

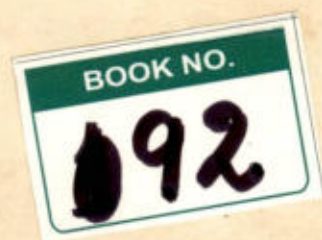
THE WILD ANIMALS OF THE  
INDIAN EMPIRE

AND THE  
Problem of their Preservation.

WITH A FOREWORD BY  
HIS EXCELLENCY THE VICEROY.

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THE Viceroy's HOUSE,  
NEW DELHI.

21<sup>st</sup> November 1933.

Having read with interest for many years the Journal of the Bombay Natural History Society I strongly commend to the notice of the reading public their series of articles on the Mammals of the Indian Empire.

The whole purpose of these articles is, as I understand it, to increase interest in all the wild life of the country with a view to ensure that necessary steps will be taken to prevent the wholesale destruction of our wild animals.

When I call to mind the vast areas in Canada (where I lived for four happy years) which are set aside as sanctuaries for this purpose, and realise that the same thing has been done in many other countries, I feel that more could be done in this country by reserving certain areas of our great forests in order to preserve in the future all the varied Fauna of India.

As a lover of Nature<sup>and</sup> one who can look back on many happy days spent in India's vast jungles, I trust that these articles may do much to achieve the great purpose which their wishes hope to secure.

Williamson

# THE WILD ANIMALS OF THE INDIAN EMPIRE.

## PART I.

### INTRODUCTION.<sup>1</sup>

#### *The Preservation of Wild Life in the Indian Empire.*

The purpose of the present series of articles is to give a general account of the Mammals of the Indian Empire.

For many years, the Bombay Natural History Society, through the medium of its *Journal* and other attractive publications, has endeavoured to create and stimulate in India an interest in the wild life of the country.

The necessity for this interest, particularly among our educated classes, is becoming more and more evident with the passing of time. During the past, extensive undisturbed areas of primeval forest, jungle and desert gave safe harbourage to wild creatures, and provided sure guarantee of their survival. But changing conditions in the country, the gradual conquest of forests and waste lands, above all, the building of new roads and the radical improvement in methods and rapidity of transport have left few areas in the Peninsula of India which are free from intrusion by Man. These factors have had and are continuing to have a disastrous effect on the wild life of the country. The danger to it has been accentuated in recent years by the enormous increase of firearms in use and by the inability of many of the Provincial Governments to enforce such laws as exist for the protection of wild animals.

In the past, similar conditions existed in most western countries. Forests were cut down, streams polluted and their livestock exterminated to meet the needs of the moment with no thought of the morrow. Even in tropical lands, gradually permeated with the spirit of material progress, primitive Nature has had to give way little by little to invading towns and settlements. Ruthless destruction of wild life and a prodigal wastage of natural resources have invariably preceded the establishment of material and prosperous civilization. Thus the magnificent animal life of many tropical and sub-tropical lands—and our country is no exception—has been driven to its ultimate retreat in fast diminishing forests and is to-day threatened with utter extermination.

Even the great marine animals of the sea—the whales and fur-bearing seals—have not escaped this menace of extinction. The solitudes and vast spaces of the ocean have not been able to shelter them from the rapacity of man. Like the terrestrial species, they have been subjected to ceaseless persecution, made

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<sup>1</sup> An Address given by Mr. S. H. Prater, M.L.C., C.M.Z.S., the Society's Curator, at the Jubilee Meeting of the Society held in Bombay on the 10th of August, 1933.

more easy by the perfection of methods employed in the destruction of life—both human and animal.

*A Changed Outlook and Some Reasons for it.*

But in recent years a gradual change has developed in Man's outlook upon the Domain of Nature. This change has been brought about partly by the spread of education and enlightenment. It is engendering a growing opposition to this wanton destruction of life, however much it may profit the destroyer. It is creating the more humane conception that it is the duty of Man to see that the wild creatures of the world are not annihilated. But apart from humanity, which in itself should impel Man to grant to lesser creatures the right of existence, there are other considerations which must influence him.

The spirit of this age, with its urge for discovery and research, with its marked tendency towards the popularization of Science among the masses and the dissemination of its truths and discoveries is fostering a widespread and intelligent recognition of the immense value to man of the myriads of species, vegetable and animal, which share with him this Planet. Today there is no educated man who does not realise that the realm of Nature provides Science with a vast and productive field for research. There is none who is not impressed with the belief that such research has given and will continue to give us results of great practical and educational value.

There are numerous investigations, anatomical, physiological, ecological, geographic and evolutionary which can only be made by the study of animal life. While considerable data has been accumulated by the study of dead specimens in museums or of the living creatures in the laboratory, the 'whence, how and where' of his existence which Man is seeking to discover cannot be discovered by these means alone. The study of the living creature under the natural conditions of its natural environment is equally important.

It is also true that there are material considerations apart from scientific. We have been accustomed to look upon Beasts of Prey as creatures to be exterminated. But with a clearer understanding of the role they play in maintaining the balance of life we know now that even-predatory animals have a distinct value. They are a controlling influence against over-population by species whose unchecked increase would adversely affect the interests of Man. On the other hand, there is the utilization for Man's benefit of animal products such as furs, hides and horns which in themselves represent a valuable economic asset. Furs collected from all parts of the world and assembled in London for sale during the current year were assessed at a value of £3,000,000. There is necessity for conserving the sources of supply which are not inexhaustible. Again, Science has revealed and is continuing to reveal hitherto undreamed of possibilities in the uses of animal products and their employment in the treatment of human debility and disease. Who can say what products still remain to be discovered which will one day be of priceless value to Man? Finally the wild • •

life of a country is a source of sport and enjoyment to its people—It gives healthy recreation to all classes and is a constant attraction to visitors. It is also a definite source of income to the State because of the revenues realised from the sale of shooting licenses and on the imports of sporting arms and ammunition. But obviously it is also an asset which may vanish without reasonable efforts for its conservation. For these and other reasons, it is now admitted generally, both in Europe and America, that the natural beauties of a country, its varied fauna and flora are an asset to its people, an asset to be protected and preserved to their own advantage and to the advantage of future generations.

*What other Nations are doing to Preserve Wild Life.*

It is interesting and instructive for us in India to know what other nations are doing to preserve wild life.

The movement for the protection of Nature had its origin barely 50 years ago. It is the European nations and the American people who set an example to the World as to what could and ought to be done to preserve wild life within their lands. In the United States of America, the rapid development of the country, the spread of agriculture and industry threatened the destruction of its indigenous fauna. The tragedy was averted by establishing great National Parks or Reserves which not only give inviolable sanctuary to wild animals, but also offer the people an added attraction because of their scenic beauty, their historical, geographical or archaeological interest.

These National Parks provide the means by which the clash of interests between Man and the Animal is obviated; whereby security is found for the creature without imposing undue restraint upon human progress. The idea gained ground because of the people's approval. Today, in the United States, there are no less than 40 great National Parks covering more than 3 million acres of land set aside for the protection of wild life.

This magnificent effort for the protection of Nature has its parallel in the British Empire, so rich in the varied aspects of its wild life. In Canada, in New Zealand, Australia and the Union of South Africa great reserves have been created which give shelter and security to the wild life of these lands. The Kruger National Park in South Africa is the largest in the British Empire if not in the world. It covers over 8,000 square miles of territory. No park in the world contains a more marvellous assemblage of wild animals. Quite apart from the protection given to the wild life of the country, this magnificent park fully justifies its existence by way of the yearly increasing revenues it brings to the State. The effort for the conservation of wild life has been equally splendid in Canada. Here again the public response evoked by the numerous National Parks within the Dominion has resulted in bringing in a great amount of money into the country. These measures have been taken by a race of people who are keenly concerned in the progress and development of their countries and nevertheless realise the advantage of making provision to safeguard their wild life from destruction.

Within the last 20 years other nations have followed the example set by the Anglo-Saxon peoples. Switzerland has established her splendid national park amid the scenic grandeurs of the Engadine. Italy and Spain have created similar sanctuaries. Sweden surpasses all Continental countries with her 14 national parks. Finland and Austria have established numerous reserves for the protection of wild animals. Poland and Czecho-Slovakia have created a common park on their frontiers in the region of Tatara and thus incidentally, in a common desire for the protection of Nature, they have found a happy solution of a vexed territorial problem. Belgium, if not the first in the field, has been equally energetic. The great wild life sanctuary in the Belgian Congo, known as the Parc National Albert, was created by Royal Decree in 1925 and by 1929 increased tenfold in area. Five hundred thousand acres of mountain and forest have been set apart for the protection of African wild life. This great reserve is open to the students of the world and in the years to come it will prove of inestimable value to scientists and to all who love Nature and are interested in it.

The cause of conservation has been advanced also by various International Conferences the last of which was held in Paris in 1930. In 1900, the British Government convened a conference in London of the representatives of the Powers which resulted in the London Convention for the Preservation of Animals, Birds and Fish in Africa. It was signed by the Plenipotentiaries of Great Britain, France, Germany, Belgium, Italy, Spain and Portugal, and is described as the Magna Charta of wild life in Africa. In 1913 an International Conference for the Protection of Nature was held at Berne at which 17 Governments were represented. The principal conclusions of this Conference was the decision to establish a central organization to deal with the question of Wild Life Preservation on an international basis. The war made this impossible and it was not till 1928 that the recommendations of the Berne Conference were given effect. A central Bureau, designed to develop as the pivot of an international movement for the protection of wild life was established at Brussels. It is known as the 'International Office for the Protection of Nature'.

Similarly, within the British Empire, the London Conference resulted in the foundation of the Society for the Preservation of the Fauna of the Empire, which has given a great impetus to the movement in England and the Colonies and has now for many years exercised its great influence in the promotion of all forms of wild life protection. Reference must also be made to the American Committee for International Wild Life Protection, representing a unity of the large museums in the United States and to the Dutch Society for International Wild Life Protection.

It will be seen from what has been written that in all civilized countries there is a general recognition of the need for concerted and practical measures to stop the forces of destruction which threaten wild life in all parts of the world. There is in India, too, the gravest need for such concerted action.

*India's Wonderful Fauna.*

In its Fauna and Flora, Nature has endowed India with a magnificent asset. An asset which cannot fail to be generally appreciated by its people if they were led to know something of its worth and interest.

All those reasons which have made the people of western countries strive for the protection of Nature within their borders apply with just as much if not more force to our country. Its wild life, in its interest, its beauty and its marvellous variety, compares favourably with that of any country in the world. There are more than 500 different species of mammals found within the Indian Empire. They include the Elephant associated in India from time immemorial with the splendour of her princely pageantry, the Gaur or Indian Bison, the largest of existing bovines, the Great Indian Rhinoceros, the greatest of all the rhinos now inhabiting the world, the gigantic wild sheep of the Himalayas, probably the largest of their race, the Swamp Deer, the Thamin and the Spotted Deer, one of the most beautiful of all deer and the Nilghai, the Four-horned Antelope and Indian Antelope or Black Buck the only representatives of these genera. The beasts of prey include the Lion and the Tiger, the most magnificent of all the great cats, and such splendid creatures as the Clouded Leopard, the Ounce and the Marbled Cat. Other species, like our Himalayan foxes, martens, gorgeous flying squirrels and silky-haired langurs are remarkable for the beauty and value of their fur. The Musk Deer and the Civets provide the musk of commerce. Other species are remarkable for the beauty of their colouring. Our little Painted Bat (*Kerivoula picta*) with its brilliant vermilion and black wings, is, without exception, the most vividly coloured mammal in the world. Peculiarity in form and structure is displayed by that strange creature the Flying Lemur, which is neither lemur nor bat but which bears the same relationship to the shrews as the flying squirrel does to the squirrels, or by the Scaly Ant-eater which, with its long scaly body, looks more like a reptile than any form of mammal. Apart from the interest in their symmetry of form, largeness of size, beauty of colouring or strangeness of structure or habits there is always that attraction and charm which the presence of wild life gives to our forests and plains—so dear to the many that live for the out-door life.

A further interest attaches to our wild life from its association with the folk-lore and the legendary beliefs of the country. It is an interest not confined to India alone, but which has spread among men of culture everywhere because of the esteem and admiration in which her Sacred Books and writings are held.

Some 30 different mammals are mentioned by name in the *Samhitas* (i.e. the four principal Vedas). Among them is the Elephant, the favourite of Indra, whose sanctity is enhanced by the belief that eight elephants guard the eight celestial points of the compass. The Langur or Hanuman Monkey is held in veneration, as is commonly known, because of its association with other warrior monkeys who helped Rama in his campaign against Ravana. The

Lion is one of the many incarnations of Vishnu; the Tiger finds mention in the later Vedic texts. The Mongoose figures in the *Mahabharata* as a teacher of wisdom to King Yudhisthira. The Deer is always associated with Brahma, the Creator and is the constant companion of the god Mahadeva. The Wild Boar is referred to as the 'Boar of Heaven'. It is told how in the primordial floods Vishnu, taking the form of a boar, raised the submerged earth from the waters and supported it on his tusks. One could cite many more references from the Sacred Books concerning the animal life of the country. But apart from this, it is of much interest for us to know that the earliest known record of measures taken for the protection of animal life comes from India. The earliest record, which we possess today, is the Fifth Pillar Edict of Asoka by which game and fishery laws were introduced into northern India in the third century B.C. In this inscription, the Emperor had carved on enduring stone a list of birds, beasts, fishes and possibly even insects which were to be strictly preserved. The mammals named are 'Bats, Monkeys, Rhinoceros, Porcupines, Tree Squirrels, *Bara singha* = Stags, Brahminy Bulls, and all four-footed animals which were not utilised or eaten'. The edict further ordains 'that forests must not be burned, either for mischief or to destroy living creatures'.

Centuries later, the Moghul Emperors, sportsmen, men of action and born observers that they were, displayed a deep interest in the animal life of the country. Their writings are full of descriptions, some in great detail, of the animals, the plants and flowers of the country over which they ruled. While Babur, Humayun, the great Akbar and Aurangzeeb display in their writings their great love of Nature, Jehangir was a born naturalist. It is said of him that had he been the head of a great Natural History Museum instead of being the Emperor of India, he would have been a better and happier man. His profuse and engrossing memoirs are a real Natural History of the animal life of India.

#### *The Problem of Wild Life Protection in India.*

We have endeavoured to show how great an asset to our country is its wild life and to give the many reasons why we should do everything for its protection. But for the protection given to the Lion in Junaghad State and the Great Indian Rhinoceros in Nepal and Assam these two interesting animals would have been exterminated long ago. The Cheetah or Hunting Leopard, once common in Central India, is now almost extinct in the wild state. The Lesser One-horned Rhinoceros and the Asiatic Two-horned Rhinoceros, once said to be common in the grass jungles of Assam and the Sundarbans have been practically exterminated in these areas. In many districts wild animals have been totally wiped out. In others, where they were once common, they are now hopelessly depleted. One does not wish to overdraw the picture. There are parts of India where the position of wild life is still satisfactory though insecure. But equally, there are extensive areas where conditions are so appalling that, if left unchecked,

they must lead to the complete destruction of all the larger wild creatures which live in them. There is yet another point which must be stressed. Any scheme for the Protection of Wild Life would be incomplete without due provision for the protection of our Birds. Quite apart from a sentimental value, birds render incalculable service to Man. While certain species may damage crops, such harm as is done by birds is overwhelmingly offset by the benefits we derive from them. Without their protection, our crops, our orchards, our food supply would be devoured or destroyed by hordes of ravaging insects. Birds are the principal agency that controls the bewildering multiplication of insect life which, if unchecked, would overwhelm all life on this planet. Birds by reason of their predominating insect food are an indispensable balancing force in Nature. The abundant bird life of this country is one of its valuable possessions. Those who appreciate its value, cannot but strive for its conservation.

If we accept this principle of Conservation as it is now accepted by almost all civilized countries, what methods must we employ to give it effect? It is obvious in a country like India, where conditions in different provinces vary so greatly, the methods of conservation must also vary, but it is necessary to arrive at some understanding of the broad principles which underlie the problem. The land may be classified for this purpose into three main categories: urban lands, agricultural lands and forest and waste lands.

#### *Agriculture and Wild Life Protection.*

As far as our wild life is concerned, one cannot expect its preservation in urban lands. Nevertheless, we believe that it is time that measures should be taken for the protection of birds in urban areas. Areas actually under the control of Municipalities or local Boards could be made, with advantage, Bird Sanctuaries, where the killing of birds should be forbidden. There is need to put an end to the wanton destruction of familiar birds which takes place in the immediate vicinity of towns.

The second category—land under cultivation—provides at once the opportunity for a clash between the interests of Man and the Animal. There are two main reasons for this. Firstly, the areas under cultivation in India are extending and will continue to extend to meet the needs of a rapidly increasing population. This has increased by 35 million within the last decade! The need of increasing the available sources of food supply can be met only by the continued absorption of waste lands or forest—the natural domain of wild life. Secondly, there is the equally imperative need of protecting these cultivated areas from wild animals. The depredations of wild animals present one of the most serious handicaps the ryot has to face. In addition to loss of cattle, there is the damage done to crops and, not uncommonly, loss of human life. Therefore, whatever the views of the protectionist, this much is clear. Human progress must continue and in the clash of interests between Man and the Animal human effort must not suffer. But this problem has been faced by other countries. Cannot a reason-

able effort be made to face it in our own? That an intensive development of the agricultural resources of a country may accompany a sane and adequate policy for the conservation of its wild life is shown by the measures taken to this end by all progressive nations.

If our wild life is to find protection at all, it must find it somewhere in our forests. It is often claimed that the proximity of forests to agriculture makes them a constant source of harassment to the cultivator. If this argument is pushed to its logical conclusion, the only remedy would be to remove such protection as is now given to wild animals in our forests, for it would not be possible to remove this menace entirely, until all the large wild animals in them were killed, died of wounds or were exterminated over large areas because of their inability to breed. Surely our goal is not the total extermination of our wild life—which is what must inevitably happen unless some form of protection is given to it within its natural domain. While it is essential that the cultivator should have reasonable latitude to defend his property, it is equally essential that there should be certain areas or reserves where the shooting of animals is regulated and where the laws for their protection are rigidly enforced. Such reserves exist—roughly about one-third of British India and Burma consist of Reserved Forest—but, while we have extensive forests to shelter and laws to protect it, our wild life is everywhere on the decrease. The time has surely come when it is necessary for us to review the position and to take such measures as are necessary to give real protection to the wild life of the country. It is the opinion of some that these great State-owned forests, where laws now operate for the protection of animals, are and must continue to remain the natural sanctuaries of wild life in this country and that they would adequately fulfil the purpose of protection if they were effectively warded. The correctness of this view depends entirely on actual conditions in a particular Province. The extent and nature of the forests, their accessibility, the density of the population and the extent to which cultivation surrounds them are factors which must influence the issue. It may be found that in certain Provinces the establishment of a national park or reserve, in specially selected areas, will provide the only means of giving adequate protection to wild life without hampering agricultural development. It is certain that the creation of such a reserve or national park would give a special status to it, and thus facilitate the passing of special laws made applicable to such an area. Further, the actual selection and declaration as a National Park of certain definite areas would have the practical effect of forcing on the attention of successive generations of officials the importance of saving these areas from any danger of disafforestation and of taking all practical measures for the preservation of the wild animals found within them.

*The Need for a Special Organization to Protect Wild Life.*

Whether our reserve forests remain the principal sanctuaries for wild life in this country or whether in some of the Provinces

the purpose is affected by establishing national parks, there is need for a real organization whose sole concern will be the protection of wild animals in these preserves. Our efforts to protect wild life have failed mainly *because of the haphazard methods we employ, the lack of any co-ordinate policy and the lack of any real protective agency to carry that policy into effect.* The Forest Department which ordinarily administers the Forest laws has multifarious duties to perform and, while the Forest Officer has discharged this trust to the best of his ability, he cannot give the question his personal attention, nor can he find time, except in a general way, to control the protection of wild life in our forests. Experience of other countries has shown the need of a separate and distinct organization whose sole concern is the protection of wild life in the areas in which it operates.

Further, the existing laws, as now applicable in many of our Provinces, are obsolete. Naturally, their primary purpose is the protection of the forest rather than its wild life. These laws require consolidation and bringing up to modern standards of conservation. No better guide to our Provincial Governments seeking to amend their game laws exists than the recently issued report of the Wild Life Commission in Malaya. Volume II of this Report gives the general principles of conservation. It shows how these principles may be embodied in an Act and indicates new administrative methods, based on actual experience and on the laws of other countries. With modifications, where necessary, it will serve as a model for Protective Legislation in India.

Lastly there is the all-important question of making adequate financial provision for carrying out the work of conservation.

In these days of depression, when most Governments are faced with deficit budgets, the apportioning of money for this purpose must be a matter of difficulty but, unless and until suitable financial provision is made by the State for the conservation of wild life within its borders, the effort cannot succeed. This much is clear. Our present haphazard methods have failed. The experience of other countries indicates the system that should replace them. The effective introduction of this system depends upon money being provided to work it. In the United States and in other countries the problem of financing the work of conservation has been helped by the creation of special funds.

The recent Wild Life Commission in Malaya, which made a careful study of this aspect of the problem, strongly urges the creation of such a fund to be termed the *Wild Life Fund* and to be used solely for the purpose of conservation. The idea is that all fees which could be collected under Wild Life Enactments, including any licenses or fees for riverine fishing, as well as revenues from all sporting arms licenses, permits, duties on arms (sporting) and ammunition (sporting) should be credited to the Wild Life Fund. If any of these fees are collected by another department, then the cost of collection should be borne by the Wild Life Fund. It is the only means by which financial provision can be made expressly for the purpose of conservation. It is the only means by which the money devoted to this purpose

will have a definite relation to the revenue derived by the State from wild life sources and which, therefore, can be expended with every justification upon the conservation of these sources. It is the only way to ensure an equitable system of conservation; the only way in which a properly organised department can be stabilised. It is the solution advocated in other countries and one which is equally applicable to any country which undertakes the conservation of wild life on sound lines. If the idea of creating a Wild Life Fund is not acceptable and, if we are yet serious in our intention to do what is possible for the conservation of wild life in India, then we must replace the Wild Life Fund by an alternative policy, which will ensure the allocation of sufficient money to meet the requirements of adequate conservation. It is so easy to refuse a constructive policy and then put nothing in its place. The necessity for conservation being clear, the importance of an adequate financial policy to support it cannot be ignored.

So much for the broad outlines of the problem. They resolve themselves as we have seen into the formulation of a co-ordinate policy for the protection of Wild Life in India, into the selection of suitable areas where our wild life can be protected without undue detriment to human interests, the creation of a special agency for carrying out the work of protection and finally, a revision, wherever necessary, of such laws as exist in order to help these agencies to carry out their task effectively.

It is obvious that in a country so vast as India, with its varying climate and physical conditions, methods in conservation will vary in different provinces. The Society therefore proposes to publish a series of papers by different authors on the protection of wild life in the different Provinces of India. These articles have been written by authorities who have made a special study of the problem in the areas of which they write. Their knowledge and experience enable them to indicate exactly what measures ought to be taken for the protection of wild life and how these measures can be given effect to in a particular Province.

Those who are contributing to this instructive and helpful series are:

Central India, Mr. A. A. Dunbar Brander (late Conservator of Forests, C.P.); Southern India, Mr. R. D. Richmond (late Chief Conservator of Forests, Madras Presidency); Punjab, Mr. C. H. Donald (Director of Fisheries, Punjab); United Provinces, Mr. F. W. Champion, I.F.S. (Conservator of Forests, U.P.); Assam, Mr. A. J. W. Milroy (Conservator of Forests, Assam); Bombay Presidency, Mr. G. Monteath, I.C.S.; Burma, Mr. H. C. Smith (Honorary Game Warden, Burma); Kashmir, Capt. R. G. Wreford (Game Warden, Kashmir); Hyderabad, Mr. Salim A. Ali; Mysore, Major E. G. Pythian-Adams (Nilgiri Game Association).

We have indicated what other countries are doing for the protection of wild life but it must be apparent that the measures which they have taken, whether initiated by acts of Government or by private enterprise must owe their success to the support of public opinion. There is need for the creation of sane public

opinion on the subject of wild life protection in India. At present, such opinion hardly exists and even if it does, in some quarters it may be antagonistic. This is mainly because people do not know, nor has any attempt been made to teach them something of the beauty, the interest and the value of the magnificent fauna of this country. In most western countries there is a wealth of cheap and popular literature dealing with the natural history of those lands. In India such literature as exists, is either unintelligible to the average reader or sold at a price beyond popular reach. Again, in most western countries, Nature Study teaching is a serious part of the earlier stages of the school curriculum. While its main object is to develop the child's powers of observation, it creates a love of Nature and a sense of companionship with life out of doors. It is true that in India feeble attempts are made from time to time to introduce Nature Study teaching into our Primary and Secondary schools. But often such teaching as is given, deals with pine trees and acorns, with polar bears and robin redbreasts, and has little or no relation to the child's own environment. The present series of articles is therefore written with the purpose of providing a popular and well illustrated account which will give people general information about the Mammals of the Indian Empire. Its object is to arouse interest in the Fauna of the country with a view to its protection and not its destruction. It is proposed to issue this series in six parts, dealing separately with the various orders of Mammals. While the series will appear in the Society's *Journal*, separately bound copies will be available for distribution. An important and essential feature of these articles is the large number of coloured and black and white illustrations. An attempt is being made to illustrate most of the more important species of mammals found within our limits. Our ability to undertake this expensive work is due to the generosity of Mr. F. V. Evans, a Vice-Patron of the Natural History Society and one of its most generous benefactors. He is paying for these illustrations. Mr. F. V. Evans was in fact the initiator of these articles on Wild Life Protection in India. It is a subject in which he has always interested himself and the great encouragement and very material assistance which he has given to the Society in advancing this cause must earn for him the gratitude of all those who are interested in this question. Our thanks are also due to the American Museum of Natural History, New York, and to the Field Museum, Chicago, for permission to use some of the pictures which accompany these articles. Acknowledgements are due to Mr. Pocock of the British Museum and to Mr. W. S. Millard for the help they have given in supervising the preparation of the illustrations.

The Society hopes that these articles will do something towards drawing the attention of people in India to the magnificent heritage which Nature has given them in this country. It hopes they will help them to realise the need for preserving this legacy to their own advantage and to the enjoyment of generations to come, who with the spread of education will be in a better position to appreciate its worth than we are today.

## PART II.

## THE DISTRIBUTION OF MAMMALS.

In the distribution of its Wild Life few regions of the Earth exceed British India in interest. The Indian Empire covering an area of approximately 1,800,000 square miles displays in its physical characters and in its temperature and climate the most remarkable variation. Its widespread frontiers include the Himalayas, soaring for thousands of feet above the level of perpetual snow, the deserts of Sind and Rajputana, the luxuriant rain swept forests of Assam and the Malabar Coast, the cold and arid plateaus of Ladak and Tibet.

Across our northern frontiers stands the chain of the loftiest mountain range in the world, while our shores are washed by an ocean which stretches south to the bleak Antarctic forming an insuperable barrier to the dispersal of our wild life.

It is proposed before describing the mammals of the Indian Empire, to give a picture of the varied conditions under which they live—these conditions being the factors which influence their distribution.

Animals are dependent directly or indirectly upon plants for their food. The vegetation of a country is therefore one of the main factors which influences the character of its animal life. But the type of vegetation, which will grow in any country, depends upon its climate and the climate upon its physical features—the level of the land, the presence or absence of mountain or hill ranges, the height and aspect of these ranges. Hence the distribution of animal life upon this Earth, as we know it today, is based entirely upon the changes which have taken place in its surface through the long ages of its history.

All through time the surface of the Earth has been changing. Mountain ranges stand in areas once submerged beneath the sea. Expanses of land have broken up to become separate continents, divided by oceans, and on the other hand dividing seas have receded to form continuous stretches of dry land.

It is believed that during the early part of the Tertiary epoch the Peninsula of India—the triangular tableland which stretches from the highlands of Central India to Cape Comorin—was a large island. This island during a still more remote period was perhaps united to Africa. But during the Tertiary period it was separated from the mainland of Asia by shallow seas which covered the plains of northern India and the whole of Kashmir. The Himalayas and the greater part of Tibet, formerly submerged beneath the sea, were then a land of moderate elevation drained by great rivers, which flowing east and west poured their alluvium and silt into the adjoining seas. During the millions of years that elapsed, while no great changes have been traced in the ancient island, the whole of those gigantic forces which created the great Himalayan ranges exerted their influence. They raised the land and drained the seas covering Assam and gave birth to the Eastern Himalayas. Thus was formed the first land

connection between India and the Continent of Asia. Thus was provided a land bridge by which all the forms of life developing in Central Asia were able to enter and colonise the Indian Peninsula.

It is believed that after a great interval of time, a second upheaval took place. It produced the main Himalayan ranges and converted what was left of the intervening sea into the plains of northern India. After an epoch of quiescence, a third upheaval crumpled and ridged up a strip of this plain to form the outer ranges of the Himalayas—the group of hills known as the Siwaliks. So was formed in the course of ages the Sub-Continent of India.

What animals inhabited the country during this distant era? The remains of extinct creatures discovered in the upper layers of the Siwalik range and in other parts of the country give us a glimpse of a wonderful wealth of animal life during the Tertiary epoch. Mastodons and great herds of elephants of various species trumpeted and tramped through the swamps and reedy forests of this region. With them lived hippopotamus, rhinoceros of various kinds and a colossal four-horned ruminant the *Sivatherium*. There were troops of giraffe, of large and pigmy horses, camel, herds of wild oxen, buffalo, bison, deer, many kinds of antelope, wild pig and pig-like creatures. Further, the fossil beds reveal the existence in the Siwaliks of chimpanzees, orang-outans and baboons, of langurs and macaques. The beasts of prey included a type of cheetah or hunting-leopard, sabre-toothed tigers and various large and small felines; wolves, jackals and foxes, civets, martens, ratels and otters. The bears were represented by a species similar to our sloth bear, the rodents by various genera including bamboo rats, mole rats, porcupines and hares.

A striking fact, emerging from the comparison of the fauna of the past with that of the present, is the wonderful variety of forms which lived in those remote times and the relatively fewer forms of our day. It must be remembered that our records are incomplete. Yet we know that eleven different species of elephants and mastodons lived in the Siwaliks as compared with the solitary living form we have now. There were 6 different species of rhinoceros and several representatives of the wild boar, some of gigantic dimensions. The beasts of prey were also more numerous than those now living in that region.

This marked impoverishment of the Fauna is not peculiar to India. The remains of extinct animals unearthed in various parts of Europe, Asia and North America reveal a similar loss.

It is interesting also to note how many forms of life akin to those of that distant epoch still continue to flourish in India after millions of years. Langurs, macaques, various species of felines, hyaenas, jackals and foxes, sloth bears, ratels, mole rats, porcupines, hares, rhinoceroses, bison, and elephants allied to those which lived in the Tertiary age, still live in this country; how many again still inhabit other regions of the Earth though no longer found in India? Chimpanzees, baboons, hippopotamus and giraffes, eland, kudus and other antelope survive in Africa, though not

in India. A considerable affinity has been traced between the fauna of the Siwalik period and the wild animals now living in India and Africa. Rhinoceroses, elephants, antelopes, various species of felines, hyaenas, jackals, foxes, rats, mongooses and several forms of rodents exist in both countries. It is believed that a very large proportion of the animals which formerly existed in the Siwaliks and the allied species now inhabiting Africa and India were derived wholly or partly from the same ancestors, which may have originally migrated southward from Europe and Central Asia. The remains of extinct animals discovered in Europe and Central Asia show that elephants, rhinoceroses, hippopotami, tapirs, antelopes, lions and tigers once inhabited these regions. During this epoch it is believed that the northern countries enjoyed an almost tropical climate. But owing to a change in climate and other causes all those forms of life which were unable to adapt themselves to changing conditions perished or migrated southwards.

It is well known that during the latter part of the Tertiary Era the climate of Europe was becoming gradually cooler and that this refrigeration ended in a Glacial Epoch or 'Ice Age' in which the northern countries were subjected to an Arctic climate. The 'Ice Age' also produced glacial conditions in the Himalayan region, but whether these conditions extended into the Peninsula of India is not known.

It is assumed that all forms of life inhabiting the countries so affected were compelled to adapt themselves to the changing conditions, to migrate or perish. Some were able to react to the new conditions, many were exterminated, while others migrated southwards to colonise warmer tropical countries. Thus is explained the disappearance of numerous forms of life from the Northern Hemisphere and the Himalayas and the survival of their descendants both in India and Africa in our time.

Many forms of life, represented in the older fauna, disappeared from this country. Their place appears to have been taken by others which subsequently migrated into India from the countries lying to the east of the Bay of Bengal. Many Indo-Chinese mammals, not represented in the older Siwalik fauna, are believed to have migrated into India from the hill ranges of Assam and the countries further east. The majority of them settled in the Eastern Himalayas, while others spread through or colonised parts of the Peninsula. About 70 per cent of the mammals living in the Himalayan forests between Kashmir and Bhutan are found equally in the hill forests of Assam, Burma, South China, while some Malayan types, like the Mouse Deer and the Lorises, inhabit parts of the Peninsula. A stream of migration has also come from the West. Such species as the Indian Lion, the Indian Gazelle and the Orial of the Punjab and Kashmir from their westerly range or their affinity with species inhabiting regions lying to the west are believed to have extended into India through her western frontiers.

Thus we see that the wild life of India is derived not only from species which were indigenous to it, which are found in no

other country in the world, but also from forms, descendants of ancestors that have migrated into India from the regions which adjoin its borders. It is composed of an admixture of Indian, Malayan, Ethiopian and European elements. These foreign forms naturally predominate in parts of the country most suited to their habits. The Malayan forms abound in the damp sheltered forest clad valleys of the Eastern Himalayas and occur again with frequency in the rain swept forests of the Malabar Coast. The fauna of Kashmir, and the Higher Himalayas is marked by a predominance of European types. The main Peninsula is described as the home of the true Indian fauna. The desert tracts of Sind and the Punjab shelter an animal life somewhat uniform with that of the great Palaearctic Desert which extends westwards from Sind to the shores of northern Africa.

With this brief review of some of the factors which influenced the character and composition of the Indian fauna we may now consider its present general distribution.

India with south-eastern Asia forms part of the Oriental Region, one of the six great Zoological Realms into which the Earth has been divided to study the distribution of its animal life. Each of these Realms supports its characteristic animal life. That the animals and plants of one country or group of countries may differ from those of another must be apparent to most people. But the Indian Empire, while it forms part of the Oriental Region, presents in itself such contrasts in physical characters, such variation in climate and vegetation that its animal life naturally varies with conditions in different parts of the country.

This vast Empire has been divided into various zones or sub-regions each of which supports its characteristic assemblage of wild animals. There is no sharp line of demarcation between these zones. It would be difficult to plot them out exactly on a map. The animal life of one zone merges imperceptibly into that of another and there are widespread species which live in one or more zones. But on the whole it may be claimed that the animal life of a particular zone is sufficiently distinctive to be distinguishable from that of another.

#### THE HIMALAYAN SUB-REGION.

The Himalaya Mountains, enclosed by the Indus in the West and the Brahmaputra in the East, support an animal life more or less distinct from the rest of India. But the great range of altitude of these mountains has naturally resulted in marked peculiarities of distribution in its plants and animals.

Three distinct zones, each with its characteristic assemblage of animals, are now recognised. The first covers the whole of the forested slopes of the Himalayas from the eastern frontiers of Kashmir to Bhutan. The second includes the Western Himalayas from Kashmir and eastern Ladak to Chitral, the third the arid plateaux of eastern Ladak and Tibet. The bare towering peaks above the tree line and a strip of upland grass country

which lies between the main Himalayan Range and the Plateau of Tibet is regarded as a transition zone. Here the animal life of the Himalayan forests merges into one which is characteristic of Europe and Central Asia.

