:

'The dimensions of the net are about fifteen fathoms long and five broad, the meshes are nine inches square, and it is made of strong cod-line. When the Seals are suspected to have brought forth in a cave, the net is rapidly and silently dropped across the entrance. A man holding a rope attached to its upper ends is placed on each side, on some convenient pinnacle of rock that affords footing, and sometimes, from the shelving of the sides of the cave, the net cannot easily close it, and in this case the men hold each a long pole, with a bunch of straw or other substance at the end, keeping it constantly in motion under water, to deter the animal from escaping by means of this vulnerable part of the line of siege. When all is secured, the boat proceeds inwards as far as possible, and by firing and hallooing we endeavour to induce the Seals that may be in the cave to venture out. In one instance I remember seeing a female taken in attempting from the outside to get to her young. Monogamous or not, the males are the first to escape. Now is the period of excitement to the hunter. None of the old ones may be within, and he looks anxiously towards the cavern, straining to

[1] These caves were in Scotland always held in strict property, and deeds of conveyance used to be made when a change of hands took place.

penetrate even its murky recesses. Nothing is to be heard but the gurgling of the ripple on its sides, or the plaintive tones of the rock babies, expressive of their impatience for the feast of "Ubera distenta lacte," which by them, alas! are never more to be drained. By and by he fancies he perceives an object in the water, and in a moment after he sees the Seal darting with the velocity of an arrow under the boat, and presently he hears the welcome sound "Fast," from the men holding the ends of the net. At the first onset they are obliged to give line; for the Seal when he first strikes, finding an impediment, makes a turn, and if the net be then held too tense, he fails to entangle his hind paws in the meshes, and thus often slips out. Some of them are wary, and do not immediately fasten, but swim cautiously along the lower edge of the net, surveying with all the coolness of a Wellington reconnoissance the state of the enemy's lines, and gliding through where they find a point unguarded. When fairly enveloped in the net or *masked*, as it is called, the capture is considered secure. The power of the animal is constrained, and even were it not, he has to lift a mass of wet net, with heavy weights attached, to the surface, every time he attempts to respire; only the largest and most powerful can accomplish this, but when he does, or when the water is so shallow as to render it easy, he is shot. Generally he cannot rise, and all that remains to be done is to wait patiently for his death by drowning. From the boat he may be seen making vain efforts to tear the net with his teeth—rolling on the bottom—now and then desperately struggling to disengage himself, and constantly looking up with a most striking expression of defiance and upbraiding at the boat, which he knows contains the agents of his sufferings. In about a quarter of an hour he begins to open his mouth, bubbles of air ascend to the surface, and death ensues.'

Those who are anxious to get specimens of this interesting animal and wish to stalk it in a proper and sportsmanlike manner will find that it is about the most difficult animal in Europe to secure. First, it is scarce; secondly, for the most part it lives in wild places where the services of first-class boatmen are absolutely necessary; and thirdly, when a specimen is shot, only part of the difficulty has been overcome. Where Grey Seals are at all numerous, they are mostly full of curiosity and rather tame when in the water; but except under unusual circumstances it is the height of folly as well as cruel to shoot an animal that is almost certain to be lost. Unlike the Common Seal, the specific gravity of the Grey Seal is about equal to that of the water, so that it nearly always sinks at once, or at the most, in very calm weather, floats for but half a minute.



1 2 3 4

GREY SEAL.

(Halichœrus grypus.)

Showing various types of Immatures. Connemara.

1. Immature female normal type aged 6 months. March. New 3rd pelage. Length nose to tail, 3 feet 6 inches.

2. Immature, aged 6 months. March. 2nd pelage. Length nose to tail, 3 feet 6 inches.

3. Immature female aged 7 months. March. Old 3rd pelage. Length nose to tail, 4 feet 10 inches.

4. Immature male aged 7 months. March. Old 3rd pelage with new black fourth pelage just beginning to appear on back and belly. Length nose to tail, 5 feet.

Old males, the chief object of the chase, being generally in poorer condition than the females, go down at once when killed, unless they are shot right through the brain and are lying along the surface of the water in the basking position at the moment of death. Unless too you have very skilful boatmen, such as the Shetlanders or the Achill men, who are lying by close at hand ready to dash out at once and secure the Seal, it is hopeless to shoot them. The only way to secure a specimen is to have patience and wait for the one or two fortunate days when the sun shines and the sea is more or less quiet, and get off to the Seal rock on the chance of surprising the big fellows when they take their mid-day siesta at low tide. Another fair way of securing a specimen is to become acquainted with certain places on the coast where the old Grey Seals come in to fish at high water and where it is shallow on a lee shore. Then if one is killed he may be taken up by means of the water glass and the pole with cod-hooks, or he may be recovered at low tide. Such places are, however, only few and far between, but it is worth waiting many days and even weeks for the sportsman to secure such a grand beast as the Great Seal; it will test all his patience, all his accurate shooting, and all his skill to secure a couple of good specimens in a satisfactory manner.

I have had fearful disappointments, bad luck, and some measure of success with these animals, and have in the end been obliged to shoot several examples in order that I might obtain a complete knowledge of the pelages. Certainly little could be learnt from such specimens as exist in European museums; pictures and correct descriptions of the coat at different ages did not exist. This must be my excuse for many hunts after the Grey Seal. The following incidents from my diary may not be out of place.

The first day I ever saw a number of big Grey Seals together was a notable one, and taking into consideration the difficulties of the stalk and its subsequent incidents it was the most exciting chase I have ever undertaken.

Sir Arthur Orde, who owns Haskeir, having kindly given me permission to go there and obtain a Seal or two, I took the farmhouse and shootings of Balranald on the mainland of West North Uist for the month of August 1898, and there awaited with patience the arrival of a sunny and still day, on which it would be possible to land on the lonely rock. This occurred only after a wait of many days, and my brother-in-law, Captain Skipwith, and I set off from Hogarey village on a lovely brilliant morning with the sea like oil and the sky cobalt.

Our crew were of the worst type.[1] The nerves of the steersman were entirely destroyed with whisky, the second man was just recovering from a 'bout,' and the third half an idiot, and although professing to know all about Seal we found they knew little or nothing. Where the beasts lay up or on what islands was quite unknown to them. Haskeir is divided into two groups—Haskeir Mor (Big Haskeir), one big island, and Haskeir Beig (Little Haskeir), a clump of five little isolated rocks which stand up out of the Atlantic like jagged teeth.

We rowed hard over a heavy ground swell for seven miles, and then, the wind rising rather suddenly, we set sail and approached the big island, which stands up like a great rock cathedral out of the ocean. With a little difficulty Captain Skipwith and I landed, and after spying along the rocky ledges and seeing nothing we started up the face to explore the rock. Enormous boulders are strewn and littered round the base of the cliff; above, to some two hundred feet, is a stretch of turf, riddled by puffin holes until it seems rotten to its foundation. The birds, whose name is legion, came up in dense clouds from the sea, swirled round above us, or swept seawards from their nests, dropping diagonally towards the water, their red legs outstretched on either side of their stumpy tails. After more climbing we passed over a wonderful rock bridge which overhangs a bore of water which cuts the island almost in two. Ascending another hill we looked into the west bay, where on occasion the *Ron Mor* were said to lie. No; nothing there but a screaming colony of kittiwakes, guillemots, and shags; so we made for the boat again and were within three hundred yards of it when I saw a splendid old *grypus* come swimming along the side of the rock in perfectly still water. Seeing one of the men leaning on the boat, and thinking the others were ready to leap in and come at once if I made a successful shot, I got into position to fire, and as soon as the Seal reappeared, as he presently did about eighty yards off directly beneath me, I pressed the trigger, and there he lay on the surface with the blood pouring in a jet from his big head. Mr. 'Pip,' as my brother-in-law is called, at once stood up and yelled for the men. The callous individual who had been indifferently leaning against the gunwale certainly awoke to a semblance of activity, but where were the other two who had promised faithfully not to budge an inch from the boat? They were both far away up on the rocks taking

[1] The boatmen, half crofters, half lobster-catchers, of the Outer Hebrides are certainly the most indifferent seamen I have seen in the British Isles. They are neither seamen nor hillmen, but hillmen forced to the sea and deteriorated by living under insanitary conditions and intermarriage. Yet in justice to the place there was one MacIntosh who with his crew were honest and trustworthy fellows, but unfortunately he was not discovered till too late to be of any use.

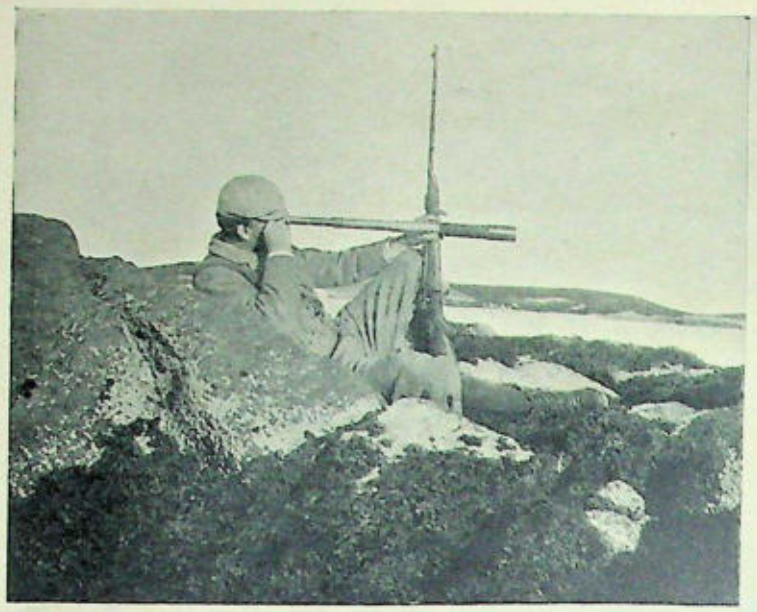
a 'wee drappie' and 'a bit smoke.' I was nearly beside myself with excitement, for the Seal continued to float high and well. He was a big fellow, about nine feet, I should say. It was only after my active relation had nearly broken his legs in rushing over the boulders and had hustled the men into the boat that a start was made, just as the Seal began to settle down. The precious seconds flew and the lumbering boat came along as the water lapped further and further over the back of the dead animal and then met. Would they reach it in time? No. It has already commenced to sink—and that was the last we ever saw of my first *grypus*.

With good boatmen this Seal would, of course, have been easily recovered, so we just had to swallow our disappointment and try the southern rocks, where there were sure to be Seals. As we left the big island another *grypus* followed us for some distance, and several times came up within ten yards of the boat as we sped along.

While we lay close to the three more northern islands of the southern group, it was easy to see from their steepness that there was no lying place for Seals there, so we sailed on expecting to find them on the western point of the southernmost island, where the rocks were said to shelve. The boatmen were now getting anxious because the wind was rising, and they said it would be impossible to land near the desired spot, but I had no intention of going there at once, as I had resolved to first spy the place from the neighbouring island, the ascent of which looked and was quite easy. What a sight greeted my eyes from this point of vantage. Twenty-five huge Grey Seals, nearly all big males, were lying huddled on the western shore of the south rock, and well above where the surf was breaking. No time was to be lost, as the sea was rising with the tide. Hurrying down to the boat I told 'Pip' of my good fortune, and we resolved to land and climb the southern rock from the east end, if possible, in spite of the boatmen's protests that no one had ever ascended the face before. There was only one point where a landing was possible, and from there, so as to proceed without showing ourselves or giving the Seals the wind, we must cross over the top of the island and then descend on our game. The point of difficulty consisted in ascending about eighty feet of sheer rock, and up this my brother-in-law went in the manner of the born climber which he is. Once at the top it was not difficult to say, 'Come along, Johnny, it's quite easy'; and though I reached within ten yards of the summit without experiencing any unusual sense of funk, yet on meeting with one of those horrible projections that bend outwards instead of

inwards I felt a strong desire to return. 'What are you doing?' said Mr. Pip, aghast, from the top. 'Going home,' I replied. 'And leave the Seals?' he almost screamed. 'You'll never get such a chance again.' I made various feeble excuses—that I was no rock limpet, that I had a wife and children, and that I had lost my nerve for the day, but he would not hear of it, and just to show what one man who is a skilful leader can do with another who is in no mood to face the disagreeable, he actually got me to tie a rope round my body, and half climbing, half being pulled, I got up and over that horrible place.

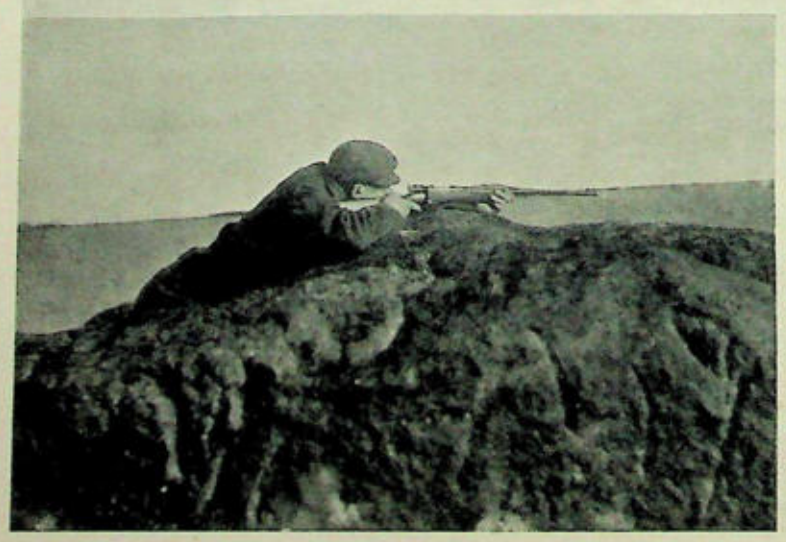
Once at the top we naturally thought all would be plain sailing, but not a bit of it. We had not gone many yards before a fresh difficulty in the shape of a great chasm, which cut the island right in half, confronted us. The narrowest point was about eight feet across, and it is not nice to know that if your foot slips there is a hundred foot drop into water from which there is no escape. Yet Pip took it like a bird, and finding he went over it so easily I summoned up my courage and followed him. Now we felt a sense of relief at last, for right in front of us was a high point which I knew commanded the Seals at what I judged to be about a hundred and fifty yards distance. After descending a steep gully and climbing up some great boulders, I peeped round the edge of the rock, and there were the great fellows lying exactly as I had first viewed them. Getting out the telescope I had a magnificent sight of a group of these animals; most of them were quite dry, so I spent some ten minutes in examining the different colours of their skins. There were two or three old grey and grizzled-looking animals, with the usual black ropes round their necks, but these were by no means the largest. Several were lying fast asleep on their backs, just like men, showing their white bellies and chests heavily marked with black. The majority were of the heavily marbled type, dark ash-grey markings on a light grey ground, and there were at least three that looked quite black all over except the grey back of the head. Those that were lying nearest to the breaking sea were uneasy and quarrelsome, and whenever one hustled or approached another he would growl like a bear and throw out his neck to seize the intruder. The largest Seal of the lot was an immense male, perfectly black and, as far as I could judge, well over 9 feet long. He was lying number three from the right, and I saw that if we could worm ourselves down to a ledge about forty yards to the right of the Seals, I should be practically certain to bag him. This manœuvre meant some pretty close crawling for nearly a hundred yards, our only cover being obtained from the top turnover of the rock overlooking a channel which ran













HUNTING THE GREY SEAL.

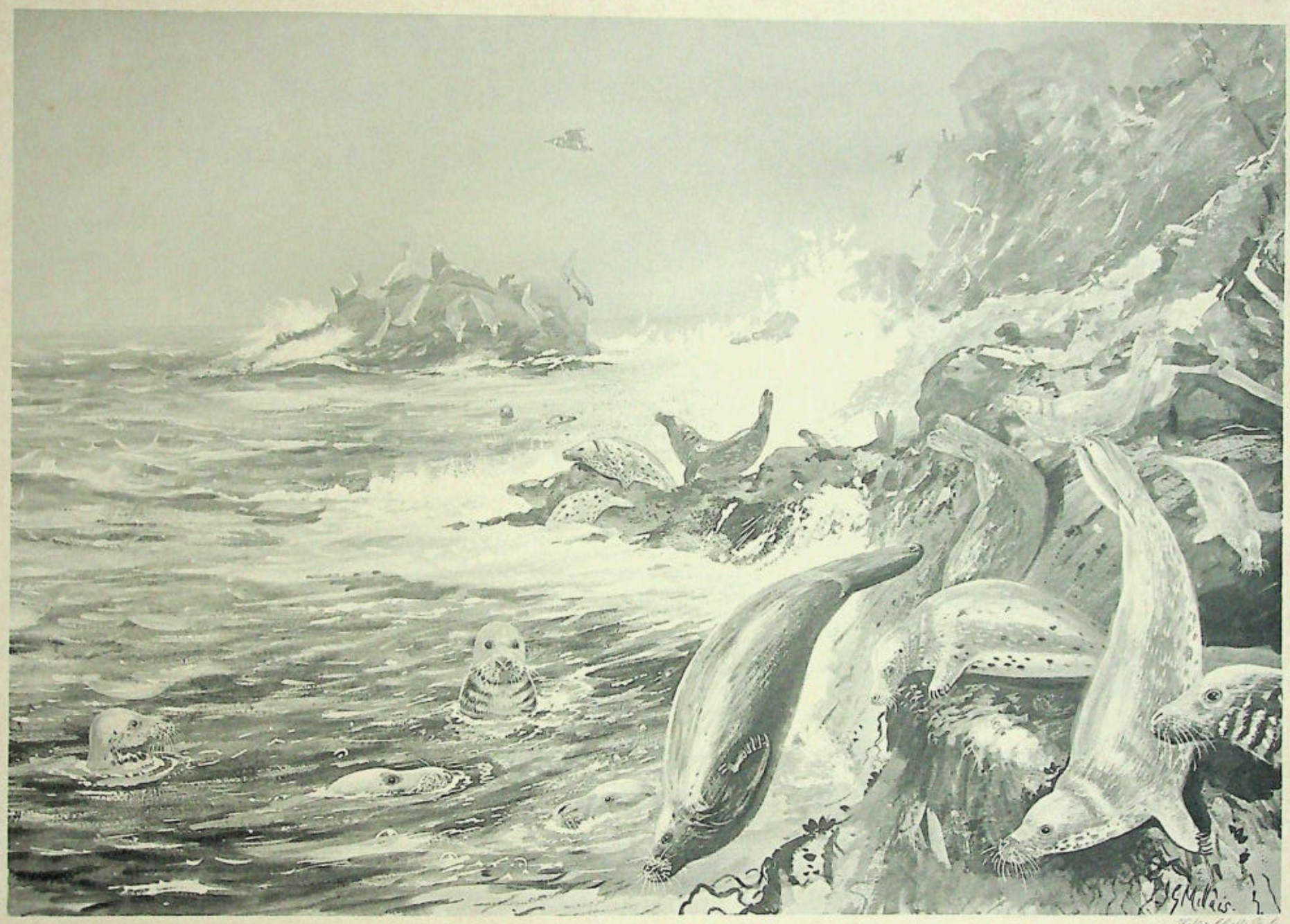
between this and the next island. We had gone about half-way over this dangerous part and were nearly opposite the western sea itself, when suddenly two young Grey Seals, which were within full sight of the bigger ones, popped up in the channel within five yards of the rocks among which we had suddenly to throw ourselves. It was a critical moment, and we dared not move a muscle, but were soon delighted with seeing the dear little things begin playing and romping with each other like a pair of puppies. They never once looked at us, but splashed and bit and sparred with their fore-flippers, till getting tired of their game of romps they suddenly dived, and we could see them several fathoms down chasing one another in and out of the green depths like a pair of water-sprites. After a bit they came up again, this time luckily outside the channel, and as soon as they again disappeared we hurried on to our point of 'abri.' One glance over the shelf of rock showed me a solid mass of Seals lying almost within a stone's throw. With difficulty I subdued the beating of my heart and got into a good shooting position. It was necessary to raise oneself a little to get the sight to bear on the head of the big fellow, but presently like a great lumbering walrus he moved up his head and shoulder and I put a Mannlicher bullet right through his brain in the exact spot I desired to hit. Naturally a scene of wild consternation followed. The majority of the Seals took headers straight into the breakers, while others began to flop a few yards. One big fellow was slumbering twelve or fourteen yards from the water, so I had time to fire three shots at his bobbing neck, the third bullet proving instantly fatal. He lay for a moment on the edge of the surf. I thought I had secured two grand specimens at any rate, but it was not to be. As we stood up to run and inspect the prizes a thundering breaker—the prelude of others to come—came crashing in, immediately swallowing up the second Seal. Sweeping right up the rocks it just reached the old patriarch sufficiently to turn him over on to some green weed, down which he slipped and then rolled over and over till he was lost for a moment in the white spray. This was staggering, but Mr. Pip at once tore off his clothes and before I could stop him was in the breakers. His hand was almost on the carcase of the bigger Seal which was now floating, when it suddenly turned over and sank, and turning to meet an incoming breaker my brother-in-law had just time to swim a few rapid strokes and surmount it ere it broke with a terrific crash. The Seals were now a secondary consideration, for Philip was only a fair swimmer and was in a really bad place, but it never disturbed him in the least. He made out to sea at once and then came round to the channel, where I climbed half-way

down; here I threw him the rope, up which he came, well-nigh perished with the cold.

Thus we came to the end of all that may be of interest to the general reader of this ever memorable and disastrous stalk. Often our failures in sport are more interesting than our successes, and in this case the prize was as nearly within the grasp as anything could possibly be. How we eventually made our way back to the boat, and how after more than an hour's talking and arguing with a crew of nerve-shattered drunkards we eventually induced them to approach near enough to allow us to get into the boat—for a nasty sea was now up—is too long a yarn and has nothing to do with Grey Seals.

The first big Grey Seal that I got was under rather peculiar circumstances, for I was not expecting to see one at the time. August 31, 1898, was a beautiful day, so Captain Skipwith and I were off to the island of Langasgeir where I hoped to shoot an old male Common Seal in the yellow coat, having seen a fine one there shortly before. We located the Seals, to the number of forty, lying on a small high rock situated within thirty yards of the south end of the larger island; there being no cover we had to go right to the north end and crawl flat on our faces through the water the whole length of the island. However, though the wind was bad the stalk was successful. Getting within a hundred yards I slew the yellow Seal where he lay, with a shot in the neck.[1] As the tide was rising swiftly I feared the body of the Seal might be floated off before the boat could arrive, so my gallant human retriever at once took off his clothes and went to fetch it. As he plunged into the water I suddenly observed two large *grypus* watching him with interest from the stream on the north side of the island, only about two hundred yards away. They were in shallow water and luckily had not seen me, for I had seated myself to fill a pipe behind some rocks. It only took a minute or two to work round to their flank within easy shooting distance, and the larger of the two had just come up again in exactly the same spot when I got into position and fired. The water, over an area of ten or twelve yards, was immediately clouded with blood and oil, but there was little doubt as to the effect of the shot, although the Seal had sunk at once. When the boat came round after picking up Mr. Pip in a nude condition, and afterwards his clothes, which had drifted far out to sea, it was no easy task to find the body of the Grey Seal owing to the fogged condition of the water, and after a disappointing hunt we were forced to abandon the search, with the hope of recovering it at

[1] This Seal is now set up in Mr. Rothschild's museum at Tring.



Grey Seals alarmed

low water early the next day. But a surprise was in store, for when the crew turned up at the point of Hanglon next morning, there was a wild cheer and sundry manifestations of joy on the part of the usually phlegmatic Hebrideans, for there was the *grypus* lying in the bottom of the boat. 'Where on earth did you get him?' we queried. 'We found him close by lying amongst the rocks. The tide sets straight in here from Langasgeir,' answered Shaggy McQuorcadale. The him 'was a her,' a very large female 6 ft. 1 in. to the end of the tail and 7 ft. 2 in. to the flippers, and a cart arrived and bore the remains to Balranald, where the skin was preserved and is now in my museum.

I paid altogether seven visits to Haskeir in two seasons, but only once with success. This was in 1899, when accompanied by my friend Mr. Hesketh Prichard we crept slowly along against the wind over the top of Big Haskeir, scanning every likely-looking 'bight' and shelf where a *grypus* might lie up. Near the centre of the island and lying on the edge of a pinnacle, fully twenty feet above the water, I suddenly noticed what looked like a large black slug. My glass at once revealed a six-foot *grypus* as black as a sloe, the very type of skin I most wanted. For some reason or other the Seal seemed in a state of nerves; every second it kept jerking up its head and wriggling uneasily, then straining its neck down towards the water into which it evidently feared to leap. Now and again it would move its body till it seemed to quiver on the very edge of the rock. Not a moment was to be lost, as we were still two hundred and fifty yards away; so hurrying as rapidly as possible through the rotten puffin holes we diminished the distance to a hundred yards. It was rather a difficult shot, for I dared not approach nearer, and the Seal would hardly keep still for a second, but it was absolutely essential to kill the beast stone-dead on the spot where it lay. Sighting very carefully and leaning on the shoulder of the big man of Patagonia, I pressed the trigger slowly and had the satisfaction of seeing the black head drop to move no more.

