

THE GEOGRAPHY OF MAMMALS.*

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No. V.—THE ORIENTAL REGION.

SECT. 1.—BOUNDARIES OF THE ORIENTAL REGION.

THE Oriental is the smallest of the six regions into which the Earth has been divided for the study of zoological distribution. On the west it includes the great peninsula of India and its attendant island of Ceylon. Its boundary on this side is probably the Suleiman range of hills, though the fauna of Western Sind and the Punjab, which lie between that range and the Indus, is intermediate in character between those of the Oriental and Palæarctic Regions. Beyond this range the boundary runs eastwards along the slopes of the Himalayas, at an elevation of from 9000 to 10,000 feet above the sea-level. Above this height Palæarctic forms are chiefly met with, below it Oriental forms mostly prevail. Eastwards of Sikkim the boundary between the Palæarctic and Oriental Regions cannot be laid down with certainty, owing to our little acquaintance with the eastern part of Tibet and the adjacent portion of China. What knowledge we have of the fauna of this Region is due almost entirely to the celebrated French missionary, Père David, who made considerable researches in Moupin, a small mountain territory, situated at the extreme western edge of the Tibetan plateau. Père David's collections have been mostly described by Milne-Edwards (2). An examination of the list of the mammals obtained by him in this district shows that the fauna has a character intermediate between those of the Oriental and Palæarctic Regions, besides containing a considerable proportion of peculiar forms. As, however, most of the Oriental genera extend even further north into the Chinese province of Kansu, and some even cross into Japan, countries which are otherwise well within the Palæarctic Region, it will be most convenient to draw the boundary of the Oriental Region to the south of Moupin. Beyond this point again our knowledge of the distribution of the mammals is very scanty, and though the northern part of China appears to be distinctly Palæarctic, and the southern Oriental in its affinity, there is, so far as we know, a considerable admixture of forms all over this part of Asia. Probably the most convenient boundary will be found to be that adopted by Wallace—the northern edge of the basin of the Yang-tze-Kiang. This is, no doubt, to a great extent an artificial boundary, but such a fault is unavoidable in the present instance, as there is here no natural frontier to separate the two regions. In addition to the south-eastern part of Asia, the Oriental Region includes within its boundaries all the large and important islands lying between the continent and the Australian Region. The principal of these are the Chinese islands of Formosa and Hainan, the large group of the Philippines, together with Sumatra, Java, Borneo, and the adjacent islands up to Wallace's line. With the exception of Celebes, all these islands are truly continental in character—that is to say, are separated from the mainland by seas of less than 100 fathoms of depth. But Celebes is in some respects anomalous, and will be considered in greater detail below.

The boundary between the Australian and the Oriental Regions called Wallace's line, as having been first pointed out by that distinguished naturalist, runs between the two small islands of Bali and Lombok. Bali is connected by shallow water, and also by its zoological relationships, with Java; while Lombok agrees in character with Timor and the other Australian islands further east. From Bali the boundary of

* Continued from vol. vii. p. 296. Map, p 428.

the Oriental Region runs in a north-eastward direction, between Celebes on the one side and the Sula islands and Gilolo on the other.

SECT. 2.—GENERAL VIEW OF THE MAMMAL-FAUNA OF THE ORIENTAL REGION.

The Oriental Region lies almost wholly within the tropics. The greater part of the country within its borders enjoys a bountiful rainfall, and is covered with luxuriant forests; the only portion which is less favoured being the north-western part of India and the strip of country along the northern shores of the Persian Gulf. In these districts there is very little rain, and desert conditions and a desert fauna, somewhat resembling those of the African Sahara, prevail.

The fauna of the Oriental Region presents, on the whole, a striking contrast to that of the Australian Region. The characteristic features of the latter are doubtless due to the long isolation to which it has obviously been subjected, whereas the Oriental Region as regards its characteristic forms is more nearly allied to the neighbouring Palearctic Region, from which probably the bulk of its inhabitants has been derived.

The Oriental Region contains representatives of eight out of the nine orders of terrestrial mammals, the monotremes alone being wholly absent, while the marsupials are barely represented by two species of *Cuscus* (phalanger) found only in the island of Celebes, which have been obviously derived from the neighbouring Australian Region.

The edentates, like the marsupials, are also represented only by one genus, *Manis* (the pangolin), which the Oriental shares with the Ethiopian Region.

The Oriental further resembles the Ethiopian Region in the multitude and variety of its forms of ungulates; but while the rhinoceroses, the wild asses, the elephants, and the antelopes are common to both, the Oriental Region possesses in addition deer, wild sheep, and wild goats. These three last-named groups have never established themselves in the Ethiopian Region, though a single goat (*Capra walie*) has penetrated as far as the highlands of Abyssinia. But a considerable number of species of all of them are found in the Palearctic Region.

Among the rodents of the Oriental Region the squirrels are especially numerous, there being upwards of fifty species found within its limits, nearly all of which are arboreal in their habits.

Although there are no families of carnivores peculiar to the Region, there are a considerable number of genera of civets (*Viverridæ*) not found elsewhere. The bears (*Ursidæ*), too, which are quite unknown in Africa, are characteristic members of the Oriental fauna.