The foothills and lower valleys or 'dhuns' of the Forest Zone are covered with dense tropical vegetation. These lower forests are inhabited mainly by animals which are found in the forests of the Peninsula. Tiger, elephants, gaur, sambhar, and muntjac are common. In the swamps and forests of the Terai—the strip of low lying country which adjoins the foothills—gaur are replaced by buffalo, and cheetal, hog-deer and swamp-deer are found.

When an altitude between 5,000 to 6,000 feet is reached the character of the vegetation changes. The forests become dark and gloomy. Oaks, magnolias, laurels and birches covered with moss and ferns replace the sal, silk-cotton trees, and giant bamboos of the foothills. At an elevation of about 9,000 to 12,000 one enters forests of pine and fir trees, of yew and juniper with an undergrowth of scrubby rhododendrons and dwarf bamboo. We enter a temperate zone with a temperate vegetation. But there is no sharp line of demarcation between the tropical and temperate forests. The transition from one to the other is gradual; much depending on the height of the intermediate ranges and the depth of the inner valleys. In the Eastern Himalayas, exposed to the full blast of the monsoon, tropical trees reach higher levels than in the colder and drier climate of the Western Himalayas. The animal life of the temperate zone is distinguished by the absence of many species which inhabit the Indian Peninsula and by the presence of many Indo-Chinese forms, which do not occur in the Peninsula, but are common in the hill forests of Assam, Burma and Southern China. Racoons, hog-badgers, ferret-badgers, crestless porcupines, and those curious goat-antelopes the goral and the serow are some of the typical inhabitants of these temperate forests. They are not found elsewhere in India but range widely in similar forests through Assam and the countries further east. The Indo-Chinese element in the fauna is very marked in the Eastern Himalayas but, as one travels westward, it gradually disappears, until in Kashmir and the countries further west, it ceases to be the principal constituent. The probable colonization of these forests by emigrants from the hill ranges of Assam has already been commented upon.

The second great zone of the mountain system extends from Kashmir and Western Ladak to Chitral. The Indo-Chinese mammals of the Central and Eastern Himalayas are here replaced largely by Indian species and by an infusion of forms allied to European and more northern Asiatic types. Many animals living in the plains of India are or were found in this zone among them the Muntjac, the Blackbuck and the Chinkara. The Sambhar is absent. The most distinctive deer is the Kashmir Stag, a relative of the Red-Deer of Europe. Again, typically northern animals, such as the Ibex and Markhor range through these western mountains, but, like the Kashmir Stag, do not extend into the Eastern Himalayas. The Oorial or Shapu is also not found



*By courtesy of*

Himalayan scenery above tree line.

*R. B. Holmes & Co.*



*By courtesy of*

Himalayan scenery at the edge of the tree line.

*R. B. Holmes & Co.*

far beyond Kashmir but extends its territory westward through the Punjab, Baluchistan and Afghanistan to the Persian hill ranges. Kashmir appears then to have received its fauna from the Indian Peninsula and the countries lying to the north and west.

The bare peaks above the tree line and the strip of luscious grass country lying between the mountains and arid plateaux of Tibet is described as a transition zone—a meeting ground between the animal life of the Oriental and the northern or Palaearctic Regions. It is obvious that the huge mass of the Himalayas must be a great barrier to the free migration of animals. This obstacle combined with the great difference in climate north and south of the range has resulted in a fairly sharp line of demarcation at about the 28°, between two distinct faunas—the Oriental in the south and the Palaearctic in the north. Evidence of this is particularly marked in the Eastern Himalayas. Here north of this line live such typically northern animals as moles, water-shrews, mouse-hares, marmots, musk-deer and the bharal, while south of it, the forests are inhabited by typically Oriental animals like flying-foxes, fruit-bats, tree-shrews, civets, mungooses and Oriental squirrels.

The Tibetan Plateau together with the Eastern Ladak is regarded as a distinct faunal area. The zone does not include the low lying wooded portions of eastern Tibet but covers the barren hills and plains which lie beyond the Himalayas but within the northern frontiers of India from Kashmir to Bhutan. It is a wind-swept region of scanty rainfall, intense cold and high elevation and is described as the only region of the globe where desert and arctic conditions prevail. The Wild Ass, which is found in various desert parts of Asia, lives in this zone which also shelters the Arctic Hare. The Great Tibetan Sheep, the Bharal and the Yak are also typical inhabitants of these cold, desolate and barren mountains. So much for the wild life of the Himalayan Region. Its great range of altitude and variety of climate and temperature; its vegetation ranging from tropical to alpine and its geological history make it one of the most interesting zoological regions in the world.

Assam and Burma are included in the same zoological province as the forest region of the Himalayas. There is the same gradation from tropical to temperate vegetation though the purely Alpine flora of the higher Himalayas is largely absent. The distribution and character of the animal life is similar, except in Tenasserim, where the fauna is distinctly Malayan in type. These Malayan types are traceable all through the province into the hill ranges of Assam, with an intermingling of peculiar forms. Of the wild animals of Burma some, like the Gaur, are identical with those of India, others, like the Sambhar or the Thamin, are regarded as Burmese representatives of Indian forms.

#### THE MAIN INDIAN REGION.

India proper from the base of the Himalayas to Cape Comorin, with the exception of the Malabar Coast, is regarded as a single

sub-region—the cis-Gangetic or Indian Peninsular sub-region. The northern part of this sub-region comprises the alluvial plains of the Ganges, the Indus and the Brahmaputra rivers and their tributaries. It covers the greater part of the Provinces of Assam, Bengal, Bihar, the United Provinces, the Punjab and Sind. This immense tract of level land from 90 to 300 miles wide and stretching for 1,400 miles from sea to sea separates the main Indian Peninsula from the Himalayas. South of the Gangetic Plain, the Peninsula takes the form of a triangular tableland; varying in altitude from a thousand to three thousand feet, broken up at intervals by the valleys of its intersecting rivers. The northern side of the tableland rests on confused hill ranges known collectively as the 'Vindhya Mountains'. Its two other sides are formed by the Eastern Ghats, stretching in fragmentary spurs down the Madras coast and the Western Ghats, which form the great, almost continuous, sea wall of the Bombay Presidency. The face of the triangular plateau is scarred with scattered peaks and hill ranges—outliers of the Ghats. The most notable are the Nilgiris, the Annamalais and the Pulni Hills of Southern India.

The animal life of the Indian Peninsular region is characterised by the absence of many of those Indo-chinese species which are so abundant in the hill forests of the Himalayas. It is the home of the true Indian fauna of which, the Spotted Deer, the Nilgai, the Blackbuck, the Four-Horned Antelope and the Sloth Bear are typical representatives. They are found nowhere else. Other species like the Gaur, the Sambhar and the Muntjac occur both in India and the Malay countries.

#### *The Indian Desert Region.*

The Trans-Indus districts of the Punjab, Western Sind and Baluchistan really form the eastern limits of a great desert region which extends through Persia, Mesopotamia and Arabia to the shores of North Africa. Naturally the character of the wild life of the Indian Desert region differs markedly from the rest of India. It consists mainly of species which have migrated into it from the desert lands lying beyond its borders, and of species from the Peninsula which are able to live under the conditions prevailing in these arid and sandy wastes.

#### *The Gangetic Plain.*

The general distribution of animals in the Indian Sub-Region corresponds to a large extent with the character of the vegetation which is again dependent on variations in climate and soil. In the great plain of the Ganges the rainfall is moderate and the winter temperature is correspondingly low. In the north-western portions of the Plain, in the Punjab and Western Rajputana the vegetation gradually merges into that of the adjoining desert zone. In this area live many desert forms of animals such as the desert cat, the desert fox, the desert hare and various species of desert gerbilles—colonists from the desert zone. These desert forms disappear as one travels eastwards into the more humid part of the Gangetic Plain. A feature of the dry zone of the Gangetic Plain



Sind : Typical desert vegetation.



Rajputana : Semi-desert vegetation.

*Photos by C. McCann.*



United Provinces : Open deciduous forest.

*Photo by C. McCann.*



Deccan Trap country : Typical vegetation and scenery.

*Photo by Salim A. Ali.*

is also the presence of large herds of antelope and gazelle. In the humid plains of Bengal, the semi-desert vegetation of the northern plain gives place to luxuriant groves of mangoes, figs and palms, such as one finds in the moist coastal tracts of the Peninsula. The wild life of this humid area differs little from that of the moister and more cultivated parts of the Peninsula. Further east, at the mouths of the Ganges, the great plain is transformed into a wilderness of swamp and forest,—the Sunderbans. It is a region of grassy savanahs and muddy islets covered with mangroves and dense evergreen forests. These forests shelter most of the larger animals found in the forests of the Peninsula with the addition of swamp-deer, buffalo, rhinoceros and such animals as have a preference for this amphibious terrain.

#### *The Main Peninsula.*

While the drainage areas of its intersecting rivers are covered with green woods and cultivation, the greater part of the tableland, which forms the main Peninsula of India, presents a scene of wide undulating plains separated by ranges of flat-topped hills. A portion of the plateau, comprising the eastern parts of Central India, Gujerat and the Deccan is sheltered from the monsoon by the great wall of the Western Ghats. It is a dry region of moderate rainfall. This dry zone extends to the low lands of the Carnatic and stretches south to the plains of southern India. These are again cut off from the monsoon by the southern hill ranges. The dry zone of the tableland has its characteristic vegetation due to climate and to soil. From the Bombay coast to the neighbourhood of Nagpur, from below Belgaum to Goona in Central India, over some 200,000 sq. miles of country, black cotton soil predominates. It is derived here from the underlying volcanic rocks known as Deccan Trap which forms the unbroken substratum throughout this area. Black soil produces its characteristic wild and cultivated vegetation. The wide grass-covered plains and the bases of the flat-topped hills in the Trap country are scattered with clumps of thorny acacias, species of *Zizyphus*, small trees and shrubs which are either leafless or burnt up in the hot weather. Forests, where they exist, are mainly deciduous and composed of stunted teak, bamboos and sundry small trees. In the open grasslands and scrub jungle, herds of gazelle and antelopes are again common. Other typical animals of the open country in the Peninsula are the Jungle Cat, the Common Fox, the Common Mongoose, the Indian Wolf, palm squirrels, hares and a variety of field rats and mice. Gaur, sambhar, spotted deer, sloth bear and wild dogs are found in its open deciduous hill forests. As one leaves the Trap country and penetrates the humid region lying north and east of Nagpur, one enters a zone where the climate is somewhat similar to the plains of Bengal, the character of the soil and of the vegetation changes. Teak ceases to be the dominant tree of the forests. It gives place gradually to Sal, while the familiar crops of the Trap country millet, pulses, and cotton yield to watery rice and cane fields. The wild life of the forests of this humid

zone is enriched by the presence of wild elephants, buffalo and swamp-deer, which occur in this area.

#### THE MALABAR COAST.

The Western Ghats, in sharp contrast to the adjoining dry zone of the Deccan, presents a region of great humidity and heavy rainfall. The forests covering the western slopes are at times very dense and composed of lofty trees, festooned with numerous perennial creepers. Bamboos form a luxuriant undergrowth. In parts of the range, the forests are more open and the banks of clear streams running through them are covered with spice and betel groves.

The Nilgiris, an off-shoot of the Western Ghats, rise precipitously to form extensive grassy downs and tablelands seamed with densely forested gorges or *sholas*. They are composed of tall evergreen trees with a dense undergrowth. Sholas, similar to those of the Nilgiris, occur in the Annamallai, Pulni Hills and other South Indian ranges. They provide the main shelter to wild elephants, gaur and other large animals of these hills. The most interesting feature of the higher level forests of the Nilgiris is their affinity to the higher forests of the Assam hill ranges. Many of the trees found in these high sholas and some of the forms of animal life are common to both areas. The forests of the Western Ghats and the South Indian hill ranges have a richer fauna than the remaining areas of the Peninsular Region. Among the species limited to these forests are the Nilgiri Langur, the Lion-tailed Macaque, the Nilgiri Brown Mongoose and the Striped-necked Mongoose, the Malabar Civet and the Spiny Mouse. In the higher levels of the Nilgiris and the Annamallais are found such characteristically Himalayan animals as the Thar and the Pine-Marten.

From this general description of the composition and distribution of the mammals of the Indian Empire and of the varied conditions under which they live, it will be seen that they share with all other living things the strong natural tendency to increase their sphere of action, to extend their territory. We find animals which have originated in countries beyond our frontiers or in our northern mountain ranges extending their range and colonising the Peninsula. When a species thus spreads into a new territory, where the climate, the vegetation and the enemies it has to face are different from its original home, it must either adapt itself to these changed conditions or it will fail to establish itself. These different conditions may produce differences in its appearance and habits, in other words, produce a variation from the typical parent form. If these colonists are subsequently isolated from the parent stock by impassable barriers, produced as a result of geological and other changes, they will tend in the course of centuries to differ more and more from the parent stock. Glacial conditions which obtained in the Himalayas during the Ice Age are believed to have driven the Thar with other animals to colonise the Indian Peninsula, which is assumed to have enjoyed a more temperate climate during this epoch. The return of tropical con-



Assam : Dense evergreen forest.



Assam : Interior of dense evergreen forest.

*Photos by C. McCann.*

ditions in India is believed to have resulted in the extermination of the Thar in the Peninsular Region. But those which were able to obtain a refuge in the temperate climate of the higher altitudes of the Nilgiris and Annamallai Hill ranges survived. Isolation from the parent Himalayan stock, different conditions of life, produced in the course of centuries those differences in colouring and texture of coat, shape of horn and other characters which now distinguish the Nilgiri from the Himalayan Thar. In other words, a new and distinct species was evolved. But if no impassable barriers are created, the new varieties evolved in different connected areas remain more or less alike. There is interbreeding and consequently an intergradation of characters between these varied geographical races linking them with the parent form. Thus, among many widespread species of animals, we find more or less easily distinguishable geographical races, evolved as a result of the different conditions under which they live in different areas of their range. In the case of the Gaur or Indian Bison, which extends from India through Burma and the Malay countries, there are well marked differences in the shape of the skull which enable us to differentiate between the Indian Gaur and the gaur living in the forests of the Malay Peninsula. While the Gaur of Burma and Assam intergrade between these two extreme types.

In the past naturalists were content to classify animals in accordance with the salient characters or marked differences between species. In recent years it has been recognised that it is not only necessary to classify species but it is equally or more important to systematically record geographical variations where they exist in a species. This data, when sufficiently multiplied, will in future furnish information for the investigation of problems connected with the variation and distribution of species. Therefore, in more recent publications dealing with Indian animal life, we find due attention paid to the description of geographical races wherever these occur.

It will also be seen that a knowledge of animal life gives us a better knowledge of ancient geography. It reveals changes which have taken place in the distribution of land and water and shows how the present distribution of land animals has been brought about. We have seen also some of the factors which have influenced this distribution or produced changes in or the extermination of numerous forms. In our day, the agency which accelerates these changes is Man. In India, irrigation by human agency in the desert tracts of the Punjab and Sind has resulted in the conversion of vast tracts of desert land into fertile country. This is bringing about a change in the character of the animal life of these areas. Desert species are retreating from them. They are being replaced by forms more adapted to the changed conditions. Again, Man sweeps away forests, dams rivers and wipes out of existence races of animals which are the culmination of centuries of evolution. While Man is a destructive agent, he can also become a preserver and protect wild creatures from the destructive effects of his own handiwork. The need for saving the wild creatures of this world from annihilation is recognised in most countries of the world.



Hoofed animals walk on the very ends of their toes, not on the soles of their feet. By this means the full extent of the limb comes into action. Its stride is increased. Now, an animal moving on the tips of its toes presents the narrowest possible portion of its body to the resisting earth. Its body obtains sufficient support and leverage. Its feet can be disentangled from the ground with greater facility. It moves with greater speed because rapid mechanical progress over the unyielding surface of the ground depends largely on one factor. The points of a moving body which come in contact with the ground must be few in number and small in area. Resistance to movement is thereby decreased. When the area presented to the ground is increased, as in the case of an animal which walks on the soles of its feet, speed is diminished. Among hoofed animals the extent of the foot coming in contact with the ground is further limited by a reduction in the number of toes. With the exception of the elephant, no Ungulate has more than four functional toes. Some have three, the majority two, horses only one. Among these animals Nature's plan has been to lengthen and strengthen the bones of one or more of the original five toes and to dispense more or less completely with the others. Coupled with this perfecting of the foot as an organ for rapid movement there is a corresponding development in the length and system of articulation of the bonelets of the wrists and ankles. These developments have given greater firmness to the foot, making it less liable 'to give' under pressure and more suited to animals which run.

Speed and surety of movement has been reached not by the immediate invention of a new limb for this purpose. Nature has availed herself of existing structures—of the normal 5-toed foot. From this she has evolved the form of limb suited to the different needs of different hoofed animals. So far as can be judged, the various hoofed animals are derived from several stocks or primitive 5-clawed ancestors. In each of them the hoofs have been independently evolved in adaptation to similar habits of life. The varied modifications which have taken place in the limbs of Ungulates is seen by comparing modern types with those which flourished in the distant past. In the instance of the Horse, a complete transition is traced from a 5-toed ungulate of the Eocene or 'Dawn Age', walking partly on the soles of its feet, to a 4-toed, then a 3-toed horse and so finally to the modern horse which has a single toe on each foot and treads the earth on the very tip of these toes. The modern horse carries the rudimentary vestiges of the second and fourth toes in the shape of 'splint bones' on each side of the long bone of its fore and hind feet. Of its first and fifth toe no trace remains.

The gradual perfecting of the fore and hind limbs as running organs in hoofed animals has been put down to the changing conditions in their environments. It is believed to be due to changes in the earth's surface, to the raising of the level of the land and the consequent change in its climate and vegetation. These changes resulted in the conversion of marshy and forested tracts into upland, open, grass-covered plains, where the safety of these

animals from numerous foes now depended on their capacity for rapid flight. The same reasons are believed to explain the modifications, which took place in the course of long ages, in the teeth of Ungulates. There has been a gradual change in the shape of the teeth. An early type, still seen in man and many mammals—a type suited to a mixed or even carnivorous diet has given place to teeth with flat grinding surfaces, complicated by folds and ridges of enamel. This is seen in the molar teeth of the majority of later Ungulates. In the horse for example, the grinding surface of the cheek teeth are made up of hard enamel ridges. These ridges are braced on either side by layers of softer dentine. The massive grinding organs are thus composed of substances of different density. An effective irregular grinding surface is always maintained by the persistence of the harder enamel and the wearing away of the softer dentine. The food of the Ungulates, consisting in most cases entirely of vegetable substances which require much mastication, is believed to be the inducing cause for the complex structure of the cheek teeth in the more specialised kinds. While their grinding teeth have undergone special development there is a decided tendency among the more specialised representatives of the Order to a reduction either in the size or in the number of the front teeth. The canine teeth are frequently small or absent; while the incisor teeth in the upper jaw and more rarely both the incisors and canines in the upper and lower jaws may be wanting. All the earlier Ungulates and the modern pigs have however well-developed tusks as well as the full number of front teeth.

#### ARTIODACTYLA OR EVEN-TOED UNGULATES.

Ungulates are divided into four Orders in accordance with certain common structural characters which the members of each of these groups exhibit. Three of these Orders are represented in the Indian Empire. The first comprises the *Artiodactyla* or even-toed Ungulates, Indian representatives of which are oxen, sheep, goat, antelope, deer and pig. These animals differ from other Ungulates in a number of characters. The most important is the arrangement of the toes. It has been indicated that the feet of the majority of Ungulates show a reduction in the number of toes and that this reduction has been effected in different ways. The *Artiodactyla* always possess either two or four toes, hence their name even-toed. In all of them the first toe is absent. The second and fifth toes are either wanting or reduced in size. They form the 'petty-toes' of cattle and pigs, which are either rudimentary, or do not touch the ground when walking. The third and fourth toes are large and equal in size. They are perfectly symmetrical. Together they support the full weight body. The centre line of the foot passes between them. The two hoofs which encase these toes present a flat surface to each other, and appear like a single large hoof cleft in two; hence the name cloven-hoofed, applied to these animals. This characteristic alone is sufficient to distinguish all the members of this group.

Artiodactyla which are extraordinarily numerous both in genera, species and individuals are divided into four main groups or sections, namely:—

(1) *Pecora*, Typical ruminants—Oxen, Sheep, Goat, Antelope, Giraffe and Deer;

(2) *Tragulina* or Chevrotain;

(3) *Tylopoda* or Camel and Llama;

(4) *Suina* or Pig, Peccaries and Hippopotamus.

### PECORA.

Oxen, sheep, antelope and deer are classed as typical ruminants. They are believed to be of comparatively recent evolution. Descendants of primitive Artiodactyles mainly inhabiting the old world, they first appeared about the middle of the Tertiary Era. The centre from which they spread over the earth is apparently northern Asia. Thence they extended their territory into northern Europe on the one hand and north America on the other. Later they spread southwards to tropical countries. Ruminants are distinguished by several well-marked characters. Like all cloven-hoofed animals they have only two functional toes on each foot, but the long bones, immediately connected with these toes, are fused into a single long bone called the 'cannon bone'. The side toes are rudimentary or altogether wanting. The limbs and feet of ruminants are highly specialised both for speed and endurance. Their cloven hoofs give them a surer hold on rough and irregular ground and, as they expand when sinking and close on extrication, a firmer footing in marshy land. Their teeth are distinctive.

Ruminants, in general, have no cutting teeth in the upper jaw. Their place is taken by a soft pad. The tongue is used to draw the food into the mouth. To do this effectively its surface is covered with rough points all directed towards the throat just as in the tongue of a lion or a cat. The molar or cheek teeth have long crowns capped with crescent shaped tubercles, which with wear grind down into crescentic patterns.

The name 'ruminant' describes their well-known habit of ruminating or 'chewing the cud'.

There is considerable advantage in this habit to these bulky though timid animals. They require large quantities of a particular type of food which must be thoroughly chewed before its nutrition becomes available. Through the process of rumination large quantities of food can be eaten rapidly. The necessarily longer process of chewing it can be continued when returning from the feeding grounds or during rest, or put off till a place of safety is reached. The complex stomach of the ruminant is specially designed to assist in this process. It is divided into four separate chambers. The first and largest—the paunch, serves to contain the hastily swallowed food. Here it undergoes a softening process and is returned in small quantities to the mouth to be thoroughly chewed in that familiar slow and deliberate manner. As each mouthful is reduced to pulp it is swallowed and immediately replaced by another. The pulped food now enters the second division

of the stomach—the *reticulum* or honey-comb bag, so-called because its walls resemble a honeycomb. In the honeycomb bag the food is pressed and shaped and sent up the gullet again. It then passes into the third and fourth divisions of the stomach. The actual work of digestion takes place in the last chamber.

Typical Ruminants found within Indian limits are grouped in two families:

- (1) The *Bovidae* or hollow-horned Ruminants which include oxen, sheep, goat and goat-antelope, antelope and gazelle,
- (2) The *Cervidae* which includes the deer.

#### BOVIDAE OR HOLLOW-HORNED RUMINANTS.

The horns of oxen, sheep, goat, antelope and gazelle consist of two parts—a core of bone and an outer cap of tough, true, horn. In the majority of genera both the core and its horny cover are permanent during the life time of the animal. In the deer the same core of bone is present and forms the substance of the antlers. As with the hollow-horned ruminants the horns of deer are covered with a skin pad. This covering—the velvet lasts only for a certain period and is then rubbed off by the exertions of the animal, leaving behind the bony core which is popularly termed the horn. Stags however periodically shed this bony part of the horn, a state of affairs which has no parallel among hollow-horned ruminants.

The Bovidae or hollow-horned ruminants are a very extensive family, containing all the cattle, goats, sheep and the antelopes. They are distributed throughout Europe, Asia and North America. Eleven genera are found within Indian limits. These are included in 5 sub-families: (1) *Bovinae*, Domestic and Wild Cattle; (2) *Caprinae*, Sheep and Goats; (3) *Rupicaprinae*, Serow, Goral and Takin; (4) *Tragelaphinae*, Nilghai; (5) *Antilopinae*, Antelopes and Gazelle.

##### Sub-Family 1. *Bovinae*: Gaur, Banting Yak and Buffalo.

The Bovines are as a rule large and massively built animals. The neck is short and thick, the tail always long and tufted at the tip. The muzzle broad, naked and moist.

In the Indo-Malayan region there are 4 species belonging to this group, i.e. the Gaur (*Bibos gaurus*), the Banteng (*Bibos banteng*), the Yak (*Poephagus grunniens*) and the Indian Buffalo (*Bubalus bubalis*).



The Indian Bison or Gaur (*Bibos gaurus*, H. Smith).

THE GAUR (*BIBOS GAURUS*, H. SMITH).

The Gaur, one of the noblest animals of the Indian forest, is apparently the largest of existing Bovines. A striking character in the build of a Gaur is the muscular ridge upon its shoulders which slopes down to the middle of the back where it ends in an abrupt dip. With its huge head, the muscular ridge crowning its deep body and its sturdy limbs the Gaur is the embodiment of vigour and strength. A bull may stand 6 ft. 4 ins. at the shoulder. The average height is between 5 ft. 8 ins. and 5 ft. 10 ins. Cows are about 4 ins. shorter. Gaur appear to attain their finest development in the South Indian hill ranges and in the forests of Burma and Assam.

The horns are large and massive, considerably flattened and corrugated at the base, rounded, smooth and turning inwards at the tips. Cows have smaller and less sturdy horns. They are rounder and have a narrower sweep. In bulls, a good average horn is 27 ins., anything over 30 ins., is a fine head. The spread of the horns taken together with the girth is the real test of a good head.

The newly born Gaur is a light golden yellow which soon changes to fawn, then to light brown and so to coffee brown or reddish brown—the colour of young bulls and cows. Old bulls are jet black—their bodies almost hairless. In the dim light of the forest an old cow may be mistaken for a bull; it looks almost as black. The dark colouring of the body is set off by an ashy coloured forehead and yellowish or white stockinged feet. Though often described as pale blue, the eye of the Gaur is brown. It is true that when the light falls on it at certain angles, the eyes are a beautiful blue. This is caused by the *Tapetum lucidum*, the membrane behind the eye-ball which is of a lovely peacock blue.

Though found in low forest in the neighbourhood of hills, Gaur are essentially mountain animals. They usually live in small herds, believed to comprise single families which, in quest of pasturage or from other causes, may unite to form larger herds. They graze at dusk or in the early morning and retire during the hotter hours of the day to the seclusion of the jungle. Except when breeding, they are peaceful animals and bulls of all sizes herd in perfect amity with the cows. A young bull, when mature, generally lives away from the herd, alone or in company with other bulls. These usually keep in the vicinity of the main herd, but wander more in quest of grazing. In the mating season, the younger bulls are driven away by the master bull who obtains possession of his cows by right of conquest. The herd bull generally returns to his accustomed hermit existence till the urge to mate is on him when he will again seek the cows and dispute with other aspirants the right of lordship. Really old beasts past the urge or capacity to mate lead truly solitary lives.

Gaur are by nature timid animals usually shunning the neighbourhood of man. They have a keen scent but comparatively poor eyesight and hearing.

Gaur range through the larger hill forests of India, Burma and

the Malay Peninsula. The eastern limits of their territory is imperfectly known. The Gaur of the Malay forests is regarded as a distinct race. It is distinguished from Gaur inhabiting the Indian Peninsula by the shape of its forehead which is less concave, the great arch of bone between the horns being less prominent or practically absent.

The Gyal or Mythun (*Bibos frontalis*) is the product of interbreeding between a bull Gaur and domestic cattle. At the fourth generation the true stage of mythun is reached—an animal of lesser stature than the Gaur, shorter limbs and usually a well developed dewlap. The arched ridge between the horns and the concave forehead of the Gaur disappear. In the Mythun the vertex of the skull between the horns is straightened and the forehead flat. The horns show a slight upward curve without the terminal inward sweep. If breeding with domestic cattle is continued, the high dorsal crest is reduced to a mere hairy thickening on the back, the horns become more cow-like and the domestic cows' varied colouring begins to appear. Mythun are found in the mountainous tracts from North Cachar; through Manipur, to the Lushai and Chin Hills. They are the peculiar and characteristic possession of the hill tribes inhabiting this region.



*Prince of Wales' Museum, Bombay.*

The Gaur or Indian Bison (*Bibos gaurus*, H. Smith).



By courtesy of

Banting or Tsaine (*Bibos banteng birmanicus*, Lyd.).

The Amer. Mus. Nat. Hist., New York.

THE BANTING OR TSAINE (*BIBOS BANTENG*  
*BIRMANICUS* LYD.).

The Banting, the Wild Ox of Burma, is a smaller animal than the Gaur, nevertheless he is massively built and stands quite 5 ft. 6 ins. at the shoulder or even higher. He is longer in the leg and the dorsal ridge is less prominent but he has the same sturdiness of limb and displays the same agility and vigour of movement as his relative.

The high concave forehead and 'roman' nose of the Gaur is wanting in the Banting. The horns are connected by a hairless mass of horny substance as hard as the skull beneath. The horns grow differently. They stand out at right angles to the skull and then turn upwards and inwards somewhat abruptly. They have the same rugged corrugations in front as in, the horns of a Gaur, but are less massive. The colouring is perhaps lighter. Good average horns measure about 24 ins. in length with a girth of 14 ins. and a spread of 25 to 30 ins. Anything over 25 may be regarded as a good head. Young bulls and cows have cylindrical horns, those of cows grow almost straight upwards, are smooth throughout with but little girth.

Cows and young bulls are a bright chestnut with a white face, white stockings and a distinctive white patch on the buttocks. Young bulls sometimes show white spots on the flanks which in time merge and turn a dirty grey. Older animals are described as being yellowish brown, sometimes turning into a soiled grey on the sides. Old bulls usually have the face down to the muzzle dirty white, almost approaching grey. The coat may be entirely grey or khaki, sometimes dark chocolate brown, more rarely, quite black like the Javanese Banting. Ordinarily, in Burma, the older the bull the lighter in colour it becomes. Burmese domestic cattle tend to resemble Banting, in colour they have white patches on the buttocks and white stockings. Banting occasionally consort with domestic cattle.

The Banting, unlike the Gaur, prefers flat or undulating country. In hill country they do not ascend to great elevations and keep to the lower slopes. During the early rains they enter bamboo jungles to browse on the young shoots and during the hot weather may seek the shade of heavy jungle and cane brakes. In general they prefer lighter kinds of forests. They wander about visiting different grounds at different seasons of the year, their migrations being influenced by the pasturage.

The herding and mating habits of the Banting are in no way different to the Gaur. Master bulls take possession of the cows during the mating season and otherwise lead a solitary existence.

The Banting is a shyer and much warier animal than the Gaur, the sense of scent, sight and hearing are acutely developed.

The range of the Banting includes Burma, Siam, the Malay Peninsula, Borneo and Java. About 5 races have been described within this area.

THE YAK (*POEPHAGUS GRUNNIENS*).

An adult bull Yak stands about 5 ft. 6 ins. at the shoulder and may reach over 6 ft. It is a massively built animal with a drooping head, high humped shoulders a straight back, and short sturdy limbs.

Shaggy fringes of coarse hair hang from its flanks, cover chest, shoulders, thighs, the lower half of the tail and form a bushy tuft between its horns and a great mane upon its neck. Its great bulk, wild unkempt appearance and glaring eyes give the Yak a formidable aspect. Conspicuous and distinctive as is this clothing of long hairs, the Yak receives additional warmth through the rigorous winters from a dense under-coat of soft closely matted hair. In the spring the under fur is shed; it comes away in great masses and, though completely separated from the skin, adheres in untidy scattered patches to his hairy body. A baby Yak differs markedly from its parents in the absence of the long hair fringes, which are not noticeable in the calves until the second or third month.

The horns of a Yak are more or less rounded and quite smooth. In old bulls, the horns may be slightly compressed at the base but are never flat or corrugated as in the Gaur or Banting.

The colour of a wild Yak is a uniform blackish brown with a little white about the muzzle. Domestic Yaks of mixed breed frequently display a tendency to piebald colouring.

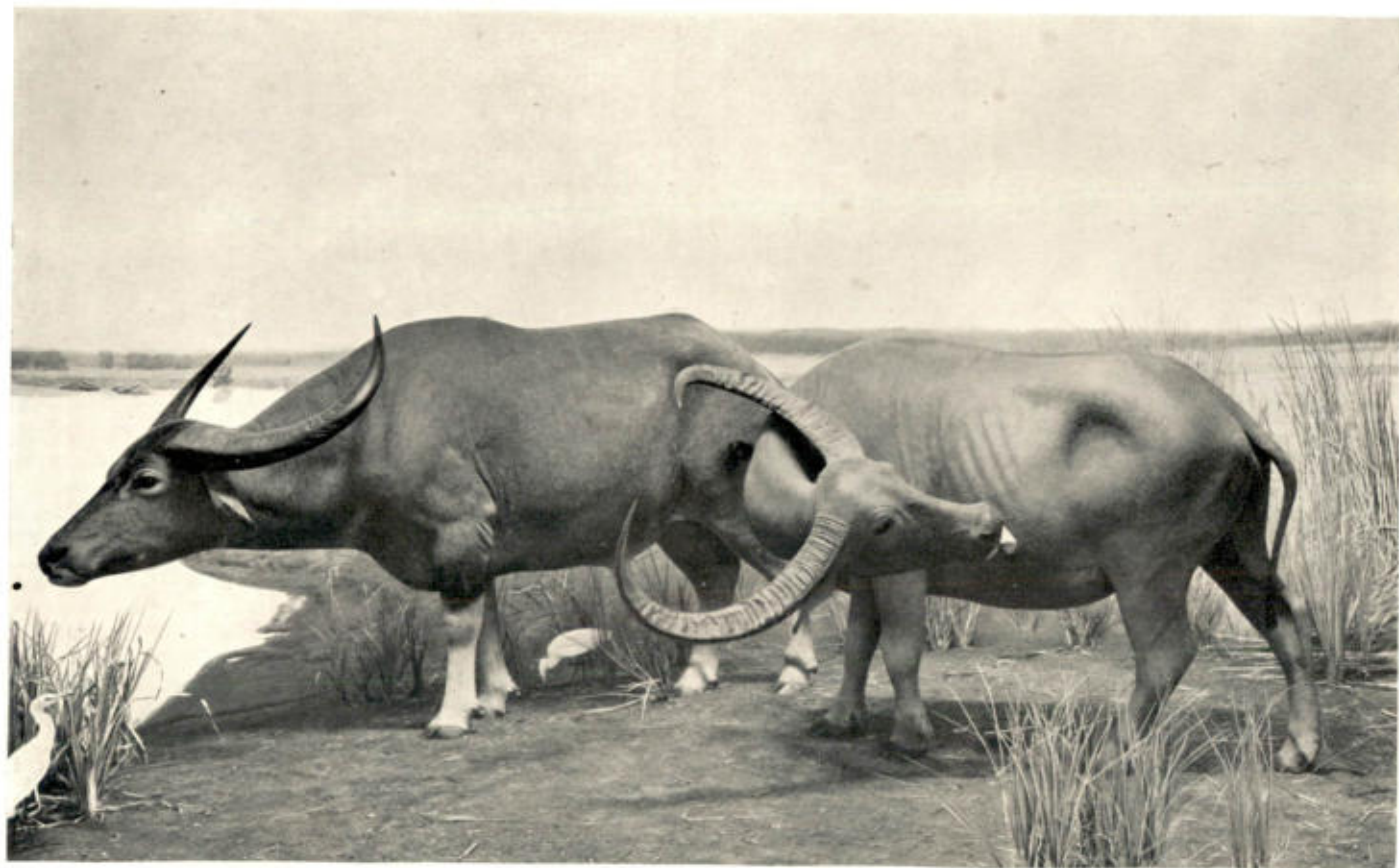
An inhabitant of the coldest, wildest and most desolate mountains of the Tibetan Plateau, where both arctic and desert conditions prevail, the Yak lives in a continuous struggle with the fiercest elements of Nature.

