

ON THE VALUE OF THE "NEARCTIC" AS ONE OF THE PRIMARY  
ZOOLOGICAL REGIONS.

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The six zoological regions<sup>1</sup> laid down by Mr. Selater, and so admirably sketched out by Mr. Wallace, have been so very generally accepted by naturalists that it may be considered as almost presumptuous for any one to attempt at this late hour a revision of the same. But yet the evidence concerning the position of at least one of these—the Nearctic—is in many respects so negative—indeed, it might be said so directly contradictory—that a reconsideration is rendered almost imperative. The question affecting the relationship of this region is thus stated by Wallace: "Whether the Nearctic region should be kept separate, or whether it should form part of the Palæarctic or of the Neotropical regions. Professor Huxley and Mr. Blyth advocate the former course; Mr. Andrew Murray (for mammalia) and Professor Newton (for birds) think the latter would be more natural. No doubt much is to be said for both views, but both cannot be right; and it will be shown in the latter part of this chapter that the Nearctic region is, on the whole, fully as well defined as the Palæarctic, by positive characters which differentiate it from both the adjacent regions."<sup>2</sup>

<sup>1</sup> Palæarctic, Ethiopian, Indian (Oriental of Wallace), Australian, Nearctic, and Neotropical (Austro-Columbian of Huxley).

<sup>2</sup> Geographical Distribution of Animals, vol. 1, p. 66, 1876. Professor Newton, in the article "Birds," contained in the Encyclopædia Britannica (9th ed., iii, p. 751, 1875), thus expresses his views in the present connection: "Thus, regarded simply from an ornithologist's point of view, what we call the Nearctic 'region,' seems to have no right to be considered one of the primary regions of the earth's surface, and to be of less importance than some of the subregions of the Neotropical region. \* \* \* It is not, however, intended here to question the validity of the Nearctic region in a zoogeographical sense. If that position could be successfully disputed, it must be done on more than ornithological grounds, and a consideration of them would be out of place in this article. It is enough to mention that though the mammals would possibly lead to much the same conclusion as the birds do, yet the lower classes of vertebrates—reptiles, amphibians and fishes—would most likely have a contrary tendency, while the present writer is quite unable to guess at the result which would be afforded by the invertebrates."

In view of the very divergent positions occupied by the naturalists above cited as to the value of the region here referred to, it may be fairly conceded, we believe, and with due deference to the high authority of Mr. Wallace, that the question of position or relationship is still an open one; and the more especially can this be considered to be the case, since several of the authors do not appear to be agreed even as to the general (or preponderating) relationship of the contained mammalian fauna, or that branch of the representative fauna which is usually taken to be most characteristic (typical) of a region.<sup>1</sup>

In the hope, therefore, of throwing some additional light on this subject the author has been constrained to make the following critical inquiry. The points which it has been attempted to solve are :—

1. Whether the Nearctic region is entitled to be considered as an independent region by itself.

2. If not, of which region, Palæarctic or Neotropical, does it constitute a part.

The relative relationship of the Nearctic fauna with the faunas of the Palæarctic and Neotropical regions constitutes the first portion of the inquiry.<sup>2</sup>

The Nearctic mammalian fauna comprises, according to Wallace, about 26 families, as follows :

Phyllostomidæ,	Suidæ,
Vespertilionidæ,	Cervidæ,
Noctilionidæ,	Bovidæ,
Talpidæ,	Muridæ,
Soricidæ,	Dipodidæ,
Felidæ,	Saccomyidæ,

<sup>1</sup> Wallace, *op. cit.*, 1, p. 57.

<sup>2</sup> In the following analyses of mammalian families, genera and species, the author has followed the tables furnished by Wallace in his "Geographical Distribution of Animals," and for two reasons: 1st, The circumstance that these tables have served as the basis for Mr. Wallace's own conclusions, *et conseq.* as the guiding data for those authors who have accepted the views of this naturalist; and 2d, The difficulty of constructing new tables, which in their application to all the various zoögeographical regions, could claim a decided advantage over those that are here furnished. For the North American fauna a reconsideration based upon the more recent works of Coues and Allen, where the number of species is very materially reduced, is given later on.