Among the insectivores we find two peculiar families. One of these has been formed for the reception of *Galeopithecus*, the so-called "flying lemur," an animal of about the size of a small cat, with thin flaps of skin between the fore and hind limbs and tail, which enable it to make flying leaps from tree to tree. The other family (*Tupaïidæ*) contains two genera. One of these, *Tupaia*, with at least twelve species, is an abnormal shrew with a curious external resemblance to the squirrels, with which, however, it has no real connection. The other, *Ptilocercus*, is distinguished from *Tupaia* by its naked tail, which is provided at the end with a bilateral fringe of long hairs. Both these families are confined to the Malayan portion of the Oriental Region.

Bats are numerous in the Oriental Region, and a very large number of the genera extend eastwards into the Austro-Malayan islands. Only four genera, each with a single species, are peculiar.

Finally, among the primates there are, first, three genera of lemurs. Two of these are peculiar, but belong to the family *Lemuridæ*, and have their nearest allies

in Africa. The third (*Tarsius*), which forms a family of itself, is practically confined to the Region, although it has slightly overstepped its boundaries, being said to occur in one of the smaller Austro-Malayan islands between Sumba and Timor. Besides the lemurine primates, six genera of true monkeys are found in the Oriental Region. Three of these, the proboscis monkey of Borneo (*Nasalis*), the gibbons (*Hylobates*), and the orangs of Sumatra and Borneo (*Simia*), are strictly endemic; while the other three, although highly characteristic of this Region, have extended their range slightly across its frontiers.

Summarizing these results, we shall find that the Oriental Region contains only two truly endemic and one quasi-endemic families out of a total of thirty-six which occur within its limits. These are the *Galeopithecidae* (flying lemurs), *Tupaia* (tree shrews), and *Tarsiidae* (tarsiers).

The total number of genera found in the Region is 113, out of which 38 are peculiar; 11 extend their ranges slightly beyond the limits of the Region, and 64 are widely spread. On reducing these figures to an average, it will be found that the Oriental Region contains about 38 per cent. of peculiar genera, or, if the quasi-endemic genera be added, about 45 per cent. In either case, this shows a much lower percentage of peculiarities than has been shown to exist in the three regions previously considered.

SECT. 3.—SUBDIVISION OF THE ORIENTAL REGION.

The Oriental Region, as regards its mammals, may be most conveniently divided into four subregions. These are—

1. The *Indian Subregion*.—This comprises the whole of India proper from the Suleiman range and the lower slopes of the Himalayas to Cape Comorin. A line drawn northwards from Calcutta to the Himalayas, forms the approximate eastern boundary between this subregion and the next. There should also be included in this subregion the island of Ceylon, and probably the narrow, low-lying strip of desert country between the Persian Gulf and the central plateau of Persia.

2. The *Burmo-Chinese Subregion*.—This subregion includes the portion of Sikkim below 10,000 feet, Assam, China south of the northern water-parting of the Yang-tze Kiang, the islands of Formosa and Hainan, and all the countries of the Indo-Chinese peninsula (Cochin China, Siam, and Burma), its southern land-boundary being approximately a line running to the north of the Malay peninsula from Tavoy on the west, to Bangkok on the east, at about 15° N. lat.

3. The *Malayan Subregion*.—The Malay peninsula, together with the great islands of the East Indian archipelago, Sumatra, Java, Borneo, and the Philippines, forms a third division, which may be called the Malayan Subregion.

4. The *Celebesian Subregion*, containing only the island of Celebes.

This subdivision of the Oriental Region differs from that adopted by Wallace in two important points:

(a) In the combination of Wallace's Indian and Ceylonese Subregions into one—the Indian Subregion.

(b) In the transference of Celebes to the Oriental Region, and the formation of a new subregion for its reception. The reasons for these changes may be here briefly considered. First, as regards Ceylon, there are nineteen genera of mammals found in the Indian Subregion, which do not extend their range further eastwards into the Burmo-Chinese Subregion. Of these, thirteen are to be met with also in the Palearctic and Ethiopian Regions, leaving only six confined to the Indian Subregion. These six are—

(1) *Tetraceros* (four-horned antelope).

- (2) *Antelope* (black buck).
- (3) *Boselaphus* (nylghai).
- (4) *Platacanthomys* (spiny rat).
- (5) *Melursus* (Indian bear).
- (6) *Loris* (slender lemur).

Of these, *Loris* alone is characteristic of Southern India and Ceylon (the Ceylonese Subregion of Wallace). *Melursus* is found in Ceylon, but occurs also all over the peninsula of India from the Himalayas southwards. *Platacanthomys* inhabits the western Ghats and the Animali hills of Southern India alone, and not Ceylon; the remaining three genera are distributed over the whole of the Indian peninsula, but do not reach Ceylon.

There is, therefore, only one genus of mammals confined to the Ceylonese Subregion of Wallace, and this hardly seems to afford an adequate reason for separating it from the Indian Subregion proper. The chief ground for so doing, according to Mr. Wallace, is the existence there of a peculiar family of snakes—the *Uropeltidae*, or rough-tails, which are entirely confined to Wallace's Ceylonese Subregion. Examples of these reptiles, however, have been recorded in India as far north as Ganjam, in 20° N. lat., and it seems probable that they may eventually be found all over the peninsula south of the great plains of the Indus and the Ganges.

Secondly, as regards Celebes, this island certainly presents a difficult problem to the student of geographical distribution. But so far as the mammals are concerned, the only Australian element in Celebes consists of two species of phalanger and a few bats; the remaining forms, although many of them are very peculiar, have been, doubtless, originally derived from the Oriental rather than from the Australian Region. It seems more logical, therefore, on the whole, to make the island of Celebes a separate subregion of the Oriental rather than of the Australian Region. This position, however, will be considered in greater detail in the account of the subregions.