They are seldom found in very large herds, except in the spring when the cows and calves congregate on the grazing grounds. Bulls are generally solitary or found in small parties of three or four, except in the rutting season in late autumn and winter when the master bull is usually accompanied by 4 or 5 cows. Wild Yak cross freely with Ladaki cattle.

Yak feed in the mornings and evenings on the wiry grasses which grow in the valleys and have been noticed eating quantities of salt earth which in some parts cover the ground with a white crust. They retire to the steep barren hillsides to rest and ascend to great elevations.

Yak display an amazing agility in climbing; a herd is said to travel in single file, each member carefully placing its feet in the imprints left by the hoofs of the one preceding it.

The Yak is restricted to Tibet and the adjacent districts of China.



By courtesy of

The Wild Buffalo (*Bubalus bubalis*, L.),

The Field Museum, Chicago

THE INDIAN WILD BUFFALO OR ARNA (*BUBALUS*  
*BUBALIS*, L.).

Wild Buffaloes are much larger than the tame buffalo and generally more hairy. A bull from the Godaveri district scaled 2,001 lbs. A large bull stands 5 ft. 6 ins. at the shoulder and may even reach 6 ft. Though it has a finer carriage, the Wild Buffalo differs little from the tame. Domestication has scarcely changed it.

There are said to be two varieties of Indian Wild Buffalo—one with straight horns turned up at the tips; the other with horns which curve upwards to form a semicircle. Both types may be found together in the same herd and there is much inter-grading between the two forms. The horns are flat and triangular in section; those of cows are less massive and vary less in shape. Occasionally, a cow with a fine length of horn is seen. The largest known horn—a cow's—is  $77\frac{3}{8}$  ins. in length. Giants of this size must be exceptional.

Like the tame, the Wild Buffalo is a slaty black animal. The legs are a dirty white beginning just above hock and the knee—in this they resemble Gaur. The new born calf is light coloured—almost yellow. Some domestic buffaloes have the same white legs and some show a white patch between the horns.

Wild Buffaloes move about in small herds. In their social life they follow the custom of their tribe. During the rut, the younger bulls are temporarily driven out, the master bull taking possession of the cows.

The younger bulls or a solitary old bull, powerless to obtain lordship over a herd, frequently mix and breed with tame buffaloes which are driven into the forests to graze.

The rut is said to commence at the end of the rains and the young are born mainly between March and May.

Wild Buffaloes live almost entirely upon grass. Grass lands—not always marsh—interspersed with nullahs provide the conditions they prefer. They have no fear of approaching villages, come to village tanks to drink and, during the rains, frequently enter cultivation.

In India, the Wild Buffalo is found in the grass jungles of the Terai, in the plains of the Ganges and Brahmaputra in Assam, in Midnapore and Orissa and in the south-eastern portion of the Central Provinces. The numerous herds of Wild Buffalo, once seen in the C. P., are now a mere tradition. Association with domestic cattle places the Wild Buffaloes in constant danger to disease to which it is very susceptible. This is one of the animals which requires strict protection if it is not to be exterminated. An allied race of our Wild Buffalo occurs in Borneo—it is smaller in build and carries smaller horns.

ii. Sub-Family II.: *Caprinae*.

## Sheep and Goats.

Sheep and Goats form the second division of Bovines. The majority of species inhabit the Highlands of Central Asia. This is in marked contrast to Africa where only 3 members of the group are present and these restricted to the northern parts of the Continent. Three species of wild sheep and three species of wild goats are found within our frontiers. They inhabit the Himalayas and the trans-Himalayan countries, the hill ranges of the Punjab, Sind and Baluchistan. The Himalayan and the Nilgiri Thar are also included in the present group.

Sheep differ in some ways from Goats. Their horns curl forwards by the sides of the face or outwards in an open spiral. The horns of Goats are situated close together, immediately above the eyes and spring upwards in the same plane as the forehead. They are either spirally twisted or scimitar shaped. Sheep usually have shorter tails, the males do not grow a beard nor have they the strong unpleasant odour of goats.

Most sheep have a small gland below the eye which lies in a corresponding depression in the skull and a small gland in each foot between the hoofs. Goats have no face glands, no gland in the hind feet and in some cases none in the fore feet. The purpose of these foot glands in Ungulates appears to be the lubrication or greasing of the hoofs and the prevention of injury from friction. Domestic goats have glands in the fore but not in the hind feet. A hind quarter of a goat with hoofs attached therefore can be at once distinguished from a sheep's by the absence of the hollow feet-pits—a point of some domestic interest when an attempt is made to substitute goat's mutton for sheep's.

Some wild goats, like the Himalayan Ibex, are hunted for their dense soft under-fur. It is used as lining for shawls, for stockings and gloves and is woven into fine cloth called *tasi*. No wool is so rich, so soft and so full. The hair is manufactured into coarse blanketing for tents and twisted into ropes. The skin of the Himalayan Ibex, when tanned, provides the best leather for the sock-like boot worn in Kashmir and the Pamirs.



Photo by

The Urial (*Ovis vignei*, Blyth).

W. S. Berridge.

THE SHAPU OR URIAL (*Ovis vignei* BLYTH).

The Wild Sheep known as the *Shapu* in Ladak, the *Oorial* in the Punjab and the *Gad* in Baluchistan lives under widely differing conditions, in its extensive range. Three geographical races are distinguished by colour and size and the form of the horns. They are the Ladak Oorial (*Ovis vignei vignei*), the Afghan Oorial (*Ovis vignei cycloceros*) and the Punjab Oorial (*Ovis vignei punjabiensis*).

The Ladak Urial stands about 3 ft. or more at the shoulder. In summer its coat is rufous grey or fawn, in winter a mixture of grey and brown. The Punjab Urial is smaller and redder in colouring. The adult Urial ram wears a great black or grizzled ruff growing from either side of the chin and meeting and extending down his throat. In older rams the ruff is grey or white in front passing into black behind. In its sleeker summer coat much of the ruff is shed. It is best developed in the Punjab race. The horns are strongly wrinkled. They are set close together and curve round in a circular sweep. In the Ladak Urial the horns usually turn inwards at the tips, in the Afghan race they tend to turn outwards and form an open spiral, in the Salt Range, Punjab, they tend to form a circle. But there is much variation in horn curvature, these divergent types may be seen in the same herd, within the same area. The record horns of the three races are as follows:—Ladak Urial 39 ins.; Afghan 41½ ins.; Punjab 38½ ins.

In Ladak, this sheep inhabits open valleys and hill sides; in Astor, the grassy mountain slopes at moderate elevations below forest. Its environment in the Punjab is rocky scrub covered hills, in Sind and Baluchistan it is found in the barren stony ranges.

Urial are sturdy active sheep ever wary and alert. As with most wild sheep, the older rams live apart from the ewes, except during the breeding season. In the Punjab hills, the rut occurs between October and November, and the lambs are born 5½ months later, in April and early in May. In Astor, lambing takes place in June. Urial cross freely with domestic sheep.

The Ladak Urial ranges from Astor to the Zaskhar range in Ladak and probably eastwards into Tibet. The Punjab race is found from Jhelum Salt Range northwards; the Afghan race is from Baluchistan and Afghanistan and is said to include the Urial inhabiting the Khirthar range and its lower spurs in Sind.

THE NYAN OR GREAT TIBETAN SHEEP  
(*Ovis ammon hodgsoni* BLYTH).

The Argali (*Ovis ammon*), the largest of all wild sheep, inhabits the Himalayas and the highlands of Central Asia. Over this extensive region this sheep varies in different areas in the form of its horns, colouring or size. Several more or less distinctive races are recognised. Two races of the Argali—the Nyan or Great Tibetan Sheep (*Ovis ammon hodgsoni*) and Marcopolo's Sheep (*Ovis ammon poli*) occur within our frontiers.

The Great Tibetan Sheep stands from 3½ to 4 ft. at the shoulder. Long in the leg, graceful and light—it suggests an antelope in build. Its massive wrinkled horns, 16 to 19 ins. in girth, curve in almost complete circle. The record, a picked-up head, measures 57 ins.

The ram is light brown with darker withers. His throat, rump, underparts and limbs are white. Adult rams have white heads and develop a white ruff about the neck much of which is shed with the winter coat.

The Tibetan Plateau, where Nyan live, presents a wilderness of desolate plains and low undulating sand hills, scorched in summer and swept by icy winds through the freezing winters. In this desert terrain the sheep are naturally migratory and wander to wherever food and water is to be got. In the spring, when the melting snows cause the scanty herbage to sprout, they frequent the borders of the snow line or enter the ravines, some of which hold trickling streams whose banks are covered with low bushes and herbage. They summer in the higher levels above 15,000 ft. and in winter descend to the shelter of the lower valleys. They feed early in the morning and again in the evening and climb some bare hillside to rest during the day. They avoid the damp snow and select some dry spot on the stony slope, kicking out with their feet a shallow 'form' in which to lie down. Their colouration is highly protective. It is difficult to discover them except in movement. When lying down they usually keep their heads erect but, when sleeping, lie with outstretched necks, the big rams resting their great curling horns on the ground.

In the spring, the sexes separate. Through the summer the older rams herd together in small parties and usually live apart from the ewes and yearlings. They rejoin them in the late autumn when the mating season begins. The young are born in May and early June, when the ewes seek the shelter of the more secluded valleys to lamb. This sheep was once plentiful in the country to the eastward of Chang-Chemo in Ladak and across the Tibetan border in the region lying to the north-east of the Pangkong Lake. They occasionally cross into Spiti, Nepal and Kumaon and are also found in the neighbourhood of the Tso Lhama Lake in the extreme north of Sikkim.



The Nyan or Great Tibetan Sheep (*Ovis ammon hodgsoni*, Blyth).



• By courtesy of

Marco Polo's Sheep (*Ovis ammon poli*, Blyth).

The Field Museum, Chicago.

MARCOPOLO'S SHEEP (*OVIS AMMON POLI* BLYTH).

Marcopolo's Sheep is a race of the Argali. It has less massive horns which form an open and extended spiral.

An adult ram is from 11 to 12 hands high at the shoulder and scales about 250 lbs. Like the Nyan, he is long legged and light in build. His magnificent horns, deeply wrinkled and the colour of old ivory, curve in a circle, then extend outwards in a bold sweep. The record pair is 75 ins. in length. The average length is about 52 ins. with a girth of 15 ins. at the base. In winter the adult ram has a creamy white head, legs and belly. His flanks are grey, merging into the darker brown of the back. The general colouring is that of the bare boulder strewn terrain in which this sheep lives. The colour makes the animal almost invisible, except in movement. Young lambs are uniform dark grey; yearlings a lighter mouse grey. The heavy winter coat is replaced about the end of May by the short paler summer pelage.

Rolling boulder strewn plateaux, cut up by broad stony nullahs, set against a sky line of snow-capped mountains—this is the dead and desert region in which *Ovis poli* live. In the spring the little patches of grass along the snow line and the nullahs, where a small lake or winding stream produces herbage, form their habitual resorts. Their food is then limited to the bunches of wiry grass and later to a species of wild onion which springs up in the sandy tracts. After a hard winter, conditions are most arduous and many die of starvation. In the summer, when there is a fair growth of grass over the Pamirs, the veteran males ascend into the higher and more remote nullahs. They feed morning and evening and go up some bare hillside to rest during the day; always moving in single file, the big ones leading. Excellent of sight and wonderfully keen in scent, when alarmed, they stand stock still or crowd together stamping the ground with their forefeet, even advancing nearer. All at once one bounds away, the herd follows heads held high, galloping with long easy strides but, intensely curious, they go a short distance, then turn and stop to see what disturbed them.

In their breeding habits differ in no way from the Tibetan Nyan. The rams fight as sheep do—a frontal attack with lowered head, the horns meeting in a clash which can be heard a long way off, or they charge alongside to strike sideways at the ribs and flanks.

Within Indian limits, *Ovis poli* are found only in Hunza. The Mir of Hunza has given them for some years strict protection in his territory. They exist in more or less reduced numbers in most of the side valleys of the Tagdumbash Pamirs. In the Russian Pamirs they still seem to be plentiful.

BHARAL (*PSEUDOIS NAHOOR* HODGSON).

In structure and habits the Bharal holds a place intermediate between the sheep and goats. Its horns are rounded and smooth, and curve backwards over the neck. This sheep has no face glands. Their position is however marked by a small bare patch of skin. In these characters the Bharal approaches the goats. But a Bharal ram is not bearded nor has he the unpleasant 'goaty' odour. Again, Bharal may have glands between the hoofs in all four feet; in goats these are always absent in the hind limbs.

A Bharal ram is about 3 ft. at the shoulder, stout and powerfully built. It scales, according to the time of the year, from 120 to 150 lbs. Its coat is dense. The general colour of the head and upper parts is brownish grey, suffused with slaty blue, browner in summer and more distinctly slaty grey in winter. The colour in any season blends perfectly with the blue shale and rock of the open hillsides where Bharal live. The face and chest in old rams is black. A black stripe runs along the middle of each flank and down the front of the legs. All these black markings are absent in ewes. The horns are smooth and marked with fine striations—lines of growth. They curve outwards and downwards and, in well grown rams, curl backwards at the tips. The record head from near Gyantse, Tibet, is  $33\frac{1}{4}$  ins.; 23 ins. may be described as a good head.

To find Bharal one must seek the higher altitudes, neighbouring on 16,000 ft. in summer, and rarely below 12,000 in the winter. In the main Himalayan Range they are found on the levels between the tree and snow line where there is rich and abundant grass. In the Zaskar and Ladak ranges the slopes above tree line are bare and they find their food in the occasional patches of coarse grass, moss and dwarf shrubs. Bharal climb like goats and take to the most difficult and inaccessible places when disturbed but never enter forest or scrub. They live in large flocks, numbering as many as 200. These mixed flocks of rams and ewes may contain well grown males but the mature rams keep somewhat to themselves. In spring and summer the really old rams seek the higher levels and rejoin the females and younger males in September.

Unlike the Urial the Bharal will not cross with tame sheep nor is it as easy to tame.

Though typically a Tibetan animal, the Bharal is also found in Sikkim, Ladak and Nepal.



Photo by

W. S. Berridge.

The Bharal or Blue Wild Sheep (*Pseudois nahoora*, Hodgs).



By courtesy of

The Field Museum, Chicago.

The Tien Shan Ibex (*Capra sibirica almasyi*, Lorenz).

THE ASIATIC IBEX (*CAPRA SIBRICA* MEY.).

The Genus *Capra* (Goats) is represented in our area by three species:—The Asiatic Ibex (*Capra sibirica*), the Sind Wild Goat (*Capra hircus blythi*) and the Markhor (*Capra falconeri*).

There are various geographical races of the Asiatic Ibex—a species closely related to the Alpine Ibex (*Capra ibex*) of the Swiss Alps. The Asiatic animal is considerably larger in size; standing as high as 42 inches at the shoulder. It is a sturdy, thick set goat, with a great beard and a coat of coarse brittle hairs. In winter, a dense under-fur of wool helps it to withstand the intense cold of its native mountains. The colour is variable. In general, the winter coat is yellowish white more or less tinged with brown and grey. In summer, the general hue is dark brown with irregular white patches. A male in good condition, weighs slightly over 200 lbs. The female is yellowish brown and insignificant to look at. The great scimitar shaped horns of the buck are flat and bossed with bold ridges in front. They are usually larger in the Tian Shan Race (*Capra sibirica almasyi*). The record length being 58 ins. The Kashmir Ibex is known as *Capra sibirica skyn*. It is a paler, brown-coloured animal with rather shorter horns than the Tian Shan Ibex. The record head from Gilgit is 55 ins. The various races of Asiatic Ibex, said to be distinguishable by the form of the horns, and differences in general colouring, cannot be satisfactorily separated by these characters which vary considerably in the same areas.

Ibex live in flocks numbering from a dozen to 40 or 50, though much larger herds have been seen. Their favourite grounds lie in the higher elevations well above the tree line. Here, on the precipitous sides of some cliff or nullah, patches of grass and small plants give them grazing. They feed early in the mornings and evenings and then climb up higher into the forbidding shelter of rock and snow to rest. Sentinels, usually an old ewe or ewes, are posted on some projecting rock or commanding point. Ever vigilant, they utter the shrill whistle of alarm which sends the flock dashing down and then upwards again, away to shelter among the precipitous steepes.

In spring and early summer, the old males are usually with or near the females and young but later in the summer the patriarchs retire to the more inaccessible mountains. They rejoin the main herds about October. The young are born in May and early June. The Himalayan Ibex inhabits the Western Himalayas on both sides of the main Himalayan Range and the mountain ranges which lie beyond in Kashmir and Baltistan. Its eastern limits are set by the upper reaches of the Sutlej River, east of which it does not occur.

THE SIND WILD GOAT (*CAPRA HIRCUS BLYTHI*  
HUME).

The Sind Wild Goat is a relative of the wild goat of the Caucasus (*Capra hircus aegagrus*). It is distinguished by its smaller size. The species is of special interest as being the chief ancestral stock from which the various breeds of domestic goats are derived. A full grown buck is from 32 to 37 inches at the shoulder—a handsome bearded goat; brownish grey in winter, close haired, yellowish or rufous brown in summer. The under parts are whitish. Old males are lighter coloured. Well grown bucks have a dark stripe running from the nape of the neck along the back to the root of the tail and a cross stripe down each shoulder. The face, the chin with its beard, the throat, the tail, front of the legs, except the knees and a stripe along the flanks are dark brown. The horns are long and scimitar like. They sweep back in a graceful curve. Unlike the flat and regularly knobbed horns of the Ibex, they are compressed in front into a narrow jagged keel. The record length is about 52 ins. Anything over 40 ins. is a good head.

The Sind Wild Goat lives in small or large herds. In the barren hills of the Khirthar range their environment is one of jagged rock and loose stones, thorn and cactus with little or no water—a furnace of heat in summer; freezing cold in winter. Like all goats they are active, agile and surefooted leaping from ledge to ledge, stopping short on the steep hillside to balance on a pinnacle of rock where there is scarce a foothold. They go to rest on some commanding ridge from whence the sentinels of the flock can obtain a view of the surrounding slopes.

The 'bezoar stone' formerly famed in Europe and regarded in the East as an antidote to poison and as remedy in many diseases is a hard concretion found in the stomach of this goat.

The Sind Wild Goat inhabits the barren hills of Baluchistan and Western Sind, but not east or north-east of the Bolan Pass and Quetta. Here it is replaced by the Markhor.



The Sind Wild Goat (*Capra bircus blythi*, Hume).



The Pir Pinjal Markhor (*Capra falconeri cashmiriensis*, Lyd.).

THE MARKHOR (*CAPRA FALCONERI* WAGNER).

The Markhor, the grandest of all wild goats, stands about 41 ins. high at the shoulder. An old male, with his great horns, flowing beard and his mane, falling from his neck and shoulders to his knees, has a dignified and patriarchal appearance. The long and silky haired winter coat is a rusty iron grey; in summer, the hair is shorter. It takes a reddish brown tinge. Old males become more or less white. Young bucks are equally shaggy though not as copiously bearded as the veterans. Female are dark fawn and about half the size of a well grown male. Some wear a scanty beard. Markhor carry magnificent horns. These show more or less constant variation in form in different areas. Otherwise there is nothing to really distinguish the 4 known races. The typical Markhor (*Capra falconeri falconeri*) inhabits Astor. In this area the horns diverge widely and form an open spiral. The maximum recorded length is 60 ins. Horns of this type are also seen in Baltistan and Gilgit. Markhor from the Pirpinjal and Kaj-i-nag Mountains (*Capra f. cashmiriensis*) have horns which diverge less and, in fine heads, show two complete twists or spirals. The record is 65 ins. This type is also common in Baltistan, Gilgit and Chitral. In the hills on the northern edge of Peshawar, the horns lose their imposing spiral and assume the straight corkscrew pattern, typical of Markhor living in the mountains of North Afghanistan. The race is known as Kabul Markhor (*Capra f. megaceros*). The straightening of the horns and the accentuation of the spiral twist reaches its extreme in the Suleman Markhor (*Capra f. jerdoni*), which is found in the Suleman Mountains in the Trans-Indus District of the Punjab. The Markhor of the mountain ranges of Baluchistan, curiously enough, show two forms of horns—one, resembling the wide spanned Astor type and the other the Pirpinjal form with its more modified sweep.

The character of the country through which Markhor range varies greatly. The Sulemans and the hills of the North-West Frontier are covered with thorn and scrub and exposed to terrific heat in summer. There Markhor must live under very different conditions to those whose environment is the pine forests and snow bound scarps of the mountains of Kashmir. Markhor associate in small herds usually selecting the most broken and precipitous country. They do not like snow and seldom go higher than the snow line and, in winter, descend to comparatively low levels. Their sensitiveness to cold is attributed to the absence of under-fur or *pashm* with which the Ibex is so well provided. Unlike Ibex, which keep to the rugged ravines above the tree line, the Markhor delights in rocky forest and seeks concealment as much as possible. They are sometimes in large mixed herds but in summer the veterans generally live apart, alone, or four or five males together. The rut is said to take place in December in the Himalayas and in October and November with the straight horned races.

(To be continued).

# THE PRESERVATION OF WILD LIFE IN INDIA.

## No. 1. THE CENTRAL PROVINCES.

BY

A. A. DUNBAR-BRANDER.

*(Late Conservator of Forests, Central Provinces.)*

### *Game Country: Status and Jurisdiction.*

Good game tracts exist both in Indian State and in British India.

The British Government has no jurisdiction over the game in Indian States. Most of the Indian Princes protect game, and there is a growing tendency for this movement to spread and become more vigorous. In most States the laws or rules for the protection of wild animals are effectively enforced.

No more need be said about the States. With regard to British India, game is found in country having a different legal status, and this must be differentiated:—

- (a) Private land.
- (b) State land.

Generally speaking, game in (a) has no owner. It belongs neither to the owner of the land nor to the State. The Government, however, has the right to pass laws regulating the slaughter of game, and in most cases such laws have been passed. I shall refer to this in more detail when dealing with game laws.

With regard to State land the great bulk of which consists of Government forest, the State owns the game, and special laws dealing with its protection throughout India have been passed. These laws are administered by the Forest Department. I shall also refer to this in some detail later on.

### *Types of Game Country.*

There are four main types of country in which game is found and which I have designated as follows:—

- (1) Himalayan.
- (2) Terai.
- (3) Central Plateau.
- (4) Southern.

### *Position with regard to Protection in each Type.*

*Himalayan.*—The terrain in which the game is found is its chief protection. To destroy it entails arduous and whole-time

work, quite incompatible with any prospective profits to the poacher, and, save with regard to certain species which frequent the outer hills, no special measures are called for with regard to this tract.

*The Terai.*—Very much the same applies to the Terai, but for different causes. This tract of country extends from Dehra Dun along the Himalayan foothills eastward into Assam and thence southward towards the Bay of Bengal. In it the jungle and grasses are so dense that no serious slaughter of game can take place without the extensive use of elephants. These, of course, cannot be employed without sanction and regulation. The amount of game and species to be killed can, therefore, be regulated; game is holding its own and no special measures seem called for in this tract.

*The Central Plateau.*—This tract embraces the great mass of India and was at one time the finest shooting country and contained the finest fauna in the East. The forest is generally open and although often hilly the hills are no deterrent to a hunter. Unlike the other tracts, nature of the terrain in the Central Plateau is an inadequate protection. Further, the game-holding tracts are not only surrounded by a dense population, but a large interior population of aborigines exists inside the forest itself, to an extent not found in the other tracts. It is in this tract that the recent disappearance of game has been so lamentable and calls for the most urgent remedial measures.

I left India in 1922 but revisited it in 1928, and was appalled to find such a change in so short a period, quite common species being found only with difficulty. The finest game country in this tract is found in the Central Provinces, and I shall deal at some length with the causes which have brought about this state of affairs in that area, as I believe they have a very wide application.

*The Southern Type.*—As I do not know this country personally I write about it with some diffidence. I have, however, taken a very deep interest in all that pertains to game during my whole service in India, and I believe the following to be fundamentally true. The country is very mountainous and the cover is often dense: less mountainous, of course, than even the outer spurs of the Himalayas, and less dense than the Terai. Nevertheless the combination of these two factors in the same area makes the destruction of game by no means easy; and so far as I know the game is fairly well holding its own except in outlying portions.

#### *Position of Game on Private Lands.*

As already stated, the game in private lands has no owner. The State has passed laws prohibiting the killing of does and immature animals, sitting over water, and the use of various methods of destruction. To all intents and purposes the laws are a dead letter as there is no preventive staff. The two main preventive services in India are the Police and the Forest Service. The latter has no jurisdiction outside State forest, and the Police take no interest in enforcing the rules. Prosecutions are very rare, and any interest the local constable may take in the matter would

often be to share in the booty. The result is that game has almost disappeared from private lands. The main Bombay-Allahabad line runs through some 200 miles of antelope country. Twenty years ago one was almost constantly in sight of herds. In 1928 in four hours I only saw two small herds, watching from the train. The only fauna left in private lands is a few chital and sambhar in specially favoured localities, pig in considerable numbers, and a sprinkling of antelope, also lesser carnivora.

The great mass of the country, however, is blank and it will be readily understood that these blank unprotected spaces surrounding Government forest which contain game act as a constant drain on the stock of fauna in the protected lands: there is constant leakage to destruction. In my opinion nothing can save the fauna in these private lands. Its extermination is certain. The people have been educated to destroy it: there is no staff to protect it, and even if the Indian Legislatures could be induced to take measures, financial considerations preclude adequate protection.

#### *State Lands: Position of Game.*

These mostly consist of State forests where the Forest Act and the rules made thereunder apply; amongst these are included the rules regulating the killing of game. On the whole, these are excellent; and, although I shall suggest certain stiffening to meet modern conditions, nevertheless it is not in the rules themselves but in their application that failure arises. As regards the European and Indian sportsmen who enter the forest to shoot under permit, the rules are absolutely efficacious, and this type of sportsman does no harm. Where they fail is in the prevention of poaching. There is lucrative trade in game; the initial detection of poaching often rests with a lowly-paid forest guard. Men possessing guns often command respect, and the guard finds the easiest plan is to take a percentage of the profits. Moreover, special rewards, which the rules sanction in poaching cases, are far too sparingly given, and the magistrates' sentences are often quite inadequate.

#### *The Main Reasons why the Destruction of Game has Recently Increased.*

(1) During the war the rules were relaxed. In certain cases the shooting of does was permitted to make leather jackets for sailors. There was a general activity in the trade in the products of game: tanneries came into being, and what was previously an occasional trade has now become an active competitive one with wide ramifications: a slaughtered deer no longer means merely a gorge of meat for the local aborigines, it is an article of commerce and a valuable one.

(2) There has been a very large increase in the number of gun licences issued as well as a large increase in unlicensed or illegal guns. It is easy to see that with a large number of guns legally possessed, the detection of illegal guns becomes more difficult.

Be the causes what they may, the State forests are surrounded by guns, many of which are constantly used in destroying game both inside the forest and just outside it. In the present political situation any attempt to regulate the number of guns to actual requirements for crop-protection is hopeless. The guns have come, and to stay.

(3) *The Motor Car.*—This is perhaps the biggest factor of all, in the disappearance of game, although without the two previous causes its significance would be small. Since the war whole tracts have been opened up—in fact no tract is inviolate—cars penetrating along dirt tracks into country in one day which previously took a week's marching with camels and horses. Every car that moves by day or night has one or more guns in it, and practically every animal seen which presents a fair chance of being killed, without further questions asked, is fired at. Moreover, expeditions go out at night with strong moveable searchlights and shoot down whatever is encountered, and the car enables the booty to be removed. The destruction is terrible. I came across glaring cases during my short three months' trip in 1928. The present game laws were framed before this menace arose, and they require to be reviewed and amended in consequence.

#### *Some Remedial Measures Suggested.*

(1) An attempt to check the increase of guns, even reduce them.

(2) Much stricter control and regulation of tanneries and businesses trading in wild fauna and its products.

(3) Complete review of the rules so as to deal with the motor car amongst other things, and to bring the owner and the driver of any car within the penalties of law-breaking.

(4) Press for stiffer sentences in poaching cases and rewards to subordinates detecting the same. These rewards are at present optional, but should be made as a matter of course, save for definite reasons.

(5) Establishing associations for the protection of Wild Life and housing enlightened Indian opinion, and enlisting influential men as members of such Societies.

#### *Sanctuaries.*

As will be seen from what I have written above, the Himalayan and Terai areas are hardly suitable places, even if required, in which to create National Sanctuaries. With regard to the Central and Southern areas, the case is different. In these tracts they will form a useful and interesting purpose, especially in the former, where the fauna can be readily observed, will readily tame, and be a delight to visitors.

My knowledge of the Southern tract does not enable me to suggest any particular area, but as I know every square mile of the Central Provinces I can definitely assert that one area is suited *par excellence* for a National Park. This is known as the Banjar Valley Reserve.

*The Banjar Valley Reserve.*

*Situation.*—Situated in the South Mandla Forest Division, 30 miles south-east of Mandla, which is the District Head-quarters.

Mandla is almost 60 miles, due south of Jabalpur, and served by first-class road and light railway. There is a fair weather motor road from Mandla to Khana in the centre of the valley.

*Maps.*—Splendid forest maps on the 4 inch to 1 mile scale made by the Forest Survey can be got from the Map Office, Dehra Dun. These show 25 feet contours, and, if desired, maps showing grass-lands, sal forest and mixed forests (Stock Maps) can be purchased.

*Area.*—From memory the area is about 40,000 acres, but for the purposes of a National Sanctuary some 30,000 additional and adjoining acres should be included. The Banjar Valley is merely a name given to a forest unit.

*General Description.*—Broadly speaking the area is a huge amphitheatre surrounded in a circular manner by a range of hills about 3,000 feet high. The bulk of the area is within these hills, but the forest extends down the outward slopes of the hills until the cultivated plains are reached. It is well watered throughout, but this of course could be improved, especially on the hill-tops.

The low-lying portions consist of grass maidans or open plains, young trees being cut back annually by frost. As soon as the contour above the frost level is reached pure Sal (*Shorea robusta*) forest is found. This, however, only extends a short way up the hillsides, where it gives place to the usual mixed forest of 200 or 300 species and bamboos. The rock and soil are metamorphic sand with occasional pockets of black cotton soil.

*The Game.*—In 1900 this tract contained as much game as any tract I ever saw in the best parts of Africa in 1908. I have seen 1,500 head consisting of 11 species in an evening's stroll. It is nothing like that now, but it is still probably true to say that it contains more numbers and more species than any other tract of its size in the whole of Asia.

*Banjar Valley.*

*Game.*—The following species are found in many numbers:

|              |                  |           |           |
|--------------|------------------|-----------|-----------|
| Bison        | common           | Nilgai    | scattered |
| Swamp deer   | common           | Bear      | common    |
| Sambhar      | common           | Tiger     | common    |
| Chital       | common           | Leopard   | common    |
| Barking deer | common           | Wild dog  | common    |
| Four-horned  |                  | Hyaena    | a few     |
| antelope     | common           | Jackal    | common    |
| Mouse deer   | common           | Fox       | a few     |
|              | (not often seen) | Porcupine | common    |
| Black buck   | two good herds   | Pig       | common    |

and a mass of small rodents and carnivora as well as Langur monkeys.

Chinkara are found on the outliers outside the reserve but rarely.

It will thus be seen that the tract contains all the game animals of the plains of India except chinkara, elephant, buffalo, lion. In 1900 elephants and buffaloes were regular rain visitors. The latter would probably return if given encouragement.

#### *Legal Position.*

This area is one of the oldest State reserves and belongs to Government. It contains valuable timber and is policed and administered by the Forest Department. Government would not care to give up working the valuable timber in the area, but this need not interfere with the Sanctuary.

It is essential that the area remain State Forest, otherwise the Forest Act would not apply. Also it is absolutely essential for our purposes that the Act should continue to apply. Some form of 'dedication' could no doubt adjust this as there is no incompatibility.

If the Act applies, as it must, and if the Forest Department continues to manage the Forest (timber), as it will, it is clear that our staff must be also the Forest Staff. Otherwise there will be two staffs in the same area, and one will be in opposition to the other. Moreover, the Forest Department has managed the game in India, against great difficulty, with signal success in most cases, and to deprive them of these functions would create resentment, especially, unless it could be shown to be reasonable and necessary.

#### *Banjar Valley.*

The shooting of game is strictly regulated, but a tremendous lot of poaching takes place. Part of it is always sanctuary, but these sanctuaries which are found in numbers in all districts are merely administrative shooting sanctuaries, resting blocks, pending opening to shooting again. They have nothing like the status of a National Sanctuary.

#### *Some Suggestions.*

The local Government might agree to the area being declared a National Sanctuary but would, I consider, be more inclined to give the proposal favourable consideration if it was initiated by Indian gentlemen. It might, therefore, be the best course to first obtain the support of the non-official members of the Legislative Council and it is believed that the conservation of Indian wild life for the benefit of the Indian People is a plea which no party can lightly thrust aside.

#### *Conclusion.*

I consider that action in India is urgently required, perhaps more so than in Africa. There are I know questions of detail which apply to particular areas and particular species which I have not touched upon but in the above I have attempted to tell you something about India as a whole, and in particular what definite action that might be taken in the Central Provinces.

## No. 2. THE BOMBAY PRESIDENCY.

BY

G. MONTEATH, I.C.S.

It is five years since I left India, and a good many more since I was last in some of the Forest districts in which I have served. Those that I knew are all, with the exception of Thana, in the Central and Southern Divisions of the Presidency. Sind and Guzerat; Surat, the Panch Mahals, and the Dangs are 'terra incognita'. Anything I say therefore is subject to the qualification that my personal knowledge of conditions is limited to certain districts, and my experience hardly up to date.

In some Forest districts a heavy decrease in the numbers of certain species—those that afford, in addition to the sport of hunting them, desirable trophies—had taken place before the question of protection began to be considered seriously and rules were made under the Forest Act to impose some limit on killing. It must be admitted that up to that time—that is till after the beginning of this century—the main agent of destruction was the 'European' sportsman, to give him the title established by long usage in India. Neither the indigenous 'shikari' nor the wild dog—two kinds of 'poacher' frequently accused—can properly be blamed for it.

To take the villager first—his share of the damage done in the past in this part of India, where, as far as I have been able to find out, he has had no inducement of profit worth considering, is negligible, and his present activities hardly make enough impression by themselves to counterbalance the natural increase of the species he is generally concerned with. His usual method of hunting—a long and wearisome, and more often than not fruitless, watch by night, whether lawfully in his field or unlawfully and surreptitiously over water or a game-path in the adjoining forest—practically precludes such a result. He is little, if at all, more efficiently armed, and it is scarcely to be supposed that he is a better marksman or sees better at night, than his predecessors—most of whom, as Forsyth says, were bunglers at this kind of work. When a number of villagers combine, as they sometimes do—most often in my experience in the Kanara district—with nets or dogs or both, they may do a little better, but even these hunts are not on the whole, I think, much more productive of result than the solitary watch. The fact that they are illegal makes it necessary to keep them as dark as possible, and since they cannot be conducted without numbers and some noise, secrecy—unless there is connivance on the part of local subordinate officials—is not altogether easy. They do not therefore take place very often, and when they do the total result after a good deal of work, involving much careful preliminary investigation and placing of nets, hardly, according to my observation, warrants the conclusion that this kind of hunting causes any real decrease in the numbers of the species that is their main object—

in the Kanara district for our purposes cheetal, which seldom go far from the comparatively easily worked forests adjoining village sites. I say 'for our purposes' because I am dealing just now with forest species that are in need of protection. Pig of course are hunted too—pig and cheetal are the two kinds of forest dwellers that do most of the trespassing on cultivation that villagers complain about—but pig are prolific and in no need of protection—in Kanara perhaps rather the contrary. Cheetal also, if considerably less prolific, have still a natural rate of increase that would more than counterbalance the occasional killing of a few of them by villagers, as long as this was all they had to fear. Provided that due care and discrimination are exercised in the matter of gun licences for crop protection, there is not very much danger that the occasional unlawful use of a gun will do more harm than it has done in the past, and the evidence seems to show that this has been inconsiderable. In fact, if the grant of licences for smooth-bore guns—which are all that is needed for protection of crops, and all that villagers usually want (most often single-barelled ones and nearly always muzzle-loaders, for financial reasons)—is proportioned to the area of cultivation (and of course conditioned by the respectability of the individuals concerned), inhabitants of forest villages will do very well, other things being equal, if they hold their own against deer and pig. If sometimes for the sake of meat one or another of them sits up with his gun in a forest, or a number of the 'lads of the village' combine for a hunt with nets and spears (in this case usually their only armament, for guns are noisy and likely to be more dangerous to hunters than hunted) and they happen to be caught at it, I should be inclined to be lenient with them. After all it is arguable that the motive is as good a one as the desire for a trophy, which if the animal shot is a large one—say a bison—often involves, in Kanara at any rate, almost entire waste of the carcase.