On examining the body of this Seal, the cause of his extreme restlessness was at once apparent, for the poor creature must have been suffering the tortures of the damned. On each side of the vertebræ and about a foot from the tail were a series of the most frightful wounds made by the teeth of a jealous old Grey Seal, into whose harem this youngster must unwittingly have strayed. The wounds themselves were several inches deep and were of a nature impossible to describe. It certainly looked as if a tiger had had hold of the poor beast and severely mauled it.

We all have our disappointments in sport, but in the following case it was more than a mere sporting failure, for I think I lost the finest specimen of a Grey Seal that ever was seen. Mr. Prichard and I went one day to Haskeir, and the Seals, being alarmed, moved off the rocks before we could get in our stalk on the south island. In the water and amongst seven other old males was the largest *grypus* I have ever seen or ever expect to see. He looked like an immense polar bear in the water, and the other old males seemed children beside him. Naturally I laid my plans carefully, and instructed the boatmen to follow my directions implicitly. The head man was armed with a Seal-gaff with which he was to hook the body if I was lucky enough to kill the beast close to the boat, whilst the others were to lie on their oars ready to pull. Well, the Seals allowed the boat to come within a hundred yards; and presently, as I lay on a high shelf waiting an opportunity, the great Seal appeared flat and high on the surface but within a long shot. I resolved to fire, and the patriarch of the Greys lay dying on the sea. It was a moment of intense excitement such as Seal-hunters only know, those few seconds in which the brain is torn with doubts of 'will they reach him or will they not?' My companion was for plunging into the sea then and there, but I restrained him, as it was a certainty that the boat would reach the Seal first. It was scarcely possible to look on the actual scene of passing events, and when I did imagine my horror to observe the prow of the boat almost touching the carcase, and the man who said he knew all about Seal-hunting suddenly drop the gaff which he held in his hand, seize a great oar, and lifting it up smash it down upon the head of the Seal. There was only one result of such a course: the floating body sank at once to unknown depths, and was seen no more. Comment in such a case is quite useless, but it is sufficient to show how all the patience, the exposure, and the time spent in attaining one's aim and object after many months may all be thrown away by the sudden action of one whisky-sodden idiot. How big that *grypus* was I should be afraid to say, but he was something far beyond the ordinary size; the Hogarey and Tigyarey men had known him for some years as the 'big bull' of Haskeir.

I did not secure a big male until the autumn of 1901, when I killed a fine one off one of the Ramna Stacks in the Shetlands. I was coming down the steep green face of the island of Gruney with a large and bellicose lamb across my shoulders, and was struggling to get him in a comfortable position, when my eye suddenly caught sight of a fine old *grypus* lolloping about in some swirling currents below, and not ten yards from the rock. My rifle lay about

fifty yards to the right on a point where I had been watching all the morning for a favourable chance, so handing the lamb to a crofter I made for the gun with quick strides and stunned the Seal immediately on his rising to the surface. The boat with six men lay within fifty yards of the Seal, and when about to shoot I had signed to them to be ready. They at once responded to the call, but found it impossible to get nearer than thirty yards, as there was a heavy swell going and they were afraid of being stove in. Then ensued a miserable exhibition of human incompetence. I could not swim, and from twelve crofters who stood around, each with a lamb boa round his neck and to whom I appealed to swim the ten yards and fetch the Seal, I received but one answer, 'Sic a peety we canna sweem.' The *grypus*, much to my surprise, floated and presently drifted away out into the Sound of Yell, where by chance a ling-boat from West Sandwich saw the floating carcase and hooked it with their cod-gaffs. A week afterwards in Yell I met by chance a man who told me of the capture, and I eventually recovered the skin minus the head and paws.

I secured another large Grey Seal the same season, in rather a curious way. At the north end of Yell is the tiny fishing station of Cullivoe, and there I obtained lodgings in the school, where for a week I received excellent fare and a good education from genial Mrs. Clubb. A long walk of seven miles round the Voe of Gloup brings the traveller opposite the Holm o' Gloup, once a great resort of the Grey Seal, but now almost deserted. Here I picked up a good local man named Robert Henderson, who knew the rocks well and said he could show me a big Seal. Exactly opposite the Holm was a little 'Geo' on the main island, and on looking over the top of a precipice, about three hundred feet high, we saw at the bottom a large Seal lying close to the water's edge. Henderson became immediately seized with the shaky palsy, but I was in no way disturbed, for I felt sure from the colour of the hide, a yellow grey, that the animal was only a very large Common Seal, which I had no intention of disturbing. 'Aren't ye going to shoot him?' asked my companion excitedly. 'No,' I said. 'It's only a Common Seal, and I don't want him.' However he begged me to do so, as he much wanted the skin for shoes for his family, so I gave in, but with doubts as to my ability to score, as it was a long shot. The first bullet hit the Seal across the back of the head and only partially stunned the animal, so I had to give two more, one of which penetrated the neck and the other the heart; then he lay still. On taking the telescope out to examine the victim I saw at once that it was a much larger animal than I at first supposed,

and that the distance looking down had made him appear small. The lips, too, looked unusually large and heavy.

The wind had got up, so Henderson could not work his boat round to the place, and for the four following days the dead Seal lay on the lip of the ocean—'The storm-tossed mockery of the eddying winds' as the poetical Virgil says. On the fifth morning the boat with six men got round to the north side in none too sweet a sea, and as it took five of the men to get the Seal into the boat I knew it was a *grypus*. Ye Gods! what a skinning there was that night outside the Gloup cottages. I for one shall never forget it. A fresh Seal is none too pleasant, but when the beast is going bad and the accumulated gases of five days are let loose it is positively awful. Nothing but a strong sense of duty and the necessity of preserving a rare specimen on my part, and a good supply of whisky and tobacco on the part of the Henderson family could have carried our labours to a successful finish. The Grey Seal was a fine old female[1] in very good coat considering the time of year.

It is not necessary to offer my readers further tales of Grey Seal hunting, but I have killed several since these memorable hunts. It will be seen that the chase is a far more difficult and arduous task than that of the Common Seal, which any boy can shoot. An extraordinary stroke of good luck may fall to the hunter, such as that which happened to Mr. Chapman in the island of Harris in 1900, when seeing a large *grypus* in the water he *stood up in the boat*, fired at the Seal, and picked it up then and there. Or we may mention the keeper of Newton, North Uist, who shot at a big male, wounded it somewhat, and his retriever *chased it into shallow water and caught it*. Such things may happen, but only once in a thousand times; and if a specimen is wanted it is better to leave the big Seals alone until the day comes when there is a certainty of recovering the body if the animal is shot.

[1] Length, 6 feet to tail, 6 ft. 11 in. to back-flippers. Weight estimated at about 20 stone.

Sub-family *PHOCINÆ*

The Common Seal

Phoca vitulina, Linnæus.

Phoca vitulina, Linn. 'Syst. Nat.' 12th ed. vol. i. p. 56 (1766).
Phoca variegata, Nilsson, 'Skand. Faun.' i. 359 (1820).
Callocephalus vitulinus, F. Cuvier, 'Dict. Sci. Nat.' xxix. 544 (1826).

Local Names.—*Seal, Common Seal, Harbour Seal, Fresh-water Seal, Sea-calf, Sea-dog* (English); *Sealgh, Selkie* (Scottish); *Ron, Ron-beig, Bodach, Biast, Moneis* (female), *Briomal, Ron-cablais* (males) (Gaelic and Hebridean); *Selkie, Tangfish* (Shetlandic and Orcadian); *Native Seal, Harbour Seal, Ranger, Dotard* (Newfoundland); *Sæl, Sælhund, Landsæl* (Danish); *Knubsjäl, Spräcklig skäl* (Swedish); *Fjordsæl, Steenkobbe* (Norwegian); *Seehund, Gefleckte Seehund, Robbe, Seekalb* (German); *Phoque, Veau-marin, Loup-marin, Chien-marin* (French); *Bay Seal, Coast Seal, Harbour Seal* (Canada, Labrador, and America); *Kassiagiak* (adult), *Kassigiaksiak* (young) (Labrador Esquimaux).

External characters.—The Common Seal is subject to much colour variation, but not to so great an extent as the Grey Seal. There are two pronounced types—a light and a dark form—which are most noticeable in adult males. In both forms the general ground colour is yellowish white, and skins may be relegated to one form or the other according to the density and frequency of the superimposed brown-grey and black spots. In males of the dark form the head and muzzle are generally black, and black spots are so numerous on the dorsal surface that the yellowish white flecks are hardly visible; on the ventral surface this light ground is nearly obliterated by brown-grey blotches, on which again jet-black spots are irregularly interspersed. The tail is black and the flippers brown-black with lighter webs. The throat is generally evenly spotted with grey-black and yellow-white, and is the lightest part of the coat except the belly.

In the light type in adult males the black and yellow-white are almost equally distributed; the appearance of the animal is similar to the markings of the Dalmatian or carriage dog. The whitey-yellow head is only covered with small black spots, but these increase in size over the whole of the back and lower parts. In this type we seldom see any of the intermediate brown-grey markings. Sometimes all four flippers are grey-black, and sometimes they are of the usual

yellow-white colour covered with small black or grey spots. Many intermediate forms exist which show variation approaching one type or the other.

This colouration is constant from the end of September until July, when the whole coat undergoes curious changes of colour before it is shed in August. In most of the dark males the hair turns a rich brown, usually in patches but sometimes all over the coat, while the old black and grey spots fade to almost a vanishing point. In nearly all adult males the whole of the under parts turns a uniform sandy or golden brown in August; the spots have vanished by the loss of pigment, and if we look closely we see the new yellow jacket with its dark spots appearing underneath. In the case of the very light types of males, in August the whole of the head, neck, under parts, and flippers turns a light sandy yellow, and only the back is still flecked with grey spots, which are not noticeable at a distance of a few yards. In a herd of Seals in August one or two of these old yellow males are always to be seen; when the sun is shining on them they look almost white all over, and are locally called 'white Seals.'

The adult females closely resemble the males, although they are rarely so big, the head in particular being much smaller. The dark spots on the back are usually set much closer together, while the under parts are generally lighter and are seldom so heavily flecked as in the males. As a rule the females change their coats more than a fortnight before the males, and although dark forms in brown pelage are common in August we never see the other extreme, namely the nearly pure sandy yellow type, among the sex at this season. I think I need hardly describe the pelages more minutely, as good examples of every type and age are given in the illustrations.

Naturalists are still disagreed as to whether the first coat of white fur is shed immediately before or after birth. At any rate I feel certain that the young are born with the complete second coat, which, although small in its markings, is almost an exact replica of that of the adult female.

Young Seals at first grow with great rapidity; by the end of July they weigh about 25 to 30 lbs. and measure about 3 feet in length. In appearance they resemble the old ones, but are without any spots on their sandy brown under parts. After this these immatures increase slowly, and do not put on more than a foot in length and are seldom fat at one year old. They continue to grow slowly, and though considered to be adult at four years old I believe they put on much weight and size subsequently.

I have measured and weighed a considerable number of Common Seals, and



Litho. W. Greve, Berlin.

COMMON SEAL.

Phoca Vitulina, (*adult males — winter*).

find that those of the Orkney and Shetland Islands are the largest on our coasts, if not in the world. Adult males in Great Britain measure from 4½ feet to 6 feet in length to the end of the tail, adult females from 3 ft. 6 in. to 6 feet. Males weigh from 9 to 16 stones, and females from 50 lbs. to 12 stones.

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Dr. J. A. Allen has pointed out[1] that the sexes may be readily distinguished by their teeth. In the male the teeth are relatively large, implanted very obliquely in the jaws, and usually furnished with a number of small accessory cusps on both the inner and outer edges. The females, he says, have teeth about one-half smaller, implanted less obliquely, and they are furnished with fewer accessory cusps, those on the inner side being almost invariably wanting. Since Dr. Allen published his paper I have examined a large number of skulls of British Seals, and though in the main I think that Dr. Allen's conclusions are correct, certain females possess teeth which cannot properly be distinguished from those of the males, and thus the test is by no means a certain means of determining sex.

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The skull differs in structure from that of the other British species; Bell[1] says: 'The posterior margin of the palatal bone is deeply and acutely notched, and the posterior palatine foramina are situated on the maxillæ, and not on the palatines or on the sutures as in *P. hispida.* Another striking peculiarity is in the form of the intermaxillary bones, the ascending processes of which do not run up to a point along the outer margin of the nasals as in the other members of the genus, but are truncated above, and either do not touch the nasals at all or are in contact with them at one point only.

Distribution.—Until the days of Linnæus there seems to have been only one species of Seal recognised in both the Northern and Southern Hemispheres, and it was that great naturalist who gave in 1754 the first systematic name to the Common Seal. It was left, however, to Fabricius to differentiate thoroughly the various species of Seals frequenting the Arctic regions, and to him is due the credit of the earliest history of the true Seals, admirably set forth in his memoir of the Seals of Greenland.

The Common Seal frequents the Pacific coast from California to Behring's Straits, as also the east coast of Siberia as far south as Japan. Its exact southern limit on the Asiatic side is at present unknown, as well as its range in northern Siberia, though it probably extends along the coast beyond the Amoor river, from which part Von Schrenk records it on the authority of the natives. In the Atlantic it is fairly common on the American coasts from New Jersey to the mouth of the St. Lawrence, becoming more numerous from this point northwards, especially on the coast of Labrador, where hundreds are caught every spring in the Seal frames. It extends as far north as open water is found beyond Davis Straits in Greenland, and is stated to be plentiful in that country at nearly all seasons. It is also common on the north and east coasts of New-

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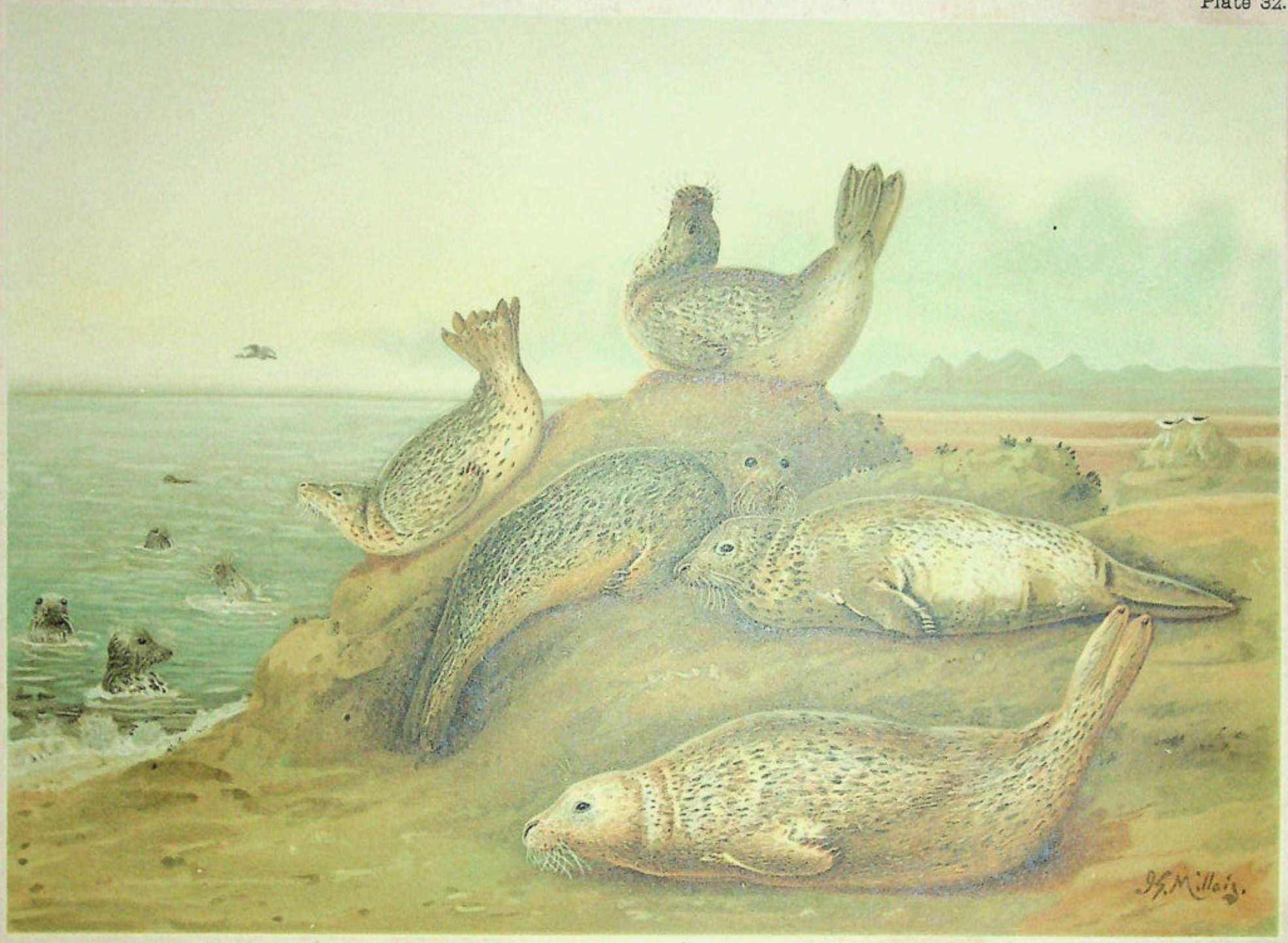
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COMMON SEAL.
Phoca Vitulina, (*adults. august*)

Litho. W. Greve, Berlin

foundland. In Europe the Common Seal occasionally visits the Mediterranean and the coasts of Spain, France, and Germany, whilst it is distributed all along the eastern coasts of Scandinavia to the very north of that peninsula, and is supposed to visit Spitzbergen.[1] This Seal also visits the Faroes, Iceland, and probably the east coast of Greenland.

The Common Seal is not very abundant in England, owing to the unsuitability of the coasts and the constant disturbance which takes place along them. To the Channel it is only a straggler, and it is first found as a resident in small numbers on the coast of Cornwall. In Scilly its place is taken by the Grey Seal, and Mr. Dorrien-Smith tells me that he has only once killed the Common Seal in those islands. A few also stay about the Bristol Channel and the coasts of South Wales and the west of England, but it is not numerous until near the Scottish border. Almost the same may be said of the east coast, where it is infrequent until we come to the Wash and Boston Deeps, where a few may generally be seen lying on the sandbanks at low tide, or fishing in the channels. Some frequent the mouths of the Humber and the Tees, and there are at times a good many at the Farnes and on the adjacent coast of Northumberland.

Of the Seals that formerly frequented the estuary of the Tees my friend Sir Alfred Pease kindly sends me the following notes:

'In the early years of the nineteenth century Seals bred in great numbers at the estuary of the Tees, and interfered so much with the salmon fishery that measures were proposed for their extermination; probably 1830–1840 is the period when they became extinct as permanent residents. In 1863 a Mr. H. G. Faber, a naturalist of Stockton-on-Tees, stated that from 1820 to 1830 about a thousand Seals frequented the mouth of the Tees, of which about thirty might often be seen at one time, but that in 1862 the number was reduced to three. They seem to have been more terrified away by steamboats than persecuted. Mr. Faber remembers them lying in dozens on the sands. About 1840 he saw twenty Seals on Seaton Snooks, and, says he, the last *native* Seal was killed in 1853, being shot from the 5th Buoy Light. Subsequently they have been casual visitors. Says Mr. Lofthouse of Middlesbrough, one of our local naturalists: "I have been informed by a gentleman who was in the habit of shooting on the Tees it was a common occurrence to see from twenty to thirty Seals on the sandbanks at one time so late as 1867."

'Camden thus quaintly describes the habits of the Teesmouth Seals: "Towards

[1] The Ringed Seal occurs in numbers in Spitzbergen, and the two species are easily confounded by any except experts.

Huntscliffe" (Huntcliff Nab near Saltburn) "and at Bullfleet Gate there are certain Rockes that at lowe water are left discovered whereupon Seales in Great Heardes like Swine use to sleepe and baske themselves against the Sunne; for their better Securitye they put in use a kind of military Discipline warily preparing against soddaine Surprize for on the outermost Rocke one great Seale or more keepes Sentinell which upon the first inklinge of any Danger giveth the Allarme to the rest by throweing of Stones or making a Noise in the water. When he tumbles down from the Rocke the rest immediately doe the like insomuch that yt is very hard to overtake them with Cunning: yf yt fortune that any unawares hath chosen his Sleepinge forthe so far from the Sea that he is in Hazard to become a Praye to the pursuer he then betaketh himself to his Armes flynginge the Pebbles and Sand from his hinder Feete with suche a Tempeste and force that a man had neede be well advised before he approache to neere; they fly the Sight of Men as of those from whom they have received many shrewde Turnes; when the poor Women that gather Cockles and Mussels on the Sandes by often use are in better Credyte with them. Therefore whoe soe intends to kill any of them must Craftely put on the Habyte of a woman to gayne grounde within the Reache of his piece."'

Mr. Lofthouse, a Yorkshire naturalist, has kept notes of the occurrence of Seals on the Yorkshire coast during recent years, and finds that one or two Seals are taken annually, generally during the autumn and winter months, up to the present time, but these are stragglers from the north and generally immature animals.

Although found at all seasons on the east coast of Scotland, by far the larger number of Common Seals seen in the estuaries of the big rivers, such as the Forth, Eden, Tay, and Esk, and in the Moray, Beauly, and Dornoch Firths, are migratory animals. Great numbers come down from the north in June, July, and August, and haunt all the passes where the salmon and sea trout enter the streams of fresh water. This especially is the case in the estuary of the Tay and the neighbouring coast, where I have seen hundreds of these animals bobbing about off shore in the course of a few days' shore shooting. Although so frequently seen in the summer and autumn months, my reason for thinking that most of these Seals are migratory is that during the winter months the observer only occasionally sees one, and even the Seals that frequent the sand bars in summer seldom pup there. The Common Seal is resident in some of the small islands of the Pentland Firth, and in all the little islands and rocks round the west coast of Scotland, where they are secure from molestation and are not disturbed by traffic. This species is common off Mull and down all the west coast, and



1 2 3 4

COMMON SEAL

(Phoca vitulina.)

Adult males showing change of tone in the colour of the pelage throughout the year.

1. April. Full winter coat.
2. July. Old coat turning to a russet brown.
3. The whole coat often turns yellow in August just before it falls.
4. September. Showing the new winter coat coming in again.

From specimens obtained in the Orkneys and the Hebrides by the Author.

I have even seen an old male lying on a small rock in the middle of the Clyde, near Bowling, amidst all the filthy output of that foul river and not five miles from the clanging hammers of the shipping yards. Big ocean-going ships slipped by within fifty yards of him every few minutes, but he was evidently dry and sleepy, and meant to have his rest at all hazards.[1]

It is not till we reach the Outer and Inner Hebrides and the Orkneys and Shetlands that we come to the true home of the Seal in our islands. There it is, in spite of frequent persecution, very abundant on most of the isolated skerries. It is one of the happy circumstances in the nature and fortune of this animal that in proportion to the amount it is chased so does it become wild and cunning. At least it is so with *P. vitulina*, for in two places with which I am well acquainted where men are out almost every day in the year in pursuit of Seals they are still almost as numerous as ever they were. One man, a grocer in Loch Maddy, who had made part of his living by shooting Seals in and about Loch Portin and the Sound of Harris, told me he could see no difference in the number of Seals now and when he was a boy.[2] Certainly on visiting one place which he described as a regular resort in North Uist I was not disappointed; for on one rock were sixty-two Seals, and during the day I must have seen some hundreds of Seals altogether.[3] Along the west coast of North and South Uist the species is abundant but scattered, for there they do not seem to live in large communities as they do in the Sound of Harris and in the Orkneys and Shetlands. About eight to twenty is the usual number frequenting certain rocks, and if they are moved off these by a shot they will take to another further along the coast or out to sea. Along the west coast of Harris and the Lews the Common Seal is less numerous, but plentiful again at the Shiants, North Ronay, and the Summer Isles. It is also common off Mull, Coll, and Colonsay.

In the Orkneys the Common Seal is abundant, especially in all the small holms and islands to the north of Kirkwall. Along the sheltered side of Hoy

[1] I am convinced that Seals have little or no objection to disagreeable odours. When I was in Rona's Voe, Shetland, in August 1904, two Seals came daily to within one hundred yards of the whale factory and lay up for an hour or two on the floating 'krangs' or flenced carcases of three dead whales, which were anchored to a buoy. The stench from these was overpowering to human nostrils, but the Seals seemed to experience no discomfort.

[2] This man said he had shot over a thousand Seals in ten years.

[3] This is opposed to Mr. Harvie-Brown's views on the subject, for he considered that the Seals are much scarcer than when he first knew N. Uist. The grocer Seal-hunter, who was the only man who harried the Seals, left for Australia in 1900, and died the same year.

Seals are preserved about Melsetter and are very tame, whilst about twenty permanently reside on Reisa Little and feed up Sandy Bay at Lyrawa Burn. In the Main Scapa Flow and the Bring they are now scarce, but are common again on the islands to the north of the mainland (especially on the Taing Skerry, where I twice saw over thirty in 1901), on the Galt of Shapinsay, and on Gairsay, Damsey, the Egilsay, and Eynhallow, all of which places I have visited at different times. The largest number I have seen together in Orkney was on the Galt, a long reef of rocks lying at the north end of Shapinsay; here one sunny August day in 1901 there must have been at least seventy lying up, although it was impossible to count them owing to their taking alarm whenever the boat came within three hundred yards of the reef. In all these places except Eynhallow, which obtains immunity on account of its terrific tides, the Seals are much harried by Kirkwall people, both residents and visitors, the majority of whom will fire at a Seal's head in the water, careless of the fact that even if the animal is killed it will probably be lost. The Calf of Eday is another Seal resort, and Harvie-Brown and Buckley mention the Linga Holm off Stromsay as a favourite spot. Sanday, Westray, and North Ronaldshay are not much frequented by the Common Seal owing to their more exposed situation, but a good number fish along the north coast of Sanday. These are probably travelling Seals.

