The Geography of Mammals. No. VI. The Nearctic Region (Continued)

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Source: *The Geographical Journal*, Vol. 9, No. 1 (Jan., 1897), pp. 67-76

Published by: geographicalj

Stable URL: <http://www.jstor.org/stable/1773648>

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All the most important and characteristic animals of Brazil, considered as a geographical region, with the exception of some tropical quadrumana, exist in the countries visited by the Commission. This part of Central Brazil may be considered as now being the principal residence of all the great mammals, less numerous—some of them even very rare—in the other districts of the New Republic. (The black and spotted variety of *Felis onça*, *F. Eyra* and *F. Jaguarundi*; the red and black variety of *F. concolor*.) It has been pointed out ('Liais,' p. 558) long ago, that the twelfth and eighteenth parallels, within which the present exploration took place, marking the intermediary zone between the Amazonian and Plata basins, are the boundary of many animal species.

Among animals of economical importance the principal are the otters (*Lutra solitaria*, *L. Brasiliensis*), the skunk (*Mephites suffocans*), the anta or tapir (*Tapirus Americanus*), and the emu or American ostrich (*Rhea Americana*), the latter, however, in decreasing numbers.

Some of the principal latitudes determined were—

Formosa	...	...	...	...	...	...	15° 32' 7"
Mestre d'Armas	...	...	...	...	...	...	15° 37' 36"
Pyrenopolis (Meia Ponte)	...	...	...	...	...	...	15° 51' 45"
Goyaz	...	...	...	...	...	...	15° 55' 26"
Bomfim	...	...	...	...	...	...	16° 40' 7"
Entre Rios	...	...	...	...	...	...	17° 43' 40"
Catalão	...	...	...	...	...	...	18° 10' 25"
Santa Rita do Paranahyba	...	...	...	...	...	...	18° 28' 27"

THE GEOGRAPHY OF MAMMALS.*

By W. L. SCLATER, M.A., F.Z.S.

No. VI.—THE NEARCTIC REGION.

SECT. 1.—BOUNDARIES OF THE NEARCTIC REGION.

WITH the Nearctic Region we enter upon a subject on which there has been considerable controversy among the students of geographical distribution. As was pointed out in the introductory article of this series, a certain number of writers maintain that this Region does not contain a sufficient quantity of distinctive and indigenous forms to entitle it to separation from the Palæarctic Region. What should constitute a sufficient number of distinctive forms depends, of course, largely on the individual opinions of the writers, but if allowance be made for the undoubted similarities of the extreme northern parts of the Old and New Worlds, which together may be considered as forming a kind of intermediate district, the facts and figures given below will, I think, convince every one that the land-surfaces of the Palæarctic and Nearctic Regions have now, and have had in the past, quite sufficiently distinct faunas to warrant their division into two primary Regions.

The boundaries of the Nearctic Region are comparatively simple. On the north, the line of the extreme limit of trees may be taken, beyond which the so-called

* Continued from vol. viii. p. 389. Map, p. 120.

"barren grounds," together with a similar district in the Old World, may form an Arctic intermediate district as mentioned above. South of the barren grounds, the Nearctic Region will include within its boundaries the whole of North America as far as the southern limit of the tableland of Mexico, in the neighbourhood of the city of that name. On either side of the tableland the Neotropical Region extends as a narrow strip along the Gulf of Mexico and the Pacific, as far north as the Rio Grande on the former coast, and to about Guaymas on the latter.

There are no islands of any importance belonging to this Region that need be mentioned here. The Pacific islands on the west coast of Mexico have few, if any, mammals. The large islands of Newfoundland and Vancouver are of the true continental type, being separated from the main land only by quite shallow water. The Antilles, or West India islands, belong entirely to the Neotropical Region, and have been already considered in a previous article.

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

On referring to the table given at the end of the first article of this series,* it will be seen that the total number of genera, and also of species contained in the Nearctic Region, is considerably less than in any of the other Regions hitherto treated of. This may be explained partly by the fact that practically the whole of this Region is outside the tropics, whereas the other Regions previously described lie to a great extent within the tropical zone, which is very favourable to the development of a rich and varied fauna.