Canidæ,	Castoridæ,
Mustelidæ,	Sciuridæ,
Procyonidæ,	Haploödontidæ,
Ursidæ,	Cercolabidæ,
Otariidæ,	Lagomyidæ,
Trichechidæ,	Leporidæ,
Phocidæ,	Didelphyidæ.

Of this number only one family—the *Haploödontidæ*—comprising one or two species of beaver-like animals inhabiting the west coast, can be said to be strictly peculiar to the region.<sup>1</sup> Of the 25 non-peculiar families, 19 are also Palæarctic, and of the remaining 6, 5 are exclusively Nearctic and Neotropical and 1 (*Noctilionidæ*, or short-eared bats) is found in the eastern hemisphere.

Comparing the Nearctic with the Neotropical fauna, we find that out of the 25 non-peculiar families 18 are also Neotropical, so that the relationship between the Palæarctic and the Nearctic on one side, and the Nearctic and Neotropical on the other, would appear to be equally great. But if we take the genera included in these 26 families (74 in all<sup>2</sup>)

<sup>1</sup> The *Sacomysidæ*, or pouched rats, which are also regarded as peculiar to the Nearctic region by Wallace, can scarcely be considered such, since a fair proportion of the species (*Heteromys*, 6 sp. ?; *Geomys* [*Geomyidæ* of some authors]) penetrate to a considerable distance within the Neotropical region. The family is more properly *characteristic* than *peculiar*.

	Number of Species.		Number of Species.
<sup>2</sup> Phyllostomidæ,		Soricidæ,	
<i>Macrotus</i> , . . . . . 1		<i>Sorex</i> , . . . . . 16	
Vespertilionidæ,		<i>Neosorex</i> , . . . . . 1	
<i>Scotophilus</i> , . . . . . 5		<i>Blarina</i> , . . . . . 7	
<i>Vespertilio</i> , . . . . . 6		Felidæ,	
<i>Nycticejus</i> , . . . . . 1		<i>Felis</i> , . . . . . 5	
<i>Lasiurus</i> , . . . . . 8		<i>Lynx</i> , . . . . . 8	
<i>Synotus</i> , . . . . . 2		Canidæ,	
<i>Antrozous</i> , . . . . . 1		<i>Lupus</i> , . . . . . 6	
Noctilionidæ,		<i>Vulpes</i> , . . . . . 6	
<i>Nyctinomus</i> , . . . . . 1		Mustelidæ,	
Talpidæ,		<i>Martes</i> , . . . . . 2	
<i>Condylura</i> , . . . . . 1		<i>Mustela</i> , . . . . . 11	
<i>Scapanus</i> , . . . . . 2		<i>Gulo</i> , . . . . . 1	
<i>Scalops</i> , . . . . . 8		<i>Latax</i> , . . . . . 2	
<i>Urotrichus</i> , . . . . . 1		<i>Enhydria</i> , . . . . . 1	