The Common Seal is abundant in suitable places throughout the whole of the Shetland group, and I have noticed a curious fact in visiting the *vitulina* resorts in these northern islands, namely that some of the principal Seal colonies occur on the western side of the islands, beneath the tremendous precipices, and entirely exposed to the buffetings of the Atlantic. The Common Seal in all other parts of Great Britain as a rule seeks the shelter of small islands flanked on the west by larger ones which take off the force of the great seas that come in from the west. In Shetland, however, this is not always the case, and the largest Seal haunt in Great Britain faces the Atlantic in one of the wildest places one could imagine, on an ironbound coast, too, that a Grey Seal might almost fear to make his home.

Seals are plentiful at Scatness, the Holms of Quendale, and Fitful Head, also about the islands to the west of Scalloway, but their principal home is the Lang Clodie Wick at the back of Rona's Hill in North Maven, where I counted over three hundred Seals of this species in half an hour on August 14, 1901. No one ever disturbs them here, nor are they likely to be molested, as the rocks on which they lie are out of shot from the top of the precipices and it is only about two

days in the whole year that it is possible to get a boat round from Rona's Voe or Sand Voe. The following extract from my diary with regard to this wonderful place may be of interest to my readers.

'Aug. 14, 1901.—The wind being down or rather coming in gusts from the land over the top of Rona's Hill, Jim Harrison said we would attempt to reach the Seal rocks at the foot of the waterfall. After a long row of four hours we passed Fingla Ness, and gradually approached Hevnadale Head, where we met the wind coming down in heavy gusts from the hill. It was only after the combined efforts of all four rowing as hard as we could that, in half an hour, we rounded the head and came into calm water. Twice I told Harrison we had better give it up, but he would not do so, although we scarcely seemed to make a yard. But it was done at last, and I looked ahead towards some great white boulders lying beneath the precipices where Harrison said the Seals were sure to be. As we approached gently I saw a splendid sight: some fifty Seals were lying scattered on some sloping ledges, and on one huge isolated boulder as big as a large house. Many of them were (as I have not seen them elsewhere in Britain) lying far up from water, and some at least thirty feet up on the shelves, which were entirely covered with the creamy excrement which they emit, showing that the rocks had been for years their abode at all states of the tide and even in heavy weather. It was delightful to see how tame they were. They waited until the silently propelled boat was within twenty-five yards before they dropped off the rocks and fell into the sea. Two Seals fell a height of quite thirty feet into the sea close beside us, drenching us with the spray, and then popped up within ten yards for a prolonged stare. After the first alarm all the Seals that were in the water crowded round within thirty yards to have a good look at us and examine the strange visitors, but we were careful to make no sudden movement; at times they even leapt up in the water, evidently to get a better view. One little fellow was so impressed with the visitors that Jim Harrison almost touched him with an oar. Meanwhile we had passed out of sight of some twenty Seals that were still lying on the north side of the isolated rock, and so I landed quietly to look them over in case there should be one of an exceptional size whose hide I coveted. As I slowly peeped round the edge of the rock there were loud splashes of Seals falling into the sea twenty feet below, but a vision of a dozen broad backs well up on the rock some fifteen yards from the dropping-off edge convinced me that I should still have a few to inspect. These Seals were not fifteen yards from me, so I had to be careful, but as soon as I had secured a good position and view of them it was evident

that ten at least were still fast asleep; some were flat on their backs and as comfortable and inelegant as a man under similar circumstances. Those that were awake, among which was one immense old male, seemed too dry and sleepy to take much notice, although one grey-faced old patriarch stared me right in the face and evidently saw me plainly. It seemed a shame to disturb so peaceful a scene, but I wanted a Shetland Seal of the largest kind, so had to harden my heart and pull trigger on the big fellow. He never moved an inch, but went quietly to sleep for good. At the shot I looked round to where I had previously spied another twenty or thirty Seals on rocks some four hundred yards to the south, and saw a small shower of Seals falling into the water, and two other clumps of Seals on big boulders still further on, which were not disturbed; so after boating our first capture (which measured six feet to the end of his tail) we continued our journey beneath the precipices, accompanied by a small army of wondering mermen. Among them were two very large old males, I think nearly the largest I have ever seen, and though the temptation to have a shot at one of them was great I resisted it, as I feared to lose the beast. Presently beneath the lovely waterfall, which comes floating like a bridal veil from the top of the precipice, were more and yet more Seals, so I began counting the number, adding them to those which I had already seen. During the next hour we kept disturbing little groups off the rocks as we passed on to the south. I actually counted over three hundred Seals, and have little doubt that at least a hundred more were about the rocks which did not come within my view, and in this case I was careful not to estimate Seals that followed us in the water, for these of course kept appearing and reappearing. On some immense boulders nearly opposite to Gruna Stack I saw one hoary old male lying on a small rock; another large rock stood in the way, so taking cover behind this I soon found myself lying within sixty yards of the big fellow, who was quite unaware of my presence. Thinking he was worth a shot I fired at his head, when after rolling twice over he lolloped into the sea. Jim Harrison was up to the spot in a moment, and as the Seal again appeared rolling on the surface I gave him another shot, which killed him at once. Luckily he floated and Jim had his gaff into him at once. The Seal was a very old male, in length 5 ft. 9 in., and had been struck in two places by the first bullet which, being a defective one, had split in two pieces in the air, one portion hitting the animal in the side, the other in the neck, only making a small flesh wound, so it was really lucky we got him. Opposite the Gruna Stack the precipices rose to five hundred feet above the sea,

and the echo when the rifle was fired was truly awe-inspiring. We felt as if the whole of that mountain of rock was about to fall on our heads.'

In nearly all the islands of the Sound of Yell the Common Seal is abundant at times. In 1901, when I visited Lamba, Little Roe, Bigga, Sliga Skerry, and Brother Isle, I saw very few Seals except at the Little Holm opposite North Rooe, where there were about twenty-five, mostly immatures. Most of the Seals were off fishing elsewhere, owing to the fine weather, but at times large numbers gather together on Sliga Skerry and Brother Isle.[1] The Muckle and the Little Skerry, lying far to the north-east of Whalsey, are other favourite resorts of the Common Seal in Shetland, as are also Linga and Hascovay to the east of Yell, and the Geos of the West Noups on the west side. On the West Noups I saw about forty lying up on three of these 'Geos,' and killed four adult males for the crofters at Gloup, who were anxious to have the skin for shoes. Here I saw one day the largest *vitulina* I have ever seen. From the top of the cliff I had just killed a male in one of the caverns, and in trying to discharge the empty cartridge case I found that the action of the Mannlicher had locked and would not move, so, having no tools handy, it was impossible to take the rifle to pieces and reload. As my companion, a crofter named Robert Henderson, and I were about to set off for home, he advised me to inspect another open sea cave a little further on. Looking carefully over the cliff I saw within sixty yards eight full-grown Seals lying on a slab, and a huge Yellow Seal swimming up and down, about to land. In the course of a minute or so he ran in on an incoming breaker, and, getting a hold, flopped up on to the dry rock. Of course the beasts we don't get are always the biggest, but I have no hesitation in saying that this was the largest *vitulina* I have ever seen; he was well over six feet to the end of the tail. I watched him for half an hour with the telescope and then went home. During the next two days I walked the sixteen miles to the cavern and back twice, with the hope of shooting the monster, but I did not see him again. Doubtless he is there still, and I may yet make his acquaintance.

The Common Seal is still plentiful in Unst, but not so abundant as in Dr. Edmondston's time, who, writing from Balta Sound in 1837, says that he has often seen a hundred at a time.

The Common Seal is not nearly so widely distributed in Ireland as in Scotland. On the east coast a few migratory Seals keep passing to and fro, and

[1] On Samfrey, off Mossbank, I counted in August 1904 over a hundred Seals. Amongst the Common Seals were several immature Grey Seals.

I have seen one or two about the Saltees Islands off the coast of Wexford, but they are common in Carlingford Lough. This species is fairly numerous on the south coast, but there and round the west and north the Grey Seal is the commoner species, although numbers of the smaller kind frequent Clew Bay, the Moy estuary, and the sheltered Sounds of Achill and Donegal, especially about Dunglow Bay. The Common Seal is also common about Roundstone in Galway, where the Grey Seal is also found.

Habits.—The Common Seal is not of a roving disposition; so long as food is plentiful it will remain within a restricted area all its life. Seals will resort year after year to the same rocks and the same lying places until the surfaces of these are as smooth and polished as marble. Fish are always shifting their ground, and unless other species take their place the Seals must follow them, so the latter may be absent from their regular resort a few days at a time, subject to wind and weather. From a close study of the habits of these animals in the north I consider that the majority of those frequenting the east coast of Scotland are migratory, while those on the west are, except for local movements, stationary. At times the big firths on the east coast may be swarming with Seals, while the following week not one is to be seen. Their knowledge of the time of running of the salmon and grilse is very accurate, for about August 1 they are in full strength on both the Tents Muir and the Carnoustie side of the Tay estuary to meet the incoming mass of the fish which always make their first big run about August 22. After meeting the run of the fish, and even taking them in some instances from the stake nets, they follow their prey right into the river till they get them in the narrows, and unless the Seals are shot at here, few salmon will reach the upper reaches of the Tay without having 'Seal-marks' on flank or tail.[1] After the first run of the fish the Seals all disappear, and scatter along the coasts to north and south, reappearing again about the last week in September, when a further big salmon movement takes place. After the end of October few Seals are seen, and they are not plentiful again until June or July, when many appear with their young ones. Certainly the majority of these east coast Seals must work south immediately after pupping in the northern islands, for save under exceptional circumstances they do not bring forth their young ones on the sandbanks or on any part of the rocks of the east coast of Scotland, and there are no holms or little islands between the Farnes and the Pentland Firth that are regularly

[1] More than one fish expert thinks that the 'fungus' disease, so prevalent in certain seasons in the Tay and Tweed, is created by Seal-bites.



Common Seals resting (Winter)

frequented by Seals in the breeding season. We must therefore conclude that the Common Seal is for the most part migratory on the east coast of Scotland, and the same also applies to the east coast of England.

Save on the Tay, where Seals are such a nuisance that the syndicate interested in the salmon fishing is obliged to keep a man constantly shooting them, but few Seals are killed on the east coast of either England or Scotland. When fishing, a Seal is rather wary, and when lying up on the sandbanks it generally has an excellent view for a mile or two round, and consequently no man with a rifle can approach it without being seen. Although Seals constantly get entangled in the stake salmon nets, so bold and clever is the Common Seal that it is but rarely taken in this manner, for its strength is great and it can both smash and bite through the meshes of the net when entangled.

About the end of August, just as the old males (which may often be seen in a herd apart at this season) are changing or have changed their old ragged yellow or brown coats for the new winter dress, they begin to fight. I have seen them spar on shore and cut at each other with their fore-flippers, but as a rule they fight in the water, seizing each other like dogs, generally by the neck, and scoring one another with their strong fore-paws till open wounds six or eight inches long are made. They fight both on the surface and below the water, and often leap into the air to avoid each other. I once observed two old males, one of which I afterwards shot, having a desperate conflict in Balranald Bay. It was a perfectly still sunny day, and six of the eleven males that frequented this bay had already 'gone up' and were beginning to enjoy their siesta, when two others came from opposite directions and began coasting up and down in the usual fashion, preparatory to hauling up. Suddenly one of the males rushed at the other and seized him by the scruff of the neck. The next moment both rolled over together and sank, only to reappear a few yards away, biting and wrestling in the water which they churned into foam. First one seemed to have the best of it, and then the other, till finally one of the combatants made a bolt and cleared out of the bay, leaping at intervals right out of the water as his enemy approached. The other, however, returned, and presently flopping ashore lay up quite amicably with the other old males.

Generally speaking the sexes remain in separate herds from May to September; but with regard to Common Seals, what is true of one district does not always apply to another. In the Orkneys and Shetlands especially, I have seen the sexes mixing indiscriminately all through August and September. Although

the males are constantly fighting, for hardly one is without abundant scars at this period, it is rarely possible to witness a conflict. The union of the sexes takes place early in September, and the period of gestation is nine months, for the female gives birth to her single young one about the first week in June.

It is generally thought that the young of the Common Seal are born with a white woolly covering which may or may not be shed within a few hours or days after birth, and that the young then follow the mother to the sea. This error is quoted in nearly every work on the subject, but many excellent observers, such as Mr. L. Lloyd (in his 'Game Birds and Wild Fowl of Norway and Sweden'), believe that the cub casts its woolly coat while still in the womb of the mother, and is born wearing the second pelage. This was also the opinion formed by the Seal-hunter of Loch Maddy, who had slain hundreds of Seals. In 1899 he showed me the tiny skin of a baby Seal *in the second coat of hair*, and also some balls of white woolly hair which he positively asserted he had taken from the dead body of the mother which he had shot at the beginning of June in that year. Dr. Edmondston too, than whom there was no more careful observer of the habits of our Seals, also held a similar opinion. 'The fœtal covering of hair is of a silvery white and of a silken fineness. This is cast in the uterus some time before birth, and thrown off with the secundines—a singular fact, directly contrasted with what occurs in the young of the Great Seal.' It is quite certain that young Seals born on sandbanks must take to the water on the day they are born, as soon as the tide flows, and to do so in their white coat seems more than strange, since this is not the usual case with other Seals which have a white first coat. I have met with many reliable persons who have seen young Seals apparently just born but in full second pelage, but never with one who has seen a young Common Seal in the white coat lying up ashore. This too is my own experience, and I have seen many baby Seals recently born.

Captain Macdonald of Waternish, who hunted Seals for many years in the western isles, is reported to have said[1] that the 'young are born white, with curly hair, like the young of *Pagomys fœtidus*, but within three days of their birth begin to take dark colours on the mouth and tips of the flippers.'[2] Mr. Allen also states, on the authority of Mr. Kumlien, that the Esquimaux affirm that 'the young remain in the white coat but three or four days, differing greatly in this respect

[1] Allen's *Pinnipeds of North America*.

[2] Mr. Robert Brown in *Proc. Zool. Soc.* 1868, p. 413. St. John also in his *Wild Sports of the Highlands*, p. 256, says the young are born cream-coloured.



Common Seals basking (August)

from *Pagomys fœtidus* (the Ringed Seal).' Added to this we have the testimony of Mr. Bartlett, who in describing a young Common Seal born in the gardens of the Zoological Society on June 8, 1868, says: 'It was born near the edge of the water, and in a few minutes after its birth, by rolling and turning about, was completely divested of the outer covering of fur and hair, which formed a complete mat, upon which the young animal lay for the hour or two after birth.'[1]

Bell, Lydekker, and Sir Harry Johnston also all state that the young is born white. Now let us look at the other side of the question.

I thought the above remarks attributed to Captain Macdonald to be very extraordinary for a man of his unusual experience with Seals, so I wrote to him and received the following interesting letter, which entirely disproves the views that have been attributed to him. 'It is quite a mistake to suppose that the young of the Common Seal is born white; I have shot hundreds of them and regret that I have shot many when in young, and when dissected have found some of the young so far advanced that the full pelage had set in. In every instance I found these far-advanced pups to be coated with a mottled grey and dark-coloured fur *and never with a white fur*. This grey and dark fur was too the colour of the young when lying on the rocks with their mothers. Some of these pups were so young that they could not get off the rocks until pushed forward by the old ones, who seeing their babes once in the water, would seize them by one of the fore-flippers and dive with them at least two hundred yards before reappearing on the surface.'

The following evidence too seems to me to finally settle the question and to leave not a shadow of doubt as to the condition of pelage of the young Common Seal at birth. Writing to me Aug. 9, 1903, Col. Gostwyck Gostwyck touches upon this point as follows: 'Perhaps you would not mind my giving you confirmation as to the Common Seal *not* being born white, as stated in every work of natural history. For my part I never believed the circumstance, and have frequently seen, as no doubt you have, the very smallest of the young Seal seated on the neck of the cow when swimming in the sea, and these youngsters were so small that they could not have been born but a short time. Their colour has invariably been dark, and more inclined to very dark. Now I will give you still greater proof. Waternish (Capt. Macdonald of Waternish) a few years ago shot a Seal at the "Ascribs" and when the Seal was in the boat Rony his man said "That's a big Seal, Captain." "Yes," replied Waternish, "I'm thinking there are twa Seals there." Well, they cut open the cow, and there was a young one so very far developed that Waternish

[1] *Proc. Zool. Soc. London*, 1868, p. 203; also *Zoologist*, 1881, p. 332.

said it would have been born in a very few hours. He gave the skin of this little Seal to me, which I had dressed and made into a vest which I send to you.' This skin I have examined. It is spotted and marked exactly like that of an adult.

It does seem strange, however, that a doubt should exist on so important a point in the natural history of one of our commonest animals, and all the more so since naturalists are perfectly well acquainted with the early stages of all the other Seals. I am quite convinced, however, that the young Common Seal is born wearing the second pelage.

Unlike those of the Grey Seal, the young of the Common Seal are regular water-babies from the very first. I have seen young ones only a few days old accompany their mothers in quite a heavy surf and not seem unhappy, but the parents are for the most part careful to place their offspring in some sheltered cranny on the lee side of an island or in a firth protected from the cruel west. The mother Seal suckles her young for about two months. Young Common Seals grow with great rapidity, the males being generally about three feet in length by September, and though they afterwards progress in size fairly quickly, they are not adult until the fourth year. Their growth seems to be more rapid than is the case with the Grey Seal, but like that animal they attain much weight after they have reached maturity. Old males often have a grizzled appearance, and will sometimes weigh as much as a gralloched stag (fifteen stones).

As a rule, in the northern and western isles the female Seals collect together about the time when the young are born, while the old males and immatures consort separately. These troops of old males and immatures still keep apart until September, but the females which have given birth to young separate, and may be seen swimming about singly or attended by their little ones. There is no doubt that all the Seals are polygamous,[1] and the Common Seal is no exception. The female is just as promiscuous as the male in her love affairs, and will wander off with any male who happens to lure her away from her temporary husband.

In most places where the animals are common, and the winds and tide favourable, the Common Seals spend much of their time ashore. Almost every day, when the sun shines and the tide has half ebbed or just commenced to flow, they repair to their favourite rock or sandbank and spend an hour or two in resting and sleeping. The sandbanks they choose are generally well out in an

[1] I make no exception, even in the case of *Halichœrus grypus*, which many naturalists say is monogamous.



Common Seals Suspicious

exposed part of an estuary, whilst the rocks they love have usually deep water round them, and, like the sandbanks, are covered at high tide. They like especially to choose a rock at some little distance from the main coast or island and of such a height and shape that they can view all approaches. Moreover, the presence of seaweed and long tangle is disagreeable to them, as it prevents their landing with comfort. As a rule they like an off-shore wind for landing, as this not only makes the sea still but gives them the wind of an enemy approaching from the only really dangerous direction.

The immatures and females are generally the first to haul up; they go farthest from the water's edge, and they will sometimes get far up on the rocks and go fast asleep, leaving it to the old males who come last to keep watch. These immatures and females are not nearly so suspicious as the old males, and I have often seen them swim straight to the landing place and 'hirple' right up the rocks to some cosy corner where, as the sun dries them, they go off comfortably to sleep, without a further thought. Not so the cunning old patriarch of the herd, but let us watch his movements as he comes to his resting place.

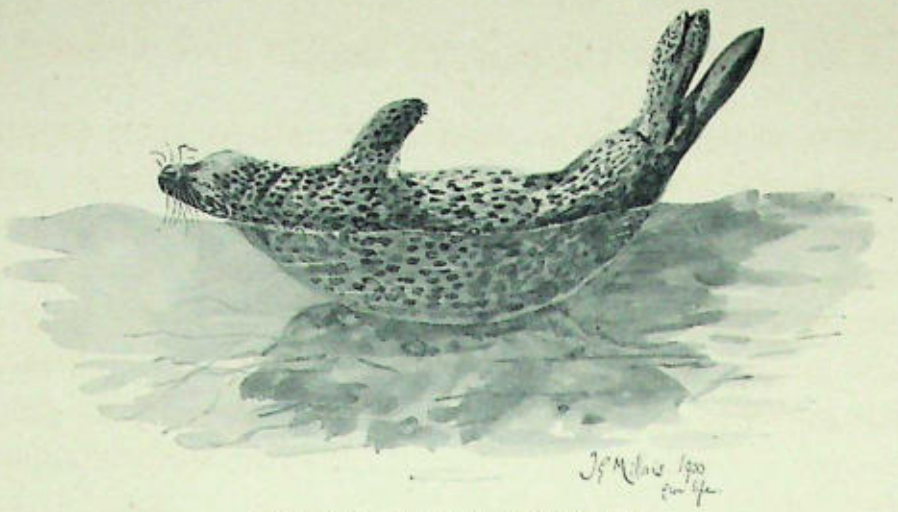
Away along the coast you see a tiny black dot which glistens as the sun catches it. Almost as soon as you have viewed the object it disappears, only to come into view again several hundred yards nearer, when you see that it is a Seal. He comes fast by successive dives, for he has done his fishing and is anxious to lay up, but he goes past and round the rock where his comrades rest until you think he has gone for good. This is only a manœuvre to inspect all sides, and the next moment his glistening head starts out of the water close to the rock itself. Now look how different is his attitude from that of the careless youngsters. He swims rapidly along the surface, backwards and forwards several times, with head raised out of the water, the picture of tense alertness and suspicion. Sometimes he is on the point of landing with the aid of an incoming roller, when he changes his mind and makes several more rapid excursions along the rock side, so as to make perfectly sure of his position. Then, summoning courage, he takes advantage of the ocean swell to carry him as far up the rock as possible, and getting a grip with the nails of the fore-flippers, and quickly holding with the back ones, he heaves his cumbrous body up on to a flat space. Immediately this is effected he whips round seawards, ready to dive off again at a moment's notice if anything has happened.

There he remains for several minutes, glancing quickly to left and right or over his shoulder—a suspicious Triton in black marble. This is often insufficient

to satisfy him temporarily, so he works his body on to some projecting angle of the rock, and rises as high as he can on the fore-flippers, and sometimes with the whole of the front part of the body raised like a dog begging. In this position, with strained neck, he glances quickly about, repeating the movement every few seconds in absolute silence. If you watch his eye very carefully now, you will see that it gradually loses some of its watchfulness, and a dreamy and less restless look pervades the countenance: he is beginning to get sleepy and to settle down to rest. As the coat dries he becomes ticklish, and you see him working his hind-flippers from side to side, and then rubbing and wriggling his whole body on the rocks. As he becomes more and more inclined to settle he assumes a variety of curious attitudes, scratching his sides with the fore-flippers, combing the hind ones, rolling, stretching, yawning, until he succumbs at last to the soothing effects of the peaceful surroundings and the murmurs of the sea. Gradually he sinks into a semi-soporific state, though waking now and again to take a look round or lollop a few yards. He may go a little further up the rocks as the tide pushes him upwards, for he is now thoroughly lazy, and disinclined to get wet, yet rarely do these old fellows go so fast asleep as the females and young. If the Seal feels that sleep is getting the better of him, he is apt to wake up with a self-conscious start, as becomes one upon whom the safety of a community depends.

It may be said that the longer Seals have been up on the rocks the easier they are to approach, for they cordially dislike taking to water again, even when the tide reaches them and floats them away. The accompanying sketch of a Seal waiting till the sea covered him was drawn from nature in Balranald Bay. I had been watching six old males lying on a small rock all the morning, until the sea came up and floated them off one by one, all but an old fellow on the top of the rock. He evidently enjoyed his siesta so much that even when the water reached his body he held his head, one fore-flipper, and the hind-flippers out of the water, to keep them dry until the very last moment.

Observers of the habits of the Common Seal are somewhat at variance as to whether the animals are in the habit of placing sentinels or not when lying up. Most certainly I have many times seen a Seal acting as a look-out, while at others no guard seems to be kept. I think it is a matter of circumstance, for where Seals are subject to frequent disturbance they find the necessity of keeping a close guard, and accordingly one of their number acts as a watcher. This Seal may be noticed lying high on the summit of the rock, and frequently



DRY TILL THE LAST MOMENT.



A LARGE COMMON SEAL.

6 feet 4 inches from nose to tail. Shot by SIDNEY STEEL in Shetland.

raising both head and back-flippers as he takes a general survey of his surroundings. The look-out is often the Seal that has most recently emerged from the ocean and is still wet. From this we may deduce a certain subtle reasoning and recognition of its own limitations on the part of the animal, for only during the short time after coming from the sea is the Seal keenly alive to the possibilities of impending danger. As his coat dries he becomes too sleepy to trouble about extraneous matters, so his place must be taken by another that is more awake and fresher from the sea. When Seals have been ashore for an hour or two, and the tide has half flowed, they are generally most easy to approach, and seldom have any guard set.