SECT. 4.—THE INDIAN SUBREGION.

The Indian Subregion has a very close resemblance to the Palæarctic Region. This is more especially the case in the north-western districts, where the country is practically rainless, and the fauna, owing to similarity of condition, is in many respects closely allied to that of the neighbouring desert regions of Central Asia. This desert district of the Indian Subregion includes the narrow strip of coast land to the north of the Persian Gulf, the Punjab, Rajputana, and the northern part of the Bombay Presidency. The greater part of the peninsula of India south of the great plains is occupied by the high, and rather dry, plateau of the Deccan and of Central India, which is covered with a thin and scanty jungle. The southern slopes of the western Ghats and the greater part of Ceylon enjoy an abundant rainfall, and are clothed with a tropical forest, in consequence of which their faunas present many points of resemblance both to each other and also to that of the Malayan Subregion, which has similar physical conditions.

Our knowledge of the Mammals of this and the next subregion is very fairly complete, owing to the excellent handbook recently published by Mr. W. T. Blandford (1).

The scaly anteater (*Manis*), which, with slight specific modifications, is also found in all the other subregions as well as in the Ethiopian Region, is here the sole representative of the edentates. The subregion is well provided with members of the various families of ungulates. Three peculiar genera of antelopes, which are not found beyond the limits of the subregion, have been already mentioned; other genera, such as the gazelles (*Gazella*), the goats (*Capra*), and the sheep (*Ovis*), are

found in other parts of the world as well as in this subregion, but are absent from the remaining subregions.

All the families of ungulates are common to this and the Ethiopian Region, except the deer family (*Cervidæ*), the entire absence of which from Africa, south of the Sahara, has already been commented upon.

The rodents do not present any marked features of interest in this subregion. One genus, *Platacanthomys*, a small dormouse-like member of the family *Muridæ*, is found only in the hills of Southern India, otherwise the genera are mostly widespread forms.

Among the carnivores the cats are numerous and large. This subregion is the proper home of the tiger, which, however, has extended itself throughout the whole region, and even across its boundaries westwards into Persia and Trans-Caspia, and eastwards far into China and Manchuria. The lion, too, which is essentially an animal haunting dry and comparatively barren countries, is a member of this division of the Indian fauna. It was formerly much more abundant in the peninsula, but is now, apparently, restricted to a small area in Western India.

As in the case with the ungulates, so here, with the exception of the bears (*Ursidæ*), all the families of Indian carnivores also range into Ethiopia.

The insectivores of this subregion need not detain us long. A tree-shrew (*Tupaia*), an outlying member of the genus very abundantly represented in the Malay countries, is found in Southern India; the other genera, the hedgehogs (*Erinaceus*) and the shrews (*Crocidura*), are widely spread throughout the Old World.

Among the bats of this subregion we find that not only there are no peculiar genera, but that even the species in nearly all cases have an extended range beyond its limits. Out of about forty species, six alone are confined to the subregion.

The slender loris is found only in Southern India and Ceylon, and is the single representative of the lemurs in this subregion. It is a strange-looking creature, with long spidery arms and no tail. Like most of its race, it is arboreal and nocturnal in its habits.

Indian monkeys all belong to the two large genera, *Macacus* and *Semnopithecus*, both of which are characteristic of the Oriental Region, although two or three species of the former genus have strayed over into the Palæarctic Region.

The following table shows, in a succinct manner, the origin and distribution of the mammals of this subregion. The species in the first line, reckoned as "Endemic," are confined to the subregion; those called "Oriental" do not occur beyond the boundaries of that Region; those catalogued as "Palæarctic" are common to that Region and to the Indian Subregion; the "Ethiopian," in the same way, are found alike in the Ethiopian Region and the Indian Subregion. The "Palæogean" genera are those which are found in the Indian Subregion and in more than one of the other three regions of the Old World. Finally, the "Cosmopolitan" genera are those found in the New World as well as the Old.

	Eden- tata.	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chitop- tera.	Pri- mates.	Total.
Endemic	0	3	1	1	0	0	1	6
Oriental	0	1	1	1	1	0	0	4
Palæarctic	0	1	2	1	0	0	2	6
Ethiopian	1	2	1	2	0	0	0	6
Palæogean	0	4	4	4	2	12	0	26
Cosmopolitan	0	3	3	5	0	3	0	14
Total	1	14	12	14	3	15	3	62

From the above-given table it will be seen that the relations of the Indian Subregion are about equally divided between the Palearctic and Ethiopian Regions; the largest number of genera are registered as "Palæogean," and far the greater number of these are common to the three regions of the Old World. The relations of this subregion to the Australian Region are very slight; with the exception of *Canis*, it is only among the bats that we find any common genera.

SECT. 5.—THE BURMO-CHINESE SUBREGION.

Owing to our imperfect knowledge of the fauna of the central part of China and of Tibet, it is impossible at present to draw up a complete list of the mammalian genera inhabiting this subregion, and it is consequently out of the question to lay down anything but a very uncertain boundary between this subregion and the neighbouring Palearctic Region. It is probable, however, that even when Western China and Tibet have been thoroughly explored, it will still be difficult to trace an absolute frontier between the Palearctic and Oriental Regions. As we already know, Northern China and Japan contain a considerable number of purely Oriental species. Even the tiger, usually associated with tropical jungles, ranges through China into the valley of the Amoor and the island of Saghalien, where a most severe Arctic winter is met with. In the same way, two species of a typically Oriental genus of monkeys are found in North-East Asia—one (*Macacus speciosus*) in Nipon, the largest of the Japanese group of islands; the other (*Macacus tcheliensis*) in the mountains north of Peking.