we find that 35 are also Palæarctic,<sup>1</sup> and only 21 Neotrop-

	Number of Species.		Number of Species.
Taxidea, . . . .	2	Muridæ,	
Mephitis, . . . .	6	Reithrodon, . . . .	5
Procyonidæ,		Hesperomys, . . . .	16
Procyon, . . . .	2	Neotoma, . . . .	7
Bassaris, . . . .	1	Sigmodon, . . . .	2
Ursidæ,		Arvicola, . . . .	27
Ursus, . . . .	3	Myodes, . . . .	3
Otariidæ,		Fiber, . . . .	1
Callorhinus, . . . .	1	Dipodidæ,	
Zalophus, . . . .	1	Jaculus, . . . .	1
Eumatopias, . . . .	1	Saccomyidæ,	
Trichechidæ,		Dipodomys, . . . .	5
Trichecus, . . . .	1	Perognathus, . . . .	6
Phocidæ,		Thomomys, . . . .	2
Callocephalus, . . . .	1	Geomys, . . . .	5
Pagomys, . . . .	1	Saccomys, . . . .	1
Pagophilus, . . . .	1	Castoridæ,	
Halicyon, . . . .	1	Castor, . . . .	1
Phoca, . . . .	1	Sciuridæ,	
Halichærus, . . . .	1	Sciurus, . . . .	18
Morunga, . . . .	1	Sciuropterus, . . . .	4
Cystophora, . . . .	1	Tamias, . . . .	4
Suidæ,		Spermophilus, . . . .	15
Dicotyles, . . . .	1	Cynomys, . . . .	2
Cervidæ,		Arctomys, . . . .	4
Alces, . . . .	1	Haploödontidæ,	
Rangifer, . . . .	2	Haploödon, . . . .	2
Cervus, . . . .	6	Cercolabidæ,	
Bovidæ,		Erethizon, . . . .	2
Bison, . . . .	1	Lagomyidæ,	
Antilocapra, . . . .	1	Lagomys, . . . .	1
Aplocerus, . . . .	1	Leporidæ,	
Capra, . . . .	1	Lepus, . . . .	15
Ovibos, . . . .	1	Didelphyidæ,	
		Didelphys, . . . .	2

In Wallace's table of the Palæarctic fauna, *Thalassarctos*, the polar bear, is considered as a distinct genus apart from *Ursus*. The Nearctic *Ursidæ* would accordingly be *Ursus*, 2 species, and *Thalassarctos*, 1 species.

<sup>1</sup> Vespertilio,  
Urotrichus,  
Sorex,  
Felis,  
Lynx,  
Lupus,  
Vulpes,

Halichærus,  
Cystophora,  
Alces,  
Rangifer,  
Cervus,  
Bison,  
Capra,

ical.<sup>1</sup> Of these 21, moreover, 6 belong to the volant mammalia—the bats—a class of animals possessing special means for self-distribution.

It will thus be seen that *generically* the North American mammalian fauna is much more intimately related to the Eur-Asiatic than to the South American.

Furthermore, of the 35 genera also occurring in the Palæarctic region, 21 are found nowhere else but in that region—in other words, 21 out of 74 genera are peculiar to the combined Nearctic and Palæarctic regions.<sup>2</sup> On the contrary, of the 21 Neotropical

Martes,	Arvicola,
Mustela,	Myodes,
Gulo,	Castor,
Ursus,	Sciurus,
Callorhinus	Sciuropterus,
Zalophus,	Tamias,
Trichecus,	Spermophilus,
Callocephalus,	Arctomys,
Pagomys,	Lagomys,
Pagophilus,	Lepus.
Phoca,	
<sup>1</sup> Macrotus,	Bassaris,
Scotophilus,	Dicotyles,
Vespertilio,	Cervus,
Nycticejus,	Reithrodon,
Lasiurus,	Hesperomys,
Nyctinomus,	Fiber,
Felis,	Sciurus,
Mustela,	Tamias,
Enhydria,	Lepus,
Mephitis,	Didelphys.
Procyon,	
<sup>1</sup> Urotrichus,	Alces,
Lynx,	Rangifer,
Callorhinus,	Bison.
Zalophus,	Capra,
Trichecus,	Arvicola,
Callocephalus,	Myodes,
Pagomys.	Castor,
Pagophilus,	Spermophilus,
Phoca,	Arctomys,
Halichærus,	Lagomys.
Cystophora,	

*Capra* has an outlying representative in the Neilgherry Hills of India, and likewise one—an ibex—in the highlands of Abyssinia.

genera occurring in the Nearctic fauna, only 11 are exclusively Neotropical. In other words, only 11 out of 74 genera are peculiar to the combined Nearctic and Neotropical regions.<sup>1</sup> Again, the 21 Nearctic-Palæarctic genera are represented by about 69 specific forms, whereas the 11 Nearctic-Neotropical genera have only about 39 specific representatives. So that, whichever way considered, there is a great preponderance of Palæarctic, as compared to Neotropical, forms in the Nearctic fauna. As far as the evidence afforded by the mammalia is concerned, therefore, there is a much closer relationship shown to exist between the North American (Nearctic) and Eur-Asiatic (Palæarctic) faunas than between the former and the South American (Neotropical).