I am exceedingly fond of lying with a telescope and watching Seals on a sunny day. They are charming creatures, and many of their little ways are very interesting. After my previously mentioned visit to the Long Clodie Wick, Shetlands, the wind got up, thus closing the place from the sea for the rest of the season, so, with Mr. Haldane's permission, I spent the next two days on the top of the precipice with my telescope, and enjoyed a remarkably fine view of the animals and their habits.[1] The place having been so long a resort of Seals the tenants regarded it as absolute sanctuary, although I had been unkind enough to disturb them the day before. Many of the Seals came ashore at high water, and in fact at all states of the tide, whilst some remained asleep the entire day without moving, a circumstance that was new to me, and probably accounted for by the rarity of disturbance. A very heavy swell was coming in on the third day, and I was interested to see how the Seals would take the rocks on a lee shore among breakers, but so cleverly were their resting places chosen that in no case did they lie up exactly in the same spots as on the first day, but took advantage of the turn of a boulder here or a 'Geo' there, and so obtained shelter. Nevertheless, there was one favourite site that seemed fairly to face the breakers, and here much to my astonishment I saw two Seals land with surprising audacity. They came in on great rollers which hurled them far up the face on to a sort of slab from which they immediately climbed on to a higher and drier ground above the rush of the waves. A moment's hesitation or lack of judgment would have meant at least a severe buffet if not serious injury, but these Seals had been brought up in these shelterless surroundings and knew the form of every boulder and its possibilities.

Whilst watching the Seals and studying their various attitudes, a comic relief was

[1] I have made no secret of this Seals' sanctuary, for no one can molest the Seals from the land side without Mr. Haldane's permission, and to approach from the sea requires such a day as comes but once a year.

occasionally offered by the advent of a young or female Seal who was late in coming ashore and whose pet lying spot was far up on the rocks and away at the back. Pouring with water the newcomer made its way up the worn passage in the rocks, and in doing so flopped its dripping body over the dry and sleeping occupants, who woke up and protested more by looks than actions. This hurt expression of injured innocence, so emblematic of their amiable character, is most characteristic of the Common Seal, being in striking contrast to that of surly exasperation shown by the cantankerous Grey Seal, who under similar circumstances would probably bite first and growl afterwards. Common Seals generally lie very close to one another, sometimes resting their heads on each other's backs, and although not infested by any parasite they like a good scratch as soon as they come ashore, probably for the same reason that most men scratch themselves all over before going to bed. The fore-flippers are not capable of doing very much in this way, but they can reach most parts of the head, neck, and flanks, and still further if the Seal sits up like a dog as it sometimes does. The hind-flippers are not of much use ashore, except for climbing from place to place, and are held together with digits closed. It is interesting to see how, as soon as it comes out of the water, the Seal combs these hind-fingers inside one another and so rinses the water out of them.

Visitors to the Zoological Gardens will remember a few years ago the fine sea lion that would perform many tricks and finish up by kissing his keeper. It may seem but an appeal to the sentimental, but in their wild state Seals *do* actually kiss one another on the lips. I have never myself seen them do more than lightly brush their faces past one another when romping in the water, as puppies do when at play, and when coming ashore a male Seal will often when passing a friend or a female of his acquaintance stop and smell the other's nose by way of greeting. Two observers, however, on whose accuracy I can depend, seem to think the circumstance not rare, and one of them, Colonel Gostwyck Gostwyck, has kindly sent me the following interesting note.

'When Seal-stalking in the Sound of Harris, the late Sir John Campbell Orde asked me if I had ever seen Seals kissing. I confessed that I had not; so he at once gave me a graphic account of the circumstances under which he had seen the act on several occasions. Nevertheless I must admit that I was not a little sceptical at the time.

'However, one day at Eynhallow my wife and I were spying some Seals from the old wall at the south end of the island when we actually witnessed this



COMMON SEALS AT PLAY.

Generally during the Autumn months, both in rough and calm weather, Common Seals may be observed playing in the above fashion. A whole party of Seals may sometimes be seen engaged in a sort of game of follow-my-leader over the waves. The first Seal jumps out of the sea like a Dolphin, and the others string out in a line behind, follow its motions, each leaping and entering the water in the same manner. A party of Gannets are seen diving into the broken water after Coal fish. They take no notice of the passing Seals.

(to me) uncommon spectacle. Just beneath us and not more than thirty yards away were some six half-grown Seals playing about in the sea. Every now and then two would rise up half out of the water and deliberately put their lips one to another's, and seemed to kiss as human beings do, then they would roll over, dive, and splash and lark about. These gambols went on for about half an hour. My wife and I had powerful glasses and could see everything that went on through the chinks in the wall. After a while I called up John Wood (the Eynhallow boatman) who has lived amongst Seals all his life, and asked him if he had ever seen Seals kissing one another. He never had done so, and was quite astonished at the sight. About this time it was nearly low water, so the youngsters all came ashore to rest and bask. Doubtless you have seen puppies after they have been fed licking each other's chops; well, my idea is that these Seals may have been doing something similar. Still we know how very affectionate Seals are, and it may have been fondness for one another that prompted the action.'

The cry of the animal is a somewhat plaintive sound, resembling the words 'Hoo' or 'Hoo-i,' long-drawn, and several times repeated. They give vent to this call to attract the notice of their young when lying on the rocks, and also before bad weather, and I have heard them call at night when the weather was very fine. I fancy they call at night more frequently than during the day.

As already noted, the males spring out of the water whilst pursuing one another in the breeding season, and a whole party of Seals may sometimes be seen engaged in a sort of game of follow-my-leader over the waves. The first Seal jumps out of the sea like a dolphin, and the others string out in a line behind, follow its motions, each leaping, and entering the water in the same manner. Some observers say that this is only done immediately before bad weather, but I think it is a sort of game which they indulge in at any season and in any weather. I have witnessed it myself twice in calm weather and once when it was decidedly rough.

With reference to this point Messrs. Harvie-Brown and Buckley's views are worth quoting. They remark[1]: 'The habit that Seals have of springing out of the water much after the manner and with the actions of a salmon has been noticed by almost every one who has written on these animals, and various reasons are given to account for it. John MacGillivray says: "*During a storm* I have seen them throwing themselves forward half out of the water several

[1] *A Fauna of the Outer Hebrides*, p. 21.

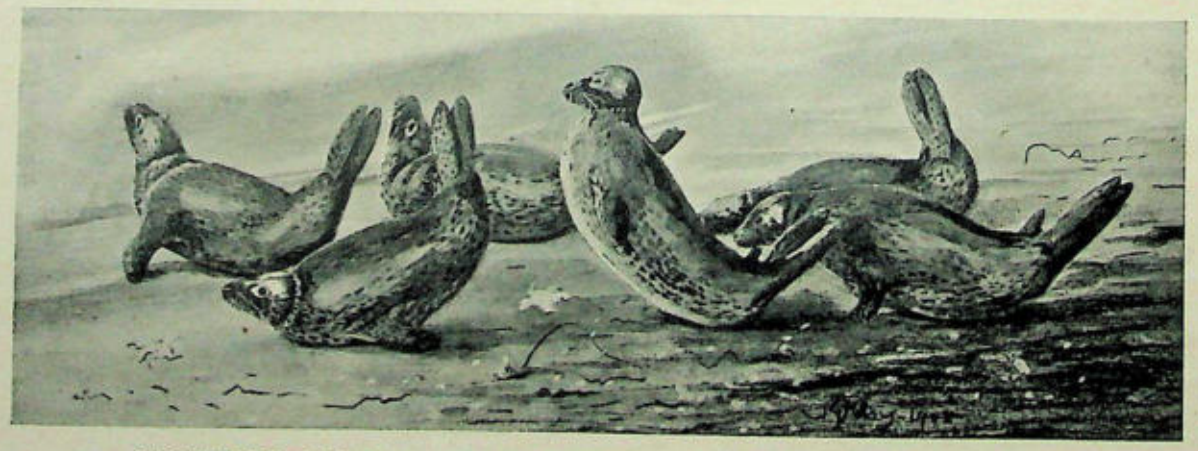
times in succession." Mr. J. Henderson, formerly tenant of the shootings of the Ross of Mull and Tiree, has seen them doing so in calm weather *before a storm*, and this is also our experience. Martin, again, in his ancient account, assigns this habit as especially exercised in cold weather, whilst other authors consider it as belonging to the *breeding season*, and assign it to the males chasing each other, but the habit is observed quite irrespective of the breeding season. With so many conflicting ideas, it seems impossible to say with certainty why Seals indulge in this habit.' On the following page (p. 22) the same authors give an interesting description of a fight between two Seals for the possession of a sea trout which one of them had caught.

The Common Seal is undoubtedly attracted by musical sounds, but that it has any more discrimination in the matter than other animals I very much doubt. Almost any strange noise, such as loud talking or singing, appeals to its abundant sense of curiosity, and it comes to see what is the matter. Some authors would almost have us believe that it would turn its nose up at the penny whistle if it once heard the piano-playing of M. Paderewski, and Highlanders have assured me that Seals have been known to weep at the skilful playing of a pibroch. Singing certainly brings Seals near, but the unsentimental observation of those who have long kept these animals in confinement tends to show that it is the strangeness of any noise that attracts them. Once the Seal has become accustomed to music or any other unfamiliar sound, and has learnt the cause of it, it takes no more notice of it than any other creature.

There is not a single account of Common or Grey Seals in any work on British natural history (with the exception of Dr. Edmondston's short paper) that has been written by men who have studied these animals in a wild state; field notes, too, on the species are generally meagre and often incorrect, and so we are taught the erroneous and oft-repeated idea that Seals progress on land by means of a wriggling, serpentine motion of the body, slightly assisted by the extremities! More often *phocidæ* move on land in this manner: when frightened on a sandbank, we will say, they at once place the fore-flippers on the sand forwards and outwards, raise the shoulders, and depressing the head drag the body forwards quickly from one to two feet. They are then prone, but immediately raise the head and throw out the fore-feet as before, repeating the motion. When very frightened they often jerk the hind-parts upwards and forwards in performing the motion, which gives an additional forward impetus. All this is done without any 'serpentine wriggling,' and though clumsy and awkward the animal



COMMON SEALS ASCENDING A STEEP ROCK.
Showing position of the tail and flippers.



FRIGHTENED SEALS MAKING FOR THE WATER AND PASSING OVER SAND.
The above attitudes exhibit one completed movement of their peculiar locomotion.

can traverse 'hard' sand at a rate of three miles an hour. When disturbed on rocks Seals have seldom far to travel in this manner, and usually only one or two movements are sufficient to enable them to reach a point from which they can drop in the sea or attain a wall of seaweed down which they can 'toboggan' to the water.

It is almost a platitude to speak of the wonderful swimming powers of Seals, but the ease and grace of their turning movements under water are ever a delight to witness, even in an aquarium.[1] I have several times, when seated on the rocks, watched Seals hunting in the crystalline depths beneath, and have once in Orkney seen one take a good-sized coal-fish and eat it under water. On another occasion I observed two Seals for half an hour chasing the flounders over the golden sands of Lywra Burn in Hoy. Here there is a headland on the west side from which the movement of Seals under water can be watched when the tide is dead low and the water is about nine to twelve feet deep in this beautiful bay surrounded by mountains. Flounders dart away from the Seal with great rapidity, but the fish themselves cannot be seen, only the marvellously rapid movement of the pursuer who, scarcely less swift, dashes after its prey, and seizes it as it bolts or endeavours to escape observation by burrowing in the sand. When hunting under water the Seal keeps his mystacial bristles extended at all angles to warn him of the proximity of the rocks.

I find a note in one of my diaries as to the speed at which the Seal swims. 'Yesterday, August 15, I timed three Seals advancing towards Port Scalpig from the point of Hanglun, a distance of about one mile as the crow flies. They were moving rapidly against the tide to reach Paible Bay, where they often fish. Each of them covered the distance in three long dives, only showing his head for a moment when necessary to take breath, and their average time was six minutes, or at the rate of ten miles an hour. Under pressure a seal can doubtless go faster than this, but even at best speed they cannot touch a dolphin in point of rapidity.'[2]

The Common Seal cannot or does not remain so long beneath the water as the Grey Seal, and almost invariably comes up again at a point further along the

[1] The turning movements of the Seal under water are of extraordinary rapidity. The animal seems to be of one mind with the fish. At present (January 1904) there is a very tame Seal in the Brighton Aquarium, and recently I was much struck with his marvellously quick motions as he endeavoured to follow my hand darting along the outside of his glass tank. He evidently took it for some sort of fish, and moved his head almost as rapidly as the thought came to me.

[2] I have timed dolphins to keep up a pace of twenty-two miles an hour for some distance.

coast than that at which it dived: another distinct point of difference in the habits of the two species. Sometimes the Common Seal will remain fifteen minutes under water without coming up to breathe, and in this case the Seal has generally gone to the bottom and is either rolling about on its back or going to sleep for a short spell. Some years ago there were three or four Seals in an all-glass case at the Westminster Aquarium, and I was much struck by the long period that they remained at the bottom without coming up to breathe. On three consecutive days I took the time of their submersion. Those that went down and moved about usually stayed under for from three to six minutes, but when they went to sleep they remained beneath the surface for as long as fifteen minutes.

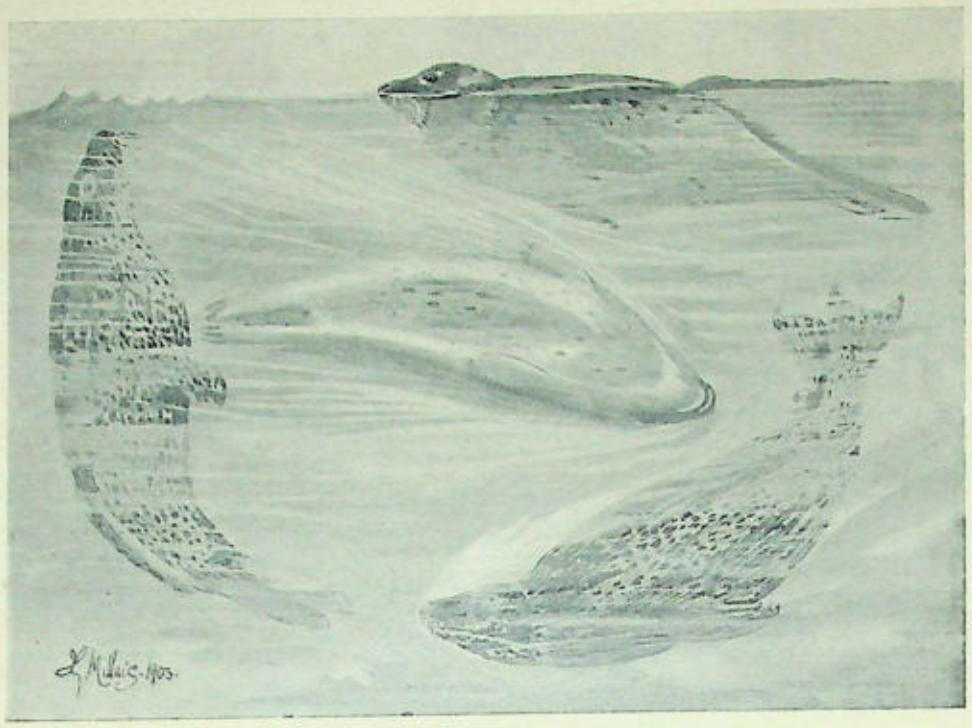
The suspended power of respiration on the part of Seals, whales, and diving birds is an interesting and much discussed subject. Scientists are not agreed as to the cause of this power of suspended breathing, but it is quite a reasonable hypothesis, as Dr. Edmondston suggests,[1] that the venous blood of diving animals may differ in its qualities from that of land ones, and 'that the conditions of the nervous system of aquatic animals are such, that venous blood requires a much longer period to circulate through their cerebral arteries than through those of land animals, to produce the same deleterious effect.' Even on land it is only necessary for Seals to respire every two or three minutes.

In the sea the Common Seal feeds largely on whitings, pollack, cod, flounders, eels, and coal-fish, especially the last-named, as this species is abundant during the summer and autumn months about the Hebrides and the northern isles, and the west coast of Ireland. This fish is easy to take, and loves the eddies of the swirling tide, such places being usually close to the rocks where the Seals lie up. It is supposed that Seals also eat *Crustacea* and *fuci*.[2] They always half skin fish of any size, and even when food is in abundance gobble it up and smack their lips as if desperately hungry, but at times they are capable of long fasts. The great length of the intestines, as well as the quantity of the blubber (which in itself is almost an additional source of nourishment), are obviously designed for long retention and slow digestion of the food, so that every particle of nourishment may be received from it.

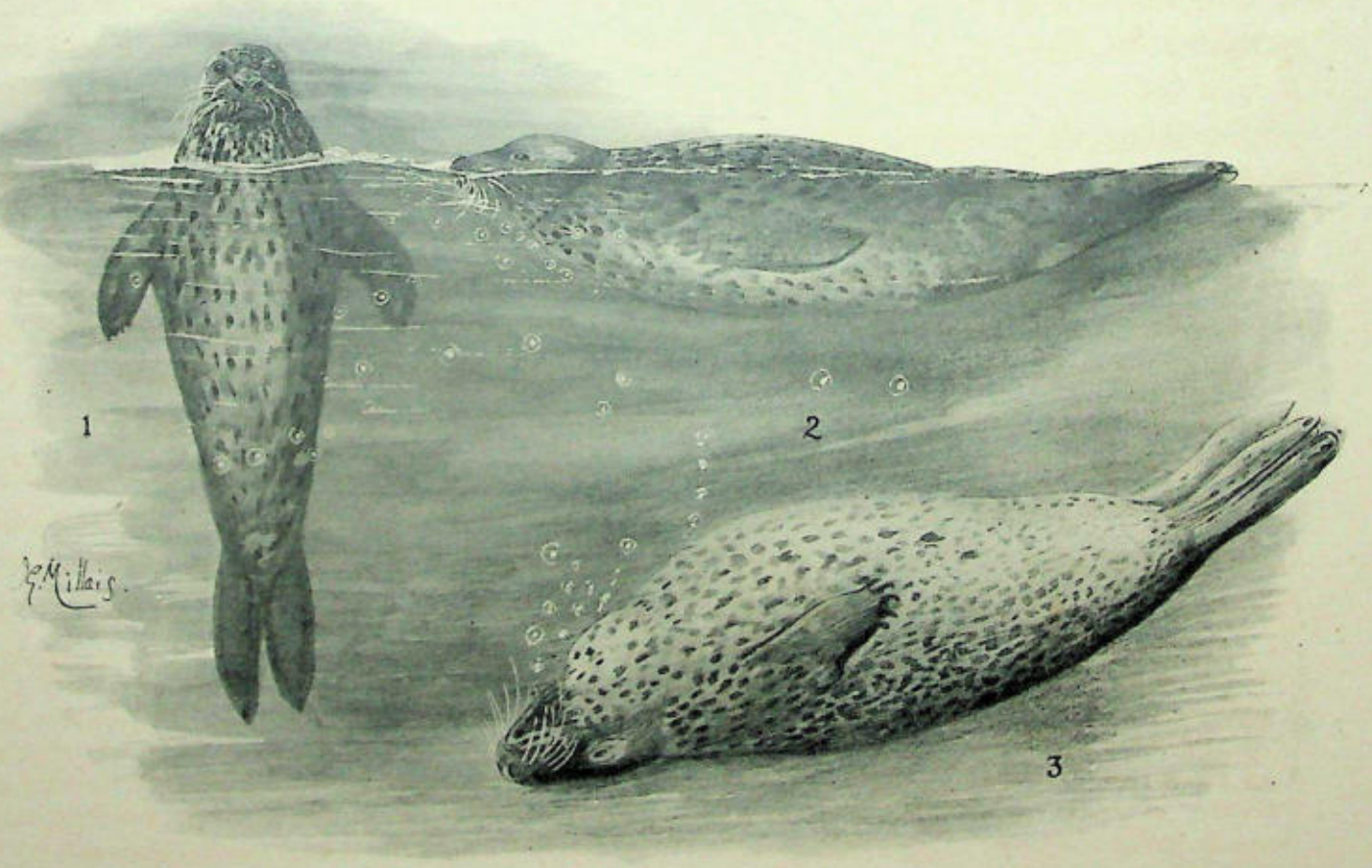
Seals are exceedingly fond of salmon, and the damage they do to the stake-net

[1] *The Seals of the Shetland Isles*, by Dr. Edmondston, pp. 17–21.

[2] Mr. Gathorne Hardy tells me he had seen Seals feeding on what he suggests were shrimps, in a shallow sandy bay in Colonsay. The water here was about four feet deep, and the hind-flippers of the Seals could be plainly seen waving to and fro on the surface of the water as the animals collected some food at the bottom of the sea.



COMMON SEALS SWIMMING.



1. A Common Seal should never be shot at when in this position.
2. A shot may sometimes be taken at a Seal as it floats on the surface.
3. Sinking in sleep to the bottom of the sea.

fishermen on the east coast of Scotland is not only to be estimated by the fish they take or the nets they destroy, for they keep the valuable fish constantly on the move and prevent them from coming into shallow water. An old male Seal is often the attendant curse of some particular station and becomes so artful in taking the fish from the nets and evading all modes of capture that the stake-men become wild with exasperation. These men seldom have rifles at hand, so they resort to every artifice to compass the destruction of the Seal. At the mouth of the Naver in Sutherland many Seals were killed some years ago by baiting for the animals with salmon poisoned with strychnine; this inhuman practice has been successful elsewhere on the east coast. I have often been asked, especially by the Tents Muir men in my shore shooting days, to come and shoot particular Seals, and have more than once sat for hours watching for their black heads with my eight-bore loaded with buckshot, but they seldom came within shot of this clumsy weapon, and only when I got the powerful and accurate Mannlicher to work did I kill one or two, and then only once recovered the carcase, which was stranded at the following tide. As soon as the first big move of the fish takes place into the mouths of the rivers, a considerable number of Seals follow them, whilst the rest migrate north; and I have seen a boat fishing with a drift net for salmon opposite Broughty Ferry Castle surrounded by no fewer than ten or twelve Seals, who seemed as busy with the fish as the men themselves. Apropos of the cleverness with which Seals avoid nets placed for their capture Mr. Alfred Gathorne Hardy, himself a keen sportsman and lover of nature, kindly sends me the following note: 'In Colonsay the Common Seals used to be much netted (for their oil) in the narrow rivers left by the tide between Colonsay and Oransay. My informant who had often taken part in the business tells me that the great difficulty against making a successful capture was that the old Seals nearly always headed off the youngsters from going into the nets, however carefully they were set.' In Orkney and Shetland it used to be a common practice to net Seals in the small tidal rivers, but this has now fallen into disuse. Shetland men have told me similar tales about the cunning of the old Seals, how they will chase young Seals away from the nets and will themselves leap over the nets like grey mullet.[1] The capture of the Common Seal by means of twine-nets has been in use for centuries in the Gulf of Bothnia, northern Norway, the Caspian Sea, and Lake Baikal. To-day the Seal net is still largely in use from September till the ice closes in, in Norway, Bothnia, Newfoundland, and Labrador, and good accounts

[1] St. John in his *Wild Sports of the Highlands*, pp. 262–263, gives an interesting account of netting Seals.

of its use are given by such writers as Lloyd,[1] Cneiff,[2] Carroll[3] and Cartwright (Labrador).

Seals used also to be taken in Scotland[4] by the barbarous method of fixing a number of strong iron hooks in the rock close to the water's edge at one of the favourite resting places. The animals suddenly frightened by the discharge of a gun hurried pell-mell to the sea, and in their headlong descent to the water one or more were often hooked. The Scots probably learned this from the Scandinavians, for the practice is still in use on the Norwegian coast, and is described by Lloyd.

The amount of mischief wrought by Seals on salmon is, without doubt, very great. During the summer and autumn running of the fish, the main body have often at low tide to pass through more or less narrow channels to enter the main river, and if Seals are numerous, scarcely one fish in four enters the Tay, the Tweed, the Beauly, and the Brora, without the marks of Seal claws and teeth. This is particularly the case on the Tay and the Tweed during the August and September movements. I once caught four salmon at Murthly, one day in September, all of these were Seal-marked; one of them had a large piece bitten clean out just above the tail, and I do not know how he had survived the injury. From these injuries Mr. R. B. Marston suggests that the salmon contract the fungus disease so prevalent in the Tay and Tweed, and says:[5]

'Only last month Sir Waldie Griffith, chairman of the Tweed Salmon Fishery Commissioners, informed me that quite a third of the salmon captured by the fishermen bore traces of injury from battles with the Seals.

'*Diseased Salmon.*—It is highly probable that this accounts for the very high mortality from the salmon disease among Tweed salmon. Mr. J. Hume Patterson's most interesting experiments and discoveries in connection with the salmon disease prove pretty clearly that it is not contracted when the skin of the fish is in a healthy state. Mr. Patterson found that to inoculate healthy fish with the *bacillus salmonis pestis* (which he discovered) he had to rub off some of the scales of the fish. It is surely not unreasonable to suppose that of the thousands of salmon which enter the Tweed and die of disease every year, a large

[1] *Game Birds and Wild Fowl of Sweden and Norway*, pp. 420–424.

[2] *Bericht vom Seekälberfange in Ostbothnien*, 1757. [3] *Seal and Herring Fisheries of Newfoundland*, p. 35.