#### *Trade in hides and horns.*

If there was money in it for the villagers, illicit hunting in Forest districts might be a more serious matter, but I never found much evidence of that kind of inducement. No doubt there has always been some illegal trade in 'Forest produce'—horns, hides, or meat for the purposes of this article—and no doubt it continues. Sambur leather I know is exported to England, but I do not think much, if any, of it comes from our part of India. I could never in fact discover that there was enough of this kind of trade in the districts I knew to matter very much—unlike some Provinces, to judge by what I have heard and read—or that most of what there was was done through the agency, or to the pecuniary advantage, of Forest villagers.

#### *Protective Legislation.*

However, such trade is admittedly illegal, and under modern conditions could increase very considerably in the absence of more

effectual obstruction than seems to be possible at present, owing, I gather, to the interpretation so far allowed of the words 'Forest produce', which makes it incumbent on the prosecution to prove that any animal that is the subject of a case was actually killed in Government Forest. Certain animals are forest-dwellers wherever they may happen to be at the moment they are killed. It is not in this context the killing that is the offence, but commerce in certain kinds of 'Forest produce', an offence which by its nature is, in part at any rate, committed outside Forest limits. The contention that the particular animal in question was killed elsewhere than in Government Forest ought not in fact to be relevant. At least the burden of proving it should be on the defence (though I doubt whether that would get us much further). If an amendment of the definition is likely to be of use it would probably be easy to make it, but I think myself that what is wanted is legislation of a wider scope, to include animals that are normally found in non-forest country, for at the present time they are in a more parlous state than the others.

I said that up to date there was not much of this kind of trade in the Bombay Presidency, or rather that I had not seen much evidence of it up to the time when I left India. It has been a problem however in some other Provinces. I read for instance not long ago in the '*Field*' that in Assam similar difficulty of proving locality had been an obstacle in the way of effective protection of rhinoceros, for which there are sanctuaries. Under the conditions of today the question is quite likely to become a good deal more serious here than it is as yet, and steps ought to be taken in time—our present 'hunting and shooting' rules were made almost too late for some districts, and altogether too late to save certain species in them. It is not the local villager but a different kind of 'poacher' that we shall have to look out for, and it is I think about time to get ready for him. I will come back to him later.

#### *Predatory Animals.*

Before I go on I had better dispose as well as I can of the case against the wild dog, a very interesting creature with a bad name, for he shares in some degree with the inhabitants of villages in or adjacent to forest the odium of causing game to disappear faster than it can breed. There is a good deal of misapprehension about the actual amount of damage done by wild dogs, based partly on the impression they give of being much more numerous than they really are, and partly on the natural exasperation and prejudice caused by the fact that when the visit of a troop synchronises with that of a sportsman to a particular bit of jungle they undoubtedly often spoil the latter's chances, since the game is for the time being more or less disturbed, and the local tiger, finding his hunting interfered with, moves off. But a troop seldom remains in one place more than a few days. It makes its kill—with luck perhaps a second kill—and departs, and is seen again perhaps twenty miles away, creating the illusion that there are twice as many wild dogs in that area of forest as

there really are. The game settles down again, the tiger returns, and the *status quo* is restored as soon as the dogs disappear, and it is a fact to be noticed that their most regular visits are to those places in which deer—their usual quarry—continue to be numerous.

Predatory wild animals do not, till man intervenes, increase out of proportion to their food-supply. Another thing to be borne in mind is the wild dog's method of hunting, which, like that of his co-accused the local villager, seems to me to settle the contention that he does enough damage to justify his proscription. The whole troop of dogs hunts one animal—most often a female or a young one—and sticks to the line (a pack of hounds might learn a lot from them) till that animal is run into, which may take half a day or longer. And a fair-sized troop hardly eats as much at a meal, so far as I have been able to observe, as one able-bodied tiger. I would do away with the price put on the wild dog's head—it is unnecessary for one thing, and for another I have never known it claimed. Instances could be given in support of what I have said, but this article is likely to be long enough without them.

I have argued this subject with Forest officers, some of whom were disinclined to agree, but it seemed to me that they had not thought much about it. I used myself to accept what was told me about the '*jugli kutta*' but long ago came to the conclusion that most of it was, to say the least, exaggerated. Certain Forest officers however of great experience did agree with the views I have just put forward—there is no harm in mentioning here that one of them is Mr. T. R. Bell, Late Chief Conservator of Forests, Bombay Presidency.

#### *Local Conditions.*

Some of the old books about 'Wild Sports' in India—classics of their kind—show how little the keen sportsman in the past, District officer, or soldier, or whatever his vocation might be, thought in the midst of comparative abundance about the future, and that the idea of protection of any kind—even of a close season other than what might be enforced by the season of the year—hardly occurred to him. Too often, as in Africa, he slew while he had the opportunity and spared not—(only in India we have not had the professional hunter). Even in Forsyth's time the result was beginning to be apparent, for 'now-a-days' he complains (writing of bison in Nimar as far as I remember—I am quoting from memory) 'a keen and active sportsman on a fortnight's leave would be lucky if he kept up his average for that period to one bison a day'. Fourteen in a fortnight—a poor bag! I do not know whether there are any bison left now in the Khandwa district—there are none in that part of Khandesh which adjoins it.

The aggregate of execution done in any area depended naturally on its accessibility from large cities, cantonments, or railway centres—in other words on the number of sportsmen that would visit it in a year. We have a good enough example in the Bombay

Presidency in a comparison of the state of things in North Kanara with that in Thana at the time when rules and a system of licensing were first put into force. In the latter district when I left it bison survived only in a small herd in one part of the forests, and today I am told are extinct: sambur were scarce: cheetal though pretty widely distributed were in small and scattered herds (and I need hardly say that their size generally indicates fairly well whether species that habitually go in herds are plentiful or not): the usually harmless bear, which, like bison, had been not uncommon twenty or thirty years previously, had disappeared altogether. Most parts of Thana, with its two main lines of railway and a sufficiency of tolerable roads, were easy enough of access in pre-motor days from Bombay, Poona, or one of the two or three hot-weather resorts on its borders, to make it worth while for any one with a taste for 'shikar' and only two or three days—say a week-end—to spare, to spend them on a shikar expedition in the Thana district. Kanara was a different proposition. Even after completion of the Southern Maratha Railway it took a good deal of time to get to Kanara for any one not resident in one of the adjoining districts, so that considerable preparation and 'bandobast' were necessary. Short expeditions repeated at more or less frequent intervals were consequently for most people out of the question. So when 'rules and regulations to govern hunting and shooting' were made there was still in Kanara plenty of game of all the species indigenous to it. It can hardly be argued that the local 'poacher' was so much less efficient in Kanara than in Thana as to account for the difference between the two districts, and the conclusion seems to be obvious.

*Local Regulations: (1) Southern Circle.*

The regulations in force in the Southern Forest Circle are in one main respect different from those governing the forest areas of the rest of the Presidency, in that the former include, and are in fact based on, the Central Provinces 'block' system. Mr. Bell and I drew them up in consultation, and they were sanctioned in the face of some opposition on the part of more than one Divisional Forest Officer, but I think Forest Officers in the Southern Circle would be sorry now to see the present system done away with and the old one reverted to. Elsewhere the views of those consulted prevailed, namely that the existing rules were good enough and the 'block' system was unnecessary and not easily workable in their circles.

That the present state of things in the Southern Circle forest areas is on the whole, as I think it is, satisfactory, is attributable mainly or very largely to the fact that the 'block' system and attendant rules were introduced in good time, that is before the general use of motor transport had begun to make many parts of North Kanara so much more accessible than they were in former days. The restrictions imposed by the old rules—consisting of little more than the necessity, for the purpose of shooting in Government forests, of buying a licence available for a year, and

a limit of the number of head of certain species that might be shot by an individual licensee—would hardly have been enough by themselves to counteract the effect of a much greater annual influx of sportsmen, with the inveterate tendency of the majority to follow one another into well known and favoured localities. The system now in force seems to provide as adequately as any set of regulations can against overshooting of those parts of the Southern Circle forests to which it applies by means of a three-fold check. First the ordinary form of licence, that for a block, is valid for a certain period, during which the licensee has a virtual monopoly of that block. Secondly, there is the definite limit to the number of certain species that may be shot in a year by one licensee. The third and perhaps most important check is the limit to the number that may be shot in one block—it varies of course according to conditions, but when the number fixed for any block is reached in respect of a particular species no more of that species may be shot there for the rest of the year. These provisions seem sufficient to counteract over-shooting on licence. Obviously their effectiveness depends a good deal on co-operation on the part of sportsmen, for instance by reporting any cases noticed of unauthorised shooting or other breaches of the law and by furnishing correct returns of their own 'bag'. Such co-operation though occasionally an individual may be neglectful about his return, can for the most part be counted on.

All this has so far worked very successfully. The additional provision, by which certain blocks may be closed altogether to shooting for a series of years in a rotation which depends on the responsible Forest officer's observation of the stock of game completes the general measures for protection in the Southern Circle. In the result the position there seems, as I have said, to be on the whole satisfactory. Bison are apparently safe enough—they have nothing much to fear except rinderpest, and although at intervals they have suffered rather heavily from that, the intervals have been fairly long ones, and their numbers have been made up again, with the assistance of judicious closure, more rapidly than might have been expected. Sambur and cheetal are in little danger from the licensed sportsman, the indigenous shikari, or their natural four-footed enemies. I particularise these species because of forest species in the Bombay Presidency it seems to be they that chiefly require protection. Others are either not much sought after or are pretty well able to look after themselves, although I should like to put in a word for that interesting character the bear. I do not know that many bears are shot in the Southern Circle, perhaps not enough to warrant a limit being placed on the number assigned to a licence, but it is to be remembered that they were once fairly numerous in Thana and have disappeared from that district. They are nervous creatures and apt to be hasty in action if startled, but generally speaking do no harm. It is a suggestion which I put forward for what it may be worth. About elephants I do not feel myself qualified to make any suggestion at all. At present I believe there is *carte blanche* to shoot them, owing to their destructiveness to crops, a proposal to

institute 'Kheddahs' or adopt some other means of capture having come to nothing. But it is likely that their case will sooner or later call for reconsideration. I do not believe that the total extent of their depredations is great, though of course that is no consolation to the individuals whose crops may happen to find favour with a herd.

It is unnecessary to go further into details in regard to the Southern Circle regulations, and in fact, though I helped to draw them up, my recollection of details is not very definite; but there is just one rule in which I should like to see an alteration made, namely that which lays down a fine for the killing by a licensee of a female of any of certain species. In practice, as far as I remember, the maximum fine was more often than not exacted in such cases. It is an irritating rule, and unnecessary in my opinion. Nobody shoots a female on purpose, and with species that ordinarily go about in herds marriageable females predominate so much over mature males that the occasional accidental killing of one of the former does no harm—it may indeed be beneficial, since the female killed in mistake for a male (it is most often a bison) is likely to be pretty well on in years. It seems unfair that an error of judgment that is practically innocuous and usually made known by the licensee's own report of it should involve a penalty—the maximum fine in many, if not most, cases—while the offence of unlicensed shooting goes so often unpunished because it cannot be brought home to the offender. It might very well be laid down that if a female of one of the 'scheduled' species is shot by a licensed sportsman and the fact duly reported, it should count as one of the number allowed by the licence. Such a provision would do no harm at all, and the sportsman would probably be more cautious in future about believing what his orderly or shikari told him.

## (2) Northern Circle.

So much for the Southern Circle. The position, as was said above, is less satisfactory elsewhere. What it was like in Thana when I left that district—rather a long time ago—I have roughly indicated, and one can hardly suppose it has improved, regulations notwithstanding. Khandesh—or East Khandesh, the part I knew—was better off. The bison had gone, but there were plenty of sambur and, in practically the only locality in the district in which they are now found, there was a pretty good stock of cheetal. I believe at one time, not very long before I came to Khandesh, these had diminished considerably in numbers from over-shooting, but owing to measures taken by Mr. Simcox—a short open season, a limit of one head per licence, and the prohibition of any form of hunting other than stalking on foot, or, more accurately, 'still-hunting'—they recovered rapidly, and in a few years were again numerous. But I doubt whether measures that were ample for their purpose when horse-back, or that instrument of torture the Khandeshi 'chakra', was the sportsman's ordinary method of getting to his destination will be enough by themselves

to prevent over-shooting in the future, now that it is easy to reach the chosen spot by motor car. It will probably be found necessary sooner or later here as in the Southern Circle to limit the total number of head that may be shot during the year, and the only way of enforcing such a limit seems to be the way in which it is done there. I have never been able to see any difficulty in using the same system that has proved its value in one part of the Presidency in any other district of it in which there is enough forest, and *ex hypothesi* enough forest fauna, to make rules of any kind for protection worth while at all. If the 'block' system can be worked in Khandwa it can equally well be worked in Khandesh, and unless it is introduced in Thana I doubt if effective protection is possible there. It may be admitted freely that the well-armed sportsman of today, 'European' or Indian, is usually, apart from legal restrictions, more moderate of his own accord than his predecessor, and that his presence is of definite assistance to the Forest officer in the latter's role of game-keeper. Nevertheless, whatever limits are laid down for the individual, their object is pretty certain to be defeated in the end by any considerable increase of the numbers that visit a given area, if there is no further check. It has proved to be the case elsewhere. If the Thana forests—to take that district alone—were divided up like those of Kanara it should be possible even now to increase the head of sambur and cheetal (bison I am afraid are past praying for) by systematic closure of a certain number of blocks in rotation, for as long in each case as the results observed from year to year showed to be necessary, the areas open to shooting having of course each its own annual limit as in the Southern Circle. An obvious advantage of the system over the old one is appreciable simplification for the already hard-worked Forest officials of the task of supervision.

With districts in the Northern Division other than Thana I have no acquaintance, but my impression is that they are not now-a-days much visited by non-resident sportsmen except for small game shooting. The existing rules may be enough in their case for the time being, but if at any future date the forest areas of these districts came more into favour with the seeker after larger game it would no doubt be well to make the changes just advocated for Thana and Khandesh.

#### *Sanctuaries.*

To sum up, the system of licensing that is in force in the Southern Circle having so far proved on the whole adequate there for its purpose, its extension to other parts of the Presidency where there are considerable tracts of forest in fairly regular request for shooting seems desirable. In fact I can see no other means at present available by which the gradual disappearance of the species most generally sought after may possibly be stayed, or the stock increased. Nor can I think of any further measures in supplement that would be feasible. The establishment, for instance, of sanctuaries on the lines of the African Game Reserves

(but of necessity on a smaller scale), which I have seen advocated for some parts of India, and which may (though I doubt it) be a practical proposition for them, is manifestly out of the question for Bombay, and likely to be so for a long time to come. Expenditure on a special establishment to look after them could never be justified, and the burden of supervising much larger areas closed to shooting, which would consequently fall on the Forest staff, would be made no lighter for them—rather the contrary—by the absence as a matter of course of licensed sportsmen. Sanctuaries indeed other than those of manageable size provided under the rules by temporary closures of blocks, plus such natural ones as still exist in parts of different districts by reason of inaccessibility combined with climate, might very well in the end prove to be no sanctuaries at all.

#### *Wild Animals in Non-Forest Areas.*

If it may be granted that in some of the districts that have considerable areas of forest the state of the native fauna is not unsatisfactory, and in others of them is still capable of improvement, it is very different in the non-forest parts of the Presidency, that is of course in much the greater part of it. Antelope and gazelle (blackbuck and chinkara) when I left India had begun to disappear from many places where they used to be numerous, and doubtless the process continues. Here again local 'poachers' may be acquitted of blame, if one can call 'local' the peripatetic sort—Pardi, Haran-Shikari, or whatever his label. The ordinary villager seldom bothered his head about blackbuck, further than to scare them away from his crops. The others, from time immemorial, have wandered from one place to another—a gang of them does not want to camp long anywhere, and could not if it would, for they are 'criminal tribes' and the Police see to it that they move on. Their numbers are not large, and their painstaking method of snaring their quarry never produced results worth considering. They may do better with partridges and quail, or hares—I am inclined to think they do—but on the whole they can be counted out. Nor for that matter did the toll taken by the sportsman in the past affect perceptibly the stock of these species—blackbuck quickly learnt to adapt themselves to the range of improved weapons, and the chinkara is seldom an easy mark.

The extension of motor transport and the greatly increased number of licences for rifles are what has made the difference. The modern high-velocity magazine rifle of foreign make is cheap enough to be bought, even new, by many who could not have afforded the shorter-ranging express, and motor cars or cycles can go almost anywhere. Obviously any one who can own or part-own some kind of motor vehicle can also pay for a rifle—new or second-hand. He can often do so when he can only afford to travel by public conveyance.

#### *Protection in Non-Forest Areas.*

The difficulty of dealing with this comparatively recent departure is plain, and I must confess I can see no very efficacious way of

doing it. Certain measures can of course, and should, be taken, but it is one thing to prescribe rules and penalties, and another to secure their operation, with no particular agency for the most part to rely on. Still, the knowledge that they exist might count for something.

So far little or nothing seems to have been done to limit killing of the species I am now considering. Yet they are clearly no less property of the State than the forest-dwelling species to protect which elaborate regulations are in force. The State is—in theory at least—the owner of all land in a rayatwari Province, with unimportant exceptions, and, as a corollary, of all game to be found on it. If indiscriminate slaughter of game animals elsewhere than in Government forests cannot be stopped altogether—and doubtless it cannot—yet it is time and more than time for some attempt to be made to delay its progress by rendering certain acts illegal.

A licence for the possession of a rifle can be granted for the purpose of self-protection, of crop-protection, or of sport, for all three purposes, or for any two of them. For self-protection a rifle is with rare exceptions unnecessary and unsuitable, and for crop-protection smooth-bore guns are the most that is needed. Remains sport. In the first place, then, when that is the ostensible object, the licence should prescribe certain definite restrictions on the species of game, and the number of each, allowed to the holder during the period for which it is available. The fee for it should be raised to an amount sufficient to emphasise its dual character—fire-arm and game licence: it should apply only to non-forest lands in the district for which it is issued, all fodder reserves or 'Kurans', whether in charge of Forest or of Revenue officials, being excluded: and the species allowed should be only those usually or frequently found outside the main forest tracts—in this Presidency blackbuck and chinkara, but not cheetal. Further, the licensee should be required, like the holder of a licence issued under the Forest Act, to furnish a return of what he has shot within the period of his licence. Such returns, on which very little reliance could be placed,—but they should be required all the same—could be rendered most conveniently perhaps to the Mamlatdars of the licensee's 'home' talukas.

So much for the licence to own a rifle (or gun) for sport, and the conditions to which it should be subject. The next thing to consider is the motor—privately owned, or public conveyance. It should be definitely forbidden, under pain of an adequate fine, to shoot from, or from the cover of, any kind of motor vehicle, and more especially to shoot by the aid of motor head-lights. I believe this prohibition already obtains in forest areas. The provision that no shooting at all should be allowed from or within a certain distance of a highway should be added in supplement, but it must be admitted that in any case, since cars can be—and are—taken over the roughest tracks across country, it would in practice be chiefly the users of public conveyances that these prohibitions would affect. Still, that would be something.

The last measure of those that I can think of is that to which I referred further back. The sale and purchase of meat or trophies

of any kind of game animal, and not only such as can be brought within the definition of 'Forest produce', should be made illegal, and the penalty should be heavy enough to make both buyer and seller cautious. It goes without saying that the bribery of subordinate officials, by the present for instance of part of the meat of an animal shot, is 'illegal gratification', and it is equally clear that it is an offence nearly impossible to detect:—information offered by a jealous rival is about the only means by which it is ever brought to light.

### *The Motoring Poacher.*

It was in this context that I mentioned that it was time to get ready for another kind of 'poacher'—one very different from and a good deal more efficient than the resident variety—and this brings me back to the forests, where he has already arrived, though he has not as yet perhaps done very much execution on the whole. The opening up by means of roads for the exploitation of timber of more and more of the high forest areas puts more and more places that were previously hardly accessible within reach of the man who can command the use of a motor car. So far not much advantage seems to have been taken by the unlicensed shikari of roads other than the main Public Works routes that run through forest land, and little damage has been done to species other than cheetal—the most 'get-at-able' for the motoring 'poacher'—but quite sufficient, I am told, to them in some places to give reason for anxiety. If he widens his sphere of operations by taking to Forest roads other species may suffer, but it should be easier to obstruct him here than on the public routes—he will be more noticeable and less mobile, and there is greater likelihood of his falling in with some of the Forest Staff. On the main roads I think the most that Forest officers can generally do is to keep these gentry moving, but the illegality of shooting without licence should be emphasised by adequate punishment of the offender when he does happen to be brought to book—including attachment of his gun or rifle, which may be unlicensed, or if licensed has probably been brought outside the district for which it is licensed. Ordinarily of course a licence to possess a rifle—or even gun—for sport should not be valid beyond the boundaries of the district in which it is sanctioned.

If distance and the offender's mobility combine to render the already hard-worked Forest official's task difficult in this respect by day, at night it will still more seldom be possible to catch the poacher in the act of poaching—he can get away too quickly. The most that can be done is to watch likely places for him at occasional and irregular intervals—a constant or regular patrol is out of the question—and trust that the knowledge that he may be looked out for, and if caught will be severely punished, will impair the accuracy of his aim. It must always be remembered that this sort of duty is not only arduous and discouraging in its results, but may at times be dangerous. It is a good deal to ask of a lonely Forest Guard that he should outbluff an armed and probably truculent man—perhaps two or three men—and he may well be excused if he sometimes looks the other way.

*Agencies for the Protection of Wild Animals.*

If things are thus difficult for the Forest staff in their domain it is clear that the Police—the only agency to all intents that we have in the very much larger non-forest areas—cannot be expected to do much in the way of enforcing the measures I have suggested. Inspection of fire-arms licences comes within the scope of their duties under the Arms Act, and that is almost all they can do. If a constable witnesses or is told of a breach of any of the rules—supposing that something like what I have indicated is done—he will, it may be hoped, report it, and the charge against the offender may be substantiated, but evasion is likely to be easy. The Police have too much to do otherwise for it to be possible to put any of them on special duty as gamekeepers. Local public opinion, what there is of it, will probably be on the side of the offender rather than of the law. If there were large zamindaris in this part of India the problem would be easier, for some measure of non-official assistance could then be looked for, and perhaps local associations formed, as I believe has been done elsewhere, but in a rayatwari Province very little of that sort of thing is possible. Neighbouring Rulers of States can no doubt be counted on to set an example, and jagirdars whose holdings are large enough to provide some measure of harbourage would in most cases be willing to co-operate to the best of their ability. For the rest, we shall probably have to wait till educated opinion—likely, one may hope, to be sympathetic but for the most part concentrated in the cities and towns—begins to influence the country-districts. By that time, it is to be feared, the herds of blackbuck and chinkara will have vanished from many places where they used to be a frequent and most pleasing sight.

However, the difficulty of enforcing measures is no argument against their being taken, if there is agreement about the object.

These species will not have been exterminated of course. Blackbuck when hard enough pressed take to the forests, and chinkara are always partly forest-dwellers, being found when undisturbed mostly on the border-line. In forest limits both can, like other species, find present sanctuary, and perhaps indulge the hope of returning some day to their old haunts. I said further back that the formation of larger sanctuaries than what the Forest Game laws afford, to be looked after by a special department, were out of the question in Bombay for financial reasons. I add here my definite opinion that for forest areas they are also unnecessary. The officers concerned have managed the laws for the protection of game in their own sphere of authority efficiently, and can be trusted to do so in the future, so long as their discretion is not unduly interfered with. The example of Africa, sometimes cited, is clearly no precedent for India—I need hardly set forth the reasons, for that would be to elucidate the obvious. The motor car is likely, it is true, to be an increasing embarrassment, but a special Game Department would be, as far as I can see, in no better case

than the Forest staff for dealing with it. However, I am wandering into an academic discussion—a Game Department is anyhow not a practical proposition for Bombay.

If any rules and prohibitions on the lines of what I have suggested have been enacted already, or are in contemplation, I am sorry for my superfluousness, and can only plead that it is five years since I left India, and that I should have been glad if some one with up-to-date knowledge had been induced to write this article, instead of me. If not, I need only say that except on some such basis I can see no way of reducing even to a slight extent the super-abundance of fire-arm—and especially rifle—licences, or dealing with that infernal invention—how happy we were, game included, without it!—the motor car, and not even a distant hope of restoring to the country-side one of its most characteristic ornaments—blackbuck feeding confidently within view of the highway.

*(To be continued.)*



Photo by

F. W. Bond.

The Himalayan Thar (*Hemitragus jemlaicus* H. Smith).

(Height at shoulder 36-40 in.).

THE HIMALAYAN TAHR (*HEMITRAGUS JEMLAHICUS*.  
H. SM.).

The Tahr does not compare well with his big-horned relatives the Ibex and Markhor. It is a wild goat with a finely formed head, narrow erect ears, a heavy body and long robust limbs. A well grown male stands from 36-40 in. at the shoulder and scales near 200 lbs. While the hair on the Tahr's head and face is short its body is covered with tangled masses of coarse, flowing hair. It grows longest on the neck and shoulders where it develops into a mane which sweeps down to the knees. An old buck poised on some precipitous cliff presents a grand picture. The colouring is very variable. Generally it is a deep reddish brown and there is a dark dorsal streak—not always distinct. Old males are darker, particularly about the back and quarters. Ewes and young males are lighter brown; kids much paler.

The horns are short and close set. They are stout at the base, keeled in front and wrinkled, except towards the tips. They curve backwards and in old bucks continue downwards. They are about 15 in. in length with a circumference of 10-11 in. at the base. The record measures  $16\frac{1}{2}$  with a girth of  $10\frac{1}{2}$ . Females are smaller in build. Their horns are diminutive. They are easily recognised by their lighter colouring and less shaggy coats.

Tahr live in a precipitous terrain of towering cliffs, rock and forest. Because of the difficult country they inhabit, it is said that few Himalayan game animals so tax the skill and endurance of the hunter.

About March and April before the snows have melted, Tahr crowd into the bottoms of the valleys. In summer, the older males herd together or live singly. They frequent the densest undergrowth and the most precipitous cliffs. They rejoin the females in late September or October. During the rutting season the males are always fighting and many are said to be killed by falling down the crags.

Tahr feed in grassy spots among rocks. If alarmed they go off with great speed and clatter but soon halt and turn to stare at the intruder. They generally follow the guidance of an old male and seek security in the almost perpendicular precipices. Their sense of sight and smell are both keenly developed. The range of the Tahr includes the Himalayas from Kashmir to Bhutan but does not extend to the northern side of the Vale of Kashmir. Tahr are common on the southern slopes of the Himalayas but do not occur on the Tibetan side of the range.

THE NILGIRI TAHR (*HEMITRAGUS HYLOCRIUS* BLYTH).

Frequently misnamed the Nilgiri Ibex, the Nilgiri Tahr is a near relative of the Himalayan species. It is slightly larger than the Himalayan Tahr, standing 39-42 in. at the shoulder. Its short crisp coat, the rounded outer surface of its horns and the presence of only a single pair of teats are other distinguishing characters.

The general colour of the animal is a dark yellowish brown, paler on the undersurface. Does and young bucks are grey. With age the bucks get a very deep brown—almost black coat with a distinctive light 'saddle' patch on the loins. From a distance the saddle looks almost white. In build bucks are far heavier and stotkier than the does.

The horns, almost in contact at the base, rise parallel for some length then diverge and curve downwards in a bold sweep. They are deeply wrinkled. The knotted keel in front, so distinctive in the horns of the Himalayan Tahr, is absent. The record buck horns measure  $17\frac{1}{2}$  with a girth of  $9\frac{1}{4}$  in. The record doe 14 in. Nilgiri heads are small in comparison to those found in the more southerly ranges.

Nilgiri Tahr live on the open cliffs and when alarmed take shelter on the precipitous slopes. They feed in flocks on the grassy downs which top the summits, grazing in the early morning or late afternoon and resting during the hot hours of the day. One or more does stand sentinel over the resting herd. While exceedingly watchful against any danger approaching from below, they are frequently outwitted by the enemy from above. Panthers levy the heaviest toll on the herds.

During the south-west monsoon Tahr generally move down to lower elevations. Old bucks desert the herds during the hot weather and, more often than not, are found solitary. Tahr sometimes have two young but one is more usual. The kids are dropped most commonly during the hot weather.

The isolated distribution of this wild goat so far south of the usual range is interesting and is taken to indicate the existence at some remote epoch of the earth's history of conditions which enabled Tahr to inhabit the country now lying between the Himalayas and the Nilgiris.

Strict preservation has saved the Tahr from extermination in the Nilgiris. From these hills its range extends to the Anamallais and thence southwards along the Western Ghats.



Photo by

Salem A. Ali.

The Nilgiri Thar (*Hemitragus hylocrius* Blyth).

(Height at shoulder 39-42 in.).

Sub-Family III. *Rupicaprinae*: GOAT-ANTELOPES.

## Serow, Goral and Takin.

The Goat-Antelopes are said to hold an intermediate position between the Goats and that heterogeneous assemblage of animals collectively known as 'Antelopes'. All of them are mountain animals. Most have a more or less goat-like build, goat-like teeth and short tails. Relatively small cylindrical horns are present in both sexes.

Serow, Goral and Takin belong to this group. It also includes the Chamois (*Rupicapra*), the type which gives its name to the group, and the Rocky Mountain Goat of North America.

Serow and Goral have distinctive conical horns. They curve backwards and have not the terminal hook seen in the straight horns of the Chamois. Though there is a superficial resemblance between them, Serow and Goral differ much in the structure of the skull. Further, unlike Goral, Serow have well-developed face glands which rest in a depression in the skull. The gland opens with its small orifice in front of the eye. At times the opening looks like a small sore. It exudes a whitish secretion which, when dry, has the consistency and smell of gum arabic. Serow have a strong goaty odour. As in sheep and goats it appears to come from the surface of the skin and not from any special glands.

Goral are much smaller animals than Serow. They have no face glands but are furnished with foot glands similar to those found in sheep. These glands open by a small orifice in front of the pastern, above the hoof. It is not known whether Serow have them. Strangely enough, in the structure of its skull, the Goral approaches the Takin. A kinship is here suggested which one would not easily suspect from the widely different appearance of these two animals.

The Takin is a large heavily built, aberrant form of goat-antelope. It lacks that lightness of limb and body to which Serow and Goral owe their agility. The horns, which are thick and nearly in contact at the base, grow outwards, downwards or forwards and then take an abrupt curve upwards or backwards in the same direction as the plane of the face.

THE SEROW (*CAPRICORNIS SUMATRAENSIS* POCKOCK).

With its large head and donkey-like ears, its thick neck and short limbs the Serow is an ungainly creature. Its habit of standing with its forelegs astraddle, the hoofs widely splayed and the head thrust downwards adds to its awkward appearance. Both sexes are similar in build. A full grown Serow is from 36-38 in. at the shoulder and scales from 170-200 lbs.

The coat is coarse and rather thin in Serow which live at lower elevations. Its colour varies so much that it is difficult to describe. It ranges from grizzled black or blackish grey-roan to red. In the darker animals the head, neck and the mane, which covers the nape and withers, is grizzled black. The black passes into rusty red on the shoulders, flanks and lower thighs and turns a dirty grey on the inside of the limbs and belly. There is a varying amount of white on the muzzle, throat and chest. In the Chin Hills and Arakan a red race of Serow (*C. s. rubidus*) occurs. In the Himalayan races the limbs are chestnut above and dirty white below from this there is a transition to the Malay serows in which the limbs are wholly black.

Horns are common to both sexes. They are black, conical and closely wrinkled for three quarters of their length. They run to 10 or 11 in.

In the Himalayas the Serow favours an elevation between 6,000 to 10,000 ft. In the Burmese hill ranges they may be met with at a height which varies from 700 to 8,000 ft.

Serow live in the recesses of thickly wooded gorges whose boulder strewn slopes and shallow caves give them shelter from the weather. In the mornings and evenings they come out to feed on the rank herbage of the more open slopes. They are more or less solitary creatures though four or five may be seen feeding on the same hill. Their movements belie their awkward appearance. They are exceedingly active animals, not only on rock but also on flat ground. When disturbed, serow dash away with a hissing snort. Their call is a whistling scream. The female usually has one kid at birth, sometimes two. In the Himalayas the rut commences at the end of October and the young are born in May and June. In Burma the young are born about the end of September. The period of gestation is said to be about 7 months.

Serow range from the Himalayas to the mountains of China and southwards through Burma and the Malay countries. They are also found in Formosa and Japan. Eight races have been described from British India and the Strait Settlements all localised forms of a single variable species.



Photo by

F. W. Bond.

Serow or Goat-Antelope (*Capricornis sumatraensis* Pocock).

(Height at shoulder 36-38 in.).

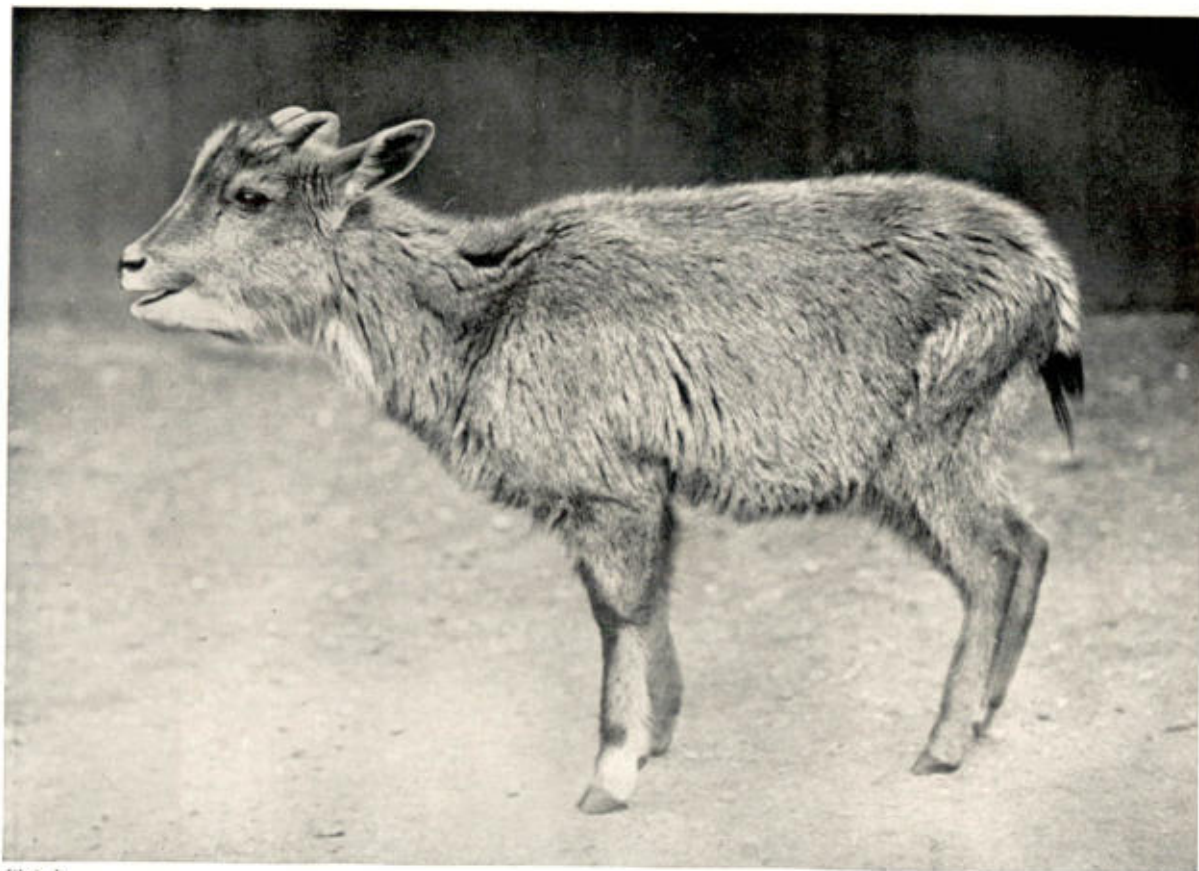


Photo by

F. W. Bond.

A young Goral (*Nemorhaedus goral* Hardw.).