It is thus manifest, that if the Nearctic fauna is not a distinct one, it should be united—if judged by its mammalian fauna alone—with the Palæarctic rather than with the Neotropical. But the question still remains, is it a distinct fauna, or is it only a lateral extension of the Palæarctic?

It has already been stated that the region possesses among 26 families of mammalia only one that is strictly peculiar to it—the *Haploodontidæ*.

The Neotropical, on the other hand, has out of about 31 families, 8 that are peculiar.<sup>2</sup>

The Australian, of 22, likewise 8.<sup>3</sup>

The Ethiopian, out of 44, 9 that are peculiar.<sup>4</sup>

The only other regions that can compare with the Nearctic in the paucity of their peculiar families are the Palæarctic and the Oriental, the former represented by 36 families, with not a single one peculiar, and the latter likewise with 36 families, of which

<sup>1</sup> <i>Macrotus</i> ,	<i>Dicotyles</i> ,
<i>Lasiurus</i> ,	<i>Reithrodon</i> ,
<i>Enhydris</i> ,	<i>Hesperomys</i> ,
<i>Mephitis</i> ,	<i>Fiber</i> ,
<i>Procyon</i> ,	<i>Didelphys</i> .
<i>Bassaris</i> ,	

<sup>2</sup> *Cebidæ*, *Hapalidæ*, *Phyllostomidæ* (one species in California), *Chinchilidæ*, *Caviidæ*, *Bradypodidæ*, *Dasypodidæ*, *Myrmecophagidæ*.

<sup>3</sup> *Dasyuridæ*, *Myrmecobiidæ*, *Peramelidæ*, *Macropodidæ*, *Phalangistidæ*, *Phascologydæ*, *Ornithorhynchidæ*, *Echidnidæ*.

<sup>4</sup> *Cheiryomyidæ*, *Centetidæ*, *Potamogalidæ*, *Chrysochloridæ*, *Cryptoproctidæ*, *Protelidæ*, *Hippopotamidæ*, *Camelopardidæ*, *Orycteropodidæ*.

number only 3 are peculiar.<sup>1</sup> But the paucity of peculiar families in the case of the Palæarctic and Oriental regions is readily explained by the circumstance that both regions are bounded along the line of their greatest development by other faunal regions, with which an exchange in forms will naturally be effected. Thus the Palæarctic region is bounded along an extent of about 140 degrees of longitude, or about 9000 miles, by the Ethiopian and Oriental regions. The proportions of bounding surface to area is perhaps still greater in the case of the Oriental region. But in the case of the Nearctic region (as recognized) we have no such bounding surface—in fact we are here limited for our exchanges to the narrow strip (Mexico, Central America) uniting the two great continents—and, therefore, on the assumption of a distinct fauna it would be doubly difficult to assign a special explanation for the very limited number of peculiar families.

While the Nearctic and Palæarctic regions are each deficient in peculiar mammalian families, yet they are eminently distinguished from their nearest faunal neighbors by certain highly characteristic families, which are only rendered *non-peculiar* by the circumstance that they are contained in both regions. Such are the

- |                 |           |           |
|-----------------|-----------|-----------|
| 1. Talpidæ,     | . . . . . | Moles.    |
| 2. Trichechidæ, | . . . . . | Walruses. |
| 3. Castoridæ,   | . . . . . | Beavers.  |
| 4. Lagomyidæ,   | . . . . . | Pikas.    |

And if the reindeer, elks, and sheep (and goats) be considered as constituting distinct families, as is maintained by many naturalists, the

5. Rangiferidæ,
6. Alcadæ,
7. Capridæ.

In addition to these 7 families we have also the hares (*Leporidæ*) and bears (*Ursidæ*), which, though not exclusively restricted to those regions, are by their numbers and vast distribution eminently characteristic of them.