On the other hand, a good many purely Palearctic forms extend into Southern China. This is more especially the case among the birds, which have hitherto received a preponderating share of the attention of the naturalists and collectors in the Chinese Empire.

Passing over the edentates, represented, as in the Indian Subregion, by two species of scaly anteater (*Manis*), we come to the ungulates of the Burmo-Chinese Subregion. Here we remark the disappearance of the antelopes, and the great development of the deer family (*Cervidæ*), of which no less than fifteen species are found in this subregion. One of these (*Elaphodus*) is a curious little deer with very small simple antlers and large canine teeth; it was first described by Milne-Edwards from Western Tibet, and subsequently a second species of the same genus was discovered in Southern China. Another small deer, for which a separate genus (*Hydropotes*) has been rightly formed, has no trace of antlers at all, and in other respects differs much from the remaining members of the family. This form is entirely confined to Southern China. A third peculiar genus, belonging to the *Bovidæ*, is the takin (*Budorcas*). This ox-like antelope is also found in Western Tibet, but extends its range southwards to the Mishmi country in the north of Assam. The takin is one of the very few of the large ruminants that has never been met with or shot by European sportsmen, and our knowledge of it is entirely derived from the natives.

The Burmo-Chinese, like the Malayan Subregion, is the most frequented haunt of the squirrel family (*Sciuridæ*). No less than thirty-two species, referable to the genera *Sciurus* (the true squirrel) and to *Pteromys* and *Sciuropterus*, the flying squirrels, are found here alone. The only rodent supposed to be truly endemic is *Hapalomys*, a long-tailed rat found in Burma.

The Burmo-Chinese carnivores do not call for any special remark; one genus alone (*Helictis*) is strictly endemic. It contains three or four species of small badger-like animals with arboreal habits.

Among the insectivores of this subregion only one genus is endemic. This is *Soriculus*, containing some small shrew-like animals found only in Sikkim and

Assam. Several species of mole (*Talpa*), as also *Anurosorex*, and *Chimarrhogale*, belonging to the shrew-family (*Soricidæ*), extend from the Palearctic Region into this subregion, but no farther.

The bats of Burmo-China need not detain us long; most of the genera are widely spread, and a very large number of them extend across Wallace's line into the Austro-Malayan islands—a distribution shared by hardly any other of the Oriental genera of mammals.

One genus of the *Lemuridæ*, *Nycticebus*, is common to this and the Malayan Subregion; it bears a certain resemblance to the Indian genus *Loris*, but is distinguished by its somewhat stouter aspect and its still more sluggish habits.

Among the monkeys of this subregion, in addition to the two genera *Macacus* and *Semnopithecus*, inhabiting also the Indian Subregion, a genus of the anthropoid apes occurs. This is *Hylobates*, members of which are commonly known as gibbons; they are slender animals, with very long limbs and no tail, and are entirely restricted to the forest districts, being exclusively arboreal in their mode of life.

The following summary of the Burmo-Chinese genera of mammals has been drawn up exactly in the same way as the previous list, except that under an additional heading, "Australian," are placed two genera common to the Oriental and Australian Subregions:—

	Eden- tata.	Ungu- lata.	Ro- dentia.	Caru- vora.	Insecti- vora.	Chiro- ptera.	Pri- mates.	Total.
Endemic	0	1	1	1	2	0	0	5
Oriental	0	0	1	4	3	2	2	12
Palearctic	0	4	1	3	3	1	2	14
Ethiopian	1	2	1	2	0	1	0	7
Australian	0	0	0	0	0	2	0	2
Paalæogean	0	1	3	1	1	11	0	17
Cosmopolitan	0	3	3	6	0	3	0	15
Total	1	11	10	17	9	20	4	72

SECT. 6.—THE MALAYAN SUBREGION.

The Malayan Subregion lies entirely within the tropics, and almost the whole of it is covered with a luxuriant tropical jungle. It is here, consequently, that we find the Oriental fauna in its highest state of development, and with the least admixture of forms belonging to other regions. With the exception of the Malay peninsula, the whole of this subregion consists of islands, which, however, are separated from the main continental mass by comparatively shallow water, so that an elevation of 100 fathoms would obliterate the whole of the sea between the various islands, leaving them connected with one another and with the Asiatic continent. There can be no doubt that these islands, all of which have very rich faunas, have been stocked from the mainland, and that a study and comparison of their component parts will go far to enable us to trace out the past history of the Region, and to find out what changes have taken place from time to time in the distribution of land and sea.

If a careful analysis of the mammalian genera of the subregion be made, it will be found that the greater number of the genera found on the mainland extend to all the three larger islands, Sumatra, Java, and Borneo, and that of the remaining genera the larger proportion are common to the Malay peninsula, Sumatra, and Borneo, and are not found in Java. This would seem to indicate that Java was separated from the mainland before Sumatra and Borneo, and this view is further

borne out by the fact that the individual species of a genus are frequently common to the Malay peninsula, Sumatra, and Borneo, whereas in Java they are replaced by slightly different forms. The Philippines, though connected with Borneo by two chains of islands, so that the straits separating the group from Borneo are nowhere very wide, contain a poor mammal-fauna as compared with Borneo. Only about fourteen genera, exclusive of bats, have reached these islands, and, with one exception, these are all widespread. But it must be recollected that the mammal-fauna of the Philippines is still very imperfectly known.