Out of the nine orders into which the terrestrial mammals have been divided, two only are not represented in this Region. These are the primates, at the head of the list, and the monotremes, at the extreme end, the latter being confined to the Australian Region. The marsupials are represented by one species only, the well-known Virginian opossum, which is found with very slight modifications from the Southern States of the Union southwards over the greater part of South America. This animal would, perhaps, judging merely by the present distribution of life, be considered to have intruded into the Nearctic Region from South America, where alone members of this family still survive; but, on examining its past history, we find that the genus *Didelphys* was formerly found both in Europe and in North America during Eocene and Miocene times, so that it is quite possible that the Virginian opossum may be a survivor rather than an intruder in North America.

The next order, the edentates, is represented in this Region only by a single species of armadillo (*Tatusia novemcincta*), which almost certainly came up from the south, and is only met with just inside the southern borders.

Among the ungulates, the most remarkable form is the prong-buck (*Antilocapra*), which forms a distinct family of that order, and is entirely confined to this Region. It is allied in some respects to the antelopes of the Old World, but it is unique among all the hollow-horned ruminants from the fact that it sheds its horns every year.

Two other genera belonging to the family Bovidæ are confined to the Nearctic Region; these are the Rocky mountain goat (*Haploceros*), found only in the Rocky mountains; and the musk ox (*Ovibos*), which ranges over the barren grounds at the extreme north of the continent, and spreads into Greenland. The latter, however, was found in the northern parts of the Old World until a comparatively recent epoch, geologically speaking.

Rodents are very numerous in the Nearctic Region. According to the tables here used, which have been compiled from Flower and Lydekker's text-book of

* *Geographical Journal*, vol. iii. p. 104.

mammals, out of a total number of twenty-eight genera, thirteen are endemic. One of these, *Haplodon*, a small animal resembling the prairie dog in its habits, and found only west of the Rocky mountains, forms a distinct family.

The Carnivora are also well represented, especially the genera of cats, dogs, bears, and weasels, all of which, however, are widely spread. The only endemic genus is that formed for the reception of the American badger (*Taxidea*), which differs from its European ally in certain anatomical features.

In contradistinction to the Neotropical Region, the Insectivora are abundant in Nearctica; there are no less than four genera of moles met with, three of which are peculiar.

Finally, the bats are neither very numerous nor of great importance; only one genus (*Antrozous*), containing one species, being peculiar out of a total of nine.

Summarizing, therefore, we find the Nearctic Region to be characterized by the exclusive possession of only two families of mammals—namely, Antilocapridæ (the prong-bucks) and Haplodontidæ (the haplodonts), and by the presence of sixty-six genera, of which twenty-one are restricted within its boundaries. On the other hand, in addition to the two orders already mentioned, monotremes and primates, the following important families are absent in the Nearctic Region, although fairly well spread over the Old World:—

Suidæ (wild pigs).	Hyænidæ (hyenas).
Equidæ (horses).	Erinaceidæ (hedgehogs).
Myoxidæ (dormice).	Pteropodidæ (fruit-eating bats).
Viverridæ (civets).	Rhinolophidæ (leaf-nosed bats).

That some of these families did, however, at one time exist on the North American continent has been shown by recent palæontological discoveries.

SECT. 3.—ON THE DIVISION OF THE NEARCTIC REGION INTO SUBREGIONS.

The recent work of American naturalists, more especially that of Merriam (2) and of Allen (1), has greatly increased our knowledge of the mammals of North America and of their distribution. These naturalists have further shown that the subregions adopted by Wallace in his well-known text-book on geographical distribution are not altogether supported by the facts now known to us.

Mr. Allen, in his paper on the distribution of North American mammals, first of all excludes from what he terms the North American Region the extreme northern parts of that continent. He considers that the Arctic portion of that continent, namely, that beyond the limit of arboreal vegetation, forms, together with the similar part of the Old World, a separate Region, or, as he terms it, “the Arctic Realm.”