Considering the Palæarctic and Nearctic regions to constitute but a single faunal division, that division would then be eminently characterized by the possession of these 7-9 peculiar families

<sup>1</sup> *Tarsiidæ, Galeopithecidæ, Tupaiidæ.*

alone, and would then stand in nearly the same relation by family distinctions to the other regions as the Neotropical, Ethiopian, and Australian. The combined Nearctic and Palæarctic regions would, moreover, be further united to each other by the negative character afforded in the almost total absence of the *Quadrumana*<sup>1</sup> and *Edentata*, orders which are abundantly represented in all the other regions but the Australian.

If now we turn to an examination of the genera peculiar to the several zoögeographical regions, we find that out of a total of 74 represented in the Nearctic, only about 26 are restricted to that region, forming 35 per cent.

In the Palæarctic, out of 100—35 peculiar = 35 per cent.

In the Oriental, out of 118—54 peculiar = 46 per cent.

In the Australian, out of 70—45 peculiar = 64 per cent.

In the Ethiopian, out of 142—90 peculiar = 63 per cent.

In the Neotropical, out of 131—103 peculiar = 78 per cent.

We here again note a deficiency in the case of the Nearctic and Palæarctic regions—an absence of positive distinguishing characters—a condition to be explained by the fact that a very considerable number of genera are rendered non-peculiar (just as in the case of the families) by the circumstance of their being represented in both the Nearctic and Palæarctic regions. But if we consider the two regions as forming in reality but one, we would have in addition to the 26 Nearctic and the 35 Palæarctic genera already referred to, 22 additional ones to be comprised in the regions as being peculiar to it, viz. :—

Genera.	Represented by Palæarctic species.	Nearctic.
Urotrichus, . . . .	1	1
Lyncus, . . . .	9	3
Gulo, . . . .	1	1
Thalassarctos, . . . .	1	1
Zalophus, . . . .	1	1
Eumatopias, . . . .	1	1

<sup>1</sup> About 5 species of *Quadrumana*, representatives of the genera *Macacus* and *Semnopithecus*, enter within the confines of Palæarctic regions. The highest latitude in the northern hemisphere reached by this class of animals is probably the Rock of Gibraltar (Lat. 36°), inhabited by the Barbary ape (*Macacus inuus*); the genus is also represented in Japan. Three or four species of *Quadrumana* (*Macacus*, *Cynopithecus*) likewise occur in the islands Timor, Batchian, and Celebes, belonging to the Australian region.



Genera.	Represented by Palæarctic species.	Nearctic.
Trichechus, . . . .	1	1
Callocephalus, . . . .	3	1
Pagomys, . . . .	2	1
Pagophilus, . . . .	2	1
Phoca, . . . .	2	1
Halichærus, . . . .	1	1
Cystophora, . . . .	2	2 (?)
Alces, . . . .	1	1
Tarandus, . . . .	1	2
Bison, . . . .	1	1
Cuniculus, . . . .	1	1
Myodes, . . . .	1	3
Castor, . . . .	1	1
Spermophilus, . . . .	10	15
Arctomys, . . . .	4	4
Lagomys, . . . .	10	1
	—	—
	57	45

To which may also be added *Capra* (with 10 Palæarctic species), *Ovis* (with 10 Palæarctic and 1 Nearctic species), and *Arvicola* (with 21 Palæarctic and 27 Nearctic species), genera whose representatives but barely pass beyond the confines of the region—making 25 in all. We would thus have a total of about 86 peculiar genera out of 173 represented, a proportion that would stand intermediate between what we find to exist in the Oriental and Australian regions, and which would constitute about 50 per cent. The region would be accordingly eminently marked out by positive generic characters.

Turning now to a consideration of the species which represent the peculiar genera of each region—in other words, to the representative forms of the various faunas—we find that in the Nearctic region, as at present constituted, out of a total of about 279 species, the 26 peculiar genera comprise but 60, or only 21½ per cent. of the entire fauna.