The following table gives the figures relating to the distribution of the genera within the subregion (excluding bats):—

Number of genera that occur in—

(1) The Malay Peninsula, Sumatra, Borneo and Java	...	...	...	...	...	...	...	36
(2) The Malay Peninsula, Sumatra and Borneo	...	...	...	...	...	...	...	6
(3) The Malay Peninsula and Borneo alone	...	...	...	...	...	...	...	3
(4) The Malay Peninsula, Sumatra and Java	...	...	...	...	...	...	...	2
(5) The Malay Peninsula and Java alone	...	...	...	...	...	...	...	1

As regards the Philippines, the total number of mammal genera (exclusive of bats) is fourteen, thirteen of which occur also in the Malay Peninsula and islands; one is confined to the Philippines alone; in addition five Malayan genera reach Palawan, a large island lying between Borneo and the Philippines.*

Although the Malayan Subregion does not contain any endemic genera of ungulates, there is one form the distribution of which is so remarkable that special attention must be drawn to it. This is the tapir, one species of which is found in the Malay Peninsula, Sumatra and Borneo, the only other tapirs now existing in the world being met with in Central and Southern America. This is one of the most interesting cases known of what is termed "discontinuous" distribution, but the explanation of it is not very difficult. If we turn to the records of palæontology, we find undoubted remains of the members of the genus *Tapirus* recorded in the Miocene formation of France, in North America, and also in the Pliocene of China. There can be no doubt, therefore, that the tapir, which is a harmless beast, destitute of all means of offence and defence, has been driven out of these northern countries into the tropical forests of South America and Malaya, where the absence of competition has enabled it to survive.

Among the Malayan rodents we find the squirrels (*Sciuridae*) even more abundant than in the last subregion. Two of the species belong to a separate genus (*Rhithrosciurus*) which does not occur elsewhere. There are also two endemic genera of rats (*Muridae*)—one (*Phlæomys*) from the Philippines, the other (*Pithechirus*) from Sumatra and Java.

A genus of porcupines (*Trichys*), which differs from *Atherura* in several important cranial characters, is confined to Borneo.

Three genera of Malayan carnivores are worthy of special mention. One of these is *Hemigale*, not very far removed from the palm-cats, with two species, a

* This calculation was made before Mr. John Whitehead's new discoveries in the highlands of North Luzon (see *Ann. N. H.*, ser. 6, vol. xvi, p. 160) were announced by Mr. Thomas. These embrace five new generic forms of rodents, and there are probably more to follow.

second one having been recently discovered by Mt. Hose in the mountains of Borneo. The second is *Cynogale*, also belonging to the same family. The latter, which is semi-aquatic in its habits, and bears a superficial resemblance to an otter, is found in the Malay Peninsula, Borneo, and Sumatra. A third endemic carnivore, *Mydaus*, which, like the American skunk, is remarkable for the very powerful odour emitted from its anal glands, was originally described from the mountains of Java, but has since been obtained from Sumatra and Borneo.

Of the insectivores by far the most important genus in the Malayan Subregion is the tree-shrew (*Tupaia*), of which at least a dozen species are here found. The tree-shrews are small animals, of the general appearance of squirrels, that live chiefly among the branches of trees, and, like the squirrels, sit on their haunches and use their fore limbs for holding their food. An allied genus, with an elegant double fringe of long hair to its tail (*Ptilocercus*), is confined to Sumatra and Borneo.

Tarsius, belonging to a distinct family of lemurs, inhabits the forests of most of the islands of the subregion, as well as Celebes. It is a small animal, about the size of a squirrel, deriving its name from the fact that the tarsal bones of its foot are enormously elongated.

Among the monkeys, in addition to the three genera found also in the Burmese Subregion, we have the proboscis monkey (*Nasalis*) of Borneo, very remarkable for its large and projecting nasal organ. Finally, in Sumatra and Borneo we find the orang (*Simia*), of which there are probably two species, although this is by no means certain. These large man-like apes, which form, along with the gibbons, and the African chimpanzee and gorilla, the family *Simiidae*, inhabit the low swampy country near the coast; they may be distinguished at once from their African cousins by the reddish-brown colour of the long hair with which they are clothed. In some respects they are the most closely allied to man of the anthropoid apes.

The following is a summary of the Malayan genera of mammals constructed on the same plan as in the case of the other subregions. It will be seen that, while the total number of genera has not increased very much, the number of endemic genera is nearly doubled, as compared with those of the other two subregions.

	Edentata.	Uogulata.	Rodentia.	Carnivora.	Insectivora.	Chiroptera.	Primates.	Total.
Endemic	0	0	4	3	1	1	2	11
Oriental	0	1	1	4	3	3	3	15
Palaearctic	0	2	1	2	1	0	2	8
Ethiopian	1	2	1	2	0	1	0	7
Australian	0	0	0	0	0	2	0	2
Palaogeon	0	1	3	1	1	12	0	18
Cosmopolitan	0	3	3	5	0	3	0	14
Total	1	9	13	17	6	22	7	75

SECT. 7.—THE CELEBESIAN SUBREGION.

As already mentioned, the island of Celebes presents a problem of considerable interest to the student of geographical distribution. Celebes is separated from the other islands, both to the eastward and to the westward, by seas of considerable depth. Compared with the other Malayan islands, its fauna is scanty. This fact,

and the very peculiar shape of the island, suggest a possibility of its having been formerly of greater extent, and of having been subsequently reduced by subsidence.