Furthermore, the southern part of North America south of the Mexican table-land, together with the lowlying country of Mexico on either flank, he assigns to the American Tropical Realm. The remainder of the continent, combined with the great mass of Europe and Asia, forms, according to this author, the North Temperate Realm. This scheme of division does not differ essentially from that of Mr. Allen. The Arctic portion of North America forms, no doubt, as Mr. Allen puts it, “part of a homogeneous hyperborean faunal area of circumpolar distribution.”

Mr. Allen’s American Tropical Realm has already been treated of in the third article of this series dealing with the Neotropical Region. There remains, therefore, Mr. Allen’s North American Region, which nearly corresponds to the Nearctic Region of our scheme of classification. Mr. Allen divides his North American Region into two subregions—the Cold Temperate and the Warm Temperate, the

two latter falling into two provinces, a Humid or Eastern and an Arid or Western. Proceeding further, he divides the Humid Province into two subprovinces, namely, an Apalachian or Northern and an Austro-riparian or Southern. The Arid or Western Province is also separated into two subprovinces—the Campestrian or Northern and the Sonoran or Southern, and, besides this, the subprovinces are divided into various minor divisions termed districts and faunas.

It will be sufficient for our present purpose to divide the North American or Nearctic Region into three subregions; these may be termed, (1) the Canadian Subregion, (2) the Humid Subregion, and (3) the Arid Subregion.

Mr. Wallace has recognized four subregions in the Nearctic Region. His Canadian Subregion corresponds fairly well to the Canadian or North Temperate of Mr. Allen, except for the fact that it has not been made by Mr. Wallace to extend southward down the mountain ranges. The Alleghany Subregion of Mr. Wallace, again, practically corresponds to the "Humid" of Mr. Allen. The two others, the Rocky mountain and Californian, correspond to Mr. Allen's "Arid," the Californian Subregion being composed of the narrow strip of coast country between the Sierra Nevada and the sea, and extending from Queen Charlotte's sound in the north to the south-western corner of California. The differences, therefore, between Mr. Wallace's and Mr. Allen's views are not so fundamental as one would gather from the critical remarks of the latter author.

The boundaries of the subregions here adopted will be best understood by reference to the accompanying map (p. 120).

The Canadian or Cold Temperate Subregion is bounded on the north by the northern limit of trees which runs through Newfoundland and Labrador, and thence, in an irregular line, trending rather northward to Alaska. The southern limit of the subregion commences, on the Atlantic side, on the coast of Maine, in the neighbourhood of Augusta, and thence runs to Quebec and through the Great lakes. Further west it is bounded by the northern branch of the Saskatchewan, and ends on the Pacific coast in the neighbourhood of Queen Charlotte's sound. But long prolongations of this subregion extend down the Alleghany mountains; in the east as far as Georgia, along the Rocky mountains as far as the Rio Grande, and along the Cascade and Sierra Nevada mountains as far as the Colorado river. Besides these, there are several smaller detached portions of other mountain ranges, which must be attributed to the Canadian Subregion.

The "Humid" or Eastern Subregion is separated from the "Arid" or Western by a line running roughly along the meridian of 100° west of Greenwich, and extending from Manitoba to the mouth of the Rio Grande del Norte.

Passing over, for the present, the Arctic portion, which will be considered along with the similar part of the Old World, the three subregions may now be dealt with individually.

SECT. 4. THE CANADIAN OR COLD TEMPERATE SUBREGION.

The Canadian Subregion is especially remarkable for a number of genera which are common to it and the northern part of the Old World, but which do not extend southwards into the other subregions to be presently treated of. It is further characterized by the small number of genera which are essentially New World forms, and have no connection with the Old World. Reviewing the mammals in detail, we find that the subregion contains no representative of either marsupials or edentates. On the other hand, there are six genera of the ungulates within its limits—a far larger proportion than that found in the other subregions. Of these the only one endemic is *Haploceros* (the Rocky-mountain goat). This somewhat isolated ruminant has its nearest allies in the