[4] I have met men in the north who said they had seen Seals taken in this manner, but whether they were merely relating what they had *heard* from their fathers or what they had actually seen I cannot say. I have often asked crofters if they knew any man who possessed one of these old Seal-hooks, but could never receive a satisfactory answer.

[5] *Daily Mail*, December, 1903.

proportion may have contracted it through being wounded by Seals; though, of course, a great many get injured in other ways also.'

Owing to their fondness for salmon and sea trout, Common Seals will ascend rivers and lakes to great distances. In America the Common Seal passes up the St. Lawrence to the Great Lakes, and Mr. Allen says that it has been taken in Lake Champlain. The same author also states that the species ascends the Columbia River to a point two hundred miles from the sea, and almost to the source of many of the small rivers of the Pacific coast. It also works far into the interior of Newfoundland by the river and lake systems.[1]

In Scotland I have several times seen a Seal below Perth bridge, thirty miles from the estuary of the Tay, and one was recently taken in the salmon nets at Stanley; but though there are rumours of a Seal having been seen as far up the river as Aberfeldy, I have doubts if one has ever passed the Linn o' Campsie, which is a rough place. But Seals will ascend rapid and rocky streams, as related at length by Mr. J. Harvie-Brown,[2] who gives numerous instances of their presence in Loch Awe and Loch Sheil. The same author in 'A Fauna of Argyll and the Inner Hebrides' tells (p. 24) a remarkable story of a Seal which came and took three 'cuddies' (coal-fish) in succession off the rod and line of a carpenter who was fishing in Loch Sunart.[3]

The Common Seal is subject to a kind of murrain or plague, a disease that attacks the throat and face, which Dr. Edmondston in speaking of it calls 'a fatal Epizooty.'

Low, in his 'Fauna Orcadensis,' written at the beginning of the last century, says that about that time 'they (the seals) drove ashore in scores,' and the plague, which apparently does not attack the Grey Seal, has occurred in Orkney and Shetland twice since then.

Everywhere round the north and north-west coasts of Britain we find superstition attaching to the Common and the Grey Seal, and this I deal with more fully when writing of the larger animal. With regard to the smaller species, it

[1] In the *Annual Report of the Newfoundland Department of Fisheries*, 1903, occurs the following passage: 'At one time the greatest enemy of salmon in the rivers were the otters. They have been nearly killed off in all the important rivers, and at present do little damage. At the present time what is known in Newfoundland as the Harbor Seal commits terrible depredations on the fish. There are large numbers of these noxious beasts in the Lower Humber, Gander, and Exploits Rivers, and also the interior lakes. They kill the fish at all times, both when they are ascending the rivers and returning. Their special ravages, however, are on the spent salmon coming down in the spring. These breeding fish are often very weak and emaciated, and they readily fall a prey to their destructive enemies.'

[2] *The Scottish Naturalist*, January 1891. 'The Common Seal in fresh-water streams and lochs of Scotland.'

[3] For a similar instance of the boldness of the Grey Seal see p. 283; see also *Field*, October 3, 1903.

is enough to say that, although never failing to slay it whenever a chance arises, our northern seamen regard the Seal with no little reverence and awe, and to this day (although disliking to be laughed at for their superstitious fear) there are many good folk in Orkney, Shetlands, and the west of Ireland, who would not harm a baby Seal on any consideration, for their fears of possible retribution and belief in old legends are very real.

This is especially the case in the north of Shetland; few papers reach these remote islands, and the ways of the people are still primitive. Even in the present day, when a cow falls sick the good folk lay a trail of gunpowder round her and apply a match. The treatment is not considered efficacious unless a Bible is flapped in the unfortunate animal's face, and to arouse her from her fit of depression the 'guid buik' must be opened at the lamentations of *Job*. This is probably done to convince the poor creature that there are worse things in the world than bovine pain and she at least has no monopoly of sorrow.

Shetlanders profess to laugh at such things as kelpies and fairies—trows they are called there, yet many still believe in them and, like the northern Norwegians, fear venturing out after dark. A North Rooe man, speaking of a friend whom he wished to be engaged in the same boat as himself, said on being asked if his friend was brave, 'Yes, he's a verra brave man, for he wudna mind sleepin' on the tap o' Rona's Hill though he *well knows* there are trows there.'

If a corbie (hooded crow) settles on the roof of his cottage a Shetlander does not like it, and the advent of a young Seal to the beach immediately below the croft is said to portend a disaster of great magnitude. When such an event occurs every effort is made to capture the unwelcome visitor, and if successful some mitigation of the misfortune may be obtained by placing the Seal in a boat and carrying it far out to sea, where it is

> Put owerboard wi' a blissin'
> For the hen and red chicken.

Seals have however a great homing instinct, and the ill-omened youngster will often return the next day to the very spot from which it has been so carefully removed. The crofter again endeavours to arrest impending doom by carrying the innocent babe to sea, but this time to a further distance. If it should return once more there is nothing to be done but to await the decree of Fate.

All the stories of tritons, mermaids, and strange sea slugs that have appeared in Highland lochs are doubtless attributable to visits of Common and Grey Seals,

especially the latter, whose presence is distinctly uncanny when met with suddenly at close quarters in a wild situation. The Orkney and Shetland folk have stories to tell about the mermaid, and during a visit to the former islands, in the summer of 1886, I heard and read much of a marvellous mermaid who haunted the point of Deerness, a few miles from Kirkwall. The papers were full of tales of the lovely creature. Many people had seen her and forthwith rushed into print, while one good man was so wrought upon by sentiment that he declared the half-woman, half-fish, had swum to and fro uttering plaintive cries and carrying clasped to her breast a lovely little child whose pathetic eyes had quite won his heart. When I eventually got to Kirkwall it occurred to me that the tourist season was in full swing, and on hearing that a certain publican, whose powers of advertisement were only equalled by his brilliant inspiration, had erected a small drinking bothy at the point of Deerness 'to view the mermaid,' I drew conclusions which my readers have doubtless already formed. As a matter of fact one man who had really seen the 'mermaid' told me that it was an old 'haaf-fish' (Grey Seal), but that the publican in question was driving too good a trade to allow the imposture to die until the summer season had ended.

Seals have practically no enemies save man. In Orkney, Shetland, and the Western Hebrides, the crofters assert that they have found Seals mangled and torn by the teeth of the large grampus, or orca. It may be that these cetaceans sometimes prey on Seals in our waters, but judging from the bites given by the old Grey Seal to any intruders on his privacy, I have little doubt that if Common Seals are found covered with large tooth marks the wounds are more likely to have been inflicted by a jealous grypus than the large grampus. On the other hand, the Common Seal has many friends amongst the birds, notably the herring gull and the great black-back. The latter especially is often to be seen perched on the summit of the isolated Seal rock, where, by its loud cries, it gives warning of the approach of man. Terns, red-shanks, and oyster-catchers are all noisy dwellers on the homes of the Seals, and in the summer season never fail to find out and mob the advancing stalker.

Seal flesh is still occasionally eaten by the crofters of the Outer Hebrides, though the practice is now discontinued in Orkney and Shetland. I tried a chop myself one day, and found it extremely nasty, but Danes who have lived in Greenland have told me that after the initial dislike is past one comes to like it better than either mutton or beef.

The brain cavity of the Common Seal is larger in proportion than that of

the Grey Seal, and consequently the animal is said to be more intelligent. This is, however, doubtful, for due attention must be paid to the form, development, and quality of the brain itself. A man with a very large and beautifully shaped head is often stupid, whilst another with an extremely small cranium may be a genius. At any rate there is little doubt that the Common Seal is a far more amiable creature than his larger cousin, and is capable of forming a strong attachment to man. There are numerous instances where Common Seals have been kept in confinement for a long period and have shown a higher intelligence and affection for their masters than many dogs, and I think that had the Seal the activity on land and powers of progress possessed by those animals, the public would recognise more generally what clever and charming pets they make. Unfortunately it is only given to the few to keep Seals under the best conditions, and those who have done so speak of their intelligence as exceeding that of the elephant and the horse and coming next to that of the dog. Since Seals can be made to perform all manner of tricks, I do not see why they should not be taught to fetch and retrieve fish, as cormorants, which are far more stupid creatures, have been made to do in China from time immemorial.

Captain Macdonald says: 'I have kept a Common Seal tame in a sheet of fresh water close to my house. It soon became happy and contented and would swim up to me when I called it and allow itself to be stroked and petted, which it seemed to enjoy.' Anyone who was so fortunate as to have witnessed the performances of a troupe of trained Seals recently exhibited at the London Hippodrome must have been struck by the extraordinary intelligence and activity of animals so ill adapted to carry out tricks usually performed by dogs, such as playing musical instruments and firing off cannons.

In 1886 there lived at Aberdour on the estuary of the Forth, N.B., a remarkable old sea-captain who possessed an extraordinary power in taming wild birds and animals. A friend in Edinburgh who knew him stated that the old gentleman was usually to be seen walking down the village streets followed by a flock of canaries which accompanied him in his short peregrinations in the neighbourhood of his house. One day some fisherman surprised a half-grown Common Seal in the mud flats and took it to the sea-captain, who soon trained it with such success that the poor creature became a perfect nuisance. The Seal would go every morning into the estuary and hunt for fish, and then make its way home over the mud up to the house, at the door of which it would knock or push with its fore-flippers. Its favourite resting place was the drawing-room sofa. The daily

arrival of mud and wet into the best parlour was soon too much for the good captain's tidy wife, so the day came at last when he reluctantly promised to get rid of the beast in the most humane fashion.

A boat was hired; the captain and his pet sailed away far out to sea off Porto-bello, where the man bade farewell to the Seal, which apparently had not the smallest intention of saying good-bye to him. The Seal swam round the boat a few times and then dived, and the kindhearted old seadog sadly turned his boat's head homewards, convinced that he would never see his amphibious friend again. A surprise however was in store, for when he opened his cottage door, it was to hear his wife's voice raised in anger; there was the Seal on the drawing-room sofa once again safe and sound and looking up reproachfully with his innocent black eyes.

After this exhibition of affection it would indeed have been a cold-blooded individual who would have banished so loving a nature; the possessor of the Seal's affections was a genuine admirer of wild creatures and could not at first be induced to send away his pet. So the sofa was made uncomfortable and a resting place made for the Seal in another part of the room. However, difficulties began to occur in the great food question. It was soon found nearly impossible to supply the animal with fresh fish, when he was unable to take them in the river; so again the edict went forth and the Seal was taken still further out to sea, near Burntisland. He stayed away for some weeks this time, and then one morning knocked at the door and flopped into the house quite in his usual fashion. A third time some fishermen took him far out to sea, and he was not heard of for so long that his master and mistress then began to hope he had entirely taken to his wild life again. Some months went by, and one night when the family were in bed knocks were plainly heard at the door of the house, but as the wind was blowing hard little notice was taken. In the morning the old captain got up and found something pressing against the door, which on opening he found to be the faithful Seal quite dead, with a number of buckshot holes in his neck. He had just managed to come home to die.

This is not merely a sentimental story for young ladies, but a true one for the student of animals, and for the details of which my friend can vouch.

As another instance of the bold and affectionate nature, in this case maternal, of the Common Seal I extract the following from a letter from Colonel W. Gostwyck Gostwyck, who takes much interest in these animals. 'I remember once in Skye that Captain Macdonald of Waternish captured a very young Seal

which he took into his boat and forthwith sailed away; but the old cow followed the boat persistently and would not be refused, and indeed made matters so hot that Waternish, for safety's sake, returned the little one to the sea. He said that the mother was on the point of coming aboard in spite of his efforts to prevent her, and there would have been a pretty bobbery had she done so.'

Even in a wild state Seals know perfectly well where they are safe, and will when protected become remarkably tame. This is shown by the following extract from the account given by Mr. Moodie-Heddle, of Melsetter, Hoy, Orkney, in Harvie-Brown and Buckley's 'Fauna of the Orkney Islands.'

'Ten years ago they (the Seals) were nearly extinct here (in the island of Hoy), being reduced to three or four. I preserved them near Melsetter, and they got so tame that I could come within a few yards of them, and even handle the young ones. Since then they were getting too numerous, and killing so many sea-trout that we had to slaughter a good many. . . . In places where they lie much ashore, and are constantly crawling over rough rocks, the nipples of the females seem to get painful, and they repulse the young when they attempt to suck. Frequently the young ones on these occasions crawl up to the houses, and get fed with cow's milk, though, from inattention, they rarely survive.

'Seals know very soon where they are safe. I could get within thirty yards of some where preserved, whilst the *same Seals* would not let me come within a hundred and fifty yards when at another beach some miles off. They actually got so tame with us that I have known two young ones killed with stones by some navvies working on the road; and one, half-grown, picked up *asleep*, and taken into a ship's boat (it was floating asleep).'[1]

If we except the present fashion of wearing coats made from the skin of Common Seal,[2] there is no demand for the hide of the animal save in the north of Shetland where brogues are made for the feet. On the other hand crofters and fisherfolk use the blubber for various purposes, such as softening harness, giving to cattle in spring, oiling boots, etc., whilst in the Hebrides the refined oil is said to be quite as good for consumptive people as that made from the liver of the cod.

[1] I have several times sailed up to Seals floating asleep on the water, and the boat has touched them before they woke up and dived with a great splash, so I do not think the last two lines of Mr. Heddle's interesting note should be taken as evidence of the tameness of the Seals.

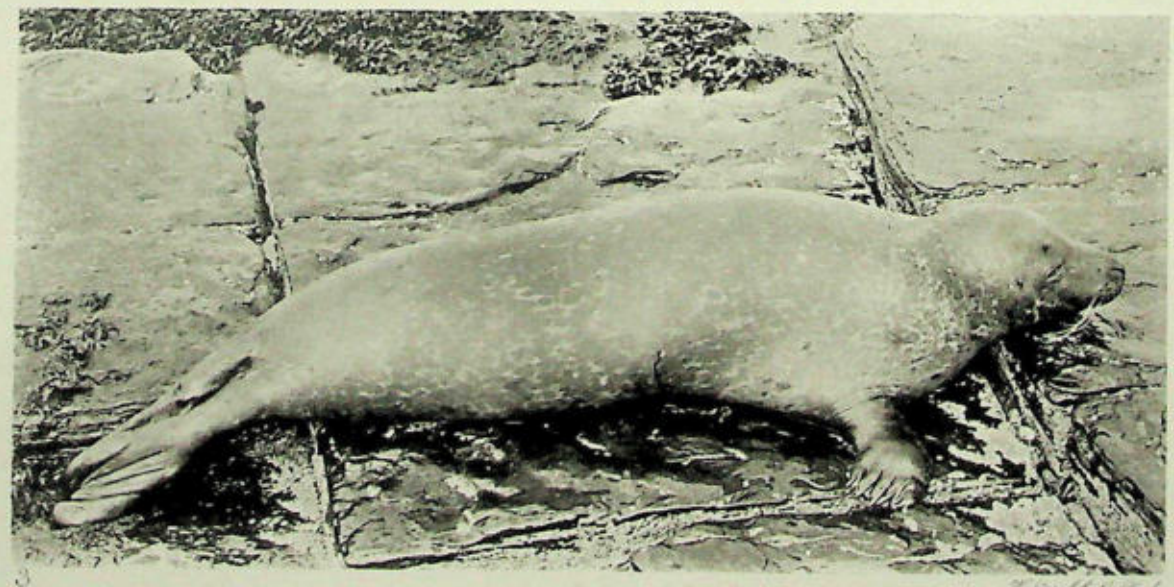
[2] The drivers of motor-cars have found out how dense and impervious to cold the skins are. Yet lovers of our wild animals need be under no apprehension lest this passing fashion will affect our Seals, for after the most careful inquiries I could not ascertain that any pelts from which these coats are made were taken in the British Isles. They all come from the big fur dealers in Bergen, Copenhagen, and Russia.



1



2



3

The Common Seal.

1. Immature, 2 years old. 2. Left figure adult male Common Seal, right figure immature female Grey Seal. 3. Adult male Common Seal, September.

In Labrador and Greenland,[1] where it serves a variety of purposes, the Common Seal is in great demand, but in this country it has practically no commercial value. We may therefore hope that these interesting creatures may be spared for many centuries in our islands. Beyond driving them from their favourite haunts for a few months sportsmen who only account for a few Seals in the whole year do no real harm, and the increase in the following June fully makes up for the small percentage shot. It is only when the skin, or other part of a wild animal, becomes an article of trade that the days of that animal are numbered.

When kept within due limits Seal-hunting with the rifle is a high-class sport. In places where the animals have been preserved or unmolested it is too easy and loses all the essentials of good stalking, but when Seals are not too numerous and have been chased a bit, nearly all the care that is required to shoot the stag must be employed over the sea-dog. The same precautions must be taken for getting within shot, and the wind must be studied, although the Seal is inferior to the stag in point of taking alarm. When it comes to the matter of shooting, however, the greater difficulty is presented by the sea animal. A Seal must be hit exactly right, in either the head or neck, and laid stone-dead on the spot. Otherwise it is sure to be lost, for, however deadly a body shot may be, the animal has time to wriggle, it may be only a foot or two, into the sea, and then it glides far into the depths and is lost. To strike the Seal in the head entails, of course, very accurate shooting, and that is what the hunter of the present day enjoys, for he has such weapons of precision and power as were never made before.

When killed in the water, Common Seals more frequently sink than float, so where there is a chance of getting a stalk at the animals ashore it is much better not to fire at swimming Seals, unless they are above the shallow waters of a sandy bay where they can be easily discovered by the water-glass and hauled up with a gaff. It is a great trial to the young sportsman to see a lot of heads bobbing up and down in the deep waters around him and to be told that he must not shoot, but it is right that he should not do so, for, sooner or later, he will get a much better chance in the shallows or, better still, on a rock, where if he aims straight he is sure of his trophy.

Like every other Seal-hunter, I could discourse at great length about why

[1] Amongst the Greenlanders the Harp Seal is reckoned the first in importance ; after him comes the Ringed Seal, whose fur furnishes the clothing of the people. Only the local magnates and the Arctic beauties can afford such extravagances as a wardrobe made from the pelts of young *Phoca vitulina*. The skins of the old male Common Seals are not much valued in northern latitudes owing to their being so cut with fighting, but they are used for tent coverings. Common Seals are largely eaten by the Pacific coast Indians, as well as by the Greenland Esquimaux.

Seals float at one time and not at another, but I shall not do so here, beyond saying that adult Seals when fat generally float, and that the respiration has little to do with the matter, whilst the position in which the Seal is lying in the water at the moment of death is all-important. One should never under any circumstances shoot at a Seal that is 'standing' perpendicularly in the water, whilst a shot as it lies along the surface or even at the Seal swimming may sometimes be taken. Females and immatures will float more readily than the old males, for they are generally in better condition. Even these, however, have their seasons, and only experience can give the young hunter the lesson in restraint that he really requires. I have killed, and picked up floating, four Seals in as many shots, but this was owing to my having selected the right Seals to shoot at. Dogs can be taught to retrieve Seals, but the use of them is to be deprecated unless the owner has good opportunities for training the hound properly. Almost any good-plucked retriever will go out to the Seal, but it requires knowledge and additional courage to seize the floating fore-flipper without pushing the whole body beneath the surface.

The water-glass, which may be made by fixing a sheet of glass in the bottom of a box or small barrel, is a useful adjunct in Seal-hunting, for with its aid, even if the surface of the water be ruffled, one can see to a depth of six to twelve fathoms. A good deal however depends upon the nature of the sea-bottom. When the Seal is found it can generally be recovered by the use of the Seal-gaff, a long pole with a few cod-hooks firmly fixed at the end. The best retriever in this case is the human one, and when I have been Seal-hunting of late years I have generally enjoyed the company of my brother-in-law, Captain Skipwith, or Mr. H. Prichard, the novelist, who were both accomplished swimmers and divers, and seldom lost a Seal that could be seen.

In all forms of the chase our pleasure is mostly due to the charm of the natural surroundings, and Seal-hunting is a fascinating sport because it leads us into such strange places and such beautiful scenery. Every man who has ever ranged the primitive isles of the North Atlantic, with their barren coasts and sea-swept corries, their great precipices and foaming surges, must have felt the indescribable charm of a sport freed from the artificiality that often clogs the surroundings of deer forests and covert shoots. He can be alone with perhaps a trusted friend, and do all his own hunting amidst some of the grandest scenery in the world. He can bask in the sun and the spray, find his game and stalk it himself, and there is a certain pleasure even in waiting for hours on a solitary

promontory whilst the cold rain sweeps before the winter blast as he watches patiently for the Seal to give him a chance. To the true hunter the rapture of pursuing depends but slightly on the name of the animal pursued. Under certain circumstances a boy in his teens may shoot a tiger or a stag, but little does he know of the delight of following, out-manœuvring, and finally securing unaided an animal difficult of approach, and it is in this that the essence of real sport lies.

Some of the happiest days of my life have been spent in the northern islands, going Seal or bird hunting with the people of the sea. The crofters of Orkney and Shetlands are very different from the men of the Scotch west coast or the Hebrides, who are often lazy, drunken, and illiterate. The northern men are really more Scandinavian than Celtic, and are often well educated as well as pleasant-mannered. It is on account of their extreme kindness of heart and general amiability of character that we grow to love these men of the northern seas. Frequently it has been my good fortune to engage men for the day who have been quite hurt on being offered money, and they have assured me that it was a great pleasure to meet a stranger and have a talk.

One Charles Ratter, a splendid giant with the smile of a child, came with me for two days' hunting and entertained me like a prince. He told me that he was much 'addicted to philosophy' and that it had been a bitter blow to him when the little library at North Rooe (Shetland) had been burnt after an outbreak of diphtheria. Fancy a Sussex or Wiltshire labourer being 'addicted to philosophy'! Even as I write these lines, the daughter of the crofter in whose house I am at present residing is reciting Shetland poetry, with no little feeling and power, to the rest of the family.

The following is an account of two days' Seal-hunting taken from my diary:

'*August* 18, 1898.—As the tide was half-ebb in Balranald Bay I saw four of the old males that frequent this shore go up on the small rock near the north end of the bay. This rock is low and out of shot from every point on the land side, as well as from the little island of S'geiralaban, which lies outside it. I have noticed, however, that when the Seals are moved off the small rock they swim slowly out to sea, going close to the larger one in doing so. The water there is about twelve feet deep and quite clear on a sandy bottom, so to-day I tried the experiment of being landed on the outer rock and afterwards sending the boat with Philip round the Bay to come on the Seals from the land side, and so put them towards me. This was perfectly successful, for on the boat approaching within three hundred yards two of the largest Seals at once slid into the water

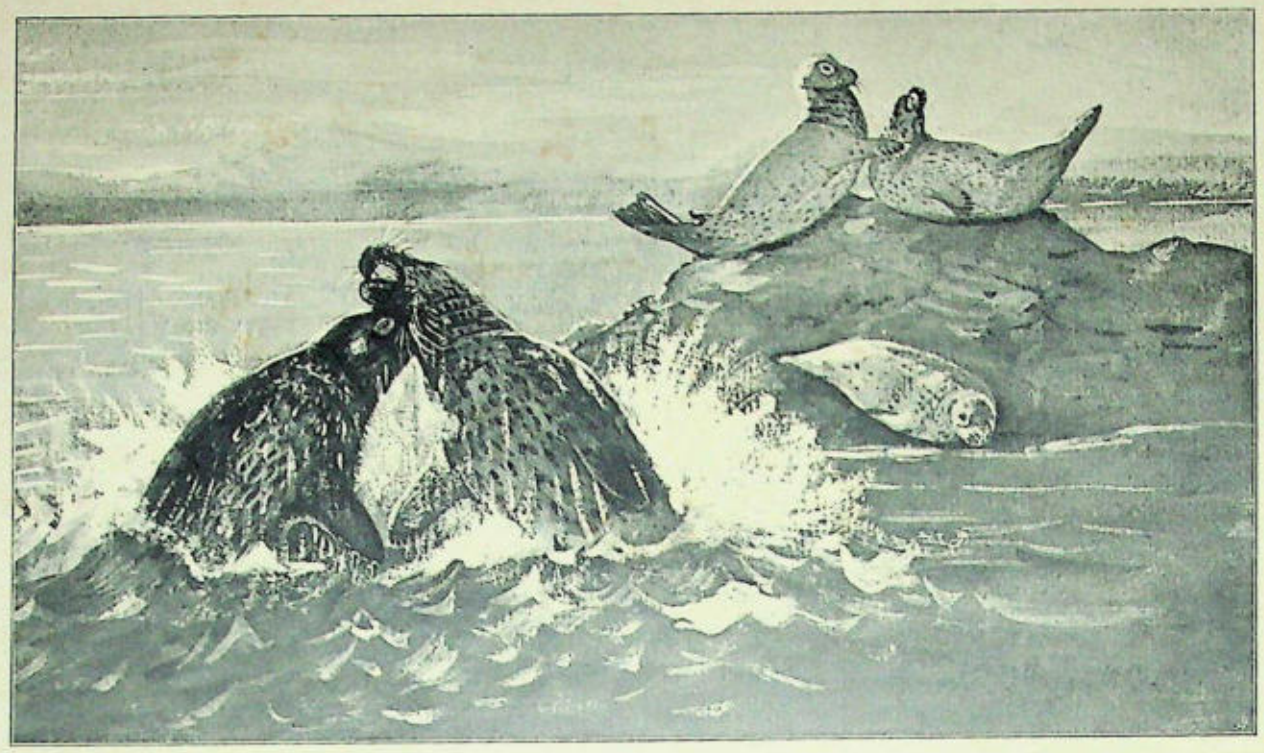
and dived. As I prepared for the shot one came up about eighty yards to my left, exactly where I could have wished him to be, showing the whole of his head. As he swam slowly, my bullet caught him at the back of the skull and he was instantly killed, floating high on the surface. Hardly had the echo of the shot died away and a fresh cartridge been inserted when the second Seal came up about one hundred yards to my right front; he saw me as I shifted my position, but did not appear much alarmed, and offered a similar target to the first with the same result.