We will first review the mammal-fauna, and then try and deduce, from a study of it, our conclusions as to its past history.

In Celebes alone of the Oriental Region we find representatives of the marsupials characteristic of the Australian Region. These consist of two species of *Phalanger*, which differ from those of the Australian islands only in slight particulars.

The next interesting animal of this fauna is the babirusa, a wild pig remarkable for the enormous size of its upper and lower canine teeth, which form, as it were, two pair of horns on the upper side of the head. Another peculiar ungulate, now generally referred to the widespread genus *Bos*, is the anoa, which shows many primitive characters, and is entirely confined to the island.

The mice and squirrels of Celebes are fairly numerous, and most of the species are peculiar to the island; one rat forms a special genus.

Carnivores are very scarce in Celebes; insectivores have not been recorded at all. The bats, which are numerous, comprise a considerable number of Australian forms, and one peculiar genus.

Among the primates, *Tarsius* of the other Malayan islands is also found in this subregion. Finally, one of the most remarkable of the animals of the island is the black ape of Celebes, belonging to a genus (*Cynopithecus*) intermediate between the macaques and the baboons. *Cynopithecus* appears to have found its way from Celebes into the adjoining island of Batchian, which belongs to the Australian Region.

The following table shows the mammals of this subregion arranged in a form like those of the other subregions:—

	Marsupials.	Edentata.	Ungulata.	Rodentia.	Carnivora.	Cibirop-tera.	Primates.	Total.
Endemic	0	0	1	1	0	1	?1	4
Oriental	0	0	0	0	1	2	1	4
Australian	1	0	0	0	0	2	0	3
Palæogean	0	1	1	2	1	9	1	15
Cosmopolitan	0	0	2	1	0	2	0	5
Total	1	1	4	4	2	16	3	31

From this summary it will be seen that the total number of mammal-genera that occur in Celebes is thirty-one, the greater number of which (twenty in all) are placed under the headings of Palæogean and Cosmopolitan. These are all widespread genera, which do not afford us any particular clue to the origin of the Celebesian fauna. Nine out of the twenty are genera of bats, which, as has before been remarked, are by nature much less restricted in their range than the true quadrupedal mammals. Of the remaining eleven only two (*Mus* and *Sus*) have any extensive distribution in the Australian Region; the others, although they have, in one or two cases, managed to struggle into adjoining islands belonging to the Australian Region, can in no sense be viewed as Australian genera.

Of the genera registered in the table as "Australian," two are bats, which have apparently reached Celebes from the more easterly islands of the Australian Region, where they have a wide distribution; the other is the genus *Phalanger*, which has been already alluded to as being the only member of the marsupial order found in the Oriental Region.

The endemic genera of Celebes are four in number, and judging from their

affinities, it is impossible to believe that they have any relation to the animals now living in the Australian Region. Everything points to their being remains of a very ancient fauna, which must have been originally derived from the Asiatic continent.

The presence of the three Australian genera in Celebes does not in any way require the supposition of an ancient land-connection with that Region. This is obviously so in the case of the bats, and the phalanger is a strictly arboreal animal, and might easily have been drifted across a narrow strait on floating timber. On the other hand, to account for the greater proportion of Oriental forms found in the island, we are driven to the conclusion that at some time or other there was some sort of land-connection between Celebes and the mainland of Asia. These are the principal reasons for transferring the island of Celebes from the Australian to the Oriental Region.

SECT. 8.—THE PAST HISTORY OF THE ORIENTAL MAMMAL FAUNA.

Considerable controversy has arisen from time to time with regard to the similarities that undoubtedly exist between the faunas of the Oriental and Ethiopian Regions. Some writers have urged that, in order to account for this, some form of direct land-connection must have existed at one time or another across the Indian Ocean between Southern India and South Africa. Others have maintained that the points of similarity between the two Faunas have been exaggerated, and that no such land-connection is required to account for the facts which can easily be explained on the supposition of a southward emigration of northern forms due to glacial cold.

If we go back to the early part of the secondary epoch of geological time, we find, very well developed in India, a geological system known as the Gondwana, composed of sandstones and shales, which appear to be of fluvial origin. These beds have long been a problem to geologists, as they cannot be at all satisfactorily correlated with any formations in Europe. In South Africa, however, we find a series of beds, also doubtless of fresh-water origin, known as the Karoo formation, which contain a nearly similar set of fossil remains, and in New South Wales, again, there are formations also agreeing in the characters of their fossils with the Gondwana beds. These facts, according to Mr. Oldham (3), our latest authority on this subject, are "inexplicable, unless there has been a continuous land-communication along which plants could freely migrate, and the conclusion is vastly strengthened when we remember that throughout the greater part, if not the whole, of this period, a very different type of flora was flourishing in Europe and North America."

This land-connection may be of use in explaining the distribution of some of the lower vertebrates, but is of no assistance so far as the mammals are concerned; because in those early times it is probable that none of the families or even orders of our present mammals had arisen. The best-known and richest of the mammal-bearing formations of India are the Manchhar beds of Sind, and the Siwalik deposits lying along the foot of the Himalayas. These beds, especially the latter, contain the remains of an extensive and exceedingly interesting mammalian fauna, which has hitherto been very inadequately explored, and will probably afford abundant opportunities of discovery to the palæontologist of the future.