genus *Nemorhædus*, of the mountains of Asia, which occurs in Japan (*N. crispus*), but of which the best-known form is commonly designated the "serow" by the sportsmen of the Himalayas. There are also no less than four genera found in the Old World, and also in the Canadian Subregion, which do not extend further south. These are *Cervus*, containing the wapiti (*C. canadensis*), closely allied to the red deer of the Old World; the cariboo (*Rangifer*), which cannot be distinguished from the reindeer of the northern part of the Palearctic Region; and the moose (*Alces machlis*), which has the same distribution as the reindeer, but is known in Europe under the name of "elk." Besides these, there are two Canadian genera of this order which are found in other subregions as well as in the Old World, namely, the ox (*Bos*) and the sheep (*Ovis*). *Bos*, of which the American representative is the so-called buffalo (now, alas! nearly extinct), is closely allied to the European bison, still found in certain parts of the Old World; while the big-horn (*Ovis canadensis*) is a representative of the wild sheep, which are extensively distributed in the Palearctic Region. The number of genera of rodents of the Canadian Subregion amounts in all to eighteen, of which three are peculiar. One of these is *Haplodon*, to which allusion has already been made; the others are *Phenacomys*, a small genus of rats, and *Erethizon*, which contains only the tree-porcupine of the Canadian forests. Among the members of this order, too, we find three genera common to this subregion and the Old World, which do not extend further south. These are *Myodes* (*M. obesus*), which is represented in Europe by an allied species, the well-known lemming of Scandinavia; *Cuniculus*, a form nearly allied to the lemming; and *Lagomys*, the "pika," or tailless hare, which is found in the higher mountain ranges of both the Old and the New Worlds.

The Carnivora do not present many features of special interest. Two genera—*Mustela*, containing the weasels, and *Gulo*, the glutton, have much the same circumpolar distribution as has been already remarked on in the case of the deer and the lemming.

The number of genera of Insectivora and Chiroptera in the Canadian Subregion is insignificant, and they are of no interest from a distributional point of view.

Viewing the fauna of the Canadian Subregion as a whole, it will thus be seen that its greatest point of interest is its resemblance to that of the more northerly parts of the Old World. This, of course, may be easily accounted for when we recollect that the sea of Behring straits is quite shallow, and in places not more than about 20 miles in breadth. There can be no doubt that there was a land-connection between Siberia and Alaska in comparatively recent geological times, and that this has resulted in the commingling of the faunas of the northern parts of these two Regions, to a considerable extent. This land-bridge must have existed so recently that there has not yet been even time for, in some cases, the animals to become differentiated into appreciable species, as in the cases, for example, of the reindeer and elk.

Below will be found a summary of the genera of the Canadian Subregion, forty in number, which are divided into five categories much in the same fashion as has been done in the previous articles, namely—

1. *Endemic*—those found only in the Canadian Subregion.
2. *Nearctic*—those not found beyond the limits of the Nearctic Region.
3. *Neogean*—those found in the New, but not in the Old World.
4. *Arctic* and *Palæogean*—those which are found in the Old World, and only in the Canadian Subregion of the New; and, finally—
5. *Neogean* and *Palæogean*—containing the most widely distributed forms.

	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chirop- tera.	Total.
1. Endemic	1	3	0	0	0	4
2. Nearctic	0	3	1	1	0	5
3. Neogean	0	0	2	0	1	3
4. Arctic and Palæogean ...	4	3	2	0	0	9
5. Neogean and Palæogean	1	9	6	1	2	19
Total	6	18	11	2	3	40

SECT. 5.—THE ARID OR WESTERN SUBREGION.

This subregion is, on the whole, the richest of the three, both as regards the total number of genera found within its limits and also as regards the number of genera peculiar to it, which amounts to seven out of fifty-three, as compared with four out of forty in the Canadian, and one out of forty in the Humid.

The Arid Subregion shares with the Humid the only representative of the marsupials found in North America, the Virginian opossum. Just extending, too, to within its limits occurs the only member of the order Edentata, the nine-banded armadillo (*Tatusia novemcincta*). Among the ungulates, the prong-buck (*Antilocapra*) is restricted to this subregion, and the genus *Cervus* of the Cold Temperate Subregion is replaced by the purely American genus *Cariacus*, of which the black-tailed deer is the representative.

This subregion is also more particularly the home of the American bison, which, however, ranged even in historic times eastward to the Atlantic seaboard. Among the rodents there are no less than five endemic genera, of which, perhaps, the best known is *Cynomys*, the prairie dog. The other endemic genera all belong to the family *Geomysidæ*, which contains a number of small rodents known as pocket-gophers.