(Height at shoulder 26-28 in.).

GORAL (*NEMORHAEDUS*).

Three species of Goral are found within the Indian Empire:—The Grey Himalayan Goral (*Nemorhaedus goral* Hardwicke) of Kashmir and the Western Himalayas, the Brown Goral (*N. hodgsoni* Pocock) of Nepal and Sikkim, and the Burmese Goral (*N. griseus* Milne-Edwards) found in Burma, Eastern Tibet and Southern China.

The Goral is sometimes called the Himalayan Chamois. It has little in common with the Chamois and is distinct in the form of its horns, and the colouring and shagginess of its coat. Its kinship with the Takin has already been suggested. The Goral is a goat-like animal standing about 26-28 in. at the shoulder.

The general colour of the Grey Goral is a yellowish grey suffused with black. Individuals differ, but no Grey Goral has the pale area of the hairs tinged with rufous or brown. The chin, upper lip, underside of the jaws and throat patch are white. The dark spinal stripe if present, does not pass beyond the withers. There is no stripe down the middle of the tail and none up the back of the thighs. The Brown Goral is distinguished by its golden or rufous brown coat, speckled with black. The black spinal stripe reaches to the root of the tail but tapers away and is indistinct on the croup. The tail is black above. A dark ill-defined stripe runs up the back of the thigh from the hocks.

The Goral of Burma is distinguishable from the two Himalayan forms by two main characters. The tail is larger; about 5 ins. long in the adult. The black stripe on the fore-leg does not pass over the knee as in the Himalayan Gorals but turns aside and runs down the outer side of the cannon bone on to the back of the fetlock.

Goral have short insignificant horns. They diverge slightly, curve backwards and are marked with rings or ridges for the greater part of their length. The record pair of Grey Goral horns measures 8½ in.

Goral frequent hillsides or rocky forest clad ground. They graze in small parties of 4-8 individuals. Old bucks are frequently solitary. In the Himalayas, Goral favour an elevation of 3,000-9,000 ft. though they may ascend to and have been observed at 13,000-14,000 ft. In the Arakan and Chin Hills, Goral are found above 3,000 ft. In Garhwal new born young have been observed in April.

TAKIN (*BUDORCAS TAXICOLOR* HODGS.).

There are said to be three species of Takin:—The Mishmi Takin (*Budorcas taxicolor* Hodgs.), the Tibetan Takin (*B. tibetana* M.-Eds.) and Bedford's Takin (*B. bedfordi* Thomas). So far as is known the Mishmi Takin occurs in Bhutan Himalaya in the Mishmi Hills, on the Burma Assam Tibet frontier and in the Mountains of the Salween Irrawady divide. The Tibetan Takin is found in Eastern Tibet and Western Sze Chuan. Bedford's Takin in the Tsinling Range in Shensi, W. China. It is possible that the three forms are geographical races of a single species.

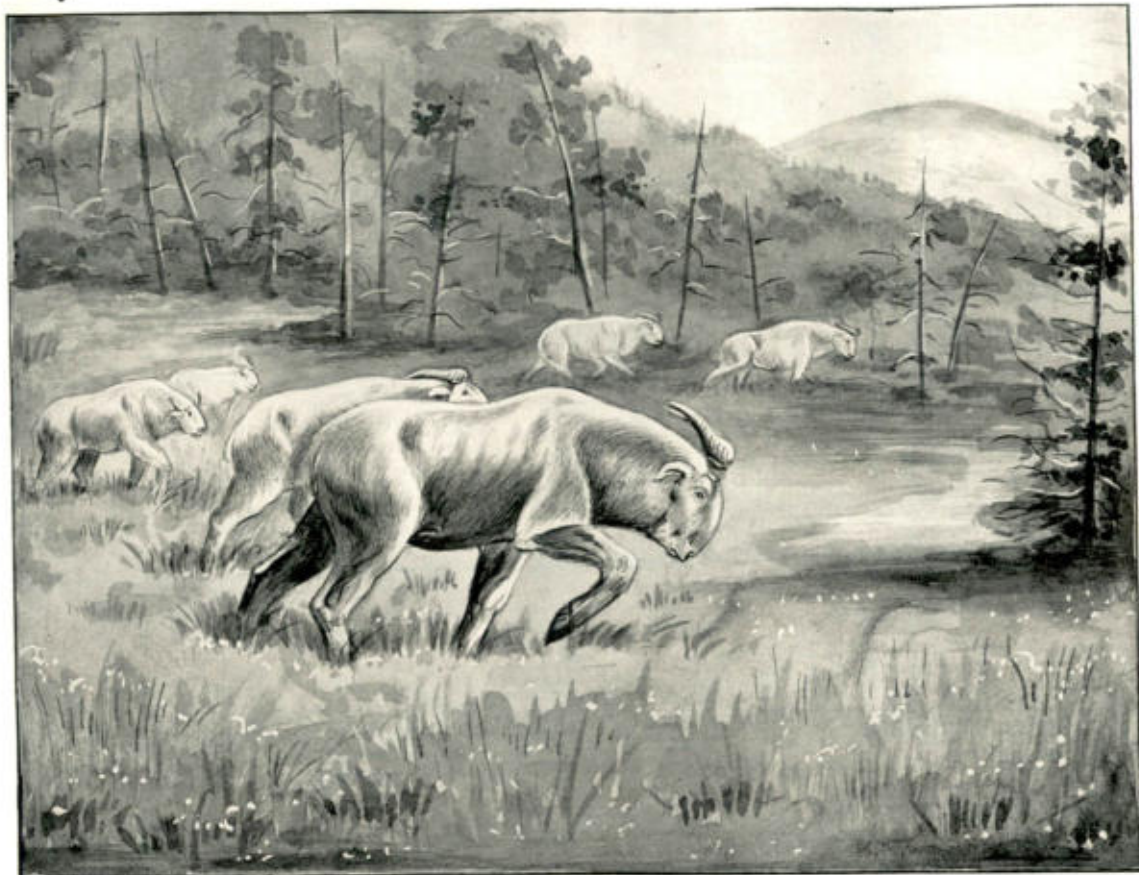
The Bhutan Takin is recognised as a separate race, *B. t. whitei*, because of its smaller size, darker colouring and smaller saddle.

The Takin is a clumsy heavy animal which from the shape of its horns looks as if it might have some relation to the gnu or musk ox, though there is no structural affinity between them. Its most striking feature is its immense convex 'face', heavy mouth and tremendously thick neck. The muzzle, except for a bare spot at the extremity is covered with hair. It is a character seen also in the yak and is probably associated with life at high altitudes, where the snow in winter has to be scraped away to get at the vegetation beneath. The Takin's heavy body is supported by exceptionally short, thick legs, thicker than those of a bison. Its withers are slightly raised and its narrow back arches in the centre and slopes downward to the root of the tail.

There is great variety of colour in Takin, ranging from dark brown to golden yellow. The withers are conspicuously lighter in tone. Adult males of the Mishmi Takin are golden yellow merging into dark brown or black on the flanks and quarters. There is a dark dorsal stripe. Young males are reddish brown in front merging into black. Calves all black. Females are greyer than the bulls with no trace of yellow. The dark dorsal stripe is inconspicuous in females and young males.

The horns of a young Takin grow straight up from the head with an outward tendency. Later they grow outwards and downwards. In the final stage the horns grow forwards, bend downwards and outwards with the points growing up.

Takin live in the steepest and most thickly wooded declivities of their native mountains. In the Mishmi hills they have been seen in tropical forest as low as 3,000-4,000 ft. They are usually found in dense bamboo and rhododendron jungle at an elevation of 7,000-10,000 ft. In the summer months they collect in herds of considerable size as many as 300 have been observed congregated about a hot spring to drink. They went to cover at mid-day and came out in the late afternoon. In the winter the herds are said to break up into smaller parties. In Western China the rut takes place in July, August. The calves, usually one at birth are dropped towards the end of March or early in April.



Reproduced from

*The Big Game of Central and Western China—Wallace.*

Takin (*Budorcas taxicolor* Hodgson) changing ground.

(Height at shoulder: bull 51, cow 42 in.).



By courtesy of

The Black Buck (*Antelope cervicapra*, L.).

The Amer. Mus. Nat. Hist., New York.

Sub-family IV. *Antilopinae*: ANTELOPES.

The Antelopes form an extensive group of ruminating ungulates which includes almost all the remaining members of the Bovine family. Although the term 'antelope' is in common use and though most antelopes are easily recognised, they are so numerous, so diverse in form that it is difficult to distinguish them as a whole from the oxen on the one hand and the goats on the other. They represent a transition between the two. Antelopes are the most generalised and oldest known representatives of the *Bovidae*. It is believed that the more distinctive and more specialised members of the family which we have so far described have been derived from them. In general, antelopes are light and graceful in build. Fleet of foot, they depend for their safety on great speed. Horns may or may not be present in both sexes. The bony core of an antelope's horn is nearly solid throughout and not honeycombed as are the horns of oxen. In the structure of their teeth some Antelopes resemble oxen, others, the sheep and goats.

Antelopes very generally have a gland beneath the eye, which distinguishes them from oxen and goats. The prominent glands below the eyes of the Indian Antelope or Black Buck attract the attention of most people. When closed the gland takes the form of a vertical slit of black, nearly hairless skin. This opens into a deep hair lined and perforated pocket into which the secretion of the underlying gland exudes.

It is difficult to surmise the exact function of these glands. They are present, as we have already seen, in other ruminants. They may have a sexual significance. They are particularly active in certain seasons and generally better developed in males than in females. But apart from this they may also serve as scent glands and, like the foot and other skin glands serve as a guide in keeping individuals of a herd together.

Antelopes are not nearly so well represented in India and Malaya as they are in Africa. If we exclude the widely spread group of gazelles the only Antelopes found outside Africa, Syria or Arabia are the Black Buck which is confined to India, the Saiga Antelope of Tartary and the Chiru of Tibet.

THE CHIRU OR TIBETAN ANTELOPE (*PANTHALOPS*  
*HODGSONI* ABEL.).

In the elevated and barren plateaux of Tibet there is a species of antelope which is remarkable for its curiously swollen snout and long, elegant horns. This is the Chiru, an antelope which is said to be the living prototype of the fabulous unicorn. Its long and slender horns, if seen in profile, may well suggest a unicorned animal. The Chiru is classed in a separate subfamily of antelopes—the *Panthalopinae* of which it is the only representative. The nearest relatives of the Chiru are the Saiga Antelope of Eastern Russia and the Impala of Africa. The Saiga carries to greater degree the curious snout development of Chiru. Its nose is inflated and prolonged into a downwardly bent, trunk-like proboscis. This inflation of the nose may have some connection with the high altitudes in which these animals live. At the side of each nostril, the Chiru has a large lateral chamber or sac whose function may assist breathing in the rarefied atmosphere of its native wilds.

Another peculiarity of the Chiru is the unusual development of the inguinal or groin glands. Perhaps the function of these glands, which are possessed also by other ruminants, is to scent the ground and so indicate to other individuals of a herd the place where one of them has rested. Chiru are known to lie up concealed in shallow pits which they scrape out for themselves in the sand. Large scent glands are also present between the fore and hind hoofs of the Chiru. It has no face glands.

The Chiru stands about 31-32 in. at the shoulder. Its body is covered with dense wool. The colour is variable. Generally it is pale fawn above and white below. The whole of the face and a stripe down the front of each leg is black or dark brown in the bucks. The horns of the bucks rise close together; they diverge towards the tips and curve slightly forward. They reach from 24-26 in. The record pair is 27½ in. Females are hornless.

Chiru live in the open rolling plains and the broad river valleys of the Tibetan Plateau, some 12,000-18,000 ft. above sea level. They may collect in large herds but it is more usual to find them in small parties of 3 or 4. They graze on the grass and small plants which grow on the open wind swept river flats. In summer the bucks live apart. The young are born in May and June. One young is produced at birth.

The Chiru is found only on the Tibetan Plateau. Its range extends north from the Chang-chenmo district of Ladak along the Nepal Tibetan frontier to the north of Tibet.



The Black Buck (*Antelope cervicapra*, L.).  
(Height at shoulder about 32 in.).

THE BLACK BUCK OR INDIAN ANTELOPE  
(*ANTILOPE CERVICAPRA* LINN.).

The Black Buck is the sole representative of the genus *Antelope*.

Its striking colour, its beautiful spiraled horns, which may reach the shoulder height of the animal, give it an elegance hardly equalled by any antelope. This exclusively Indian animal is perhaps the most beautiful of all its tribe.

A well-grown buck stands about 30 in. at the shoulder and on the average weighs some 80 lbs. When young, its coat, like that of the does, is a yellowish fawn. When 3 years old it commences to turn black. This darkening of the coat varies in intensity. In South India the adult buck is rarely black, his coat remains a dark brown. Well matured brown bucks may again be seen in all parts of the country. In general there is a fading in the richness of tone during the hot weather and an increase in its velvety lustre after the rains.

In the yearling buck the horns are without a spiral. In the second year a large open spiral is developed. It is believed that the full number of spiral twists are attained with the dark coat about the end of the third year. The best heads come from the dry and arid districts of the Punjab and Rajputana, the poorest from South India and the humid plains lying west of the United Provinces. Here a head above 18 in. is considered good. The record 31½ in. is from Jind State.

Black Buck are usually seen in herds of 20 or 30, though in Rajputana and the Punjab herds may number several hundreds. Black Buck live in open plains covered with scrub or cultivation. They feed on grass or various cereal crops. Usually Black Buck graze till mid-day and again in the late afternoon. Their sense of hearing is moderate: scent fair. Keen eye-sight and speed are their protection. When alarmed the herd moves off in a series of astonishing leaps and bounds and then breaks into a gallop. The leadership of the herd is usually vested in an old and vigilant female. There is generally an old buck in attendance who keeps in the vicinity. He frequently deserts the herd for a period taking a favoured doe with him. Black Buck breed at all seasons but mainly about February and March. Then the bucks grunt and strut about with their peculiar gait, their heads thrown well back. Their great face glands are everted and give off their strong smelling secretion. One or two fawns are born at a time, these are usually concealed by the mother in tall grass or among bushes.

Black Buck may be found practically all over the Indian plains except on the Malabar Coast. They avoid forest or hill tracts.

### THE CHINKARA OR INDIAN GAZELLE (*GAZELLA BENNETTI*, SYKES.).

Three species of Gazelles inhabit the Indian Region:—The Indian Gazelle (*Gazella bennetti* Sykes), The Tibetan or Goa Gazelle (*G. picticauda* Hodgs.) and The Seistan Gazelle (*G. seistanica* Lyd.).

The Chinkara or Indian Gazelle is found practically all over the plains districts of India. It lives in small herds of 10 or 20 in waste lands broken up by nullahs and ravines, in scattered bush and thin jungle. It is common in the sandhills of the desert zone. In the Salt Range, Punjab, Chinkara have been seen as high as 4,000 ft. They do not enter forest; prefer broken country and live less in open level plains than Black Buck.

A buck Chinkara is 26 in. high at the shoulder and scales about 50 lbs. The horns which usually have 15 or 16 rings average from 10-12 in. They rarely exceed this length in Central or South India. The best heads come from the dry desert tracts of Rajputana and the North-West. The record is slightly over 16 in. Both sexes are usually horned. Though hornless females are not uncommon. The horns of the doe are smooth conical spikes usually about 4-5 in. long, slightly curved at the tip or straight and distinctly ringed at the base. Chinkara are less diurnal than Black Buck. They lie up earlier in the day and come out later in the evening. A Chinkara is a wary animal when feeding, always on the alert, always raising its head to look round. When alarmed the herd goes off at a wild pace and then stops at about 200 or 300 yds. on some eminence to turn and discover the cause of their alarm. Their food consists of grass, leaves, various crops and fruits such as gourds and melons. They go without water for long periods but will drink when they can get access to it. There is no regular breeding season. One or two fawns are born at a time.

The Tibetan Gazelle inhabits North-Eastern Ladak, the Tibetan Plateau and Shensi. It is a small gazelle, from 24-25 in. at the withers. Its slender close ringed horns rise vertically and curve sharply backwards. A good head tapes 12 in. The record is 15½ in. The summer coat is short and slate grey. In winter it is dense and pale fawn. The Seistan Gazelle, described from Siestan in Persia, is found in Baluchistan. The females are hornless. The horns of the bucks bend backwards and have their tips more or less distinctly in-turned. The greyish forehead of the older buck and the white muzzle and a whitish band at the base of the horns are distinctive.



The Indian Gazelle or Chinkara (*Gazella bennetti* Sykes).  
(Height at shoulder 26 in.).

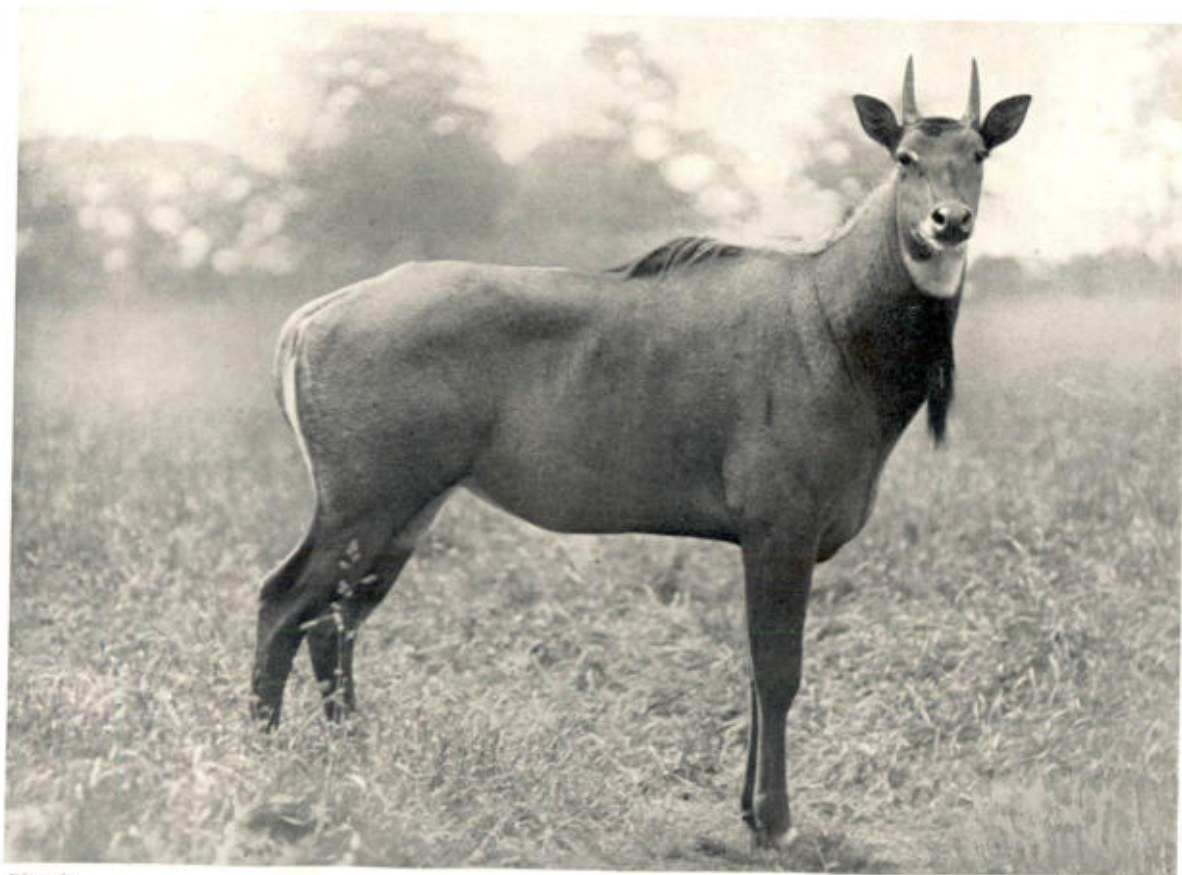


Photo by

W. S. Berridge.

The Blue Bull or Nilgai (*Hemilaphys tragocamelus* Pallas).

Sub-Family V. *Tragelaphinae*: TRAGELAPHINE ANTELOPES.

The Tragelaphine Antelopes form a fifth division of the Hollow-horned Ruminants. The group is more African than Indian. It includes the African Bushbucks, Kudus, Bongo and Elands. Only two forms are found in India:—the Nilgai and the Four-horned Antelope. Tragelaphine Antelopes are characterised by the general absence of horns in the females (except in two African genera). The horns of the males are not ringed; they are keeled in front and in most genera, such as Eland, Kudu etc., they are spirally twisted. The Indian genera are characterised by the shortness and straightness of their horns, the absence of distinctive body stripes and by the possession of face glands. The hoofs are not deeply cleft as in true antelopes and there are no foot glands. The structure of the foot is practically the same as in Bovines—the molar teeth again are semi-Bovine. Lateral or false hoofs are well developed in both limbs. The muzzle is naked and the tail long.

The distributional area includes Ethiopian Africa and Peninsular India. There is reason to believe that a Tragelaphine Antelope probably existed in the Euphrates Valley during the Assyrian period.

THE FOUR-HORNED ANTELOPE (*TETRACEROS*  
*QUADRICORNIS* BLAINV.).

The Four-horned Antelope or *Chousingha* is the only Antelope with 2 pairs of horns. Of these the front pair are always the shorter. At times they are no more than horn-covered studs or mere bony knobs under the skin. The maximum length of the back pair is  $4\frac{1}{2}$  in., of the front  $2\frac{1}{2}$  in.

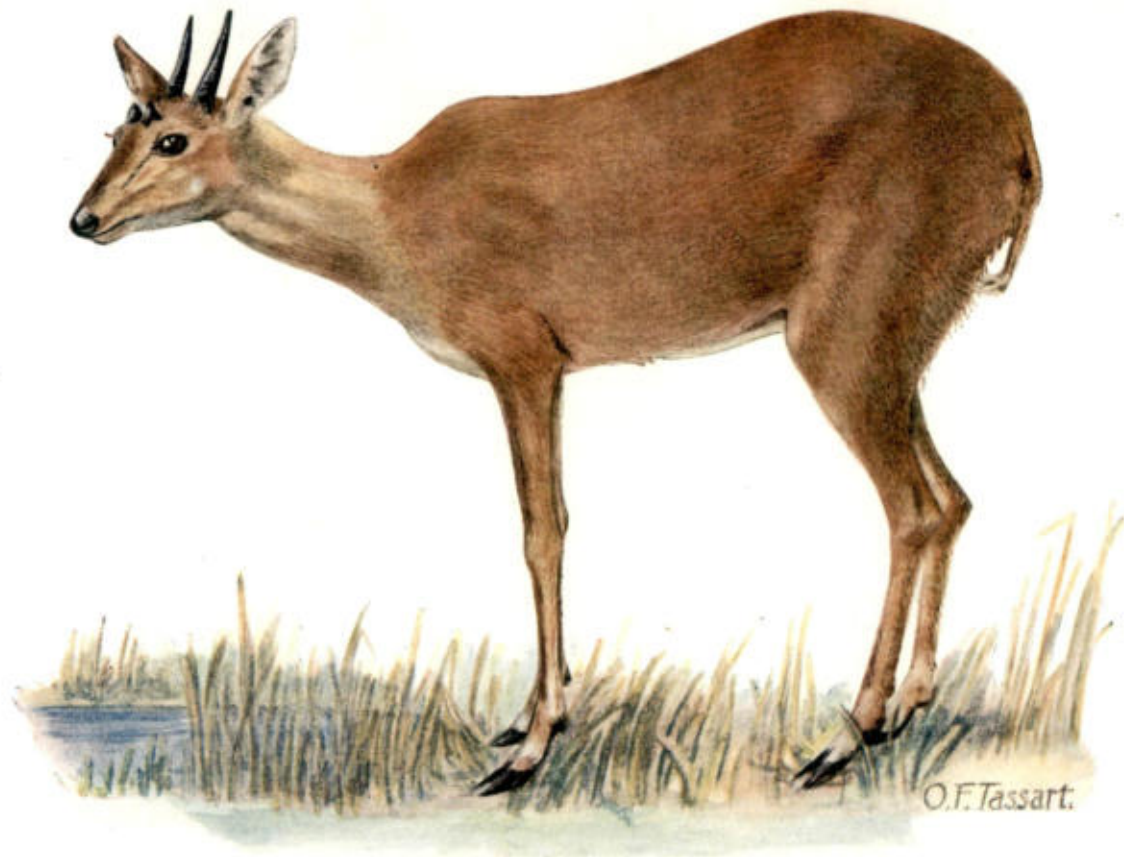
One of the most interesting features in this Antelope is the presence of a pair of well-developed glands between the false hoofs of the hind legs in both males and females. This is the only antelope which has such glands.

The *Chousingha* is about 25 in. high and scales near 50 lbs.

Its coarse coat is dull red brown above and white below. It lives in undulating or hill country and shelters in tall grass or open jungle—a terrain more usual to deer than to antelope. In this environment it has developed some of the habits of deer. It has a low whistling call, which the bucks repeat frequently in the hot weather and a sharp alarm note which the doe uses to guide her fawns through cover when in flight.

These little antelopes drink regularly. They are much more dependent on water than other antelopes and seldom live far from it. The edge of the jungle round a village tank is a favourite resort. Again, unlike antelopes they do not gather in large herds. *Chousingha* are usually seen alone or in pairs. In the early part of the year, before the rains, the female may be accompanied by one or two fawns. Sometimes two old animals and two young will be seen together, or even a buck with 4 or 5 does.

The Four-horned Antelope is found along the base of the Himalayas. It does not occur in the Gangetic plain. In the peninsula of India it has a more or less localised distribution. Here it keeps to the hill tracts covered with open forest. It is not found on the Malabar Coast.



The Four-horned Antelope (*Tetraceros quadricornis*, Blainv.).

(Height at shoulder about 25 in.).



The Nilgai or Blue Bull (*Boselaphus tragocamelus*, Pallas).  
(Height at shoulder 56 in.).

THE NILGAI OR BLUE BULL (*BOSELAPHUS*  
*TRAGOCAMELUS* PALL.).

The Nilgai is a great ungainly antelope standing fully 54 in. at the shoulder and weighing about 600 lbs.

Its high withers and low hind quarters recall the build of the African Hartebeeste. As is usual with so many African Tragelaphines, the sexes differ in colour.

The adult bull has a coarse iron grey coat. He has a white ring below each fetlock and two white spots on each cheek. His lips, chin, the inside of his ears and the undersurface of his tail are white. Young bulls and the cows are tawny. Both sexes have dark manes and the males wear a distinctive tuft of stiff black hairs on the throat. The bulls have stout cone-like horns. They are distinctly keeled, triangular at the base and circular towards the tips.

Horns average about 8 in. The maximum length is  $11\frac{1}{4}$  in.

Nilgai are usually seen in herds of 10-15 animals. Males are often solitary or perhaps several bulls will herd together. Females and young, attended or not, by one or two old males may be seen in smaller or larger parties. The country they live in may be level, undulating or hilly. They favour a mixture of grassland, scrub and cultivation, usually avoid really dense forest but will live in more or less open tree jungle.

They feed on grass and cereal crops and browse on leaves and wild fruit and are particularly fond of eating the fallen flowers of the Mowha tree. They feed at all times of the day.

When alarmed the herd goes off with an ungainly slouching gallop covering the most difficult ground with ease.

Nilgai droppings are commonly found heaped in one particular spot. This habit is common in many animals. It is suggested that the spot may provide *rendezvous* for reassembling the scattered members of a herd.

The period of gestation is 8-9 months. Young are seen at all seasons.

The Nilgai is found in the Indian Peninsula from the base of the Himalayas to Mysore. It does not occur in Eastern Bengal or Assam or on the Malabar coast. The sanctity attributed to it is the main source of its protection in many districts where it has survived.

Family II. *CERVIDAE* OR DEER.

The last tribe of true ruminants is the Deer. Branching horns or antlers are the distinctive appanage of deer. Save in one or two aberrant forms only males carry them. In the Reindeer alone both sexes are horned. Deer, like other ruminants, are generally large and heavy creatures without the agility and litheness of beasts of prey. It is precisely to this sort of animal, where weight is an important factor, that horns are the most suitable weapons. They are perhaps a counterpoise to the teeth and claws of Carnivores. The need for defence against enemies, for weapons of attack in combats with their own kind has led to this distinctive form of protective armament among hoofed animals. But there is a distinction between the horns of oxen, sheep and antelopes and the deer tribe. A deer's horn when fully developed is really a mass of dead bone, devoid of any covering of skin or horn. The antlers are worn for a time, shed and then replaced. The budding antler grows from a pedestal or pedicel of bone which forms part of the skull. It appears as a velvety knob, grows rapidly, increasing in length by the vigorous deposition of bony matter. In young deer it remains a simple spike. In adult stags it branches into tines and takes the form of the complete antler. The new grown antler is highly sensitive. It is covered with 'velvet'—a thick soft skin, fed by numerous blood vessels and clothed with a mat of fine hair. When the growth of the antler is complete, a ring of bony matter, the 'burr', forms at its base just above its union with the pedicle. The bony ring constricts and cuts off the flow of blood to the antler. The blood vessels in the 'velvet' dry up. The 'velvet' shrinks and is eventually rubbed away by the deer. When present, it takes the place of the horny sheath which forms a permanent cover over the bony cores of the horns of cattle and other hollow-horned ruminants. But in the deer the outer cover of the antler is temporary. It is removed and leaves behind the dead bone which we call horn.

Besides the antlers, there are other characters which distinguish deer from other ruminants. Deer have a large fissure in the skull just in advance of the eye socket. As a rule canine teeth are present in the upper jaw. They are particularly well developed in forms which have no antlers such as Musk deer and Chevrotains.

Again, with the exception of the Musk deer, none of the tribe have a gall bladder. All deer have well developed lateral hoofs in both feet. The tribe ranges over a great part of Asia, North and South America and North-West Africa.

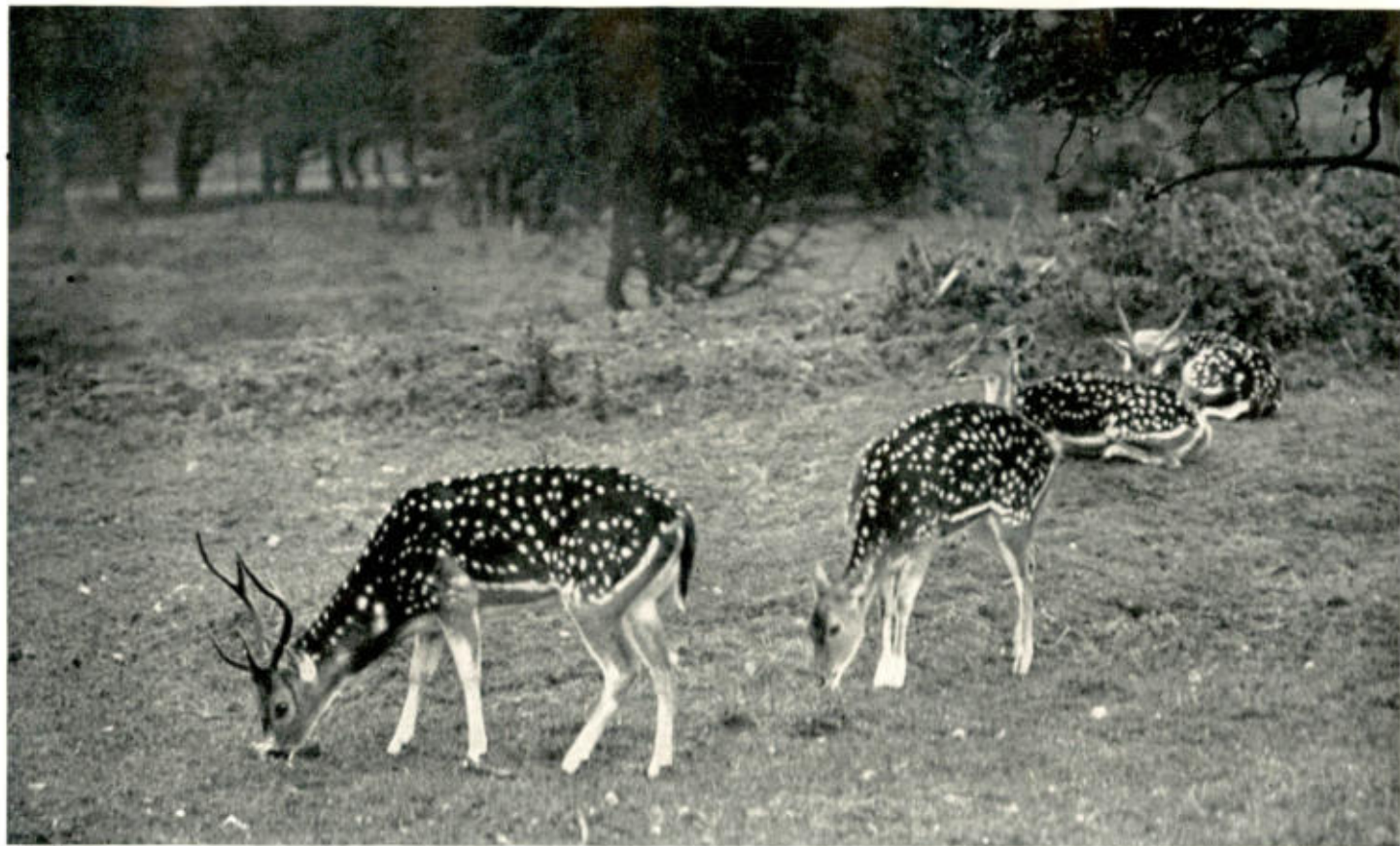


Photo by

W. S. Berridge.

Axis, Spotted Deer, or Chital (*Axis axis* Erxl.).



The Musk-Deer (*Moschus moschiferus* L.).  
(Height at shoulder 20 in.).

Sub-Family I. *Moschinae*: MUSK DEER.THE MUSK DEER (*MOSCHUS MOSCHIFEROUS* L.).

The Deer tribe is divided into two groups or sub-families—the *Moschinae*, containing a single genus and species the Musk deer and the *Cervinae* which includes all the remaining deer. The Musk Deer holds a place between the deer and the antelopes. It is regarded as an undeveloped form of deer which has not progressed with the rest of its tribe. It is hornless, has no face glands; these are generally present in all deer, and it has a gall bladder which no deer possesses. In some ways it has taken a special line of development of its own. This is seen in its possession of a caudal gland and a musk gland. The tail of a musk deer is peculiar. It is completely buried in the long hairs of the anal region and is for the most part naked except for a large tuft at the tip and a tuft at the base which covers its upper surface and sides. The lateral surface of the tail bears a narrow slit in its flacid skin which is the opening of the caudal gland. The musk gland is situated beneath the skin of the abdomen of the males. When fresh its secretion has an unpleasant pungent, urinary odour, when dry it acquires the scent of musk. Valued as a commercial product it induces the persecution of the species. From the great development of the caudal and musk glands it is inferred that in this deer the females seek out the males in the breeding season. Finally, musk deer have specially mobile feet, the hoofs are long and pointed and the unusually large lateral hoofs are well adapted to give it a foothold on snowy slopes and slippery rocks. The absence of horns is compensated by the great development of the canine teeth.