The number of genera hitherto discovered in these formations amounts in all to about sixty, of which thirty-nine are still in existence, while twenty-five are extinct. Among the recent genera are a considerable number which, though still occurring in Africa, have become extinct in the Oriental Region; such are *Bubalis*, *Cobus*, *Oreas*, and *Strepsiceros*—all genera of antelopes, *Camelopardalis* (the giraffe), *Hippopotamus*, *Loxodon* (the African elephant), *Cynocephalus* (the African baboon), and *Troglodytes* (the chimpanzee), while others still survive in India.

The most remarkable feature, however, of the Siwalik fauna is the fact that, while certain of the genera are only found in Miocene beds in Europe, and not in more recent deposits, the greater number are only known from the Pliocene and Pleistocene out of India, so that it is very difficult to fix the age of the Siwaliks as compared with the formations of Europe.

Beds containing a somewhat similar fauna, in most cases not so rich, have been discovered in Greece, near Athens, at Samos, and in one or two other localities, at least, in South-Western Europe; while north of the Alps nothing of the sort has been found of a corresponding age. The most plausible explanation of the whole matter, therefore, so far as we can say at present, is that the increasing cold at the end of the Miocene and the beginning of the Pliocene times gradually drove the northern inhabitants southwards. It thus came to pass that, at that period of the world's history, the mammalian faunas of Southern Europe, South-Eastern Asia, and of India were so nearly uniform as to constitute these countries, as regards their mammals, one widely extended Region.

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DR. NANSEN'S NORTH POLAR EXPEDITION, AND ITS SCIENTIFIC RESULTS.*

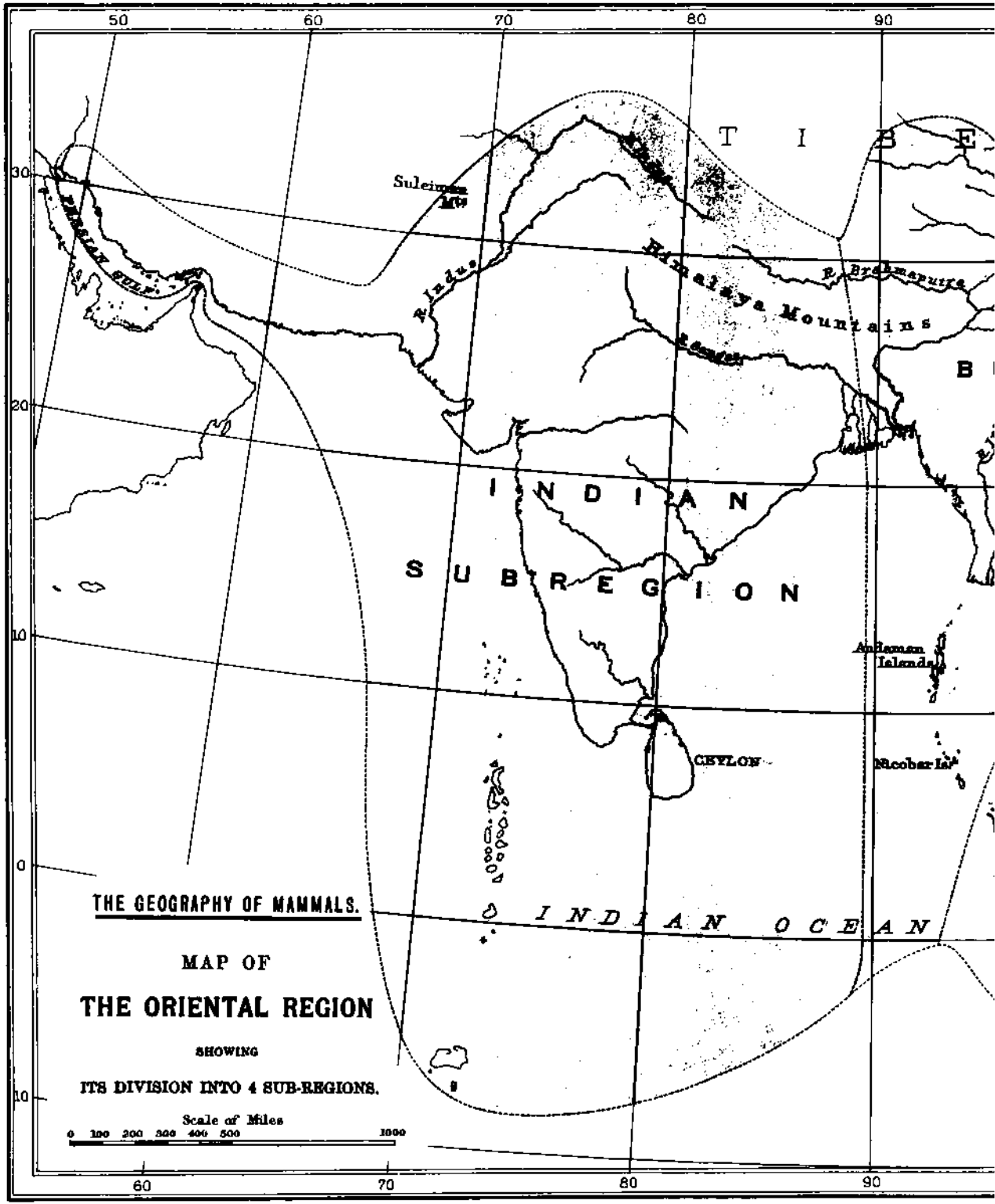
By Professor H. MOHN.