Among the Carnivora there are no genera in the Arid Subregion which are not more or less widely distributed, the greater number of them, both in the case of this order and of the last, being also found in the Old World. Three genera of moles belonging to the next order, Insectivora, though confined to North America, extend into the Humid Subregion. The bats of the Arid Subregion include among their members two genera (each with one species) which occur only in California, while four other genera are found only in the New World. One of these, *Otopterus*, is of special interest, since it is the only member of a very large and well-marked family (*Phyllostomatidæ*), which extends into the Nearctic Region from South America.

This subregion, as compared with the Canadian, contains a far larger proportion of Neotropical genera, and, in addition, is characterized by the absence of a number of the Palæarctic forms found only in the Canadian Subregion. Such, for instance, are *Rangifer* (the reindeer), *Alces* (the elk), *Ovis* (the sheep), *Haploceros* (the mountain goat), *Gulo* (the glutton), and many others.

The following table, which gives a summary of the genera of this subregion, differs only from the summary of the Canadian Subregion in the omission of the heading "Arctic and Palæarctic," since practically all the genera common to this subregion and the Palæarctic Region are also found in the Canadian Subregion.

	Marsu- pials.	Eden- tata.	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chiro- ptera.	Total.
Endemic	0	0	1	4	0	0	2	7
Nearctic	0	0	0	5	1	3	0	9
Neogean	1	1	2	3	5	0	4	16
Neogean and Palæogean ...	0	0	1	9	6	2	3	21
Total	1	1	4	21	12	5	9	53

SECT. 6.—THE HUMID OR EASTERN SUBREGION.

So far as peculiar forms go, the Humid Subregion is quite the least peculiar of the three. It contains only one genus strictly confined within its limits; this is *Neofiber*, with a single species commonly known as the "round-tailed musk-rat." This rodent is found only in Florida, and is much less completely aquatic in its habits than the true musk-rat (*Fiber*), which is spread over the rest of North America.

Taking the orders *seriatim*, the marsupials are represented by the widely spread Virginian opossum; but the edentates do not reach the region at all. Of the ungulates only the genus *Cariacus* (the Virginian deer) occurs, the bison (though formerly inhabiting this subregion) not having been seen east of the Mississippi for the last forty or fifty years.

The rodents, as in the other subregions, make up the great mass of the mammalian genera, numbering seventeen in all, including *Neofiber*.

The Carnivora, Insectivora, and Bats do not differ very markedly from those of the Arid Subregion.

On the whole the Humid Subregion is not a very well-marked division; it differs from the North Temperate chiefly in the non-existence of the numerous northern Palæogean types found there, and from the Arid Subregion in the absence of a good many characteristic desert-haunting forms, and also of several of the South American genera, which have spread up northwards from the Nearctic Region into the Arid Subregion, but which have not reached the more distant Humid.

The following table gives a summary of the genera of this subregion, from which it will be seen that the total number (forty) of genera is markedly less than the corresponding number in the Arid Subregion.

	Marsu- pials.	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chiro- ptera.	Total.
Endemic	0	0	1	0	0	0	1
Nearctic	0	0	5	1	3	0	9
Neogean	1	2	2	3	1	2	11
Neogean and Palæogean ...	0	0	9	5	1	4	19
Total	1	2	17	9	5	6	40

SECT. 7.—THE PAST HISTORY OF THE NEARCTIC REGION.

During the last twenty years the wonderful discoveries of American Palæontologists have thrown a flood of light, not only on the past history of the Nearctic Region, but also on the evolution of many of the mammalian groups themselves. It is, therefore, very necessary, when reviewing the geographical distribution of the

present mammalian fauna, to shortly recapitulate the more important results and conclusions arrived at from their writings.