'The boat at once made all speed towards the first Seal, but as the other one appeared to be sinking lower every moment the direction was changed, and the occupants were just too late to seize the vanishing form. It was a warm sunny day, so Philip at once stripped and dived two or three times after the carcase, but without success, owing to the dense halo of blood and oil that always surrounds a recently killed Seal. Seeing that nothing further could be done at the time, the boatmen now rowed with all haste towards the first Seal, picking me up on the way. As he still floated high I caught his forepaw, and with the help of two men we got him into the boat.

'After waiting half an hour and admiring our prize, which proved on examination to be a three-year-old *grypus* weighing 14 stones 2 lbs., and 6 ft. 1 in. in length, we again made for the spot where the second Seal had sunk. The curtain of oil and blood had now drifted some distance from the actual spot where the beast had sunk, and after peering about for an hour we failed to find the carcase whose recovery had seemed almost a certainty.'

The most successful stalk at Seals I ever had was in the Sound of Harris on Sept. 30, 1897, when staying with my friend Mr. George Henderson, who has given me many delightful days of sport. Mr. Henderson rented during this season the shootings of Rodel, South Harris, where there was excellent shooting and fishing. One day he kindly placed a small yacht at my disposal, so I went across the Sound to the Uist side, accompanied by Finlayson the keeper and Rorie Morrison, who had been Lord Dunmore's Seal-hunter for many years. What Rorie did not know about the Sound was not worth knowing. I was anxious at the time to get two or three Seals in good winter coat, and he said that he could show me some for certain.

'Leaving Finlayson in the boat, Rorie took me to the summit of a high hill from which we commanded a magnificent view of the whole Sound of Harris. The tide was only half ebbed, but the sight of so many rocks and islands dotted



COMMON SEALS FIGHTING.



A HERD OF COMMON SEALS WATCHING AFTER BEING SCARED.

in the waste of sunlit sea was a wonderful one. Shetland, Wales, and Donegal are remarkable for their towering precipices and heavy seas, the western isles for their golden sands, Scotland for her mountains, and England for her parks, but nowhere in Britain is there such a sight in the way of islands as the Sound of Harris at low water. There are some hundreds of these islands, all a bright emerald green in the sunlight, and in the evening when we saw it at dead low water the sea was like a molten sheet of gold dotted with emerald jewels, whilst for a background were the blue hills of Skye and Harris. With all this host of resting-places I could make out no Seals for a while till Rorie asked me if I had yet found any. I replied in the negative. "Well," he said, "ye're no lookin' the right way. D'ye see yon grey rock close inshore by them sheep," pointing to an unlikely-looking place near to the mainland of North Uist. "If they're up anywhere, yon's the place." He was right. What a sight filled my glass as I brought it on to the object named! There was no rock visible, it was *all Seals*, huddled together as thick as swine at a country fair.

'Plans for the stalk were at once discussed, and it was arranged that I should descend the hill and pass round a long promontory, and then get well up on the North Uist shore, far behind the Seal rock, and come in under cover of the peatlands. Rorie was to follow at a safe distance by water, and was to come at a signal to pick up any Seal that might float. He told me to shoot several Seals if possible, as he and the other people at Obbe would be glad to have them, and that I was sure of more than one chance if I kept down after the first shot. Between the big rock where the Seals lay and the land was a narrow channel, which at dead low water was not more than six feet deep, said Rorie, and the Seals would keep coming back through this channel, and any that were killed there were certain to be recovered. After receiving these instructions I started off, having a good walk of three-quarters of a mile before I had to think of going cautiously. Then a spy showed me that the Seals were quite quiet, but it also disclosed the unwelcome fact that all the sheep which we had first seen well up on the land had wandered down in scattered parties all about the line along which I hoped to make my final advance. This was rather annoying, particularly as the wind, which up till now had been fitful, dropped altogether.

'After waiting half an hour all the sheep fed slowly on except about ten, who stood in their usual provoking manner staring about for something to be frightened at. As they were mostly lambs I decided to go on and get in such

a position that I could either get past or scare them mildly out of the way. A close and very wet crawl of about two hundred yards through peat and slime brought me unexpectedly to another arm of Loch Portin, and by keeping close to the water I crept along to a point which I thought must be beyond the sheep and exactly opposite and about one hundred yards from the Seals. By chance I happened to turn round at this moment and found myself face to face with a fairly large Seal not twenty-five yards away, which was regarding my ungraceful movements with extreme interest.

'I could clearly see the sandy bottom not six feet below him, but did not like to shoot because I wanted to have a good look at the Seals in front, and this I knew I should certainly spoil if I fired my rifle off in the backwater. A moment later I almost wished that I had taken the certainty, for, on creeping up the bank to take a peep at the Seal rock, I suddenly found myself face to face with an old Highland ewe. We tried to stare each other out of countenance, but it was of no use, there was a loud hiss and a rush of many feet and I raised myself just sufficiently to see a mass of Seals, nearly all asleep, on the rock about eighty yards off. There was just a chance that the tame wild animals might not have taken the hint from the wild tame ones—some Highland sheep are almost as kittle as deer—so sinking out of sight I remained still for five minutes before I again looked up.

'The rock on which the Seals lay was a conical one, well raised out of the water, and affording resting places on three sides, all of which were visible from the land. Here were congregated more Seals than I have ever seen in one group before. I counted them over twice and made out sixty-two, which is quite an unusual number, even in this home of the Seals.[1]

'They were nearly all fast asleep with dry coats, except one old beast, which, lying on the very top of the equilateral triangle, kept raising itself up alternately back and front to watch for approaching danger. I remained some ten minutes watching the Seals with my telescope, and looking them all over, till I could select the one in the best coat. They had all changed into the winter pelage by this time, and presented every variety of the dark and light spotted types, but there seemed to be no very big Seals among them, which led me to presume that they were an assemblage of adult females and immatures.

[1] On asking Rorie Morrison, who had constantly been here hunting Seals, what was the greatest number he had ever seen together, he said eighty-two, one May day on this same rock. I have since seen many more Seals at one time, but not all piled together as they were on this occasion.

At last I selected the watch Seal, who seemed as good as any, and fired at her head when she raised it to take a look round.

'Few animals make much of a commotion when a rifle is let off near them, yet sixty-one Seals falling from a rock and splashing in terror in a silent sea is a sight to be remembered, and one which no word-picture can adequately describe. For a moment the Seal at which I had fired lay on the top of the rock, then, after some spasmodic twitching, it turned over and reached an inclined plane, down which it rapidly rolled into the sea. After the sound of the shot had died away the sea became dotted with black Seal heads at about two hundred yards distance, but most of these presently disappeared, except a few inquisitive youngsters, who came back close to the rock to see what had frightened them.

'I waited for about five minutes out of sight, and was about to signal Rorie to come on, when I observed two large Seals coming along the coast in my direction. Presently one suddenly appeared in the shallow channel about sixty yards away and immediately opposite my position, and as he offered an easy chance he lay over to the shot at once, and the second Seal coming up without having heard the shot shared a similar fate, but sank immediately. He was, however, afterwards recovered by Rorie.'

My readers will, perhaps, have had enough of the shooting by this time, so in conclusion I will only say that after the most successful day that Rorie could remember we returned to Rodel with five fine Seals, all in good coat.

The Ringed Seal

Phoca hispida, Schreber.[1]

Phoca hispida, Schreber, 'Säugethiere,' iii. (about 1775).
Phoca fœtida, Fabricius in Müller's 'Zool. Dan. Prod.' p. 8 (1776).
Phoca annellata, Nilsson, 'Skan. Faun.' p. 362 (1820).
Callocephalus discolor, F. Cuvier, 'Dict. Sci. Nat.' xxxix. 545 (1826).
Pagomys fœtidus, Gray, 'Cat. Seals and Whales Brit. Mus.' p. 23 (1866).

Local Names.—*The Rough Seal, the Ringed Seal, Marbled Seal, Stinker, Floe-rat* (English); *Ring-sæl, Fiordsæl, Natsek, Stink-robbe, Steen-kobbe, Grä-själ, Grä-wikare-skäl, Viksjäl* (Norwegian and Swedish); *Der geringelte Seehund, Der rauhe Seehund* (German); *Nerpa* (Russian); *Netsik* (adults), *Tiwak* (old males), *Netsiarik* (young after shedding first coat till one year old), *Ibeen* (young in white coat), (Eskimo); *Tigak* (male), *Minek* (female) (Labrador Esquimaux).

Characters.—The upper parts of the adult Ringed Seal are blackish grey or blackish brown in autumn; interspersed over this ground colour are a number of yellowish white spots, occurring singly or in figure-of-eight rings, which often again form into groups in well-marked individuals. In most adult specimens there are blackish grey spots in the middle of these rings. The lower parts are generally a dirty yellow-white, which in the autumn takes on a greenish tinge. Spaces round the eyes and the back of the head are black. In immatures all these colourings are modified and faint. Those of one year old have a yellow-white groundwork of colour with fainter and smaller dark markings on the back than in the adult which show only through the dorsal pelage; many immatures have, however, a number of black spots dotted over the flanks and back.

The young are at first snow-white, turning soon to a yellowish white. The hair is soft and woolly and rather long, but at four weeks old this begins to give place to the short hair of the immature dress.

Authorities are generally agreed that this Seal averages about 4 ft. 7 in. from the nose to the end of the tail, and 5 ft. 4 in. to the end of the flippers, but there is little doubt that very large specimens of males reach 5 ft. 4 in., giving a

[1] Mr. Sherborn discovered that Schreber's name, *hispida*, had a year's priority over *fœtida*; see Thomas, *Zoologist*, 1898, p. 102. Allen uses *P. fœtida*. Fabricius had withdrawn his name in favour of Schreber's.



THE RINGED SEAL.

PHOCA HISPIDA.

Printed in Vienna.

length to the end of the hind-flippers of 6 feet and over.[1] The very largest, however, are not so long or so heavy as a Common Seal.

The brain cavity is very large in proportion to the size of the animal, but the jaw, especially of the female, is small, and the teeth are placed in a straight line. The pre-maxillary bones are continued by the side of the nasals for some distance; the bony palate is acutely notched, and the posterior foramina open on or behind the palato-maxillary suture.

Distribution.—The Ringed Seal probably ranges farther north than any other creature. It is essentially an inhabitant of the Arctic seas of both hemispheres. On the eastern coast of America it rarely comes as far south as Labrador or the Newfoundland ice-pack. All along the western coast of Greenland it is abundant; it goes far north of Disco, even beyond lat. 82° in the Polar Sea, where it was seen and captured by Captain Fielden.[2] It is common in both south and east Greenland, and also in north Iceland, where I have seen the skins in farmhouses. Mr. E. Montagu, who travelled in north Iceland in 1898, tells me of the abundance of small Seals which frequent one of the northern fjords near Husavik, and there is little doubt from his description that they belong to this species. It is also numerous in Spitzbergen, Nova Zembla, Russia, and north Finland. Of its distribution in Arctic Asia we know nothing at present, but it is numerous on the Siberian side of Behring's Strait and on the north coast of Alaska.

The Ringed Seal is only a rare straggler to Norway,[3] North Germany, and the British Islands, though there is reason to believe that several have come to our coasts of recent years, but have not been recognised owing to their similarity to the Common Seal.

Bell in his first edition does not include this species amongst the British mammals, and even so recently as 1871 Professor Flower, overlooking the record of its capture on the Norfolk coast, says that it cannot be reckoned as a British species.[4] Since that date, however, several of these Seals have been taken in Scotland, and I am convinced that the species is by no means so rare as it is generally supposed to be.

[1] A very big male which I measured in Mr. Bruhn's establishment at Trondhjem was 5 ft. 2 in. to the end of the tail. Two adult males in my possession measure 4 ft. 5 in. and 4 ft. 7 in., and an adult female 3 ft. 10 in. from nose to tail.

[2] *Zoologist*, 1877, p. 359.

[3] Nilsson includes this animal in the Norwegian fauna, but Collett excludes it, a point in which he is mistaken, for it has been captured several times recently on the northern coasts of that country.

[4] *Proc. Zool. Soc.* 1871, p. 510.

The first undoubted British example of this Seal was captured on the coast of Norfolk in June 1846. It was purchased in the flesh in the Norwich fish-market by Mr. J. H. Gurney, and the skull is now in the museum of that city. The honour of identifying this specimen and establishing its claims to the British list is due to Professor Flower and Mr. Thomas Southwell, who has done some good work among the Seals and whales.

While in Aberdeen in the autumn of 1901 Mr. George Sim showed me two skulls of *Phoca hispida*. One of these was from an animal that had been killed at Collieston, Aberdeenshire, in August 1897, and the other was from a Ringed Seal taken in the salmon-nets in Aberdeen Bay during the summer of 1901. These two recent occurrences, which so far as I am aware have not been previously recorded, are of considerable interest to naturalists, as they point to a regular visitation of this northern species. Mr. Sim, to whom the credit of noting these fresh arrivals is due, kindly lent me one of these skulls, which is figured.

There is little doubt that among the great numbers of Bearded and other Seals that visited the coasts of Norway during the winter of 1902–1903 a certain number of Ringed Seals wandered south, and with some Greenland Seals made their way northwards again along the Scottish coasts.

Mr. Allen, in his excellent monograph on the North American Pinnipeds, speaking of the Ringed Seal says (p. 615) 'it undoubtedly occurs in the Orkneys and the Hebrides, where it is supposed to be represented by the species known there as "Bodach" or "Old Man."' This is a manifest error, for no crofters such as live in the Orkneys or the Hebrides are sufficiently observant in the matter of Seals to distinguish this species from the Common Seal in the water, while 'Bodach' or 'Old Man' is the name commonly applied only to the adult male of the Common Seal.

I have taken some trouble of late years to see a very large number of skins of Seals killed on the east coast of Scotland and in the northern islands, but up to the present have not been able to discover further instances of the presence of this species on our shores. There is no doubt of the abundance of this animal in former times in Scotland, for Sir William Turner records[1] numerous remains of this animal in the Glacial clays of that country.

Habits.—The Ringed Seal was first noticed by the Danish missionary Cranz, who, in his 'Historie von Grönland' (1765), refers to the animal under the Eskimo name of *Netsik*. Pennant refers to it as the Rough Seal in his 'Synopsis

[1] *Journal of Anatomy and Physiology*, 1870, p. 260.

of Quadrupeds' (1771), and after using Cranz's description suggests that it may be the 'Square Phipper' of the Newfoundlanders, an obvious mistake. In the list of Greenland mammals enumerated in the introduction to Müller's 'Zoologiæ Danicae Prodromus' (p. viii.) it is referred to by Fabricius as *Phoca fœtida*, but no description is given, the writer also making the mistake of confounding the species with the Grey Seal by adding the Icelandic name of the last-named mammal. Very shortly afterwards the Ringed Seal was described by Schreber in his 'Säugethiere' (part 3), his description being based on Cranz and Pennant's remarks, and attached to a plate which bears little resemblance to the animal is the title *Phoca hispida.* Three years later Fabricius gave an adequate description of the species in his 'Fauna Groenlandica' (1780), in which he refers to it as *Phoca fœtida*, although quoting *Phoca hispida* as a synonym. In 1791, however, in his memoir of the Greenland Seals the same author concedes priority to *Phoca hispida.* All this is somewhat confusing, and consequently there exists considerable difference of opinion as to the correct synonym of the Ringed Seal, but most naturalists will prefer to follow Professor Flower, who has adopted *Phoca hispida* on account of priority.

Since the days when Otto Fabricius wrote, many naturalists and Polar voyagers have added to our knowledge of this creature of the ice-floes. The Ringed Seal is a Seal of the ice, and when away from its favourite resting places rarely goes to sea, but rather loves the sheltered fjords and bays of the main coast. In these situations the Seals remain so long that the waterways get blocked with ice, and when this breaks they move to floes, where they bring forth their young. The young are born in a hollow in the ice early in the spring, and are said to take to the water before shedding the first coat.

The Ringed Seal generally lies close to its breathing hole in the ice, and through this dives to the water below at the approach of danger. How these holes in the ice are kept open in the cold of the Arctic spring is not yet known to naturalists; even the observant Eskimo, who are constantly among the Seals, cannot properly explain the matter.

It is only the adult males that give forth the disagreeable odour[1] which has suggested the name *fœtida* for this Seal. Mr. Kumlien states that it is possible to smell an Eskimo some distance away when he has been partaking of the flesh; the Eskimo say that it is more nourishing than the flesh of the females, and that a person can endure great fatigue after eating it.

[1] Dr. Rink says the smell is something between assafœtida and onions, and almost insupportable to strangers.

The food of the Ringed Seal is said to consist largely of crustaceans, but during the winter it lives much on fish.

Some trade is occasionally done in the skins of these Seals, of which Dr. Rink calculates at least 51,000 are annually captured; but the skins are not so highly thought of by the Eskimos as those of the Common Seal, although these people generally use them for clothing. Were it not for the Ringed Seal the Eskimo would starve in the winter, for they are a happy but improvident people who only take what the Almighty sends them directly, and will not hoard up for a rainy day. So the Netsik which remains all the winter is at once their food and clothing.

Those who would further study the history and habits of this Seal will find an excellent account taken from various sources in Mr. Allen's 'Monograph of North American Pinnipeds.'

The Harp or Greenland Seal

Phoca grœnlandica, Fabricius.

Phoca grœnlandica, Fabr. in Müller's 'Zool. Dan. Prod.' p. viii. (1776).
Callocephalus grœnlandicus, F. Cuvier, 'Dict. Sci. Nat.' xxxix. 545 (1826).
Pagophilus grœnlandicus, Gray, 'Cat. Seals and Whales Brit. Mus.' p. 25 (1866).

Local Names.—*Harp Seal*, *Greenland Seal*, *Saddleback*, *Whitecoats* (young), *Sadler*, *Blackside*, *Ragged-jackets* (first moult), *Turning Harps*, *Bettlemers*, *Bedlamers*, *Bedlimers* (two-year-olds), *Breeding Harps* (adults), English; *Grönlandsæl*, *Harpsaël*, *Sadelsaël*, *Sulryg*, *Svartside* (Norwegian); *Grönlandsjäl* (Swedish); *Vadeselur* (Icelandic); *Grönlands-Robbe*, *Sattel-Robbe*, *Grönlandischer Seehund* (German); *Phoque à croissant* (French); *Kiölak* (Eskimo,[1] Greenland); *Kariolik* (Eskimo, Labrador)

Characters. Adult Male.—The general colour of the Harp Seal is yellowish white. The nose and front part of the head to behind and below the eyes are black. The chin and throat are sometimes yellow-white and sometimes heavily marked with black. A black band runs from the shoulders downwards and along each flank towards the tail, where it again rises and nearly meets over the

[1] It is not surprising to find a number of local names, all applying to the various stages in the life of the Greenland Seal, used by people so thoroughly acquainted with this animal as are the west coast Eskimo. Fabricius says that the young are at first called *Atarak*; later in the same summer, and after the first moult, and during its first winter it is *Ataitsiak*. The second year it is *Utokâitsiak*; the third year *Agletôk* or *Aglektungoak*, and in the third winter *Aglektytsiak*. The first year it keeps the same name, *Agletok*, as well as taking a new one, *Aglektorsoak*; but after the fourth moult it takes the name of *Mitlaktok*, when it is considered adult. Still later it is called *Atarsoak*.



THE HARP SEAL.

PHOCA GRŒNLANDICA.

Printed in Vienna.

vertebræ. Sometimes there are irregular black spots on the hind limbs. The usual length is between five and six feet. An unusually large adult male in my possession measures seven feet.

Adult Female.—As is usual among Seals the female is considerably smaller than the male and less strongly marked, the black markings being sometimes wholly absent or confined to a few black spots; most females are a bluish grey on the upper parts. They rarely attain five feet in length.

Young and Immature.—The young are at first white or yellowish white, sometimes golden, and the hair is soft and woolly. In a few weeks this first hair comes out and the whole coat becomes pale grey with small ill-defined spots along the back. The upper parts, especially the head, are darker, and, as in all young Seals, the lower parts lighter in tint. In the second and third year the colour remains the same, but the spots become larger and darker as the animal grows. In the fourth-year males the dress approaches more closely to that of the adult, which is attained in the fifth year; the general colour becomes yellower or whiter in some instances, while the black markings are more intensified and tend to mass together. The animal is not considered adult till the fifth year, when the pelage is complete.

During a visit to St. John's, Newfoundland, I had several interesting conversations with Captain 'Sam' Blandford, who is generally admitted to be the most successful Harp Seal hunter of modern times. Captain 'Sam,' as he is affectionately termed by the Newfoundlanders, is now seventy years of age and has made no fewer than fifty voyages to the ice-fields, forty of these years as captain: a feat of endurance which no past or present seaman has ever equalled. He is a close observer of nature, and has given me the following interesting note on the change of pelage in the Greenland Seal: 'The Harps reach the Straits of Belle Isle about December 25. This they do by working down the coast of Labrador, the main body passing Nain and Hopedale about November 12 and Cartwright November 25. A number cruise for the winter about the straits, some going as far south as the Gulf of St. Lawrence, but all adults work to the north-east of the Newfoundland coast by February 20, and the great mass of females pup on the broken ice between this date and March 5. We will say that a "whitecoat" (pup) is born March 1; this white dress they retain till March 28 or April 1. It then rapidly falls and gives place to the new spotted coat of the second dress. At this season the mothers desert their young, and they (the young) scatter in all directions and go north alone, working their way by instinct up the Labrador coast. At this season these youngsters

are nothing but skin and bone. These young Seals return the following spring, keeping apart from the old ones, and from April 20 to May 10 they shed their second coat and take on the third dress, which is more strongly spotted. These Seals are now called by us "Small Bettlemers" or "last year's Seals," and in the external form there is no difference between males and females except in length and weight.

'In the third year they again return and shed about the same time. In this new coat the males begin to show the form of the harp, and the spots to come together. We call these third-year Seals "Rusties" or "Turning Seals" and I do not think they ever breed.

'In the fourth year the complete dress is almost assumed. A certain number of the Seals breed, and we call them "young dogs" or "young bitches." They invariably whelp a little sooner than the completely adult animals, further to the south, and in small bunches or "spots" as we call these isolated gatherings.

'In the fifth year the Greenland Seal is quite adult.'

Although the Newfoundlanders and the Eskimo state that it takes five years before the Seal is adult, Dr. Brown and other authorities consider that in some individuals the process of coat-changing proceeds more rapidly, and that the adult dress is assumed in three years.

Dr. Rink gives the weight of a full-grown adult as 353 lbs., but Mr. Carroll gives much higher weights and says that when in prime condition they vary from 700 to 800 lbs. I think that these last weights must be slightly exaggerated, since the male Greenland Seal seldom exceeds 6 feet in length, whereas an adult male Grey Seal of over 9 feet rarely exceeds 600 lbs. In February 1903 Mr. Bruhn of Trondhjem, Norway, sent me what he considered the finest male Greenland Seal that had come into his hands. The skin measures exactly 7 feet from the nose to the end of the tail.

Lydekker[1] thus describes the important cranial distinctions of *P. grœnlandica*. 'The free hinder margin of the bony palate is almost entire, instead of being deeply and acutely notched; while the two branches of the lower jaw, in place of diverging at once, are nearly parallel in front.'

In Bell's 'British Quadrupeds' (2nd edit. p. 252) the following cranial characters are given: 'Skull with the hinder end of the long palate entire, nearly straight; branches of lower jaw sub-parallel in front.' The dentition is similar to that of *P. vitulina* but not nearly so heavy.

Distribution.—The Harp or Greenland Seal is a boreal species which makes

[1] *British Mammalia*, p. 156.

its home in the icy seas of the polar regions. It is very abundant in the North Atlantic, and although an inhabitant of the North Pacific its present distribution there is but little known. The Greenland Seal ranges as far south as the Magdalen Islands and Nova Scotia on the American side, but the coasts of Newfoundland and Labrador are its usual southern limit in winter. In the spring the great slaughter of adults and young, when hundreds of thousands are annually slain, takes place on the ice pack in March, about two days' sail to the north of St. John's. In their spring and winter migrations they regularly pass to the coast of Labrador, and appear early in the year in the south of Greenland, from whence northwards to Davis Straits and Disco they are exceedingly abundant throughout the summer. How far they range up the east coast of Greenland is at present unknown,[1] but they are common on the north coast of Iceland, where I saw six individuals swimming together in May 1890. They are very numerous about Spitzbergen, Jan Mayen, Nova Zembla, and Franz Josef Land; they also occur in the Kara Sea and on the Finmark coast in winter.