The Musk Deer is a little creature standing 20 in. at the shoulder and weighing as many lbs. It is protected from the cold by a deep coat of thick and bristly hairs, almost pithy in structure. The general colour is a shade of rich dark brown speckled with grey. It lives singly or in pairs. Musk deer are generally met with in birch forest above the zone of the pines, at times they come down to lower levels but always keep in thick cover. They scrape out a shallow form in which they lie concealed and come out to feed in the mornings and evenings.

The breeding season is believed to be in January and the young are born in June. Musk Deer range over a wide area in Central and North Eastern Asia. The typical form *Moschus moschiferous* is found in Kashmir, Nepal and Sikhim.

Sub-Family II. *Cervinae*: DEER.THE MUNTJAC (*MUNTIACUS MUNTJAK* ZIMM.).

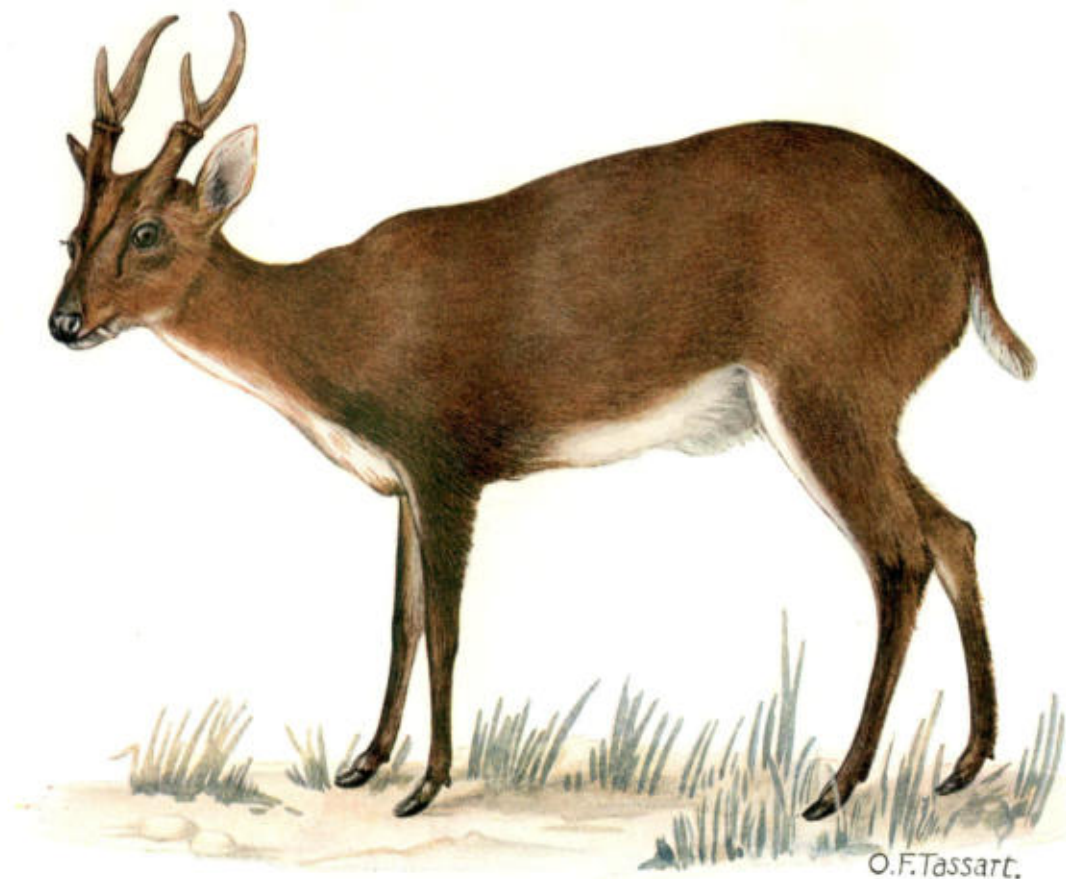
The second division of the Deer tribe—the *Cervinae* contains all the remaining deer. True deer have no gall bladder, no caudal or musk glands—all present in musk deer. With the exception of Roe deer, all deer have face glands. Again, all, save the Chinese water deer, have antlers and all of them, except the little Pudu deer of the Chilian Andes, have foot glands. The group contains 19 genera six of which are present in our area.

The Muntjacs, known also as Barking Deer, are small animals standing from 20-30 in. at the shoulder. The antlers are small. They consist of a short brow tine and a beam which is undivided and curves downwards and inwards at its extremity. The horns are set on long bony pedicels. A bony ridge extends down each side of the face from the base of each pedicel. The marked prominence of the facial ridges gives the creature the name 'rib-faced deer'. In females there is a bristly tuft of hair and a small projection in place of each horn.

Muntjacs range over the greater part of the Indo Malayan countries and are found also in China, Formosa and Japan. Various races are recognised over this wide range.

In our area there are supposed to be three: the Muntjac of North India is known as (*Muntiacus m. vaginalis*); the southern form is (*M. m. aureus*). The third race (*M. m. grandicornis*) is found in Burma. The Muntjac of Tenasserim (*M. feae*) is regarded as a distinct species. The coat of the Burmese Muntjac is described as tawny yellow; the North Indian race is bright chestnut. A bright red form is equally common in Burma. The antlers of an adult male in Burma average 4 in., their bony pedicels measuring from 2-4 in. The best Burmese head is 7 in. Average Indian antlers measure from 2-3 in. The pedicel 3-4 in. The maximum length obtained in the C.P. is 7 in. A good buck weighs from 48-50 lbs. Horns are shed during May and June. The Muntjac is a solitary animal. It is seen singly or in pairs; more rarely, in small family parties. It keeps to more or less thick jungle and comes out to graze in the outskirts of forest or in open clearings. It is fairly diurnal in habit. The food consists of various leaves and grasses and wild fruits. Its call from a distance sounds much like the bark of a dog. It is given out at intervals; usually in the mornings and evenings, sometimes after nightfall.

When alarmed and in flight these deer give out a series of short cackling barks which may be reduced to a sharp rattle likened to the sound of castanets. Muntjac appear to breed at all seasons. The rut mainly takes place in the cold weather. The young usually one—sometimes two, are born at the beginning of the rains. The young are spotted white till about 6 months old.



The Muntjac or Barking Deer (*Muntiacus muntjak* Zimm.).



The Chital or Spotted Deer (*Axis axis* Erxl.).  
(Height at shoulder 36 in.).

THE CHITAL OR SPOTTED DEER (*AXIS AXIS EXRL.*).

The Chital, perhaps the most beautiful of all deer, is found only in India and Ceylon. In India, it is found in the forests at the base of the Himalayas and practically throughout the peninsula wherever there is more or less open jungle combined with good grazing and a plentiful supply of water. It is unknown in the arid plains of the Punjab, Sind, in a large portion of Rajputana, in Assam and the countries east of the Bay of Bengal.

The Spotted Deer is at its best in the Himalayan foot hills, in the jungles of the Terai and in the Central Provinces. A well-built stag from these parts stands 36 in. at the shoulder and weighs about 190 lbs.

In South India, or in the jungles of the Sunderbans, the height seldom exceeds 2 ft. 6 in. The coat is a bright rufous fawn profusely spotted with white. The lower series of spots on the flanks are arranged in longitudinal rows and suggest broken linear marking. Its dappled hide almost obliterates the chital in a sun-flecked jungle, particularly when it sits down to rest as it usually does, in some shady place.

The graceful antlers have 3 tines—a long brow tine set nearly at right angles to the beam and two branch tines at the top. The outer tine, the continuation of the beam, is always the longer.

The record head measures 39½ in. A 34 in. antler would be good anywhere; 31 in. in South India.

One always associates Chital with beautiful scenery, with grassy forest glades and shaded streams. They are seen in herds of ten to thirty, which may contain two or three stags; but assemblages numbering several hundred have been met with. They do not shun the proximity of villages, enter cultivation and frequently associate with many forest animals, particularly with monkeys. They are less nocturnal than sambar and feed till late in the morning and again in the afternoon, and lie down in the interval in some shaded spot.

The time at which the stags shed their antlers varies in different localities. In the Central Provinces and South India, as a rule, stags cast their horns in August and September. The new antlers are in velvet till the end of December. But stags carrying horns in various stages of development have been seen at all seasons. It is suggested that regularity in the intervals at which antlers are shed is only attained by fully mature stags. In the Central Provinces, the pairing season is at its height in May. The rutting stag has a loud harsh bellow and combats between males for the possession of the hinds are fierce and frequent. In North India the pairing is said to take place during the winter months. Fawns may be met with at any season. One to three are born at a time—two being the commoner number. Chital are prolific breeders; an interval of 6 months may see the production of a new family.

THE HOG DEER (*HYELAPHUS PORCINUS* ZIMM.).

The name Hog Deer has been probably suggested by the squat pig-like appearance of this animal and by its hog-like movements. When running it keeps its head low down, moves without that bounding action so characteristic in deer.

The Hog Deer is a relative of the Chital but is smaller and stouter in build. The body is long and the legs relatively short. The height at the withers is about 27-29 in. The fur is brown, dark brown in old stags, with a yellowish or reddish tinge. The white tips to the individual hairs give the coat a speckly appearance. The under parts of the body are paler and the inside of the ears and the underside of the tail are white. The young are spotted. Some young stags and hinds show these spots though they are not always discernible. The summer coat is generally paler.

The small antlers are set upon very long bony pedicels. After giving out a short brow tine the beam is almost straight till it divides into a shorter fore and longer hind tine. Average horns measure from 12-15 in. Burmese stags carry better heads than Indian. The record is 24 in. Hog deer favour grass jungles by the banks or rivers, grass-covered delta islands or open grass plains; always where the grass is not too high. On the banks of the Indus in Upper Sind they live in scrub jungle and in Burma, they were once common in mangroves. Hog Deer are generally solitary creatures. A pair will continue to frequent a particular stretch of grassland. Sometimes small parties of 2-5 may be found grazing together. They come out to feed early in the mornings and in the evenings, and shelter in long grass during the hot hours of the day. They are wary creatures; their sense of sight, smell and hearing is acute. Persecution has made them almost nocturnal in many parts of their range.

The main pairing season is believed to be in September and October and the young are dropped in April and May. Pairing must also take place earlier in the year as young are often born during the rains. The period of gestation is 8 months. The Hog Deer is not found in the Indian Peninsula. It lives in the low alluvial grass plains of North India from Sind and the Punjab to Assam whence its range extends into Burma and Tenasserim.



The Hog-Deer (*Hyelaphus porcinus* Zimm.).  
(Height at shoulder 27-29 in.).



The Sāmbar (*Rusa unicolor* Kerr.).  
(Height at shoulder 5 ft.).

THE SAMBAR (*RUSA UNICOLOR* KERR.).

The Sambar is the typical forest deer of South Eastern Asia. In the Indian Empire it is represented by the Indian Sambar (*Rusa unicolor*), whose range includes Ceylon and by the Malay Sambar (*Rusa unicolor equinus*), which inhabits Assam, Burma and the Malay countries.

Of the many races of Sambar, the Indian is the largest and carries the grandest horns. It is a heavily built deer which may reach a shoulder height of nearly 5 ft. The average height is about 55 in. A full grown stag scales from 500-600 lbs. The coat is coarse and shaggy. In stags it forms a mane about the neck and throat. In the hot weather much of the hair is shed. The general colour is brown with a yellowish or greyish tinge. The under parts are paler. Females are lighter in tone. Old stags tend to grow very dark—almost black. The antlers are stout and rugged. The brow tine is set at an acute angle with the beam. At its summit, the beam forks into two nearly equal tines. In some heads the outer, in others the inner tine is longer. The full number of points are developed in the fourth year. The Sambar stag is said to be at its prime in its ninth year. Really old beasts carry poor heads. Sambar from the Himalayan foot hills have more rugose and perhaps more massive antlers than those of the C.P., but they are never so long or so graceful. The finest heads come from the forests about the Narbada and Tapti and from the Central Provinces generally. The record is the famous head from Bhopal which tapes 50½ in. The horns of the Malay Sambar are set closer. They have a more rugged and massive appearance. The average length is 26 in. A head over 30 in. is good.

Forested hill sides, preferably near cultivation, are the favourite haunt of Sambar. Their food consists of grass, leaves and various kinds of wild fruit. They feed mainly at night and retire into heavy cover at day-break and do not come out till dusk. The capacity of so heavy an animal to move silently through dense jungle is amazing. Their powers of sight are moderate; their scent and hearing acute. Sambar take to water readily and swim with the body submerged only the face and the antler showing above the surface. There is much variation both as to the pairing season and the time at which the antlers are shed. Stags in velvet and others with mature horns are seen together. In Central and Southern India the majority of stags cast their antlers between the end of March and mid-April. The horns commence to grow in May and are in velvet during the rains. In September, the stags commence to clean their horns by rubbing them against trees. The tree is taken between the brow tine and beam and the antler is rubbed up and down leaving a long blaze on the bark. Most of the stags are clear of velvet by November. They roar in challenge to each other. The challenge is a loud metallic bellow quite distinct from sharp short 'ponk' which is the alarm note. The males fight for territory. Each stag fights to obtain sole rights over some favoured valley. The victor becomes master of

the hinds which enter it. The hinds are attracted to the stags by their calls and the scent of the face glands, which are everted during the rut and give out their strong smelling secretion. Pairing takes place in November and December. The stag's harem is limited to a few hinds. After the rut he deserts them and lives a solitary life till the return of the mating season. The young are born at the commencement of the rains, in late May or early June. Young stags remain with the hinds. Sambar are rarely found associating in large numbers. Four or five to dozen are what one usually sees. Both stags and hinds are seen singly or a party of hinds and fawns without a stag.



• By courtesy of

*Amer. Mus. Nat. Hist., New York.*

The Sambar or Rusa Deer (*Rusa unicolor* Kerr.)

(Height at shoulder 5 ft.).



The Swamp Deer (*Rucervus duvaucelli* Cuv.).  
(Height at shoulder 54 in.).

THE SWAMP DEER (*RUCERVUS DUVAUCELLI* CUV.).

The Swamp Deer group, forming the genus *Rucervus* contains three species within our area:—The Swamp Deer (*Rucervus duvaucelli*), Eld's Deer (*Rucervus eldi*) of Manipur and the Thamin (*Rucervus thamin*) of Burma.

The Swamp Deer—the *Barasingh* of the Central Provinces and the *Gond* of the United Provinces and Terai is found in the Central Provinces, the United Provinces, parts of Assam and the Sunderbans. Its occurrence in Sind is doubted.

This splendid deer attains its finest development in the Central Provinces. A good stag stands 54 in. at the shoulder and scales from 370-400 lbs. Its coat almost woolly in texture shades from brown to yellowish brown. The stags are maned and darker in colour. The summer coat of stags and hinds is paler, some develop spots, not always distinct, of lighter tone. The young are spotted.

There is much variation in the form of the antlers. Two distinct types are recognised with a wide range of intermediary patterns. In the first form, the beam takes a backward and then forward curve bringing the points of the horns in line with the top of the head. Half way up the beam, tines are given off at intervals: the first usually having a shoot of its own. In the second and far handsomer type, the brow tine is set at right angles to the beam, which grows with an outward curve giving the antlers a wider spread. At the point where it branches, the beam takes an almost horizontal curve and gives off number of vigorous vertical tines each of which throws out shoots. The whole effect is to produce an extraordinarily beautiful form of antler. Antlers from the Terai are smoother and whiter than C. P. heads. Heads exceeding 41 in. are rare. 10-14 is the usual number of points, though antlers with as many as twenty points have been obtained. The term Swamp Deer exactly suits the animal in the Terai where it lives in marsh land and is seldom out of water. In the Central Provinces this deer lives in grassy plains on hard ground and is, on the whole, less dependent on the proximity of water than the Chital. In Assam they usually live in high ground in the proximity of water. Swamp Deer are highly gregarious. In parts of the Terai a few miles of swamp may contain thousands of these magnificent animals. Swamp deer are less nocturnal than Sambar. They feed till late in the morning, again in the evening and lie up during the day. Their eyesight and hearing is moderate. The sense of smell acute. When alarmed the whole herd sets up a shrill baying sound which is continued in flight. In Assam the antlers are shed in February and March. The new antlers appear between April and May. They are in velvet till the end of July and are clean by the end of September. In the U.P. and C.P. stags are hornless by mid-April. Horns are mostly in velvet between May and August. They harden in September and are generally clear of velvet by mid-October. The master stags assemble.

Their eerie and penetrating roars are thrilling and impressive. They live more or less in amity till the rut develops. In the C.P. this is mainly between mid-December and mid-January. In the U.P. the chief rutting season is in November and December. The males fight for the possession of the hinds and each master stag so acquires his harem which may number as many as 30 hinds. It is reported that in Assam the pairing season is in April and May when the stags' new antlers are beginning to sprout!

With the cooling of their short-lived ardour the stags desert the hinds. The master stags collect again in small herds. The younger males remain with the hinds. The finest stags go off to live alone or in company with another of equal development. The young are born just before the rains. In Assam the young are born mainly between December and January or as late as February.



By courtesy of

The Amer. Mus. Nat. Hist., New York.

Swamp Deer (*Rucervus duvaucelli* Cuv.).

(Height at shoulder 54 in.).



By courtesy of

The Amer. Mus. Nat. Hist., New York.

The Brow-antlered Deer or Thamin (*Rucervus eldi* McClell.).  
(Height at shoulder nearly 4 ft.).

THE THAMIN OR BROW-ANTLERED DEER  
(*RUCERVUS THAMIN* THOS.).

The Thamin, the typical deer of Burma, is found mainly in the dry zone of Central Burma. It is sparingly distributed in other parts of the Province. It was once found in immense numbers in the wide plains of Pegu.

This beautiful deer is nearly 4 ft. high at the withers. The hinds are smaller. The coat is coarse and sparse. In stags it is dark brown or nearly black. Stags have a dense mane or ruff about the throat. Hinds are a light fawn. The young are spotted. There appears to be a seasonal colour change; the dark brown thamin of the cold season developing into the yellowish brown animals of the hot weather. The close set antlers are very handsome. In profile their form is almost circular. From the tip of the brow line to the point of the beam the antler sweeps in one continuous, graceful curve. The number of terminal tines varies from two or three to as many as eight or ten. There are supposed to be two races of Thamin in Burma. The typical thamin and Bruce's Thamin (*R. thamin brucei*), described from the Ruby Mines District, in which the horns are said to be slightly palmated. The maximum length of the antlers is 42 in. Heads over 35 in. are good. Stags are believed to acquire their horns in the second year and reach their prime when 7 years old.

Thamin avoid hills or heavy forest. These Deer prefer open scrub jungle on flat or undulating land between rivers and hill ranges. They live in small herds, lying up in cover during the heat of the day and feeding in the mornings and evenings. After nightfall, they come out to graze in the large *kwins* and *kwins* or to raid crops in their vicinity. Their speed and sharp sight is their main protection.

Stags shed their antlers in mid August and are clear of velvet by the end of December, when the horns are at their best. The rut develops between March and April. The period of gestation is 8 months. The fawns, one at birth, are dropped mostly in October. After the rut the master stags go off either alone or attended by one or two hinds. Big stags are seldom seen with the herds after May.

Eld's Deer (*Rucervus eldi*) is confined to Manipur where it lives in grassy swamps. Its antlers are indistinguishable from the Thamin. The hind pasterns are horny instead of hairy and applied to the ground when walking.

Thamin have suffered much from persecution in Burma. Without effective measures for their protection this beautiful deer must face extinction.

THE KASHMIR STAG OR HANGUL (*CERVUS*  
*CASHMIRIENSIS* FALC.).

The Red Deer of Europe typifies a group of large deer consisting of several species and varieties distributed over Europe, Asia, north of the Himalayas, North Africa and North America. The best known Asiatic species is the *Hangul* or Kashmir Stag. Its range is limited to the north side of the valley of Kashmir and some of the adjacent valleys.

The Kashmir Stag is smaller than the Sambar. It is from 48-50 in. high at the withers. A well grown stag scales a little over 400 lbs. The coat ranges from light to dark brown, fading to dingy white on the lips, chin, underparts and buttocks. The colour fades during the summer but tones up with the denser winter coat, which, in a big stag, is very dark or rufous brown. Fawns are spotted. Old hinds may show white flecks. The fine spreading antlers assume great variety in form. Normal heads have 5 points on each antler. Heads with 16 points have been obtained, 14 pointers are rare; 13 and 11 more common.

The Kashmir Stag is essentially a forest animal. These deer are found singly or in small parties. They seldom remain long in one area but roam from forest to forest to find good grazing. Stags shed their antlers between mid March and April. Young stags may carry their horns upto the middle of May. After shedding their antlers most stags go up hill and congregate about the snow line. They spend the summer at an elevation of 9,000 to 12,000 ft. About the end of September the stags' new antlers have hardened. They commence to roar and challenge. They join the hinds at the beginning of October and, as the rut develops, engage in conflict. The master stags collect a number of hinds whose possession is disputed by rivals. In November, when the dry leaves cover the ground, the stags desert the hinds and go to the upland meadows or into the horse-chestnut forests. In hard winters the deer descend to lower levels. They come to the lower elevations in the early spring to feed on the new sprouting grass and the budding larches. The fawns are born in April.

The Chumbi Valley in Tibet and some of the adjacent valleys of Bhutan are inhabited by another species of the Red Deer group—the Shou (*Cervus affinis*). It is also called the Sikhim Stag though its existence in Sikhim is doubted. The Shou is much larger than the Hangul, standing from 4½ to 5 ft. at the shoulder. Its antlers are longer and more massive. Their distinctive feature is the forward bend of the beam at the junction of the third tine.



The Kashmir Stag or Hangul (*Cervus cashmiriensis* Falc.),  
(Height at shoulder 48-50 in.).



The Indian Chevrotain or Mouse Deer (*Moschiola meminna* Erxl.)

## SECTION TRAGULINA.

## CHEVROTAINS OR MOUSE DEER.

The cloven-hoofed animals which we have considered so far all belong to one great division—the *Pecora* or Ruminants. The Mouse Deer represent a second division. They are true ruminants and, like ruminants, have no front teeth in the upper jaw. But they differ in having a three-chambered stomach in place of one with four divisions. They have four well-developed toes on each foot, the bones of the petty or side toes being complete. In true ruminants some of these bones are imperfect or wanting. Antlers are not developed. Mouse Deer, like Musk Deer, are furnished with tusks. These are better developed in males. Mouse Deer are included in a single family the *Tragulidae* which contains three genera: (1) The Indian Chevrotain (*Moschiola*), (2) The Malay Chevrotains (*Tragulus*) and (3) The African Water Chevrotain (*Hyemoschus*). The Asiatic Chevrotains are distinguished from the African by having true cannon bones developed.

The Indian Chevrotain or Mouse Deer (*Moschiola meminna*) is a tiny little creature no more than 10 or 11 in. high. Because of its small size, shy habits and very protective colouring it easily escapes observation. Its coat is olive brown speckled with yellow. The flanks are marked with rows of buff or white spots. The lower parts are white. The throat has three white stripes. The Malay Chevrotains are distinguished from the Indian by having the skin on the chin and throat naked instead of hairy. Their coats are not spotted. There are two species in Burma—the larger Malay Chevrotain (*Tragulus canescens*) and the Lesser Malay Chevrotain (*Tragulus kanchil rarus*). The former is about 28 in. long and 13 in. high, the latter is no longer than 18 in. from the tip of the nose to the root of the tail. The smaller animal has three white stripes on its throat, the larger five. Both species are common in the forests of Tenasserim.

All Chevrotain have similar habits. The Indian Mouse Deer shelters in grass covered rocky hillsides or in forest. It conceals itself in the crevices of rocks or among large boulders, coming out to feed in the mornings or evenings and never venturing far out into the open. In these 'hides' the female brings forth her young, generally two in number, at the end of the rains or the commencement of the cold season. The males live solitary except during the pairing season. The Indian species is found in Central and Southern India. The Malay species live in dense thickets. Like the Indian species they pair in June or July.

## SECTION SUINA.

## PIGS, PECCARIES AND HIPPOPOTAMUSES.

The Chevrotains represent, as was shown, a group of animals somewhat distinct from the true ruminants. Pigs, Peccaries and Hippopotamuses are a stage yet further removed from typical ruminants. They form a third section of the *Artiodactyla*. Their feet, like the feet of the Chevrotains, have the bones of the 4 toes complete. All these pig-like animals have incisor teeth in the upper jaws. Their molar teeth when unworn are capped with small hillock-like columns which do not wear down to crescentic patterns seen in the grinding teeth of ruminants. As they are not ruminants their stomachs are much less complex and may, as in the pigs, consist of a single chamber.

Finally, cannon bones are not developed in the feet, the bones which fuse to form a cannon bone in true ruminants remain distinct in these animals. These pig-like animals represent a more primitive type which existed at a time when ruminants were unknown and which formed the ancestral stock from which they have descended.

The Peccaries are exclusively American in their distribution. Hippopotami are now limited to Africa but many species once inhabited India. They were probably contemporary with the Stone Age Man in this country.

The Pigs (*Suidae*) are the only representatives of the division in our area. There are two genera: (1) the Wild Boar (*Sus*) and (2) the Pigmy Hog (*Porcula*). An elongate head with an abruptly truncated mobile snout, ending in a flat disc containing the nostrils is distinctive in pigs. Their feet are narrow. The petty toes are completely developed but do not reach the ground when walking. The upper canines curve upwards and outwards.

The Pigmy Hog is closely related to the typical Pigs. On account of its small size, short tail and the presence of three pairs of teats instead of 4, it is regarded as a separate genus. Though a single species of wild boar is now found in India, in the Eocene Period six or seven species inhabited the country—one of them a monster form, the largest known of its race.



Reproduced from "The Jungle in Sunlight and Shadow." Copyright, F. W. Champion.

Photo by F. W. Champion.

The Indian Wild Boar (*Sus cristatus* Wagner).

Family IV. *SUIDAE*, PIGS.THE INDIAN WILD BOAR (*SUS CRISTATUS* WAGN.).

The Indian Wild Boar is widely distributed. It ranges over nearly the whole of India, Burma and Tenasserim, Siam and part of the Malay Peninsula. It is also found in Ceylon.

A well grown male stands about 36 in. at the shoulder. It is believed to be a larger animal than the European Boar with a sparser coat and a fuller crest or mane. The weight of an adult may well exceed 300 lbs. The tusks are well developed in the males both the upper and lower curve outwards and project from the mouth. The lower tusks in a large boar are said to have measured 12 in. including the portion embedded in the jaw. But they rarely exceed 9 in.

The tame pig of India is probably derived from the wild. The two probably interbreed when opportunity offers. The colour is black mixed with grey, rusty-brown and white hairs. The young are browner and old boars greyer. New born wild pig are brown with light or dark stripes.

The Indian Wild Boar lives in grass or scanty bush jungle—sometimes in forest; after the rains, quite commonly in high crops. They are omnivorous living on crops, roots, tubers, insects, snakes, offal and carrion. They feed in the early mornings and late in the evening and, where much disturbed, chiefly at night. No animal is more destructive to crops and, in cultivated areas, it is impossible to make a plea for its protection.

Wild Boar display great intelligence, and few animals show greater courage and determination. The sense of smell is acute, the eyesight and hearing moderate. Wild Boar are highly prolific. They apparently breed at all season. In Central India the majority of young are born at two periods shortly before or after the rains. Boars and sows are known to collect in large assemblies when pairing. A herd of 170 or more were seen by Mr. Dunbar Brander. They were collected in a circle, the master boars in the centre. Two males were fighting—two others had fought; the rest were passive though interested spectators. The period of gestation is said to be four months—4-6 young are born at a time. The mother shelters them in a heaped up mass of grass or branches which she builds before she litters.

After breeding the big boars live alone or in company with another of equal size or with one or two sows.

The Pigmy Hog (*Porcula salvania*) inhabits the forests at the base of the Himalayas in Sikkim, Nepal, Bhutan and in Assam. Its habits are similar to those of Wild Pig. It is said to live in herds of 5-20. It is nocturnal and rarely seen.

## PERISSODACTYLA: ODD-TOED UNGULATES.

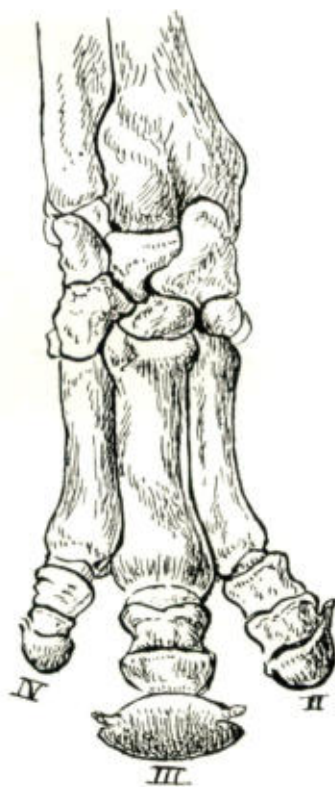
It has been shown that there are four main divisions or Orders of hoofed animals and that all those considered so far, belong to the first and largest division the Artiodactyla or Even-toed Ungulates. The salient feature which distinguishes the even-toed ungulate lies in the arrangement of its toes. The axis of the foot—a line drawn down its middle—passes between the third and fourth toes. These two toes are large and equal in size. The hoofs which encase them appear like a single hoof cleft in two. This prominence of the third and fourth toe is accompanied by the diminishing in size of the second and fifth and the complete disappearance of the first toe. This is the general plan of structure in the feet of oxen, sheep, goats, deer and pigs.

With Horses, Rhinoceroses and Tapirs we come to an assemblage of animals differing in many important respects from those so far described. Their most obvious distinction is again displayed in the structure of the feet. Like the even-toed ungulates they are descendants of 5-toed ancestors. But with them it is the third or middle toe of the foot which has increased in size at the expense of the others. The number of toes varies. A Tapir has four and a Rhinoceros three toes on the fore feet. Both have only three on the hind. The foot of a horse has but one functional toe. But in all these animals it is the third or the middle toe of the foot which is most prominent. It is always symmetrical in itself and always larger than the other toes, when these are present. This pre-eminence of the third or middle digit of the foot gives this group of animals its name—*Perissodactyla* or Odd-toed Ungulates. With them, except in the case of the Tapirs, the number of toes in each foot is usually odd—either one or three. The Odd-toed ungulates are further marked by having their molar and pre-molar teeth in one unbroken series, the posterior molars resembling the pre-molars in shape and size.

The Odd-toed ungulates are poorly represented at the present day. Horses, Rhinoceroses and Tapirs are the only surviving members of a group of animals which flourished in great variety during the earlier Tertiary period. With the exception of the Tapirs which are found also in Central and South America all the existing odd-toed ungulates are Old World animals.



TAPIR.



RHINOCEROS.



HORSE.

• The bones of the forefoot of the three animals are shown : the Horse with 1 digit, the Rhinoceros with 3 and the Tapir with 4. In all of them the 3rd or middle digit is symmetrical in itself and much more developed than the other digits.

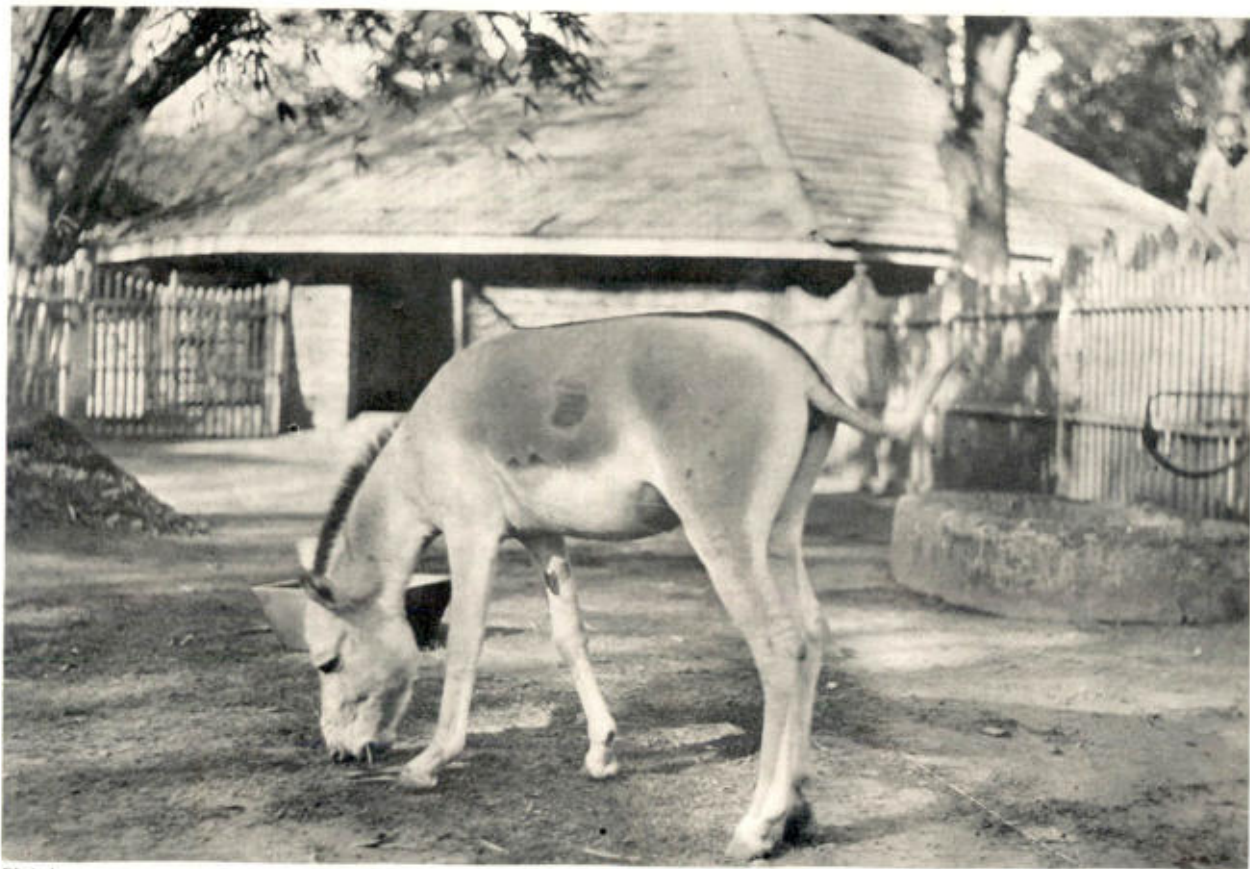


Photo by

C. McCann

The Indian Wild Ass (*Equus onager indicus*, Pallas).  
(Height at shoulder 44-48 in.).

## Family 1: EQUIDAE.

## HORSES, ASSES AND ZEBRAS.

THE KIANG (*Equus kiang* Moorcroft.).THE GHOR-KHAR OR INDIAN WILD ASS (*Equus onager indicus* Blyth.).

The Horse tribe includes the Asses and Zebras. In all these animals each foot has a single complete toe encased in a large solid hoof. It is supported by a long bone known as the 'cannon bone'. Small splint bones on each side of the 'cannon' bone represent the vestiges of the second and fourth toes. The cheek teeth are large, quadrangular and complex, the enamel foldings being numerous as compared with the simpler ones of the Rhinoceroses and Tapir.

In the wild state the family is confined to the plains of Asia and Africa. Two species are resident in our area. The Kiang (*Equus kiang*) and the Ghor-khar or Indian Wild Ass (*E. onager indicus*). The Kiang lives in the high open plateaus of Ladak and Tibet. The Indian Wild Ass is found in Baluchistan, Cutch and in parts of the desert zone of North-Western India. Both the Kiang and the Ghor-khar are more closely allied to the Horse than to the true wild asses of North Africa. Like all Wild Asses, they have short upright manes. Those curious callosities seen on the inside of the legs of the horse, the purpose of which is unknown are absent in the ass. The Kiang is distinguished by its large horse-like hoofs. The hoofs of the Ghor-khar are smaller and more ass-like. A Kiang's ears are comparatively short. The coat is reddish in summer, tawny grey, woolly and dense in winter. Like all wild asses it has a dark brown stripe along the back from the nape to the tail. A Kiang stands about 51-52 in. at the shoulder.