A very useful and comprehensive summary of this work will be found in a paper by Professor Zittel, (3) lately published in the *Geological Magazine*. The beds which contain the remarkably perfect remains above alluded to are found only in the western part of North America. Here, apparently, there existed throughout the Tertiary Epoch a series of great fresh-water lakes, on the sides and the bottoms of which were formed an almost continuous series of deposits with the remains of the animals of the surrounding districts embedded in them. The great interest of these discoveries lies in the fact that we can here trace the gradual formation and evolution of several of the mammalian orders as they at present exist. In the oldest beds the mammals resemble one another so closely that it is often impossible to assign them very definitely to any of the existing orders, although the germs of the commencing distinctive characters can even here be traced.

In the later horizons the various groups gradually differentiate themselves, until in the most modern of the deposits the genera can all be definitely assigned to existing orders.

The earliest mammals that have been found in North America come from the Trias of North Carolina, but neither these nor any of the other mammalian remains of the Secondary Period tend to assist the geographical problems involved or are of importance in the present juncture.

With the oldest Tertiary beds an entirely new fauna appears, and furnishes us with remains of forms belonging to various orders of which no traces can be found in the earlier Secondary deposits. The following is a short list of these deposits, together with their European equivalents so far as they can be ascertained:—

LOWER EOCENE.	{Puerco beds of New Mexico. Wasatch beds of Wyoming, Utah, and New Mexico.
MID-EOCENE.	Bridger beds of Wyoming.
UPPER EOCENE.	Uintah beds of Utah and Wyoming.
LOWER MIOCENE.	White-river beds of Nebraska, Dakota, Colorado, and Wyoming.
MID-MIOCENE.	John-Day beds of Oregon, Nevada, and Washington.
PLIOCENE.	Loup-Fork beds of Nebraska, Colorado, Wyoming, Kansas, and New Mexico.
LATE PLIOCENE.	Equus beds of Western and South-Western States, and Megalonyx beds of Eastern States.

In the lowest Eocene beds, not only the genera, but even the orders of mammals are in almost every case different from those at present existing. The greater number of these belong to two orders—Creodontia and Condylarthra; the former the progenitors of modern Carnivora, the latter of the existing Ungulata. These two, and indeed the other orders to which the mammals of this fauna have been assigned, all show considerable points of resemblance to one another, first in the possession of five toes on both limbs, which are provided with neither claws nor hoofs, but with a structure somewhat intermediate between the two, and, secondly, in their extremely small cerebral cavity. A similar, though much more incomplete, fauna has been found in certain beds of a corresponding age in Europe, the genera of their fossil mammals being in most cases identical with those of the Nearctic Region.

In the next stage, the Wasatch beds, which correspond in age nearly to the London Clay of England, a further development of the same fauna is found, with, however, the commencement of certain of the modern orders; such, for instance, as the Perissodactyla (or odd-toed ungulates), the rodents, the insectivores, and the

lemurs. Here, too, so far as the scanty remains found in Europe allow us to form a comparison, there is a close similarity between the faunas of the two regions.

In the succeeding 'Bridger beds' of Mid-Eocene age is found the earliest evidence of the still surviving genus *Didelphys* (the opossum). Here also marine mammals and Chiroptera appear for the first time. But any comparison of these remains with European forms is even more difficult than in the last case, owing to the scarcity of such fossils in beds of the same age in Europe.

With the Uintah beds of the Upper Eocene we first begin to find very distinct traces of differentiation between the European and the North American faunas, although a good many of genera met with are still common to the two Regions.

A great advance is found in the fauna of the White-river beds of Miocene age. In this case the mammals can almost all be referred to existing orders, but comparatively few of the genera are common to the Old and New Worlds; and it appears that, whilst during the older Eocene there was a considerable emigration of New World forms into Europe, in Miocene times the stream was reversed, and North America received the greater number of its immigrants from this side of the Atlantic. This immigration continued during the Middle Miocene epoch, the fauna of which has been well preserved in the John-Day beds of the extreme west. At the same time many endemic families and forms are also met with, especially as regards the early predecessors of the camel family, which apparently had its origin and early development in the Nearctic Region, though now entirely absent from it. In the John-Day beds we also find, for the first time, remains of the modern genera, *Rhinoceros*, *Sciurus*, *Hesperomys*, and *Lepus*.

The succeeding "Loup-Fork beds" contain additional recent genera, some of which, such as *Equus* and *Camelus*, are now no longer found in the Nearctic Region, while others, such as *Canis*, *Mustela*, and *Lutra*, still remain there. On the whole, however, the fauna of this epoch is still further removed from that of the corresponding period of the Old World than that of the preceding.