To Britain the Harp Seal has occasionally come as a wanderer, most of the occurrences taking place in summer. The first recorded occurrence of the Harp Seal in Britain was in 1836, when two Seals were killed in the Severn. The skulls were exhibited at the meeting of the British Association in that year, and though Professor Nilsson at first thought they were referable to the Ringed Seal, he subsequently agreed with Professor Bell that they were skulls of this species. The skulls have been mislaid and doubt has been cast upon the identification, but Bell maintained his point, and the matter will remain in doubt unless the skulls are subsequently discovered.

In 1837 Dr. Edmondston issued his paper on the Shetland Seals, and speaks therein[2] of a young specimen of the Greenland Seal being shot in the bay of Burrafirth, Unst. Sir William Turner assigns[3] to this species the skull of an immature Seal captured in Morecambe Bay, January 1868. This is undoubtedly the most satisfactory of the early records, for the skull is still preserved at Kendal. MacGillivray[4] mentions a young Seal which was taken in the Firth

[1] That excellent authority Mr. Thos. Southwell says (*Zoologist*, April 1884, p. 122) that they 'travel northward, still along the margin of the ice, resting as they go, till they reach lat. 76°; they then make for the south end of Spitzbergen, and even pass on to the shores of Novaya Zemlya.' Most Seal captains, however, will dispute this, and say that the two great bodies of eastern and western Harp Seals are distinct, and that the Spitzbergen herds may come from the east.

[2] P. 12. [3] *Journal of Anatomy and Physiology*, ix. 163. [4] *Nat. Lib.* xxii. 210.

of Forth, and which was considered to be a Harp. This occurrence can only be considered 'not proven,' as also the one mentioned by Dr. Gray, a reputed Harp Seal captured in the Thames in 1858. Dr. Saxby[1] mentions the occurrence of Harps in 1864 in the Voe of Baltasound, Shetland, where he considered the animal was not uncommon.

Mr. H. D. Graham,[2] an admirable observer, as all will admit who have read his charming 'Birds of Iona and Mull,' gives an interesting account of three Harp Seals seen by himself in West Loch Tarbert, off Jura. Mr. Harvie-Brown believes that a Seal of this species was killed previous to 1870 at Kintradwell in Sutherland, and he also gives an account of four Harp Seals which he saw, one of which he killed and unfortunately lost in the tideway, near a rock in the Sound of Harris, on May 2, 1870.

Till recently the only adult specimen taken in the British Islands and preserved in a complete state was shot by Mr. Kennedy whilst out punt-shooting in Invergowrie Bay, Carse o' Gowrie, Perthshire, N.B., on September 6, 1895. Mr. Kennedy shot the Seal with his big gun and it sank, but was recovered at low water the same day. I examined the specimen, a fine adult male, in a hair-dresser's shop in Dundee shortly after death, and mentioning the importance of the capture to Colonel Drummond Hay it was secured for the Perthshire Society of Natural Science in Perth, in whose museum it now rests.[3] We may expect to hear of other captures of Harp Seals in the Tay estuary before very long.

I have myself seen a Greenland Seal on the island of Damsey in the Orkneys, and extract the following from my diary, August 15, 1897.

'Sailing to-day to Damsey in a stiff breeze I saw fifteen or twenty Seals on the far point opposite the ruin, and amongst them a very large Seal all white with a jet-black upper head, and the black and unmistakeable Harp of the Greenland Seal on each side of his back. He lay right on the point against the green water, and there could be no possibility of mistaking him for any other creature, although I could not get a good sight of him with the telescope owing to the rocking of the boat. We sailed by within two hundred and fifty yards and his coat looked very snow-white, not yellow, in the sunshine. By the time we rounded the island and I had taken a spy preliminary to commencing the stalk, something had alarmed the Seals and they were all in the sea, looking

[1] *Zoologist*, 1864.

[2] *Proc. Nat. Hist. Soc. Glasgow*, i. 53; as also in his *Birds of Iona*.

[3] Cf. *Ann. Scot. Nat. Hist.* 1902, p. 182.

frightened and making out for the Firth. I did not see the Greenlander again, although I visited Damsey twice for that purpose. Corrigal, my boatman, said that two years previously a Seal exactly answering the description of the one we had just seen came and stayed all the summer months at Damsey.' Recently a Harp Seal was captured at Wick.

Mr. Burgess, the postmaster of North Rooe, Shetlands, and a man who knows Seals well, told me that he saw a Greenland Seal among Common Seals near Uyea in September 1902, probably the same animal about which Mr. Haldane of Lochend sent me the following note, September 1902. 'Mr. Thomas Anderson of Hillswick told me that, during a walk from Rona's Voe along the top of the banks near Birka Water, he saw eighty-four Seals lying up in the Long Clodie Wick, and among them a Harp Seal, with the mark over the back.'[1] Finally James McNicoll, who shoots Seals for the Tay Fishery, sends me word that three Seals answering the description of the Harp Seal frequented the Tay estuary during the summer of 1901.

There seems to have been a very remarkable southward movement among the Arctic Seals during the winter of 1902 and in the spring of 1903. The winter of 1902–1903 was by no means a severe one in higher latitudes, and probably the scarcity of fish along the edge of the permanent ice where most of the northern Seals find their winter food led the great body of the Bearded Seals to move southwards to the Scandinavian coasts, where they worked havoc and in many cases almost ruin to the poor Norwegian fishermen. Later in the same winter came a fair number of Harp Seals, and quite a number of these must have extended their travels as far as the coast of Scotland, for several were captured in the month of March 1903. Knowing my interest in Seals friends in the north have sent me full particulars of these captures, which were as follows. The first, a large male (five feet in length), was captured on March 7 by some workmen of Messrs. Brand who were constructing some new docks at Grangemouth, estuary of the Forth. The Seal was observed to leave the water and climb out on to a slag bank, whereupon the animal was surprised and captured. A few days afterwards another Harp Seal, a female, was captured close to the same place, both animals finding their way to the Scottish Zoological Society in Glasgow.[2] Shortly after this the smaller animal of the two was transferred to the Zoological Society in London, where it lived for eight days. At the beginning of March another large male (measuring 6 ft. 9 in.

[1] Cf. *Ann. Scot. Nat. Hist.* 1902, p. 117.

[2] Now mounted in the Glasgow Museum of Natural History.

to end of flippers) was taken in nets of the salmon fishers at Deemouth. This was received in the flesh by Mr. George Sim of Aberdeen, who found the skin so decomposed that it was of no use; the skull however is in his possession. The same naturalist also informs me that a large adult male was caught in the salmon nets at Stonehaven, Aberdeen, on March 7, 1903. The skin measures 6 ft. 3 in. from nose to end of the flippers, and the specimen is now mounted in the Marischal College museum at Aberdeen.[1]

Lastly Colonel Gostwyck Gostwyck writes to me, August 1, 1903: 'Last year (1902) I got my glass on a veritable Harp Seal and had a long stalk after him in Eynhallow, Orkneys, but the Arctic terns were so troublesome, even striking the soft cap off my head, that you cannot wonder that the Seal made off and that the stalk was a failure.'

From the above fresh records it will be seen that the occurrence of the Greenland Seal in Scotland is not so rare as is generally supposed; I think that if there were more expert observers who could recognise the differences between the Seals at a glance we should oftener hear of this animal on our northern coasts.

As regards the occurrence of this Seal in Ireland there is only one authenticated instance of its having been seen in that country, that of a Seal shot and lost by Mr. Henry Evans in 1856 near Roundstone, co. Galway. This record should, I think, have credence because Mr. Evans is a good observer and is well acquainted with both the Common Seal and the Grey Seal.

General Habits.—The home of the Harp Seal is near the bleak shores of Greenland and the polar islands, forlorn regions of dreary waste where the accumulations of centuries of winters have formed fields of ice, topped by glittering heights. Near such lands the Greenland Seal loves to lie close to the open cracks in the floes, or to fish in the surrounding depths. Its enemies are the Eskimo hunter, the white man from St. John's, Trondhjem, Copenhagen, and Dundee, the polar bear, the shark, the sword-fish, and perhaps the orca; and yet despite the toll these take, it is only the fringe of the great multitudes that are molested. Imagine the abundance of a species of which 200,000 are annually killed in one small area, to the north of St. John's, and there is no diminution. Yet it is so. Twenty sealing steamers, with crews averaging two hundred men, leave St. John's about March 10 every spring, and after a few weeks return with full

[1] Cf. *Ann. Scot. Nat. Hist.* 1903, p. 183; see also *Zoologist*, 1903, p. 312.

cargoes; year after year this business slaughter is continued, and still there is no perceptible difference in the number of the animals.[1]

The Harp Seal, though found throughout a wide area of the polar seas at different seasons of the year, does not seem to be resident in any one spot during the twelve months. It is a migratory Seal, whose movements are conducted with great regularity. The Harp Seals seen in west Greenland during autumn are believed to breed to the east of Jan Mayen, but it is quite as reasonable to suppose that they move southwards, for immense numbers are seen passing south along the coast of Labrador and through the Straits of Belle Isle during early winter. These Seals mostly winter about the Grand Banks, from whence in February and March they turn northwards again round Newfoundland and haul up to the east of that island for breeding purposes. After this they again appear in Greenland in the spring, and spend the summer there till August; they leave for a few weeks but return again in September, migrating northwards until the ice forms and they are compelled once more to move south.

The Seals that frequent the ice floes of Jan Mayen are supposed to come from the west (east Greenland), but as Mr. Allen remarks, they may also come from the east and north from points of Asia that we are unacquainted with. Of the winter migrations of these Jan Mayen and Spitzbergen Seals nothing seems to be known, for no one winters in these inhospitable seas or has followed the autumnal migrations of these eastern herds. Yet they are there in immense numbers every spring.

The Harp Seal is gregarious and so numerous as to outnumber all other Seals of the Arctic seas. Owing to the quantity of its blubber and the value of the skin, it forms the chief export of the northern sealing trade. When settled for a short season the Harp Seal is generally found on broken floating floes, and does not seem to affect firm ice, a circumstance accounted for by its not forming 'breathing holes' like the Ringed Seal.

About the end of February the Harp Seals assemble in broken floes from Greenland to the north-east of Newfoundland, where the white pups are born between March 8 and 10.[2] According to Mr. Carroll, the 'breeding Harps' go north first and travel as far north with the ice as they can, so as to protect the

[1] Captain Sam Blandford tells me that the annual catch nowadays is from 300,000 to 350,000 Whitecoats. In his early days it used to be from 400,000 to 600,000. Yet he does not think that there is the slightest diminution in the number of Seals.

[2] Lindemar says that about Jan Mayen the young are born later, namely about March 23 or 24.

young from the waste of northern storms. Many pups are born near the Newfoundland coast, and when a sea gets up thousands are ground to pieces by the action of the ice. To save their young, says Mr. Carroll, the mothers display great forethought and sagacity, often bolting up on the ice and dragging their babes from the sea. 'I saw many interesting examples,' he adds, 'of how courageously the mother worked under such an accident in order to bring her young again upon firm ice, either by trying to swim with it between her fore-flippers, or by driving it before her and tossing it forward with her nose.'

The males accompany the females to the breeding grounds and stay about in the open pools close at hand.[1] The mother Seals fish in the neighbourhood of their young ones and return to suckle them at intervals. So nutritive is their milk that at three weeks old the pups are half as large as the old animals.

Four or five weeks after the birth of the young, the old ones change their coats, and Mr. Carroll says that this is a period of great discomfort to the Seals, which frequently get sunburnt on the skin. They will not leave the ice, for entering the water involves pain, and so are easily killed. The calls of a herd of these Seals can be heard many miles away, and this often directs the sealers to their whereabouts. Sometimes, owing to the jamming of the ice, herds of Harp Seals get embayed and have to travel over the ice to the nearest water. 'Supposing,' says Mr. Carroll,[2] 'the water to be fifty miles from them, they know well by scent where it is, for you will see them stretch out their necks and sniff; should the ice part in any direction from them they will at once turn round and avail themselves of it. . . . They travel principally by night.'

The young Harp Seals enter the water when they are about twelve days old, but it is some days before they acquire any skill in swimming and fishing for themselves. After taking to the water they assemble in large herds and in these compact bodies move away northwards after their parents.

I learnt several interesting points respecting the hunting of the Greenland Seal by talking to Seal-men in Newfoundland in the autumns of 1902 and 1903. The bulk of the Seals are found from the Straits of Belle Isle to the Grand Banks, an area of ocean more or less covered with floe-ice every winter. The Harp Seals

[1] At this season the males are very fat and float well. Captain Jackman tells me that he has more than once killed a hundred adult males in a morning's shooting with the rifle. All of these carcases were recovered.

[2] *The Seal and Herring Fisheries of Newfoundland*, p. 25 (1873).

lie on these vast white fields and are carried rapidly south by the Arctic current. It is mostly at the inset of the current towards Labrador, where the floes are deflected by currents along the northern coast of Newfoundland, that the sealers first strike the game. The Seals are found in immense herds or 'patches'[1] and often cover a range of ice far beyond the vision of man, and at these the crews work day and night, slaying, skinning, and reducing to blubber, for a week or two, until as many as 250,000 are taken by the crews of the twenty vessels employed.

We think it wonderful that in a black-headed gullery of, say, 10,000 individuals each parent finds its own young amid the screaming multitude; but instinct and parental love are far more highly developed in the mother Harp Seals, who leave their young at dawn and go sometimes for the whole day to fish in the neighbouring depths, and yet return at evening almost directly to their progeny and lie up beside them for the night. This is the more wonderful when we consider that the floes on which the pups lie are often whirled to and fro by the action of the sea and borne along in the drift of ocean currents.

To the general reader as well as the naturalist it may be of interest to trace briefly the history of the northern Hair-Seal industry from its beginning to the methods employed at the present day.

When John Cabot and his English sailors discovered Newfoundland and Canada in 1497, they came home after their adventurous voyage and told wonderful tales of the wild creatures they had seen in the distant western lands. Great beasts with tusks they called sea-cows (walrus) and huge white bears of extraordinary tameness and without fear of man abounded, and as for the Seals they were as the sand upon the sea-shore. With the romantic people of Elizabeth's day these stories found full credence, and the wonderful part of it all was that they were perfectly true.

The first result was the initiation of the great fishing industry, for fish was always a marketable commodity and could be brought home to Europe and exchanged for all the desirable things that made life pleasant. English, Portuguese, French, and notably the Spanish Basques, were the first to appreciate this harvest of the waters and its great value, and year after year these daring fellows crossed the ocean in their poor craft and snatched their livelihood from the dangerous waters of the North Atlantic.

[1] The 'patch' of seals in 1903 was four miles wide and thirty miles long.

Fishing pure and simple naturally induced the more daring to attack the Seal and even the whale, and the first men to do this were the Biscayans (who already knew how to kill the Atlantic right whale on their own coasts) and the men of the Basque provinces. In 1540 the Seal and whale industry may be said to have commenced. We read that in the fateful year of the invasion of the Spanish Armada these same men had from thirty to fifty vessels pursuing the whale, the Seal, and the walrus round the coasts of Newfoundland and the Gulf of St. Lawrence. One year, 1577, some of their ships were caught in the ice and 540 men frozen to death, yet none of these misfortunes seemed to deter these hardy old sea rovers, and year after year they continued their calling, generally with most successful results. These men soon began to grow rich, as they deserved, and founded some of the most distinguished families in northern Spain, which to this day bear on their coat-of-arms the emblems of the source of their original prosperity. But they are no longer what they once were; war and Spanish oppression and misrule have long since crushed their power and destroyed their wealth.

When the English and the Scotch first took to the western Seal and whale trade they had to learn the game from the Basque men, as these alone were sufficiently skilful in the use of the harpoon. So time went on, and our people began to understand the business more thoroughly; yet it was not until the end of the eighteenth century that well-equipped fleets of sailing vessels left England and Scotland to prosecute the annual slaughter. In this they were now thrown into rivalry with the Americans, who soon started a great trade employing thousands of hardy New Englanders. Forty or fifty years ago the Scotchmen deserted the western icefields, and now hunt the north-west of Greenland after whales, or towards Jan Mayen, up east Greenland, after Seals[1]; the Norwegians too go north to Spitzbergen or Jan Mayen, while the Newfoundlanders have entered the western fields and the Englishmen have retired from the game.

The Newfoundlanders, who are the most experienced Harp Seal hunters, curiously enough look back at the old days of the wooden sailing vessels, thirty years ago, as the 'good days' of Seal hunting; and to emphasize the contrast between what life was and what it now is on the little overcrowded steamers I will quote the speech of one of my guides, old Bob Saunders, who accompanied me on two caribou-hunting expeditions in Newfoundland.

[1] British vessels first seriously attacked the Greenland and Labrador Harp Seals in 1876.

'Captains had to really navigate in them days, sir, and they was kind to their men and treated them as frens. We made a bit o' money too, as we had every second swoile to ourselves, and we was allowed to take a few billets o' wood and make coffee out on the ice. Those was the good times o' sealing when men weren't treated like dogs,' and little Bob puffed fiercely at his pipe.

'Now it's full speed ahead up into the good ice. Two hundred men in a foul tub not fit to carry thirty, an' a bully to thrash you out o' your bunk whether you're fit to go to the ice er no. They fling you out on the floe ice with a few billets o' wood and steam away a day to dump down another crowd, and like as not you've got to spend the night out wi' your clothes freezin' on you, for you're bound to fall in the cracks least once a night however loose (active) you may be. Thar's no room below once the steam winch gets a'goin' and the swoiles a'comin' aboard, so up comes the coal, and what with the grit and the blubber two hundred men can't sleep very comfortable on the open deck in a mass o' muck with the cold afreezin' into yer marrow.'

'I wonder the men stand it, and that they can get crews year after year,' I suggested.

'Ah, that's cos you don't know what the poverty o' Newfoundlan' is,' returned the old man sadly. 'There's boys goes once or twice to prove they're men, but the crews *don't consist o' them.* It's the poor, the very poor, that never has a dollar from one year end to another, thet's the Seal-hunters, now, and they jus' hev to go er starve.'

When Seals are found the men are sent out in gangs and scatter over the floes, sometimes going many miles from their ship. The lookout man in the crow's nest is supposed to keep an eye on the hunters, but he frequently loses sight of them, and if the men strike Seals in quantity each man skins and hauls his catch to a common pile on firm ice, and plants the ship's flag upon it. This is called 'panning' or 'bulking.'[1] Constantly ships steal each other's 'pans,' and litigation and marvellous lying ensue when the vessels return to St. John's. My friend Judge Prowse has taken part in many such cases, and sends me the following amusing incident: 'I was engaged in one case where the plaintiff claimed that their Seals marked B.S.T.—"*Brilliant Star,* Tobias," the surname of the master—were stolen by another crew and found so marked in their possession. The defendant's name was Slocum, and he and all his crew swore that they had marked their pelts

[1] Called by the Dundee men 'binging.'

"*Iona*, Slocum Brothers," thus, I·S·B., the B made by illiterate men, and if you turn the letters upside down you will see that they come very near alike. It was highly ingenious, but somehow the jury did not believe my clients, though they were, as the Irishmen say, "all on the wan word, and swore like a corporal's guard"; we lost the case.'

Seal-men have told me that although great risks have to be borne and life is constantly endangered in this pursuit, so great is the fascination of the work that year after year the same men go to the ice and take their part in the toil of the hunt, the exposure, the wretched food, the accidental duckings, the ice-blindness, the lack of rest, and the filth.[1] The most famous Newfoundland proverb is 'Man'll goa for swoiles (seals) where gold won't drag 'un.'

One of the worst dangers is from fog. Hundreds of men at work on the floes are often cut off from their ships, and are indeed in a pitiable plight for the night. This is the least that may happen, for if the wind gets up many lives are certain to be lost. When thus isolated from the ships the anxiety is intense, for calls are often misleading in the fog, and the men fear to walk into the open channels between the floes. The ships themselves as well as their crews are occasionally lost, the most terrible disaster being that which befell the *Greenland* in 1888. The ship was struck by a blizzard while 180 men were off hunting Seals. They, poor fellows, were left helpless whilst their vessel was driven to sea. Two days and nights elapsed ere she again reached her men, when 48 were found to have perished from hunger and cold, many had gone mad, and others had fallen in the water and been drowned, while about fifty of the survivors were found to be badly frost-bitten. In 1897 there were several disasters. The *Wolf* was 'nipped' in the floes and sunk, and the crew of 275 men made their way over the ice to the shore. The *Neptune* also was nearly sunk, and the crew had to bail all the way to St. John's.

During February large numbers of young Seals are often born on the ice close in shore near White and Trinity bays, and at such times numbers of men leave the land and attack the Seals, either simply running afoot or using small boats. Considerable danger is incurred in this business, as a heavy gale rising from the land may render retreat impossible. Such a disaster occurred in Trinity Bay in 1892, the blackest year in the annals of Newfoundland. 'Two hundred and fifteen men,' says Judge Prowse in his 'History of Newfoundland' (p. 521), 'were out on that

[1] Even if the ship returns 'full,' the men only get about 8*l.* as wages. The recent strike (1902) has, however, increased this one-fifth.



HARP SEALS TAKING TO THE FLOE ICE IN MARCH.

day; the majority got safe to land after a tremendous struggle for their lives. the rest of the unfortunate fishermen, in spite of their heroic exertions, were finally overpowered.'

Apart from man, sharks and swordfish are said to prey on the Harp Seals. Mr. Carroll says he has seen these marauders taking Seals. He has witnessed the swordfish pressing down the side of a small 'pan' of ice and forcing its prey to fall into the water, where it is torn to pieces. 'I have been,' says the same writer,[1] 'on pans of ice when Seals mounted the ice to avoid the sword-fish and sharks, and I was obliged to fire on the monsters to keep them off. Seals will shake with fear, and should a man be on the pan when swordfish and sharks are after them, they will run between a man's legs for protection.'

The catch nowadays consists mainly of 'whitecoats,' i.e. young Harp Seals of five or six weeks old. At this season they are best for killing, as the skin is now tough and there is about forty to fifty pounds of fat upon it. The young are caught on the ice, despatched with a blow from the sealing gaff, and the pelt and fat removed in one skinning. If the ships are early on the ground the sealers sometimes kill a good many of the old males swimming about in the open sheets of water. At this season they are fat and float well, so none are lost. Prior to the year 1880 the crews of British, Norwegian, and Newfoundland ships generally killed only old Seals, the pups being considered too young to yield oil and their skins valueless. Since that date, however, all this is altered, and but few adult Seals are killed. The hides of the whitecoats of the Newfoundland catch all go to New York, where they fetch a good price and are principally used for the 'uppers' of boots.

In March 1901, eighteen steamers carrying 3,836 men landed 345,382 Seals at St. John's. In March 1902, 230,000 Harps were killed by the St. John's men, but this is somewhat below the average, which is 350,000, the cargoes being valued at 100,000*l*. As many as 500,000 Seals have often been taken in a high spring catch. Dr. Rink says that about 33,000 are annually killed in Greenland, and Mr. Allen gives the Jan Mayen take at 300,000, so that the total annual capture of Harp Seals ranges about 800,000 individuals.

The complete returns of the Newfoundland Seal fishery since the year 1875 have been sent to me by Mr. Murphy, Minister of Marine and Fisheries, St. John's.

[1] *The Seal and Herring Fisheries of Newfoundland*, 1873, p. 26.