Wild asses are usually shy and difficult to approach but the Kiang is one of the most inquisitive of animals and will frequently approach within 50 yards or so of any strange object.

The Ghor-khar which is the eastern race of the Persian Wild Ass is a smaller animal than the Kiang. It is about 46 in. high at the shoulder. In summer its coat is sandy, in winter, grey.

Wild asses are remarkable for their fleetness and their capacity of getting over rough and stony ground at a great pace. As a rule these animals inhabit desert plains or as in the case of the Kiang open rolling tablelands where both desert and arctic conditions prevail.

They associate in small parties of 4 or 5. Sometimes these parties unite and form large herds. During the foaling time the Kiang mares collect in certain favoured areas while the stallions are scattered about either solitary or in twos and threes.

In the plains to the west of the Indus, Wild Asses are found wandering about for the greater part of the year but in the hot weather when the grass withers and water is scarce they migrate to the hills. The mares are said to drop their foals in July and August.

## Family II: RHINOCEROTIDAE RHINOCEROSES.

The various species of Rhinoceroses, all now confined to the Old World, differ remarkably from one another in structure. As a result of migrations during past epochs into different habitats and climates, into new feeding grounds to which they became adapted, the various species appear to have become distinct at a very early period of their history.

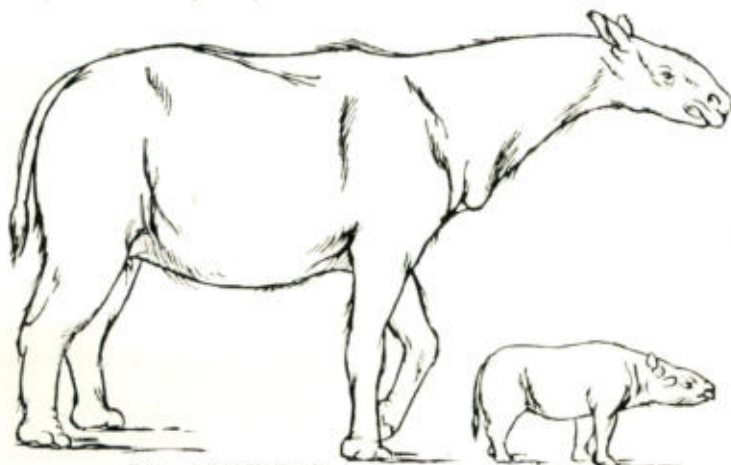
A comparison of the remains of numerous extinct forms with those now living indicates 7 distinct lines of descent and evolution from which lesser branches were given off. Though these animals are externally similar they are thus really very far apart both in history and anatomy: even the two living African Rhinoceroses probably separated from each other and became distinct species a million years ago.

Three species of Rhinoceros are found within our limits. The Great One-horned Rhinoceros (*Rhinoceros indicus*) and its relative, the Smaller One-horned or Javan Rhinoceros (*Rhinoceros sondaicus*) have an obscure genealogical history. No representatives of these true and typical Rhinoceroses have been discovered anywhere but in South-Eastern Asia. Their remains are not found in the more ancient Sivalik beds. But they appear with relative suddenness in the uppermost and more recent beds in the form of two species known as the Sivalik Rhinoceros (*R. sivalensis*) and *R. palacindicus* the ancient Rhinoceros of India.

The Asiatic two-horned Rhinoceros (*R. sumatrensis*) was on the other hand widely distributed in the past. It was quite abundant in the Sivalik hills in Pliocene times. It was a geological period when these animals, favoured by a genial climate, inhabited a broad forest belt which stretched from the east coast of England southwards and eastward across Southern France and North Italy to India.

All the living Rhinoceroses are included in a single genus. Their massive build, the thickness and solidity of their bones, their short stumpy legs each furnished with three toes are some of the family characters. The skin in all the living forms is either thinly clad with hair or naked and in all the Indian species the heavy hide in places is thrown into deep folds. The nasal bones are enlarged to serve as a support for a single or double horns. When two horns are present they are situated one behind the other in the middle line of the snout. The horn is formed of a closely matted mass of horny fibre issuing from the skin. It has no connection with the skull, although a supporting boss of bone in the skull may serve as its foundation.

The horns grow throughout life and if lost are reproduced.

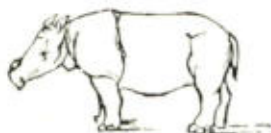


BALUCHITHERE

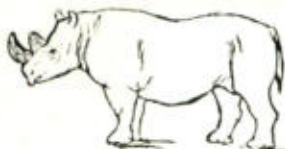
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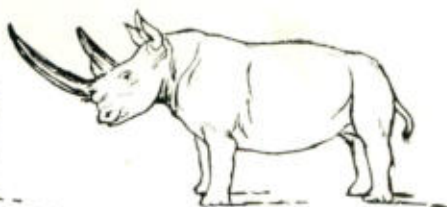
INDIAN RHINOCEROS



SUMATRAN RHINOCEROS

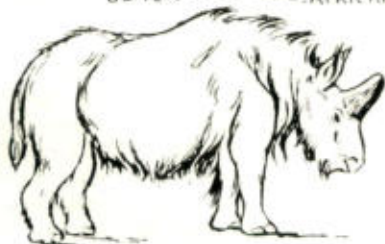


BLACK



AFRICAN RHINOCEROS

WHITE



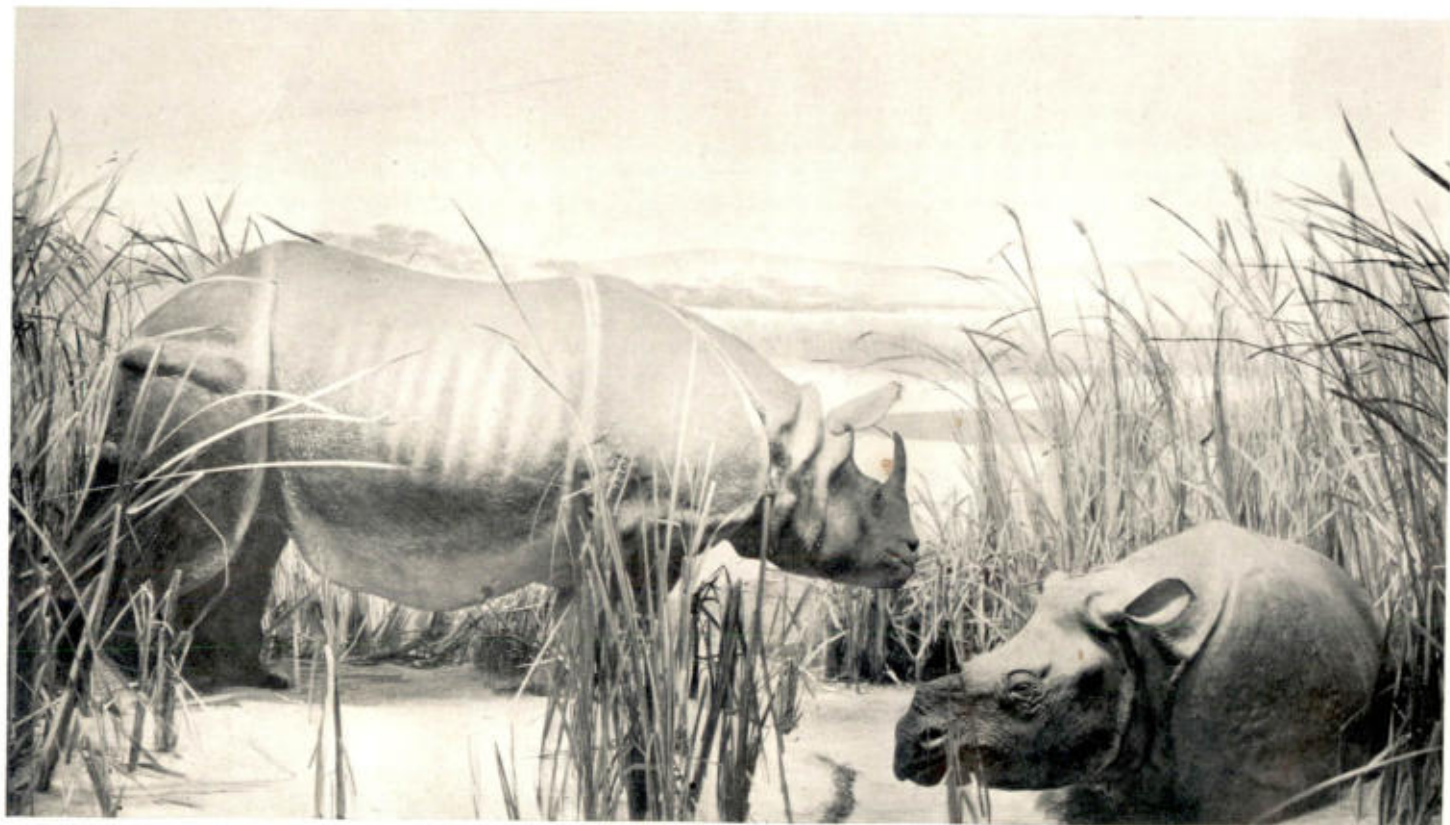
ELASMOTHERE



TELEOCERAS

RHINOCEROSES LIVING: (*facing left*); EXTINCT (*facing right*).

The Baluchithere, an aberrant form of Rhinoceros, whose remains were discovered in the Butgi Hills, Eastern Baluchistan is believed to have been 13 ft. high at the withers. It towers above all its relatives. (*Reproduced from Natural History, Vol. XXIII, No. 3*).



By Courtesy of

The Field Museum, Chicago

The Great One-horned Rhinoceros (*Rhinoceros unicornis* L.).  
(Height at shoulder 60-69 in.).

## THE GREAT ONE-HORNED RHINOCEROS (*RHINOCEROS UNICORNIS* L.).

The Great Indian Rhinoceros, probably the largest of all living Rhinoceroses may reach over 6 ft. at the shoulder.

The average height of a well-grown animal is about 5 ft. 8 in. with a girth of 11 ft. behind the shoulder. The skin of this massive creature is divided into great shields by heavy folds before and behind the shoulder and in front of the thighs. In this Rhinoceros the folding of the skin in front of the shoulders is not continued right across the back. The skin on the flanks, shoulders and hind quarters, is covered with a mass of rounded tubercles. With his grotesque shape, long boat-shaped head, his folds of armour, his scaly hide he looks like a monster of some bygone age. The horns of the Indian Rhinoceros never compare with those of the African. The record from Assam measures 24 in. 15-16 in. is a good average length.

The males may be recognised from the females by a shorter and thicker horn blunted by frequent combats. The female's horn is sharper and longer. Though it prefers swamp and grass the Great Indian Rhinoceros is also found in wood jungle up ravines and low hills.

The animal is solitary as a rule though several may occupy the same patch of jungle. Along the numerous rivers which flow through the jungles of the Nepal Terai the rhino has particular places for dropping its excreta. Mounds so accumulate in places. In approaching these spots a rhinoceros walks backwards and falls an easy victim to poachers. Breeding takes place at all times of the year. The period of gestation is given as 17 to 18 months. In Nepal it is generally believed to be one year. A fully developed calf taken from the uterus measured 4 ft. 1 in. and scaled 120 lbs.

The food consists chiefly of grass. In Nepal during the rains Rhinoceros frequently enter cultivation. Many legends and beliefs are attached to this animal. In Europe, during the Middle Ages its horn was generally believed to have peculiar medicinal virtues.

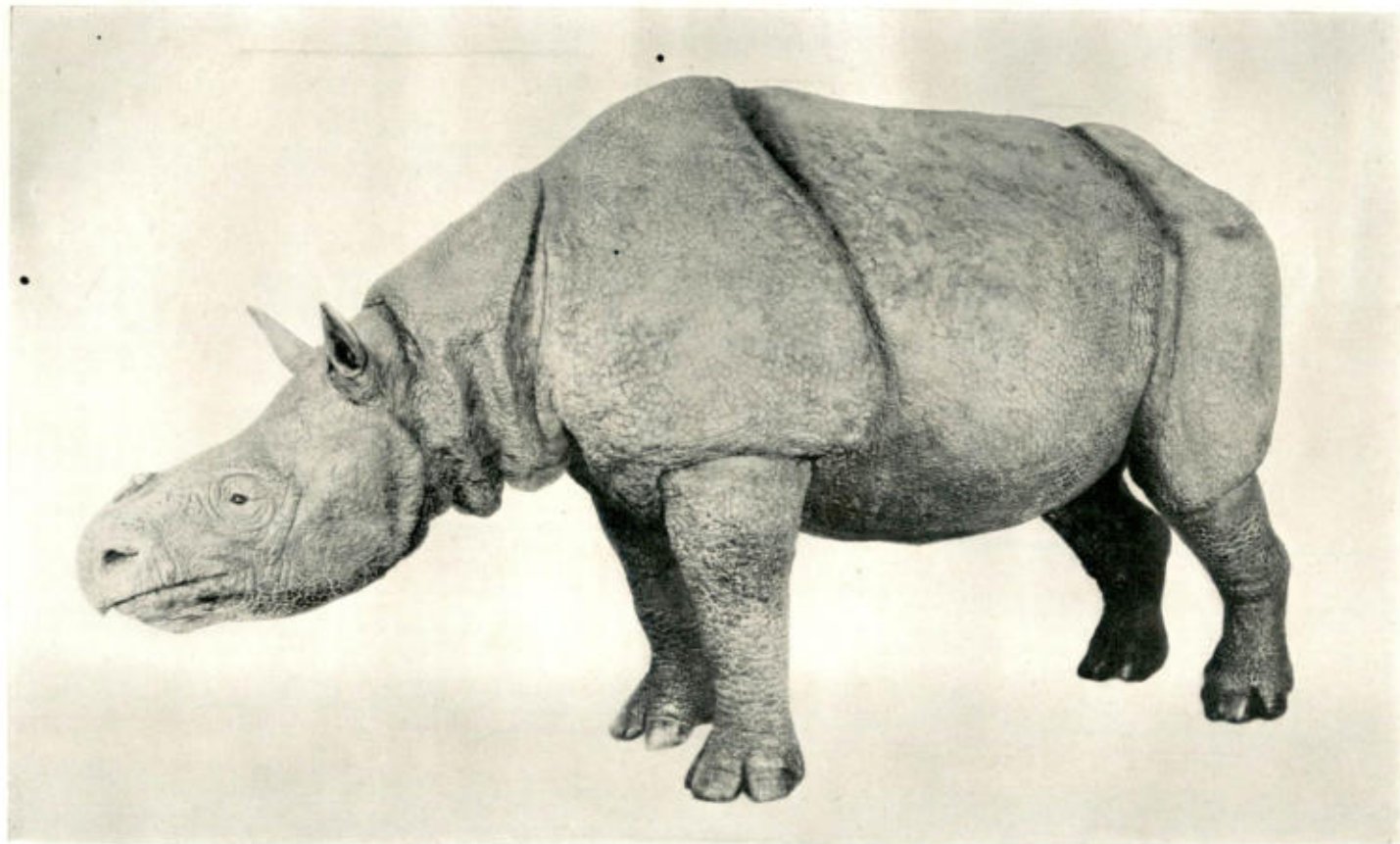
In Nepal the flesh and the blood of the Rhinoceros is considered highly acceptable to the *Manes*. High caste Hindus and most Gurkhas offer libation of the animal's blood after entering its disembowelled body. On ordinary *Sradh* days the libation of water and milk is poured from a cup carved from its horn. The urine is considered antiseptic and is hung in a vessel at the principal door as a charm against ghosts, evil spirits and diseases. These beliefs connected with the Rhinoceros are prevalent in varying form in Burma, Siam and China. They set a great value upon the animal and provide the main reason for its persecution. In Nepal, the Indian Rhinoceros is found only in the country to the east of the Gandak river known as Chitawan where strict preservation by the Nepal Government has saved it from extinction. In parts of Assam, where it is still found, strict preservation has temporarily saved it from extermination.

THE SMALLER ONE-HORNED OR JAVAN RHINOCEROS  
(*RHINOCEROS SONDAICUS* CUV.)

The Javan Rhinoceros is a close relative of the Great One-horned Rhinoceros. Though smaller, it is still a very bulky animal. Old bulls measure about 5 ft. 10 in. at the shoulder. The single horn is never very long. 10½ in. is the record. The horn does not appear to be developed in females or, if developed at all, it is only a low boss. In distinction to its relative, the fold of skin on the shoulders is continued across the back. The hide is marked all over with a mosaic like pattern.

The Smaller One-horned Rhinoceros was once believed to range from Bengal and Assam through Burma and the Malay Peninsula to Sumatra. As far as can be ascertained its range is now limited to the Malay Peninsula and Java where a few still exist under protection. In earlier works on Burma, it is mentioned as having been once abundant in the forested banks of large rivers, in the district of Tenasserim. Recent attempts to discover whether this rhinoceros still exists in Burma have failed and it is doubted whether there are more than half a dozen specimens and it is doubtful whether these will survive without adequate measures for their protection. Though it occurred in the Bengal Duars, in former years, its presence in this area at the present time requires verification.

The Smaller One-horned Rhinoceros is more an inhabitant of tree forest than of grass land. Its low crowned grinding teeth indicate that it is a browser, indulging less in grazing than the Indian Rhinoceros, whose armoury of high crowned grinding teeth are peculiarly adapted to the mastication of grass. Its usual habitat is hill country where it has been found at elevations as high as 7,000 ft. above sea level.

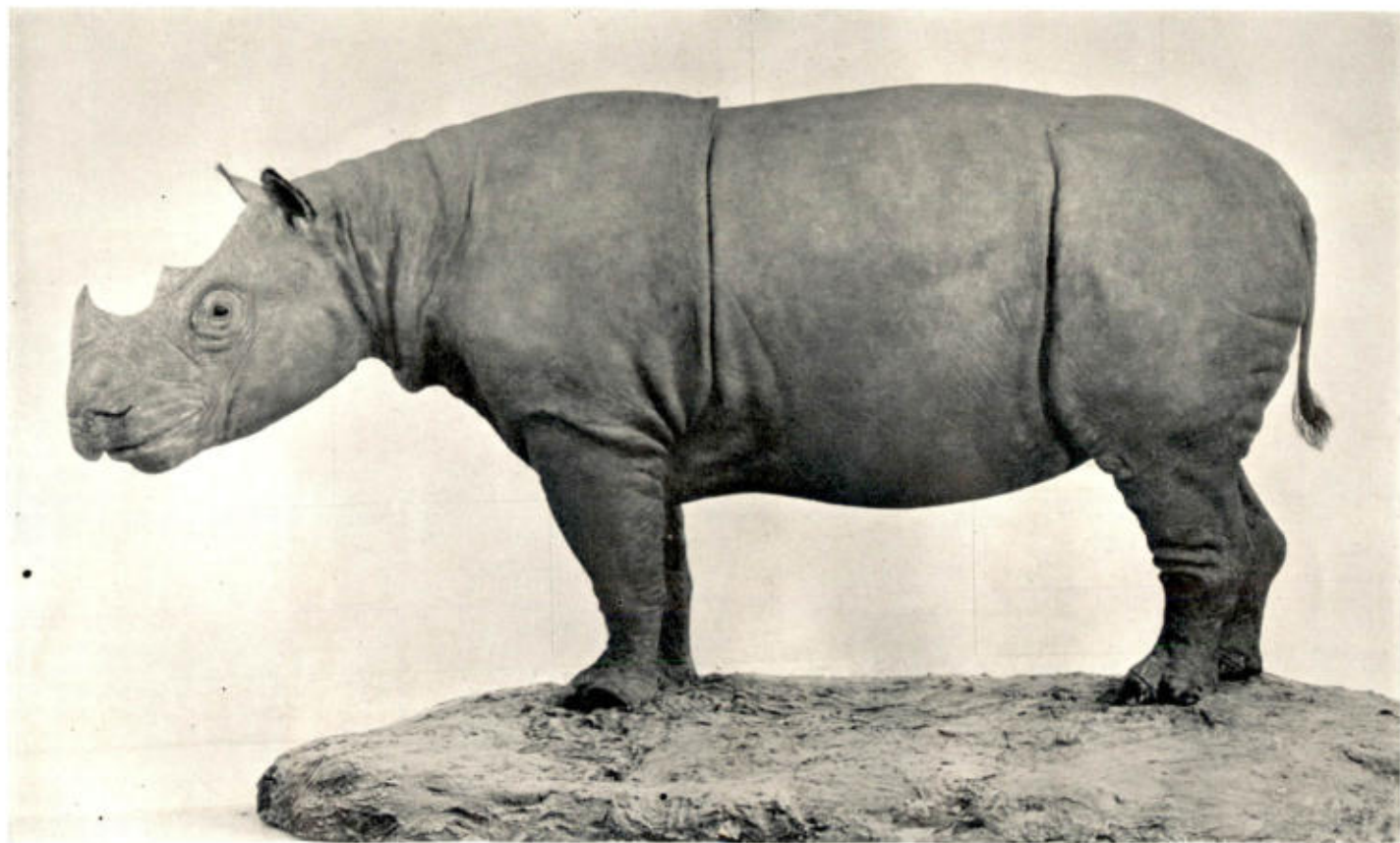


By Courtesy of

The Smaller One-horned Rhinoceros (*Rhinoceros sondaicus* Cuv.)  
(Height at shoulder 70 in.).

The Brit Mus Nat. Hist.,

2



By Courtesy of

The Sumatran Two-horned Rhinoceros (*Rhinoceros sumatrensis* Cuv.).  
(Height at shoulder about 52 in.).

The Amer. Mus. Nat. Hist., New York.

### THE SUMATRAN TWO-HORNED RHINOCEROS (*RHINOCEROS SUMATRENSIS* CUV.).

The Sumatran Rhinoceros differs from the two other Asiatic Rhinoceroses in possessing two horns. On this account it is considered to represent a distinct sub-generic group (*Diocerhinus*). It is further distinguished by having a single pair of lower front teeth instead of two pairs as in the Indian and Javan animals.

The Two-horned Rhinoceros, like the Lesser One-horned species has a preference for forested hill tracts where it wanders up to considerable elevations. A sufficiency of shade and a good supply of water are essential to its habitat. A pair will frequent a given area for a time and then move off, their movements being affected by the water supply. They enter streams by night and also during the hot hours of the day. In suitable spots there are regular wallows or 'mud baths' in which the huge creatures roll much as buffaloes and pigs do. As a result of this habit their bodies are always well coated with mud. Tracks lead off in all directions from these 'wallows'. They present the appearance of large tunnels hollowed through the dense undergrowth. Unlike the elephant, a rhinoceros does not break through the jungle but burrows his way through the dense tangle. They visit the wallows singly or a bull and a cow may be found together. The night and early morning is spent in wandering about and feeding; the hot hours of the day in rest in some cool and shaded spot. In the cold weather and rains they visit the low country coming down in search of particular foods. They are not grazers but browse on twigs, shoots and are very partial to fallen fruit:—wild mangoes, citrous fruits and figs.

The sense of smell and hearing is acute but the sight is poor. Collections of dung found at particular places reveal a habit similar to that noticed with the Great One-horned Rhinoceros.

Little is known about their breeding habits but it is known that the young remain with the mother to a fairly advanced age.

The Two-horned Rhinoceros was once fairly common throughout Burma—it also occurred in Assam from which province it is now practically exterminated. At the present time a few inhabit the forests of Lower Tenasserim and the hill tracts about Myitkyina, the Arrakan Hills and the Pegu Yomas. A small number are present in the Shive-u-daung Sanctuary in the Mogok division of the Katha District where proper protection may save this species from extinction in Burmese limits.

Family III: *TAPIRIDAE*: TAPIRS.THE MALAY TAPIR (*TAPIRUS INDICUS* CUV.).

The third and least specialised family of surviving Odd-toed Ungulates contains a single genus—*Tapirus*, the Tapirs. Tapirs differ little in their anatomy from their fossil ancestors and appear to have retained their primitive character even to our times. In the remote past they probably inhabited, as they do now, the deep recesses of the forest. Such protected environment is never favourable to rapid evolution but rather to persistence of type. We see this exemplified in the Two-horned Rhinoceros, like the Tapir, a creature of dense forest which shows little change in its anatomy as compared with the Two-horned Rhinoceros of past geological epochs.

Tapirs differ from all odd-toed ungulates in having 4 toes on the front feet. Their hind feet as with the Rhinoceros is three-toed. The three large toes of the fore foot correspond to the three middle fingers of the human hand. The little outer toe represents the fifth finger.

The cheek teeth have two simple transverse crests on their crowns, very different from the complex enamel foldings of the teeth of rhinoceroses and horses.

A heavy ungainly body, short stout limbs, a muzzle lengthened to form a short trunk, small eyes, oval ears and stumpy tail, all give the Tapir a peculiarly antediluvian appearance.

Tapirs once inhabited Europe and from thence they appear to have migrated southwards. One group reached the New World where they still survive in Central and South America and the other passed down into the Malay countries.

The Malay species is very distinct from its American relations. It is larger and has a bi-coloured coat. The head, limbs and front part of the body is brownish black, the rest of the body behind the shoulders is greyish white. The American Tapirs are uniform brown. The young of both animals are striped. The Malay Tapir stands from 3-3½ ft. at the withers and slightly higher at the rump. The species is confined to Sumatra and the Malay Peninsula and only enters our limits in the south of Tenasserim. Here it lives in densest forests and has many of the habits of the rhinoceros browsing on leaves and twigs and visiting wallows. It is a water loving creature and swims and dives well. A pair of Tapir in captivity displayed a habit of carefully concealing their droppings. Copulation took place in the water. A single young was produced. The period of gestation was 9 months.

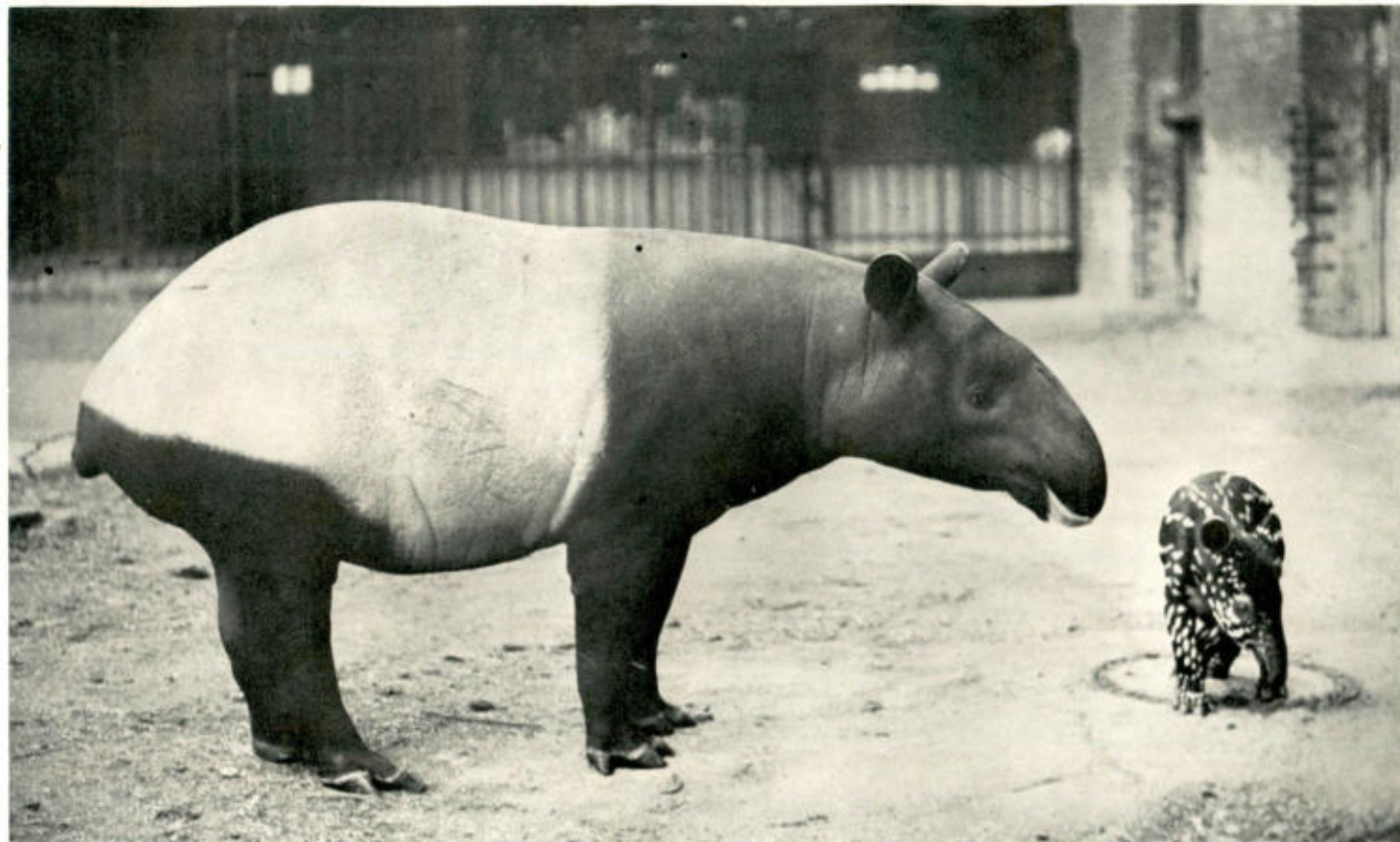


Photo by

W. S. Berridge.

The Malay Tapir and young (*Tapirus indicus* Cuv.).  
Height at shoulder 36-42 in.).



Evolutionary changes of Proboscidea. Based on restorations modelled by  
R. S. Lull.

- a. *Elephas columbi*; b. *Mammuth americanum*;  
c. *Tetrabelodon angustidens*; d. *Moeritherium*;  
e. *Palaeomastodon*. (Reproduced from Ann. Report,  
Smithsonian Institution, 1909).

## PROBOSCIDEA: ELEPHANTS.

The proboscis or trunk of the elephant gives the name Proboscidea to this the fourth and last order of Ungulates. There are but two species of elephants in existence—the Indian and the African. They are the sole survivors of a great assemblage of species which once inhabited the earth. No fewer than seven species of elephants and 8 different Mastodons are known to have existed in India during remote geological periods.

With its pendant trunk, its curious dentition, and its great size the elephant presents distinctive characters which differentiate them from all other mammals. However remarkable these characters may be, they are the ultimate results of a gradual deviation from a standard type of mammal—a hairy creature of no great size walking on the soles of its five-toed feet and carrying in its jaws the typical complement and number of incissor, canine and molar teeth. A comparison of existing and extinct forms of elephants and their allies has helped to indicate the great physical changes which the race has undergone during the long ages of its history. Changes which have been brought about largely by migrations to new countries and the new condition of life which they imposed. These migrations were impelled not only by the natural urge of the creature to extend its territory but also by actual changes in the earth's surface which bringing about a difference in climate and vegetation forced the ancestral forms to migrate into areas where conditions of life were more congenial. The physical modifications which elephants display are seen firstly in an increase in size. This necessitated the development of pillar-like limbs to support the enormous weight of the body which again implied the straightening of the limb bones and a change in the angle of their articulation. The foot itself changed its posture from the primitive plantigrade position. The heel and ankle bones were elevated above the ground and a thick pad of gristle developed beneath each foot and so formed a cushion to receive its share of the weight. The toes were embedded in the common mass of the cylindrical foot and encased in a common skin. Their position is indicated externally by broad flat nails which may be fewer than the number of toes. Thus, the limb bones gradually developed into vertical shafts through which the weight of the body was transmitted.

The shortness of the neck and the height of the head from the ground necessitated the development of a proboscis or trunk—a combined and lengthened nose and upper lip—as a device for securing food and water. Its development was accompanied by marked changes in the character and form of the skull. The skull of an elephant shows no 'snout'. The bony part of the face is almost straight. But it would appear that the ancestral elephants had a longer face—a prolonged bony snout more in conformity with the standard mammal skull. This is seen to some extent in the skull of the American Mastodon and to a more remarkable degree in a yet more ancient form of Mastodon—the *Tetrabelodon*. The creature had an extraordinary lengthened lower jaw furnished with

two horizontal tusks. These tusks were additional to a downward bent pair in the upper jaw. Its trunk must have rested horizontally on its lower jaw between the tusks. It was not a pendant trunk but an elongated upper lip. It is believed that an elephant's trunk originated in this way. Firstly by the great elongation of the lower jaw producing a corresponding lengthening of the proboscis to reach to the need of the tusks and then by a shrinkage of the lower jaw and the straightening of the bones of the face. The long proboscis was no longer supported by the lower jaw. Gradually dropping as the lower jaw receded, in the course of successive ages, it at last hung down as a pendant trunk.

Other physical changes undergone by elephants are seen in increase in the size and complexity of the teeth, their consequent diminution in number and the development of a peculiar method of tooth succession. All the canine teeth have been lost and all the incisors, except the second pair in the upper jaw. These have developed into tusks. As to the grinding teeth an elephant develops 6 molars in each jaw during its life time. But the jaws are so short and the grinders so large that there is never room for more than two—one entirely and the other partly exposed above the gums. The new tooth forms in the rear of the jaw. Pushing forward it gradually replaces the preceding tooth which, as it wears away, is crowded out of the jaw. The first milk molar appears at the age of two weeks, it is shed at the age of 2 years, the second is shed at the age of 6, the third at 9, the fourth (or first adult tooth) between the 20th and 25th year, the fifth at 60 and the sixth lasts for the remainder of the creature's life.

Each molar is larger than the one which preceded it. Its structure has no parallel in the teeth of other animals. It is made up of a series of plates each composed of a flattened mass of dentine invested by a layer of enamel, the whole bound together in a solid mass by cement. As the dentine wears the harder enamel appears in a series of transverse ridges across the crown of the molar. The number of these ridges varies. In the Indian elephant the last or 6th molar may show 27 of these ridges. In the African species the number never exceeds 11. The African elephant is larger than the Indian. It has enormous ears, a hollow back and only three nails on each hind foot. There are 4 in the Indian species. The trunk ends in two equal sized 'lips'. The Indian elephant has but one.

The *Proboscidea* form a single family the *Elephantidae* which includes but one living genus.



Photo by

The Indian Elephant (*Elephas maximus indicus* L.)

W. S. Thom.

THE INDIAN ELEPHANT (*ELEPHAS MAXIMUS INDICUS*).

The Indian elephant rarely exceed 10 ft. 6 in. at the shoulder. The average height of an adult male is 9 ft. The female is a foot lower. Twice the circumference of an elephant's fore foot gives a fair indication of its height. The rule does not apply always in the case of young and growing animals.

Generally only the males have large tusks. The tusks of females scarcely protrude or perhaps protrude a few inches. In some males the tusks are no longer than in females. Many of these tuskless males or *maknas* are very large in build with extraordinarily well developed trunks. The contour of the tusks varies. In some elephants they are wide spread and curved, in others straight and pointed downwards. A pair in the Royal Museum at Siam taped 9 ft. 10½ in. A pair in the possession of H.M. the King measures 8 ft. 9 in. and 8 ft. 6½ in. and weighs 160 and 161 lbs. respectively. The elephants found in Ceylon are regarded as a separate race (*E. maximus zeylanicus*). The males carry quite normal tusks. The females are tuskless. A few big tusked shot in Ceylon are believed to be the descendants of elephants introduced from India.

The Indian Elephant has normally five nails on its fore foot and four on its hind. The outside nails are comparatively small and crinkled and their impression is only traceable in very wet soil. Ordinarily the imprint of at most three nails is to be seen and that only on soft ground. The colour of the elephant is greyish black. The chest, forehead and ears are often covered with flesh coloured spots.