A little later, in the so-called "Equus beds" of the Western States, and in the contemporaneous "Megalonyx beds" of the Eastern, we first find a number of neotropical forms, such as *Myiodon* (a gigantic sloth), *Glyptodon* (the gigantic armadillo), *Hydrochaeris* (the capybara), and *Toxodon*, a member of a peculiar extinct family of ungulates.

The occurrence of all these animals indubitably proves that now for the first time a connection had been formed between the continents of North and South America. Before this epoch, no trace of a Neotropical admixture can be anywhere detected in the Nearctic mammal-fauna.

Thus the evidence of Palæontology in every way supports the deductions drawn from a study of the distribution of recent forms, namely, that the bulk of the present Nearctic fauna has been mainly derived from the Old World, although at times the Region has been sufficiently isolated and sufficiently extensive for the independent evolution of its own characteristic forms. In accordance with these deductions, the present remaining inhabitants of the Nearctic Region may be divided into three categories, as follows: (1) The Endemic fauna, the bulk of which has had, at some considerably remote geological period, a common origin with that of the Palæarctic Region, although it has enjoyed ample time to develop and differentiate itself on its own lines. (2) A Neotropical constituent, which first appeared in the Nearctic Region in Pliocene times. (3) A comparatively modern Palæarctic fragment, in which not only the genera, but frequently the species, are identical in both Regions. This portion of the fauna has probably reached the Nearctic Region by the passage which must have existed in comparatively modern times across Behring straits. Consequently, while the Neotropical element is

the stronger in the south, this last, the Palæarctic element, is far more prevalent in the extreme north.

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ON THE DISTRIBUTION OF TOWNS AND VILLAGES IN ENGLAND.

By GEO. G. CHISHOLM, M.A., B.Sc.

I. PHYSICAL ASPECTS OF THE QUESTION.

THE subject of which I propose to treat in the present paper has points of interest under two aspects—first, with reference to the physical features of the country, and, second, with reference to historical conditions. These two aspects cannot be kept wholly distinct, for at all times physical conditions have to be taken into consideration, and in various ways historical development gives at different times a different value to physical features. Still, it is convenient to consider the subject under each of these aspects separately, so far as that can be done. In the physical aspect of the question, geological conditions must be taken into account, both on account of their direct effect and on account of their indirect effect on town and village distribution through the influence they have had on topographical features. In this aspect of the question, the distribution of villages as well as towns will in a large measure engage our attention, whereas in the historical aspect it is chiefly towns that present such points of interest as it will be possible to take notice of in a brief handling of the subject—such, for example, as the permanence and impermanence of towns, their rise and decay or changes in relative importance, the late origin of towns now of considerable importance in widely different situations, the loss of manufactures by some towns, and their long retention under varying conditions by others.

In examining the subject first under the physical aspect, it may nevertheless be well to take an historical fact as determining the point from which we start, the fact, namely, that most English villages at least bear names of an origin which it is on the whole most convenient to call Anglo-Saxon, or, if not Anglo-Saxon, at any rate Teutonic, and among Teutonic names the Anglo-Saxon come first. We will begin accordingly with the region first settled by those invaders. As is known to every one, the Anglo-Saxon settlements spread inland from various points on the east and south coasts, more particularly the coasts south of the Wash and east of Southampton Water; and for centuries, and indeed down to a comparatively recent period, this area remained beyond comparison the richest and most populous in the country. Now, it is of the highest importance, with reference both to the physical features and the distribution of towns and villages, that in this area a single geological formation, remarkably uniform in structure, occupies a greater extent of ground than any other formation of uniform character in the country. This, of course, is the Chalk. From Hunstanton point to Weybourne, on the north

THE GEOGRAPHY OF MAMMALS.

MAP OF

THE NEARCTIC REGION

SHOWING

ITS DIVISION INTO 3 SUB-REGIONS.

Scale of Miles

100 0 200 400 600 800 1000

W. & A. X. Johnson, Edinburgh & London.

Published by the Royal Geographical Society