SEAL FISHERY—NUMBER AND VALUE

Year	No. of Seals	Value	Year	No. of Seals	Value
1875	370,679		1890	220,846	$675,381.00
1876	341,292		1891	364,854	555,031.00
1877	431,373		1892	390,174	779,438.00
1878	419,220		1893	175,478	865,785.00
1879	457,855		1894	284,463	321,696.00
1880	261,508		1895	303,276	503,582.00
1881	408,879		1896	297,969	685,216.00
1882	178,812		1897	116,628	372,461.00
1883	322,603		1898	248,717	348,119.00
1884	266,290		1899	278,560	388,599.00
1885	238,596		1900	363,243	595,935.00
1886	272,656	$538,863.00	1901	355,380	707,525.00
1887	230,355	529,766.00	1902	284,354	800,314.00
1888	286,464	458,853.00	1903	317,760	767,557.48
1889	335,627	573,984.00			

The following table also gives particulars of the vessels now engaged and the general return for the year 1903:

NEWFOUNDLAND STEAM FLEET—SEAL FISHERY, 1903

Arrived 1903	Steamer	Master	Gross tonnage	No. of seals	Gross weight				Nett value	No. men	Men's share	Suppliers
					Tons	Cwts.	Qrs.	Lbs.				
March 28	Virginia Lake	W. Winsor, jr.	760	22,677	460	14	0	6	$32,547.88	208	$51.91	Reid-Newfoundland Co.
„ 29	Aurora	A. Kean	580	26,069	497	2	0	5	35,364.57	187	62.37	Bowring Brothers, Ltd.
„ 30	Greenland	I. Mercer	448	15,083	293	9	0	4	20,882.85	152	45.75	Baine, Johnston & Co.
April 1	Southern Cross	D. Blandford	522	17,183	301	14	3	8	21,113.67	175	39.99	Ditto
„ 1	Grand Lake	H. Dawe	896	25,688	514	2	0	16	36,722.05	203	60.00	A. J. Harvey & Co.
„ 4	Leopard	P. Blackwood	320	8,862	183	6	0	26	12,720.47	104	40.38	Baird, Gordon & Co.
„ 6	Vanguard	G. Barbour	559	24,238	439	14	0	21	31,226.37	179	58.13	Baine, Johnston & Co.
„ 8	Windward	A. Carter	321	1,185	24	13	0	7	1,738.63	114	5.01	R. Prowse & Sons
„ 13	Terra Nova	A. Jackman	744	20,954	387	9	1	3	27,424.27	203	44.81	Bowring Brothers, Ltd.
„ 13	Neptune	S. Blandford	684	24,226	476	18	2	26	33,404.18	203	54.58	Job Brothers & Co.
„ 14	Ranger	J. Knee	520	17,979	358	11	3	12	25,445.98	165	51.09	Bowring Brothers, Ltd.
„ 15	Harlaw	D. A. Scott	451	5,126	162	8	1	4	9,452.38	126	25.00	Capt. J. Farquhar
„ 15	Newfoundland	J. Farquhar	919	10,530	198	10	0	5	13,828.47	173	26.64	Ditto
„ 15	Iceland	W. Winsor, sr.	423	16,337	343	16	1	22	24,286.26	139	58.02	Baine, Johnston & Co.
„ 15	Algerine	W. Bartlett	500	12,820	351	18	1	26	21,114.36	161	43.44	Bowring Brothers, Ltd.
„ 16	Kite	D. Green	280	8,128	144	3	3	7	10,108.20	89	37.43	Ditto
„ 16	Walrus	R. Bragg	406	6,634	153	3	3	26	10,146.24	112	29.72	G. Browning & Son
„ 17	Labrador	G. Hann	436	14,420	258	17	1	20	17,912.85	140	42.35	Baird, Gordon & Co.
„ 22	Diana	A. Barbour	473	15,038	338	2	1	11	23,315.10	152	50.80	Job Brothers & Co.
May 4	Eric	J. Kean	533	15,941	428	5	1	4	26,598.47	172	51.25	Ditto
„ 4	Nimrod	R. Bartlett	334	5,661	147	4	0	18	8,591.48	104	27.27	Ditto
„ 6	Panther	N. Kean	363	2,981	109	1	3	0	5,852.75	117	16.53	A. J. Harvey & Co.
			11,472	317,760	6,573	7	1	25	$449,797.48	3,378		

The annual catch brought in by Scotch vessels averages about 150,000 skins.

The food of the Harp Seal consists mainly of fish, but crustaceans and molluscs are also eaten. Off Newfoundland these Seals catch an immense quantity of cod and white fish. The capture of cod being the Newfoundlander's chief occupation, he looks upon the annual Seal slaughter almost as a necessary precaution; an increase of Seals always means a decrease in the number of fish.

Genus *Erignathus*, Gill

Allen[1] gives the characters of the genus as follows: 'Muzzle broad, forehead high, convex; small supra-orbital processes. Dental formula as in *Phoca*: teeth small, molars spaced, slightly implanted, early becoming defective by attrition; partly deciduous in old age. Palatal area broad, elliptical, deeply emarginate posteriorly; narial septum incomplete. Lower jaw short, small, the rami outwardly convex. Scapula with no acromion process. Iliac crests not abruptly everted, and produced. Middle digits of the manus longest. Mammæ four.'

The Bearded Seal

Erignathus barbatus, Fabricius.

Phoca barbata, Fabricius in Müller's 'Zool. Dan. Prod.' (1776) and 'Fauna Grœnl.' (1780); Gmelin, 'Syst. Nat.' 1 (1788); Nilsson, 'Skand. Faun.' 1 (1820); Bell, 'Brit. Quad.' p. 212 (1838); MacGillivray, 'Brit. Quad.' (1838).

Erignathus barbatus, Gill, 'Proc. Essex Inst.' v. (1866) 12.

Phoca naurica, Gray, 'Suppl. Cat. Seals and Whales' (1871).

Local Names.—*Bearded Seal*, *Great Seal*, *Ground Seal* (English); *Square Flipper* or *Square Phipper* (Newfoundland Sealers); *Long-bodied Seal* (Parsons); *Leporine Seal* (Pennant); *Oo-sook* (Greenlanders); *Ogjook* (Cumberland Eskimo, Kumlien); *Storkobbe*, *Blaakobbe*, *Havert* (Norwegian); *Hafert-skal*, *Storsjäl* (Swedish); *Bart-robbe*, *Bärtige Seehund* (German).

Characters.—Long confused with the Grey Seal, to which it bears a somewhat close resemblance for unskilled observers, this fine Seal differs from the other true Seals inhabiting or visiting our coasts in possessing a high forehead and a small bullet-shaped head, and for the large size of the animal small weak teeth. The most prominent feature, however, by which it may readily be distinguished,

[1] *North American Pinnipeds*, p. 654.

is the form of the whiskers, which are only flattened hairs, and not diamond-shaped *vibrissæ* as in the other true Seals. These are nearly the same thickness throughout, says Mr. Southwell, and sharply curved at the end. This the only member of the genus *Erignathus* also differs from members of the genus *Phoca* in 'the great breadth, arched form, and elliptical outline of the palate and in the great depth of the narial fossæ.'[1]

The colour of the adult Bearded Seal is very variable. The most common type of adult male is a pure grey with dark blackish blotches along the back, or with this part merely a darker shade of grey. Some examples have splashes and bands of black running along the back. The under parts are very pale grey. Others in full winter pelage are pure grey over the whole of the upper parts, and a dirty white below. In summer the darker markings fade to brown. Kumlien, who has visited west Greenland and seen many in the flesh, says that the colour is variable, the yellowish brown being 'more or less clouded with lighter or darker markings, irregularly dispersed.' The length of adult males varies from 10 to 12 feet from nose to tail; females are generally a little over 7 feet in length.

When first born the young are covered with a dark grey wool, which is replaced in about two weeks by a coat of short, rigid, bluish grey hair.

The teeth are the same in number as in the genus *Phoca*, but they are much smaller and weaker. Before the animal is old the teeth become much worn, and in old animals the crowns of the middle molars are often worn away. Mr. Kumlien says that 'in many adults the teeth can almost be 'plucked out with the fingers.' The first, second, and fifth upper molars are double-pointed, and only the posterior accessory cusp is developed in each case, whereas the third and fourth upper molars have three points, but without an anterior cusp. All the lower molars have three points.

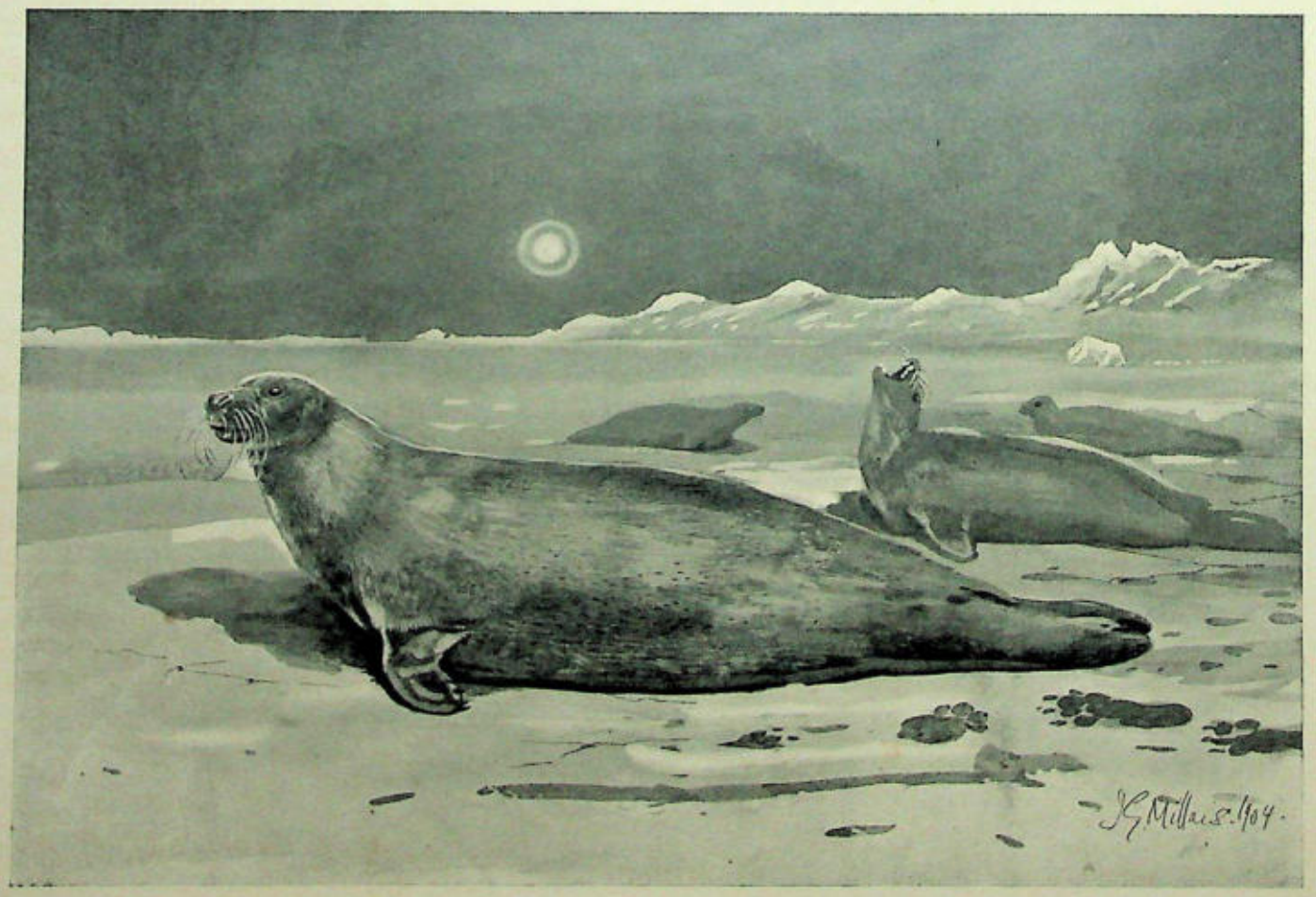
Distribution.—The Bearded Seal is said to be a solitary creature, and is known to sealmen as the 'Ground Seal' and the 'Square Flipper.' It frequents the circumpolar regions of both the Eastern and the Western Hemispheres. On the Atlantic side its best known home is west Greenland, and it undoubtedly goes as far north as ships can pass in summer, for those experienced sealmen Captains Jackman, Bartlett, and Blandford, have told me that they have seen the 'Square Flipper'[2] as far north as they have been at the heads of Baffin's

[1] Allen, *North American Pinnipeds*, p. 655.

[2] Even these experienced sealmen and navigators constantly confuse the Grey Seal with the Bearded Seal. Both species are called by the Newfoundland sealers the 'Square Flipper,' and they do not recognise any difference between the two.



ESQUIMAUX HUNTERS HAULING BEARDED SEALS.
Coast of Labrador.



THE BEARDED SEAL.

Bay and Davis Straits. This Seal certainly occurs all down the coast of Labrador as far as the Straits of Belle Isle in winter, and is sometimes killed in spring on the sea to the north-east of Newfoundland. Turning to the eastern side of the Atlantic, it is common on the east coast of Greenland, and not rare on the north of Iceland, but here it is only a winter visitor, for the Grey Seal is the resident Seal of that island.

The species is common about Spitzbergen and Franz Josef Land, and is considered rare about Jan Mayen, whilst it is still resident in small numbers, according to Professor Collett, in Norway from the fjords of Finmark down to latitude 62°, where it occurs throughout the year. During the winter of 1902–1903 an immense migration of Seals, principally of this species, took place on the north coast of Norway, extending as far south as Trondhjem. The Seals completely barricaded the mouths of many of the more important fishing grounds, and so close was the investment that hundreds of the poor fishermen were practically ruined.

With regard to the distribution of this species eastwards we are still somewhat doubtful. Middendorff reports what he believes to be this species from the mouth of the Taimyr, and Von Schrenck from the Ochots Sea and the mouth of the Amoor. In the Pacific its distribution is not well known, but it has been found on the Siberian side of Behring's Straits, and Temminck reports the skins as articles of commerce in Japan.

At various times during the past century this Seal has been erroneously reported to have occurred in Britain,[1] but there is only one certain record of its capture in our islands, that of a young male which was captured alive on the Norfolk coast in February 1892. A full account of this rare visitor's advent is given in the *Transactions* of the Norfolk and Norwich Naturalists' Society (v. 555), and it is again referred to in the *Zoologist* (1894, p. 81). The skull of this

[1] The following note in Mr. Allen's *Monograph of North American Pinnipeds* gives what is thought to be the first description of this Seal, as the specimen was *supposed* to have been captured on the British coasts. This account is taken from the *Phil. Trans.* 1742–1744, p. 383: 'The first notice of the species that can be fixed with any degree of certainty is Dr. James Parsons' account, published in 1744, of the *Phoca*, Vitulus marinus, or Sea-calf, showed at Charing Cross in February 1743, which, if reliance can be placed on the figure—declared by Dr. Parsons to be drawn from life and to have been pronounced by all who saw it to be an excellent likeness—and the characters given in the text, must be unquestionably the present species (*Phoca barbata*).' Mr. Allen then goes on to give his reasons for so thinking, which are that the example possessed a long third finger and four mammæ (the Grey Seal also has four mammæ, J. G. M.) whilst the hind-flippers terminate squarely. The teeth were also weak, and some were lost. These are all undeniable characters of the Bearded Seal.—J. G. M.

specimen is now in the University Museum at Cambridge, and Mr. Southwell in a letter to me (July 1, 1904) says that he has no doubt as to the correct identity of the specimen.

It is not improbable that this northern Seal has visited our shores from time to time, but the difficulty of capture and the absence of skilled observers would account for the lack of notes attaching to the species.

I fully expected to hear that a Bearded Seal had reached our shores in the spring of 1903, for during the winter of 1902–1903, when vast herds of Seals descended upon the coasts of Norway—herds which consisted of Bearded Seals as well as of Ringed, Hooded, and Greenland Seals—many of the examples which ranged furthest to the south passed along our shores, at any rate on the north-east coast. If any passed, however, they were unnoticed, or, if seen and slain, remained unrecognised.

In Pleistocene times this Seal lived on the east coast of England and Scotland.

An interesting account of the habits of this animal as observed by Mr. Kumlien in Cumberland Gulf, West Greenland, is to be found in Mr. Allen's book, but as the species is of such rare occurrence in this country, it is unnecessary to do more than point out its differential characters.

Sub-family *CYSTOPHORINÆ* (Gray)

Genus *Cystophora*, Nilsson

The genus *Cystophora* is distinguished from *Halichœrus* and *Phoca* by its dentition. In the Hooded Seals there are only two pairs of incisor teeth in the upper jaw and one pair in the lower; the total number of teeth is thirty. Another character is that the first and fifth toes of the hind-flippers are much longer than the three middle digits, and the webs project well beyond the toes when the feet are closed. On the nose of the adult male there is a curious muscular bag lying beneath the outer skin, capable of being inflated in moments of anger so as almost to cover the head.

The Hooded Seal

Cystophora cristata, Erxleben.

Phoca cristata, Erxleben, 'Syst. Reg. Anim.' p. 590 (1777).
Phoca leonina, Fabr. 'Faun. Grœn.' 1790.
Cystophora cristata, Nilsson, 'Skand. Faun.' p. 327 (1820).
Stemmatopus cristatus, F. Cuvier, 'Dict. Sci. Nat.' xxxix. 551 (1826).

Local Names.—*Hooded Seal, Hood Seal, Hood, Seal with a Cawl* (Ellis, 'Voyage to Hudson's Bay,' 1748), *Crested Seal, Bladdernose* (English); *Klapmyds* (Danish); *Blåssjäl, Blass-skäl, Klapmyts* (Swedish); *Blæresal, Klapmytse* (Norwegian); *Tevyak* (Russian); *Klappmütze, Blaserobbe* (German); *Phoque à Capuchon* (French); *Netsivak* (Labrador Eskimo); *Neitersoak* (male), *Nesaursalik* (female), *Kakortak* (young) (Greenland Eskimo).

Characters.—The colour of the adult male Hooded Seal is usually dark grey or bluish black on the upper parts, becoming much lighter on the sides and belly. Scattered over the skin are many yellow-white spots, sometimes collected together in the form of rings with large dark centres on the back.

Full-grown males average from 7 to 8 feet in length, and weigh, according to Mr. Carroll, from 800 to 900 lbs.

On the head of the male is a sac which can be inflated with air in moments of anger, and which serves as a protection to the crown of the head. This curious feature is thus described by De Kay[1]: 'Head small in proportion to the body, with a movable muscular bag on its summit, extending from the muzzle to about five inches behind the eyes, and in certain positions nearly covering the internal canthi. This sac is twelve inches long, and when fully distended nine inches high, covered with short hairs, and with slight transverse wrinkles. The nostrils are round, each two inches in diameter, and pierced in the anterior part of this hood. When the hood or nasal sac is not inflated the septum nasi can be distinctly felt, elevated into a ridge about six inches high . . . nasal sac bright brown or rufous.'

Females resemble the males but are much smaller, paler in colour, and rarely exceed 7 feet. They have no air-sac above the nose. Nearly all authorities, even including Mr. Allen, the most careful and accurate authority on the subject of Seals, make the common mistake of saying that the young of the Hood Seal are

[1] *New York Zoology*, pt. I. pp. 55, 56.

'born white, with a soft woolly pelage.'[1] The Hood Seal is, however, of such rarity in this country that I do not feel entitled to enter into a lengthy discussion of my reasons for controverting the opinions of many recognised authorities, but will merely state that the young are not 'born white with a soft woolly pelage,' but come into the world wearing a coat of short stiff hair, resembling the adults. This is brownish black above and brownish grey or light grey on the under parts, while the limbs are black. The puppy coat of soft woolly hair is, I believe, shed in the womb of the mother, and ejected by her with the afterbirth. Thus we see that the early life-history of the Hood Seal is similar to that of the Common Seal. Another point of similarity between the two species is that the young Hood will take to the water immediately after birth, which none of the other young northern Seals which wear a soft woolly coat will do. The Hood Seal is one of the commonest of the Arctic Seals, and though seen and studied by numerous excellent observers, none of them have, so far as I am aware, followed the gradual growth or made remarks on its pelage. After the examination of a large series of skins in Trondhjem and St. John's, and discussing the subject with Captains Blandford and Jackman, the two most experienced sealmen of modern times, I feel satisfied that the Hooded Seal passes through the following changes:

After remaining with their parents for two or three weeks the 'young Hoods,' as they are called, which are born in Newfoundland scatter and become extremely thin. Some travel north to west Greenland, but the majority travel along the east Greenland coast towards Jan Mayen. At the approach of winter they work south again towards Cape Farewell; about December they arrive on the Labrador shores, and reach the ice to the north-east of Newfoundland in February. They are now known as 'Bettlemer Hoods' and keep apart from the adults. About the beginning of May a pelage closely resembling that of the first year but darker on the back is attained. They measure about this time from 4 to 4½ feet in length. When they return to Newfoundland in the third year they are about 6 feet long; they still keep in big herds by themselves, and are known as 'third-year Hoods.' The coat which is gained in the beginning of the third May is often interspersed with greyish yellow rings and spots. The 'young dog and bitch Hoods,' as they are called in the fourth year, still continue apart from the adults, though doubtless a few of these nearly mature Seals breed. They are generally recognised by the

[1] Allen, *North American Pinnipeds*, p. 726.



NEWFOUNDLAND SEAL HUNTERS ATTACKING AN OLD 'HOOD.'
In the foreground are Female Harp Seals with pups. From a photo.



HOODED SEAL.

fact that they are gathered in smaller parties, and that they breed further to the south than the adults. In the fifth season they are mature.

The Hooded Seal differs from the *Phocidæ* (sub-fam.) in the character of the cranium. The nasal aperture is wide, the nasal bones short, and the bony partition between the nostrils is extended so as to support the specialised air-sac. The skulls of males average about 275 mm. in length, and of females about 220 mm. The teeth are somewhat degenerate; they have small crowns, which are plaited rather than lobed, and with the exception of the last pair of molars are single-rooted. The canines however are well developed, as are also the outer pair of incisors.

Dental formula: I. $\frac{1}{2}$; C. $\frac{1}{1}$; P.M. $\frac{6}{6}$; M. $\frac{1}{1}$.

Distribution.—The Hooded Seal ranges from Greenland to Spitzbergen and along the coast of Arctic Europe to beyond the White Sea. It also goes far north of the end of Baffin's Bay. This Seal seldom comes south of the Straits of Belle Isle on the western side of the Atlantic, or of Norway on the eastern side, but it has been found a few times on the American coast, while in Europe it has once been taken in France.

The first recorded British example was taken in the river Orwell, June 27, 1847, and was described and figured by Mr. W. B. Clarke.[1] The specimen, which was a young one, was preserved, and is now in the museum at Ipswich. Dr. Gray, who admits that it is quite possible that this individual had escaped from some ship coming from North America, says that there is no doubt whatever regarding the determination of the species.

I have not seen this specimen, but Mr. Douglas Carruthers has kindly sent me a photo of it with the following particulars: Length 50½ inches, nose to tail. Head and back a dark chestnut (this colour is doubtless due to indifferent tanning—J.G.M.), below a dirty yellowish white.

There is in the Brown Museum, Liverpool, a young Hooded Seal which was captured alive on the Mersey shore at Frodsham, Cheshire, on February 3, 1873. The animal was subsequently exhibited alive at Widnes, and its capture recorded in the 'Proc. Lit. Phil. Soc. Liverpool.'[2]

A young Hooded Seal, described in detail by Mr. R. Walker,[3] was killed—stoned to death—on the rocks near St. Andrews on July 22, 1872.

On December 6, 1890, a Hooded Seal was shot by Mr. B. Swanson in

[1] *A Seal New to the British Shores*, Clarke, 1847, 4to; fig. of animal and skull.

[2] Vol. xxvii. p. lxxiii. 1873; also in the *Zoologist*, 1875, p. 221.

[3] *Scot. Nat.* ii. 1–8.

Ollerswith Bay, Sanday (Orkney); and it was said that another was seen in its company. The skull of this Seal was submitted to Mr. Oldfield Thomas, who confirmed the identification.[1] In May of the following year an immature Hooded Seal was killed on Benbecula by Ranald Macdonald; it was killed in Loch Uiskevagh, and the skin and skull were sent to Mr. J. MacNaught Campbell, who recorded it in the 'Annals of Scottish Natural History' (1892, p. 69).

The most recent occurrence of this Seal was on February 15, 1903. One of the keepers at Pitgaveney estate, Elgin, N.B., was wandering along the river bank at the mouth of the Lossie when a small Seal popped its head up close by. He immediately fired and killed it, and as it floated it was secured. Captain Brander Dunbar, who is an observant naturalist, and was at home when the keeper returned at night, had never seen a young Seal like this one, and so had it mounted and sent it to me for identification. The specimen is without doubt a young Hooded Seal about seven months old.

The above occurrences point to the curious fact that whilst in nearly all cases the other rarer Seals which visit us are adults, those in the present species are immatures.

There are many other vague records of this Seal off the British coasts, but none of them are worthy of notice.

Habits.—Like the Greenland Seal the Hooded Seal is a migratory animal. It loves the drift ice and rarely visits rocky shores. The Hooded Seals accompany the great body of the Harp Seals that come through the Straits of Belle Isle every winter, and after fishing about the Newfoundland banks, haul up on the floe-ice to the east of that island, where they bring forth their young about a week later than the Harps. At this time the males fight savagely and the noise of their spring battles can be heard at a great distance. They are polygamous, and the males will stand and fight bravely for their families when attacked by man; in consequence many meet their death from the bullets of the sealers. Carroll says that if the female or young are killed, the male will mount the ice and take the dead one in his mouth and bring it into the water; as a result of this brave act he frequently loses his life.

Towards the end of April the Newfoundland Hood Seals move north and great numbers spend the summer floating on cakes of ice off the east of Greenland from a point opposite Iceland up to the Liverpool coast. At this season they are seldom hunted by man owing to the poor condition of the hair, but they are then

[1] T. S. Peace, *Ann. Scot. Nat. Hist.* 1892, p. 267.

the favourite prey of the polar bears, which follow the Seal herds with unremitting energy. In one bay on the Liverpool coast Captain Jackman in July 1891 counted no fewer than fifty-one polar bears in sight at the same time.

In the water the Hooded Seal is said to be active, swimming very low with only the top of the head above the surface. The young and females are of an amiable disposition, but the adult males are extremely savage; their pursuit in kayaks as practised by the Esquimaux is said to be somewhat dangerous. Various writers speak of the difficulty of killing the male with the seal-club, and many sealmen have been injured from the bites of these animals. Nowadays, however, as they are generally shot with powerful small-bore rifles, the danger is practically nil. The Hood Seal feeds on various kinds of fish, cephalopods and other molluscs. When the ice is forming this Seal keeps putting up its head and so forms a 'bobbing' hole. Dr. Rink says the annual catch of Hooded Seals in west Greenland is about 300,000. Single Newfoundland vessels have killed as many as 42,000 in a few weeks. During a nineteen years command of the *Neptune*, Captain Blandford tells me that he has taken 442,000 Hoods. In spite of all this slaughter he considers that Hooded Seals are on the increase.

END OF THE FIRST VOLUME

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