An elephant usually moves at a walking pace, when alarmed or annoyed it breaks into a shuffling run. The huge creature can attain a wonderful speed and when 'all out' may travel at quite 20 miles an hour. Despite its bulk the elephant is wonderfully active going up and down steep hill sides with ease. It is an excellent swimmer and in deep water swims with practically the whole body except part of the head and trunk submerged.

Elephants chiefly frequent districts covered with tall forests where the ground is hilly or undulating and where bamboos grow in profusion. They are extremely adaptable and will live in steamy humid jungle or in cool elevated forests. In Burma they wander at all seasons of the year into bamboo forest at a height of 10,000 ft. while in Sikkim, their tracks have been seen in the snow 12,000 ft. above sea level. In the dry season the herds generally keep to the denser forests but during the rains come out into open glades and frequently enter cultivation. Individuals of various sizes and ages associate in herds which may vary from 5 to 60 or more animals. Herds are believed to be composed of single families. Different herds do not mix but stray females and young males may migrate from one herd into another. When fodder is scarce, the larger herds break up into small parties, which reunite when conditions are favourable. The big tusked are usually seen feeding at some distance from the main herd. The bulls when they arrive at a certain age, live as solitaires or, two males of equal age may associate together. A solitary bull will graze with a herd when it happens to be in the same patch of jungle

and will seek the herd when the urge to mate is on it and desert it again when its desire is appeased. When travelling elephants move in single file, the tuskers generally bringing up the rear. The leader of a herd is invariably an old female. Herds travel to and from their feeding grounds by well worn paths, wandering from them when the terrain is favourable but returning to these fixed paths, which generally follow the easiest and straightest line across the country and represent the accumulated wisdom of generations of travelling elephants. When undisturbed, the herd pursues a regular and ordered routine, drinking and feeding in accustomed places and lying up to rest in its usual retreat. They sleep during the hot hours of the day, being intolerant of the sun, feed early in the morning and evening and come out after nightfall to feed in open forest or to raid crops; retiring to sleep after midnight. An elephant rests standing or stretched out on its side. The food consists of various kinds of grasses and leaves, stems and leaves of wild bamboos and plantains, all species of crops and the bark of particular kinds of trees. A full grown elephant will eat from 600-700 lbs. of green fodder in a day.

Male elephants, very rarely females, both tame and wild, on attaining maturity are subject to peculiar periodical paroxysms of excitement known as '*musth*'. *Musth* seems to have some connection with the sexual functions. It is probably analogous to the '*rut*' in deer. It occurs most frequently during the cold season and may perhaps be due to ungratified sexual desire. In some cases this is not always so since the society of a female will by no means quell or pacify the animal. At other times an elephant in *musth* will seek a mate.

The exact breeding season is uncertain but as most of the young are dropped in the late autumn and the period of gestation lasts about 20 months it is probable that the main breeding season is during the hot weather and at the commencement of the rains. One calf is only born at a time though, in rare instances twins and once, even triplets have been recorded. The mother of a young calf is invariably assisted in caring for her young by another female who takes on the duties of a guardian and is as assiduous in her care of the calf as its parent. A new born calf will walk a few hours after birth. In height it averages about 2 ft. 10 in. It suckles with its mouth and when alarmed takes refuge under its mother's body.

Elephants have a very poor sight, the sense of smell and hearing is highly developed, more so than in most animals. Much mystery is attached to the deaths of elephants. They are reputed to seek out some solitary and secluded spot to which they retreat when they feel their powers failing and death approaching. The legend is widespread, though it remains to be substantiated. The fact that dead elephants are seldom found may be explained firstly by the infrequency with which deaths must occur among such long lived animals and secondly by the rapidity with which decomposition in a tropical climate will remove all traces of the carcass. There are some instances on record where other elephants have attempted to move or have actually moved the dead body of a companion.

## THE PRESERVATION OF WILD LIFE IN INDIA.

No. 3. ASSAM.

BY

A. J. W. MILROY.

(*Conservator of Forests, Assam*).

The question of affording adequate protection to game in Assam is a difficult one that we cannot expect will receive much local attention just now with so many important political changes staged for the immediate future, but in view of the imminence of these inevitable changes in administration it might be undesirable to postpone any longer the consideration of what system of preserving the fauna, whether the present one or something on different lines, will be most likely to survive the introduction of provincial autonomy.

Up to thirty years ago there were still very extensive unoccupied tracts in the Province, the first to disturb them being Gorkhali buffalo-keepers who began then to invade Assam with their herds, to be followed by ever-increasing hordes of immigrants, after the Brahmaputra Valley had become linked to Bengal by the railway.

Rules regarding close seasons had been framed at an early date for the Reserve Forests in conformity with practice in other parts of India, but game remained entirely unprotected in the waste lands known as Unclassed State Forests, until about 1910 when close seasons were introduced following a letter to *The Times* by Sir Harry Johnston on the indifference shown by Provincial Governments in India to the fate of their wild animals; but as no fees have ever been charged for shooting in the Unclassed Forests, there have been no funds for the maintenance of a special patrolling or protective staff, and the protection afforded by the rules alone has consequently been very meagre.

### *Types of Game Country.*

Enormous areas of grass and reeds used to extend from the banks of the Brahmaputra towards the hills which enclose the valley on both sides, and it was here that most game used always to be found—rhinoceros, and swamp deer in the low-lying places, elephants, bison, and other deer nearer the hills—but these are precisely the very localities that attract the buffalo-herdsmen and the settlers, so that a great deal of this type of jungle has now disappeared for ever and it is only a matter of time before the most of the balance goes too. In these circumstances the policy adopted a few years ago of issuing gun-licences almost indiscriminately has only accelerated what was bound eventually to take place, and what has already occurred in all countries suffering from, or

blessed (as the less far-sighted hold) with, an increasing human population.

Most of the former great shooting grounds are thus being occupied exclusively by Man and nothing can be done in them for wild animals. There remain for consideration the Reserve Forests, which have been taken up mostly for timber, but which include as Game Sanctuaries two important grassy areas.

Dense, evergreen forests contain comparatively little fodder suitable for game animals, which prefer the more open and the deciduous tree forests, but everywhere in Reserves reasonable game preservation should be looked for, seeing that the sale of shooting permits is a possible source of revenue, that rules exist for the benefit of the various species of animals, and that a Forest Staff is provided by Government to uphold these and other Forest Laws. It must be confessed, however, that in Assam just as in Burma, judging from some recent Annual Forest Administration Reports from that Province, game preservation is largely a matter of individual whim, and that encouraging results obtained by one Divisional Forest Officer are only too often dissipated during the regime of a successor, who is indifferent to this side of his multifarious duties.

The present Government cannot be accused of lack of keenness. Three years ago, a British Officer and a Company of Assam Rifles were detailed to spend six weeks touring a district where the inhabitants had got out of hand and were poaching in the Monas Game Sanctuary on a commercial scale, while at the present moment an energetic Assistant Conservator, is on special duty at the head of an anti-poaching campaign that is doing some very good work indeed. The Assam Legislative Council have recently declared Rhinoceros horns to be forest produce wherever found, it has become much easier to deal into the trade in these, as horns are now liable to seizure unless their possession can be satisfactorily accounted for. No help from the centre, however, can make up for lack of interest on the part of the officers on the spot, though an enthusiastic Conservator can do much to overcome apathy, thanks to the tradition of loyalty in the Forest Service, but to be really effective he must possess both the time and the inclination to tour 'off the map' and away from the usual comfortable, stereotyped marching routes.

At the worst a certain amount of game of most sorts will linger on in the larger Reserves for some time yet, but not in the smaller ones which can be easily raided, and from which animals are always straying into settled lands bristling with guns: at the best, if the Forest Department does not depart from the policy of recent years as regards Forest Villages and as regards demanding the co-operation in these matters of its subordinates, quite a fair number (in some places sufficient to allow of restricted shikar) of the more interesting species will survive in suitable localities within the forest boundaries.

Increased pressure on the outside land being likely to lead to a demand for catastrophic disforestation of cultivable areas inside the Reserves, it would appear to be advisable to proceed cautious-

ly, when and where needs be, with the formation of Forest Villages, especially of non-resident villages which luckily for wild animals are preferable from the utilitarian point of view, as they do not waste good forest land in hamlet sites and cattle-grazing grounds. Forest Officers in Assam will always be dependent on elephants for getting really inside their forests, and this again is lucky for the game, because it is essential permanently to set aside from settlement adequate and inviolable elephant grazing grounds while there is yet time, for want of which provident measure other Provinces have had to plant fodder at considerable expense for their Government elephants.

It would be illogical to allow villagers to grow crops in a forest and then to withhold from them the means of guarding the same, but the practice lately enforced of calling in guns for safe custody after the harvest is over is only logical and reasonable, and prevents the villagers from degenerating into professional poachers, as some of them have become in the past.

It had been intended, in order to obtain complete control, to acquire on behalf of Government all the guns owned by Forest Villagers for temporary issue at the right time, together with any others that might be necessary, but this measure has had to be postponed until funds become available again.

#### *Game Sanctuaries.*

The two Game Sanctuaries of which mention has been made are situated, the Monas towards the north-west on the Bhutan frontier and the Kazirunga in the centre of the valley on the south bank of the Brahmaputra. Both areas were originally selected for the Great One-horned Rhinoceros (*R. unicornis*) they contained, and a very fine stock of these animals was raised as the result of the protection afforded. Kazirunga, the more low-lying, is particularly suited for buffalo too, the Monas for bison along the Bhutan boundary.

The rhinoceros, our most important animal from the natural history point of view, is a difficult species to preserve even though its destruction is forbidden by law, because all parts of its body may be eaten even by Brahmins and because its horn is reputed throughout the East to possess aphrodisiac properties, while it lays itself open to easy slaughter by its habit of depositing dung on the same heap day after day. The demand for rhinoceros' horns has always been considerable in India, but of recent years China has also been in the market, consequent on the practical extermination of *R. sondaicus* in Lower Burma, Tenasserim, etc., with the result that a horn is now worth just about half its weight in gold. The prospect of a lucrative business led to an organization being formed for passing on rhinoceros' horns and elephant tusks to Calcutta, and the disturbed political conditions provided the virile Boro tribes (Meches and Kacharies) living near the Monas with the opportunity to take up poaching on a large scale.

The operations of the financiers in the background were checked for the time being; the advent of the Assam Rifles restored order;

additional game-watchers were engaged, and an Assistant Conservator was placed in charge of the Sanctuary to carry on the good work, but in view of what has happened in Burma, despite the best efforts of the authorities there, one cannot be confident that the fight we are putting up will not prove in the end to be a losing one if we merely continue on present lines.

A fundamental obstacle to success lies in the difficulty of identifying poachers unless these are actually caught in *flagrante delicto*, and this must always be a rare occurrence when members of a gang have only to separate and run a few yards into the high grass to evade capture.

Both Sanctuaries are at present inaccessible for want of roads and camping huts except to those who can travel light, such as poachers and game-watchers, and to those who can command the use of elephants, such as Forest Officers and a few planters. It was pointed out some years ago that this being so it would be quite possible, without the outside world being any the wiser at the time, for a dishonest subordinate in immediate charge of a Sanctuary to sell all the game while his Forest Officer, absorbed in other duties, was earning credit for the good work he might be doing elsewhere in the division. The loss would obviously be irreparable, and it was suggested that in these circumstances the western and eastern portions of the Monas Sanctuary, which with adjacent Reserves contains an effective area of about 150 sq. miles, should be opened to shooting under very strict supervision, the bag being limited (wounded to count as killed) and very high fees being charged, while the central part was preserved inviolate for the benefit of those interested in studying or photographing wild animals. The Sanctuary is only 10 miles north of the Amingaon branch of the Eastern Bengal Railway, and the interior could very cheaply be made accessible to lorries and cars running up from the station by constructing a few cold weather roads in flat country; the whole journey from Calcutta would take less than twenty-four hours of comfortable travel.

It was felt that in this way a healthy publicity would be ensured, because anyone coming up to shoot or to photograph would have plenty to say if game was found to be very scarce, also that the Sanctuary would be put on a paying basis, for whether the East actually is or is not less materialistic than the West, it is certain that no Province will be able to afford idealistic Finance Ministers, and finally it was felt that overstocking of the ground could in this way be guarded against.

It is permissible to believe that the Sanctuaries might have some chance of survival if they could be made more or less self-supporting, but precious little otherwise, and the question is one on which, we may feel sure, advice from the Society from the depths of its experience would not be resented. The Assam of the future may very well be proud to think it is taking its stand by the side of other civilized countries in saving its fauna from extinction, but it is going to be a poor Province, at any rate to start with, and if only some revenue could be expected from shooting permits and from the sale of captured specimens to Zoological Gar-

dens, there would clearly be less initial hostility for the good cause to face.

Anything in the nature of a Public Park on the lines of the Kruger National Park would be out of the question unless it was under Imperial control because if the Assamese tax payer ever wants anything of this sort, he will certainly demand that all predatory and dangerous animals be removed before he disports himself in it.

#### *Balipara Political Area.*

Apart from the two Sanctuaries mentioned previously, the rhino have one remaining refuge, namely, the Balipara Political Area. Here some very valuable protection has been afforded to this animal in one area by a planter who is an enthusiastic game preserver. Efforts should be made now to enlist the sympathies of the authorities who will have to guard the welfare of frontier tracts for many years to come, and who will doubtless welcome more extended interest being taken in a matter that has now become of world-wide importance to naturalists.

The specially favourable factors in the case of the Balipara Political Area are:—

(1) It will permanently remain outside the influence of the new reforms.

(2) It consists very largely of Forest Reserves, which contain a number of rhino haunts, Gohpur, the Diputa, Gabharu, and Sonairupa rivers and, if buffalo-grazing was stopped, the Bor Dikrai.

(3) The tract is under a Political Officer who is provided with summary powers and the means of upholding them.

The possibilities here are obviously great, and the opportunity of achieving something permanent seems too good to be neglected.

#### *Type of Game.*

A few particulars regarding some of the species found in Assam are added by way of conclusion:—

*Elephant* (*E. maximus*). The country available for wild elephants has been much reduced as the result of land being taken up for settlement while the increasing unwillingness on the part of villagers to tolerate damage to crops will prevent any slowing down of catching operations, but elephants will continue to be numerous in several districts for a long time yet. Over 400 were caught three seasons ago by the Forest Department in one area alone, but this was probably the last big Kheddah that the Province will ever see. Casualties used to be heavy during training, but Government took the matter up and has demonstrated that these are unnecessary and that much higher profits follow the adoption of more humane methods. The rumour that a dumpy breed of wild elephant lived on the central ridge of the Garo Hills has been found to be false as regards the existence of herds composed of such animals, but the inquiry showed that exceptionally short-

legged specimens are to be met with; it is a matter that some local officer might find interesting to pursue further.

One result of the decrease in the number of wild elephants is the inconvenience experienced in getting about Reserves where elephants have become scarce, as their paths are no longer kept open by the passage of herds. The Province of Bihar has always been the best customer for elephants but as it will be out of this market for many years to come, it is not improbable that elephant control measures will have to be undertaken as in Burma.

The Great One-horned Rhinoceros (*R. unicornis*) has been dealt with already at sufficient length.

The Smaller One-horned Rhinoceros (*R. sondaicus*).—It is on record that Messrs. Rowland Ward identified the head and shield from a rhino shot by a Forest Officer in the Bengal Doonars as belonging to this species, and it would be strange if it did not also occur in the contiguous Goalpara Reserves and Monas Sanctuary. Pairs of smaller, less truculent, and definitely less armoured rhino can be put up in the Sanctuary and these, if not cases of *R. unicornis* pairing while still far from mature, must be specimens of *R. sondaicus*.

Investigation into this is most desirable, and perhaps the Society could arrange for it being carried out in the course of time. The Kacharies recognize three varieties of rhino, and though their classification is not made on scientific lines, it does not follow therefrom that it is all moonshine.

The Sumatran Two-horned Rhinoceros (*R. sumatrensis*).—Formerly common in the Luhsai and Manihar Hills and occasionally found in North Cachar, but by now almost hunted to the vanishing point by Lushais and Kukis. The opening up by forest villagers of several big patches of marshy land in the Forest Reserves of South Cachar seriously reduced the number of suitable haunts available for this species. Most of the remaining patches, however, will have to be kept closed to cultivation in order to preserve feeding-grounds for the timber-dragging elephants, and some special steps have already been taken to try and look after the few rhino still left alive in this difficult country where little control can be exercised over shikaries. The record flood of July, 1929, drove the rhino up into the hills and very few have been allowed by the Lushais to return.

The Indian Buffalo (*Bubalus bubalis*).—The great-horned variety, *macroceros*, formerly existed on the Monas, but had been practically shot out before the formation of the Sanctuary. The writer was fortunate enough to meet the last survivor, a well-known cow, at least a hand higher than the ordinary sized bull with which she was consorting. The Vernay-Fanthorpe Expedition searched for this cow unsuccessfully, and she was never seen afterwards. The best heads come from Central Assam, so there should be some very fine specimens in the adjacent Kazirunga Sanctuary.

The Assamese utilize the services of solitary wild bulls for their domestic cow-buffaloes, a magnificent breed which is bound to deteriorate now that wild bulls are getting scarce, and in the ab-

sence of anyone interested in scientific breeding. Buffaloes with wild blood in them live longer and are finer draught animals than those of inferior strains, and the cows give more milk. Their disadvantages are sensitiveness to sun and bad tempers.

The wild and tame buffalo of the marshes live largely on the wild rice-plant and are accustomed to warm wallows, but the wild buffalo of the upper reaches of the Monas feed on highland grasses and bathe daily in the cold river water which would be fatal to the marsh-dwellers. These upland buffalo are possibly a little higher on the leg.

The wild buffalo in the Diyung Valley of the North Cachar Hills are very distinctive with short legs, great barrels, and straight horns without the backward sweep before coming forward again to form the tips. Many Mikir Buffaloes ran wild about 1897, when their owners had died from Kala-azar, but probably the whole stock had tame ancestors as they closely resemble the so-called 'Manipuri Buffalo' which is brought through Manipur from Burma for sale in the Surma Valley.

The Gaur (*Bibos gaurus*).—Just as the buffalo is having a bad time from everyone wanting to grow rice where it wants to live, so the gaur, though safe from the Hindu and living in hills in which shifting cultivation alone is practised, is suffering from the hillmen, who sit up at night over saltlicks and plug everything that comes along; consequently it is already only a tradition in many hills where formerly numerous. Solitary bison bulls breed with the tame gayals or Mithun (*Bibos frontalis*) in the neighbourhood of the Kutchha Naga villages in North Cachar and consequently the tame animals there are coloured the same as the wild ones, but wherever there has not been any infiltration of wild blood for a long time, as in the Abor Hills and parts of Manipur, albinism in varying degree is common, many Mithun being pied like Friesian cattle.

A Kachari gamekeeper, a bold man not given to romancing but also not infallible, declares that he has encountered and is scared of a larger, redder, fiercer mithun to be found at a few places on the Bhutan border, and the same story is told by the Mikirs in the hills on the Kamrup-Nowgong border away on the south bank. This may have something to do with the alleged large 'moh-mithun' and smaller 'Goru-mithun' of the Assamese Plains. The writer before he had heard about the supposed red variety was once eating his breakfast at dawn on a cliff while camp was being struck, while two bull mithun were mooning about in the rocky river bed below. One, as ascertained by glasses, was young but was as big as the old black fellow; the young one was very markedly red even to the naked eye at a range of 500 or 600 yds., and was either a freak in colour or else belonged to a separate variety, associating perhaps with one of the black kind after having been driven out from its own herd. Circumstances always arose to prevent the fruition of the expeditions planned to investigate the matter but as there is some possibility, if not probability, about the story being true, it is to be hoped that somebody will one day be able to find time to go and camp in those parts and inquire.

Swamp Deer, Barasingha (*Rucervus duvaucelii*).—This beautiful deer will soon only be found within protected areas, as it is so easily shot by poachers using elephants in their business. The horns in Assam are poor.

Sambar, Hog Deer, and Barking Deer (*Rusa unicolor*, *Hyelaphus porcinus*, *Muntiacus muntjak*) are all common in Assam. The sambar is the big-bodied, solitary Malayan type with small antlers; both sexes display that extraordinary raw patch on the lower side of the neck, for which no reasonable explanation has been suggested. Specimens reared in captivity do not develop it.

The Indian Wild Boar (*Sus cristatus*) is abundant and still interbreeds with village pigs. These without occasional crossing with the wild stock often develop white patches, like the tame mithun, either in the form of blazes or white socks.

Pigmy Hog (*Porcula salvania*).—Not uncommon in places but seldom seems to be shot.

Wild Dog (*Cuon rutilans*?).—All villagers and many Europeans in Assam assert that there are two kinds of wild dog, a larger species hunting in packs. The writer had only come across the latter once and so long ago that he was beginning to think he must have been mistaken until an opportunity occurred a couple of years ago on the Barak in Manipur to observe this small variety at close range. A sambar hind was standing in the water staring into a little hidden bay and occasionally stamping her foot. While the boat was paddled quietly up the pool a wild dog appeared on the bank, apparently to act as sentry, and not noticing the boat at once it proceeded to perch itself on a rock. It was not only considerably smaller and more foxy looking about the ears and muzzle than the familiar wild dog, but in place of the rather short thick tail it had a regular brush, which it curled gracefully forward just as a fox would do when sitting down. There were about a dozen of these dogs round the corner worrying the skin of a sambar fawn, which had been devoured before the very eyes of the mother standing less than 30 ft. away. This was being discussed one day at a station on the hill-section of the Assam-Bengal Railway called Harangajao when a Gurkhali herdsman chipped in to say that both varieties of wild dog killed cattle of his during the Rains: he distinguished them as Hindu and Mussulman dogs. A good reward was promised if he would bring in skins and skulls of both kinds, but without any result.

The most interesting bird that Assam can boast of is the Pink-headed Duck (*Rhodonessa caryophyllacea* Latham), which is possibly extinct elsewhere. There were a good few at one time in some lagoons known to the writer and a few friends, but their number was unfortunately thinned out by a baboo doctor posted in the locality in connection with Kala-azar duty, who was the possessor of a gun and, if he liked eating these duck, of a most indiscriminating palate. The jungle which protects the lagoons is gradually being cleared away and with it the last of the duck is likely to disappear.

whole Province, which are causing so much worry to those who are interested in wild life. Frankly the position is appalling. The vast increase in gun-licenses which has taken place within recent years, combined with the greatly improved means of transport, has caused a drain on the wild life of the districts such as can end only in the almost complete destruction of any kind of wild creature considered to be worth powder and shot. Laws do exist imposing close seasons, but these laws often are not, and cannot be, observed in present-day conditions. Deputy Commissioners and Superintendents of Police in some cases do their utmost, but they are so over-worked nowadays with political and economical troubles that, however keen they may be, they literally have neither the time nor the energy to try to enforce unpopular laws, which, by comparison with present-day troubles, possibly do not seem very important. Further the responsible officers in a district are very few in number and it is quite impossible for them to stop bribery among their often low-paid subordinates. A rupee or two or a piece of meat is quite sufficient temptation to an underpaid *chowkidar* not to report an offence under a Wild Animals' Protection Act, particularly as it is often extremely difficult to prove such an offence, and, even if proved, a subordinate magistrate will generally let off the offender with a purely nominal fine. It therefore seems that, in the present state of the country, any Act enforcing close seasons outside Reserved Forests, however well it may be conceived, is worth little more than the paper on which it is written. In actual fact special efforts are now being made in Hamirpur and Meerut districts to protect *sambar* and *chital*, but it is not known to the writer how far such efforts are proving successful. Animals like black-buck and *chital* and game-birds, both in the plains and particularly the hills, are literally being wiped out at an increasingly rapid rate and one wonders if there will be anything left except monkeys and jackals after another two or three decades. There is one bright spot, however, and that is that non-game birds at least are not harried to the same extent as in England because the egg-collector is scarce, and the average Indian boy, unlike his English confrere, does not amuse himself by collecting vast numbers of birds' eggs, only to throw them away in most cases as soon as the boy begins to grow up. Taken as a whole there is no doubt whatever but that the position in these plains districts of the United Provinces is just about as bad as it could be, but one must always remember that these areas are very densely populated and that really there is not very much room for any considerable numbers of the larger game animals, which must tend to interfere with the cultivator and his crops. In any case leopards are found in many places, since they are prolific breeders and very difficult to keep in check, and, even if more adequate protection were given to the game animals in cultivated districts, it is probable that their numbers would still be kept down by a corresponding increase in the numbers of leopards.

Sufficient has now been written to show that the position in the cultivated districts is very unsatisfactory, but that increasing population in already heavily populated areas, combined with the

present political and economic distress, makes it very difficult to make practical suggestions for improving matters. What can be done is for large land-holders in sparsely populated districts to preserve restricted areas really efficiently and noble examples of what a great help to the wild life of a country such measures can prove to be is to be found in the great swamp-deer preserves of Oudh, notably those of the Mahrani Saheba of Singahi and of Captain Lionel Hearsey. The former of these has been under careful protection for many years and an area of perhaps 20 square miles now contains several thousand head of these magnificent deer. A few are shot annually, but the number destroyed is almost certainly less than the natural increase, and these public-spirited benefactors can justifiably feel that, so long as they maintain their present standard of efficient preservation, there is no fear of the swamp-deer following the already long list of fine animals which have been exterminated from the United Provinces.

#### *Reserved Forests.*

Now the position of wild animals in the Reserved Forests, of which the writer, being a Forest Officer, has perhaps a specialised knowledge, will be considered. Firstly the writer would state most emphatically that United Provinces forest officers as a class are, and always have been, extremely sympathetic towards wild animals. Few are really heavy killers and quite a number do not shoot animals at all, beyond their requirements for food for themselves or their camp followers. An odd individual here and there, both in the present day and in the past, has possibly let his sporting instincts drive him into becoming a really heavy killer, but the amount of slaughter done by the average forest officer in these Provinces is conspicuously small. It sometimes happens that disgruntled sportsmen state that Forest Officers are selfish or destroy more animals than all other classes put together; but these statements are most emphatically untrue and generally have an inner history, which reveals the accuser as having some personal grudge against an individual Forest Officer, which leads him to make general insinuations which are totally unfounded. None could be keener on the preservation of wild life than the present writer, and, if he thought that his brother officers were indifferent to the preservation of wild animals, he would not hesitate to say so. The writer believes that it would be a great mistake to remove the wild animals inside Reserved Forests from the protection of the Forest Department and place them in charge of a separate Game Department. The present system is working very well and such action would be regarded as a slur on Forest Officers and would alienate the all-important sympathy of the powerful Forest Department.

The United Provinces reserved forests are not very extensive and they are all under the personal supervision of divisional forest officers. Poaching does occur to a limited extent, particularly during the monsoon when the forests have to be deserted owing to their unhealthiness, and from motor cars, but such poaching

is not very extensive and every effort is made to keep it in check. Elaborate rules, which are constantly being amended, do exist for the issue for shooting licenses, for the enforcement of close seasons, and for helping any species which is tending to become scarce. These rules may not be perfect—no rules ever are—but at least their object is to provide shooting for all who apply in the right way, and at the same time to preserve the wild animals in perpetuity without letting them increase to such an extent as to become a nuisance to forest management or to surrounding villagers. Species that, for any particular reason, need help are entirely protected, examples being wild elephants for many years and Sambar in Lansdowne division since an attack of rinderpest in 1927; and senior forest officers are always ready to listen sympathetically to applications for protecting particular animals in particular tracts. Even tigers now have a close season and are not allowed to be shot by artificial light. Some may argue that it is a wrong policy to protect tigers, but at least such protection shows that forest officers consider that even tigers have the right to live in their own jungles.

On the other hand some wild animals, such as deer, do seriously interfere with the management and revenue of valuable forests, and the forest officer cannot allow deer to increase to an excessive extent. In some cases, particularly where the balance of nature has been upset by the excessive destruction of carnivora, deer have become a positive pest, and it has proved necessary to reduce their numbers. Or again, the proportion of hinds may have become excessive, with consequent deterioration in the size of the stags, so that some of the hinds have had to be shot off; but such destruction is stopped as soon as the position becomes normal once again. It is true that individual forest officers, keen silviculturists who have found all their efforts at improving the forests ruined, have occasionally advocated the total destruction of deer; but it is not the general opinion that such drastic measures are required and interesting experiments are now in progress by which considerable areas, in which plantations or efforts at obtaining natural regeneration of valuable trees are in progress, are entirely closed with game-proof fencing, which keeps out the deer. Such fences are somewhat expensive in initial cost, but they can be moved from place to place as required and are probably the best solution for managing forests both in the interest of the forester and also of the indigenous wild life.

It is sometimes stated that, even in the reserved forests, wild animals are much scarcer than they used to be. The writer cannot speak for 30 or 40 years ago since the old records are not clear and he was not in India at that time; but, even if the head of game had diminished, it is possible that the numbers were excessive in the past or that the memories of those who claim that animals are disappearing are a little at fault. After all, most of us tend to think of the 'good old times', although it is possible that those times were not quite so good as they now appear in perspective. An effort has been made to collect figures of animals shot in the past with those shot nowadays for comparison, but

records of 30 or 40 years do not give the information required. The following are the conclusions that the writer draws from the figures that are available:—

(a) Taken as a whole the head of game shot recently has generally not shown any marked decrease, except in the mountain reserved forests, where control is not so easy.

(b) Tigers appear to have increased and marked decreases seem to have taken place in the numbers of *nilgai*, *kakar*, wild-dog and black-buck. The decreases are partly due to serious floods and rinderpest epidemics, and are probably natural fluctuations which will right themselves in time. Wild-dogs have decreased owing to the large reward paid for their destruction.

(c) The decreases in the number of some animals shot recently are due to the removal of rewards as a measure of economy.

(d) It must always be remembered, however, that the number of animals inside Reserved Forests is probably being artificially swelled by the influx of refugees from the appalling conditions at present prevailing outside. This influx will decrease as animals outside become exterminated. Also modern rifles are so good and shooting with the help of a motor-car is so easy, that probably a greater proportion of the existing animal population is shot annually nowadays than was the case in the past.

(e) The Forest Department watches these lists carefully and takes action whenever such action appears to be required.

(f) The general impression of senior forest-officers is that, although there have been considerable fluctuations in particular areas, the game in the United Provinces Reserved Forests as a whole has not markedly decreased during the last 25 years, except in the high hill forests.

To summarise, the present position of wild animals inside the Reserved Forests of the plains and foot-hills of the United Provinces does not give cause for serious anxiety, except for the ever-increasing use of that arch enemy of the wild animal—the motor car. The numbers of wild animals in the mountain reserved forests appear definitely to be decreasing. The position in some *zemin-dari* estates is good and in others poorer; and the position in the ordinary districts is almost hopeless.

#### *Some Suggestions.*

The writer would make the following suggestions to help the present state of affairs:—

(a) *Public opinion.*—This is by far the most important of all methods of wild life conservation, and, without it, all efforts to preserve wild creatures will prove abortive. Good work is already being done by propaganda and by lectures, but much more remains to be done. Good illustrated books help greatly and the formation of sanctuaries and national parks, where the general public can see wild animals in their natural state, would all help. Major Corbett as local Secretary of the United Provinces branch of the Preservation of the Fauna of the Empire Society is doing a lot to assist in this work.

(b) *Laws*.—It is much easier in the present state of India to pass a law than to see it enforced, but the writer would greatly like to see laws passed on the following points:—

(1) *Sale of shikar meat, trophies, etc.*—It is of vital importance that a law be passed at an early date totally forbidding the sale of any portion of a wild animal, with certain definite exceptions. Such exceptions would be the dropped horns of deer, and the hides of deer where numbers have to be reduced. Special licences should be issued in such cases and such licences, liable to cancellation at any moment, should be under the personal control of the Divisional Forest Officers, where reserved forests are anywhere near, or under Deputy Commissioners where there are no forest officers. The sale of any *shikar* trophy should be entirely and absolutely prohibited. Such a law, properly enforced, would finish the professional poacher, and would end the nefarious dealings of certain taxidermists who sell *shikar* trophies to those 'sportsmen' who are incapable of bagging anything themselves.

(2) *Limitation of gun licences*.—This is very difficult in the present political state of the country, but at least greater efforts could be made to differentiate between game licences and licences for the protection of the crops, person, property or display. Gun licences for the protection of crops should insist that barrels should be sawn-off short, as such licences are very largely applied for when the real object is poaching.

(3) *Motor cars (and also carts and tongas)*.—The shooting of any wild animal from, or within, say, 400 yards of a motor-car, cart or tonga, either by day or by night, should be made an offence liable to prosecution. The writer personally would like to stop motor cars altogether from entering Reserved Forests, or, where this cannot be done, he would like to place check-chowkies at the entrances and exits of such roads, the cost to be covered by a small wheel-tax. Fire-arms would either have to be deposited at such *chowkies* or would be sealed, so that they could not be used while inside the forests. The excuse of requiring fire-arms for protection en route should not be accepted, as passengers in motor-cars very rarely need protection from wild animals, except possibly from occasional rogue elephants or man-eaters. Luckily recent economies have resulted in the abandoning of some of the motor-roads in the Reserved Forests of the United Provinces. The writer would like to see them all abandoned! The old time *shikari* or Forest Officer managed perfectly well without them, and they tend only too often to make his modern successor slap-dash and lazy.

(4) *Protection of rare stragglers*.—It occasionally happens that a rare animal, such as a rhinoceros, strays into Reserved Forests from Nepal or elsewhere. Such animals should be rigidly protected with a fine of, say, Rs. 2,000, or imprisonment, for their destruction. The excuse that 'If I don't shoot it, someone else will' should never be accepted in such cases. The recent law passed in Bengal for the protection of the rhinoceros, should be extended to the whole of India.

(5) *Rewards*.—The writer considers that Government rewards

for destroying wild animals given far more sparingly than in the past. Recently, recent economies have resulted in a great reduction in the rewards offered, and it is sincerely to be hoped that such reduction will be permanent. Rewards in the past have encouraged poachers and have sometimes caused an upset in the balance of nature where they were misapplied. They are really quite unnecessary except for man-eaters and notoriously destructive creatures such as porcupines.

It has been suggested that details of breeding-seasons of various animals should be appended to this article. Inside Reserved Forests every effort is made to protect wild creatures during their breeding seasons and nothing more can be done. Outside Reserved Forests, as already explained in this article, the position is such that protection can very doubtfully be enforced. Hence such an addition to an article which is already too long seems unnecessary, but the writer can supply a list of breeding seasons, so far as they are known, to anyone who is specially interested in the matter.

Since writing the above I have been reconsidering this question and have read up a certain amount of literature on the subject. On the whole I have little to add to what I wrote before except that I am not so certain as I was that the head of game inside the United Provinces' reserved forests is not decreasing. I was posted to N. Kheri Division in 1921 and I returned there again in 1931. Although still a good place for animals in 1931, I would estimate that there had been at least a 25 per cent decrease in nearly all species during that decade. The reasons for this reduction I would put down to (a) Motor-cars making shooting far easier than it used to be, (b) the destruction of game in the adjoining areas outside the forests resulting in a smaller influx and greater damage to animals straying outside.

I am now in Bahraich division in Oudh, which has a reputation of being a good game division. I have now been here for 5 months and, so far, I have found game of all kinds to be rather scarce, although I hear that more animals come in from Nepal in the hot weather. The reasons for this apparent decrease are the same as in Kheri, i.e., motor-cars and destruction of animals outside the forests, combined with increased poaching along and near the Nepal border.

I have recently heard from Col. A. E. Wood, I.M.S.—a keen supporter of the Darjeeling Natural History Society—that in his earlier days Lachiwala in Dehra Dun division used to be a 'veritable paradise' for wild animals. I am well acquainted with Lachiwala and I can only say that it is very far from being an animal paradise nowadays. It is more a 'paradise' for motor-picnicers from Dehra Dun City and Cantonment!

On the whole I am afraid that there is a distinct doubt that the game inside the reserved forests—particularly in Oudh, where motors now penetrate to every corner—is so plentiful as it was, though the present position does not give rise to the same anxiety as is the case with other areas not under the control of the Forest Department.