THE object of this expedition was to explore the regions around the North Pole, which had remained quite unknown, on account of the immense difficulties offered to exploration by the physical features, the high latitude, and the severe climate of those parts of our globe. If Fridtjof Nansen has now succeeded in overcoming these difficulties, so as to have crossed a large part of the formerly inaccessible seas round the pole, and has collected such invaluable information and materials for a better knowledge of those latitudes, this was due, first and foremost, to the fact that he is a man of science, who, with his mastery of all that had been done, and the penetration of his genius, could gain an insight into the unknown; and that, with unsurpassed practical sense, he knew how to make the arrangements necessary to secure that his journey, from beginning to end, should be a unique success.

The information about Nansen's journey which we have at our disposal is almost entirely limited to what has come to general knowledge through the press. It is evident that such information contains only the very first rays of the light which will be thrown by the observations of the expedition upon this part of our globe (when they are known in full), but already those first glimpses indicate conclusions of such importance and width, that it will be welcome to the reader to have a preliminary sketch of the scientific results which already have been won by Nansen and his admirable and gallant companions.

As is known, Nansen based the plan of his journey on the assumption that there

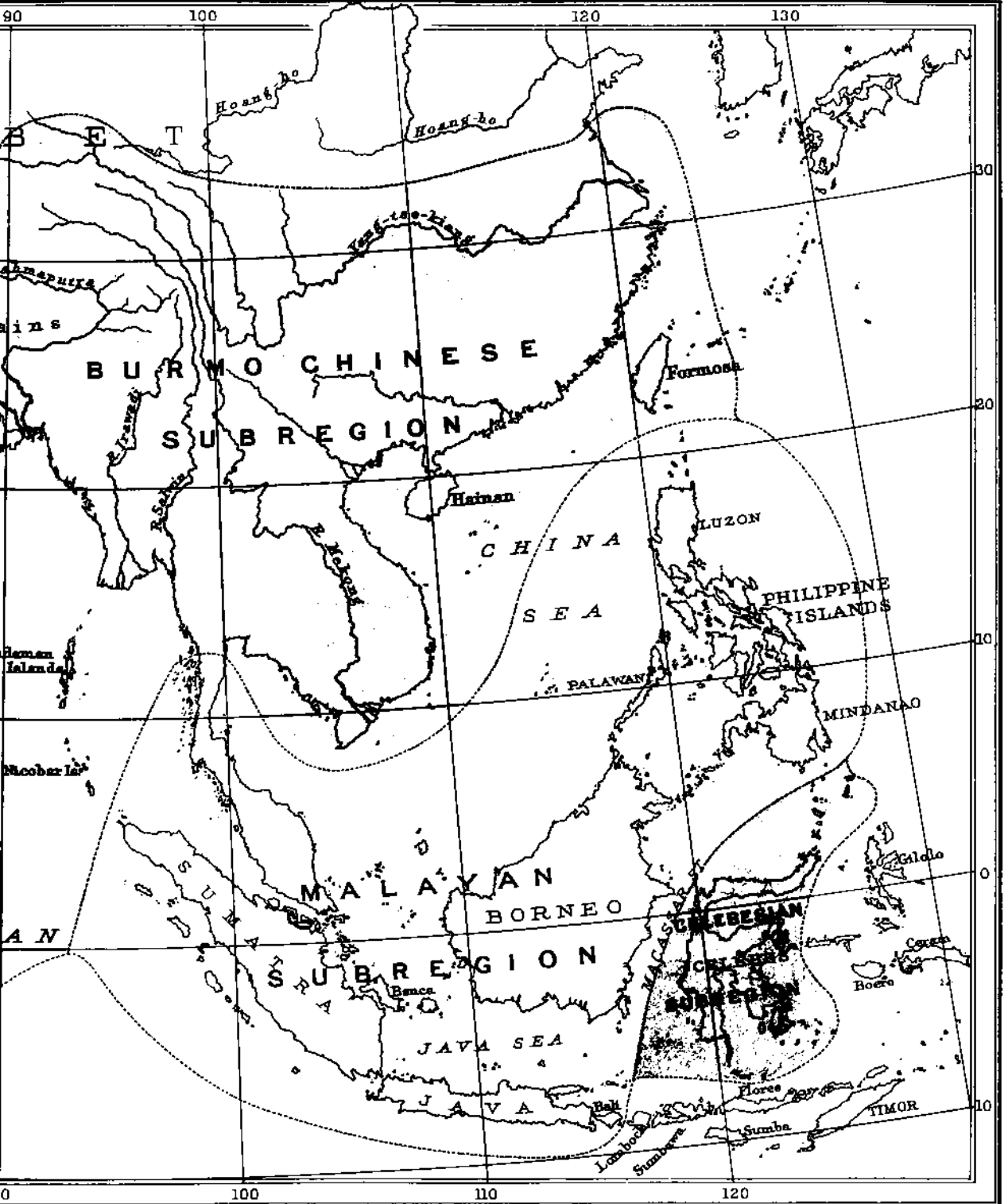
* Translated from the Christiania *Morgenbladet*, September 6, 1896.



THE GEOGRAPHY OF MAMMALS.

**MAP OF
THE ORIENTAL REGION**
SHOWING
ITS DIVISION INTO 4 SUB-REGIONS.

Scale of Miles
0 100 200 300 400 500 1000



W. & A. Johnson, Edinburgh & London