In the Palæarctic, of 426 species, the 35 peculiar genera comprise 71 = 17 per cent.

In the Oriental, of 505 species, the 54 peculiar genera comprise 165 = 33 per cent.

In the Australian, of 243 species, the 45 peculiar genera comprise 151 = 62 per cent.

In the Ethiopian, of 525 species, the 90 peculiar genera comprise 288 = 55 per cent.

In the Neotropical, of 634 species, the 103 peculiar genera comprise 376 = 60 per cent.

So here, again, just as in the case of families and genera, the Nearctic and Palæarctic regions show a very decided deficiency, the specific types that ought to characterize a fauna being but very feebly developed. But if we unite the two regions, the negative character is developed into a positive one by the incorporation of a considerable number of species representing the 25 genera, which are held in common by the two regions. The number of species held by the Nearctic region has been stated to be about

	279
And of the Palæarctic, . . . . .	426
	705
Less 30 species (as will be seen further on) held in common,	30
Total for the combined region, . . . . .	675

Of this total of 675 species for the combined region we have:—

- 60 represented by the genera peculiar to the Nearctic region ;
- 71 represented by the genera peculiar to the Palæarctic region ;
- 153 (171—18 common = 153) represented by the 25 peculiar genera common to the two regions ;

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284

or a proportion of species representing the peculiar genera of 284 : 675 (42 per cent.), a ratio sufficiently large to impress upon the fauna a distinctive character.

In our estimates of the Nearctic fauna we have relied upon the tables furnished by Wallace. If instead of these, however, we avail ourselves of the later data furnished by the various papers of Coues and Allen, the result will not be materially altered. According to the lists furnished by these authorities it would appear that the Nearctic mammalian fauna has, instead of 279 species, only about 210.

Two new families,<sup>1</sup> and three new genera<sup>2</sup> (of which one is peculiar) are indicated.

Out of a total of 75 genera, 27 are peculiar, which would give a proportion (36 per cent.) very little different from that deduced from Wallace's data.

These 27 peculiar genera, again, are represented according to Coues' table by about 49 species, which, out of the total of 210, would give 23 per cent. of the entire fauna, or  $1\frac{1}{2}$  per cent. over that which was found in our first estimation.

Again, uniting the Palæarctic and Nearctic regions with the new data, we find, instead of a total of 705 species, only 636

Deducting 30 species held in common, . . . . . 30

Total, . . . . . 606

Of this total of 606 species for the combined regions we have :

71 species represented by the genera peculiar to the Palæarctic region ;

49<sup>3</sup> species represented by the genera peculiar to the Nearctic region ;

132 species ( $150^4 - 18 = 132$ ) represented by the 25 genera peculiar to the two regions ;

—  
252

or a proportion of species representing the peculiar genera of  $252 : 606 = 42$  per cent., or precisely the figure that was obtained from Wallace's tables.

The following species of North American mammalia are generally considered to be identical with Palæarctic forms, or, at any rate, to have such close Eur-Asiatic representatives as to be but doubtfully distinguishable from them :

Evotomys ( <i>Arvicola</i> ) rutilus,	Putorius erminea,
Myodes Obensis,	? Putorius vison,
Cuniculus torquatus,	Felis Canadensis,

<sup>1</sup> *Zapodidæ*, *Geomyidæ*.

<sup>2</sup> *Ochetodon* (*Hesperomys*, pars), *Evotomys* (*Arvicola*, pars), *Oricotodipus* (*Perognathus*, pars).

<sup>3</sup> Instead of the 60 before recorded, corresponding to the general reduction in the number of species.

<sup>4</sup> 98 Palæarctic ; 52 Nearctic.

<i>Lepus timidus</i> ,	<i>Canis occidentalis</i> ,
<i>Castor fiber</i> ,	<i>Vulpes vulgaris</i> ,
<i>Tamias Asiaticus</i> ,	<i>Ursus Americanus</i>
<i>Spermophilus empetra</i> ,	(et <i>U. horribilis</i> ?)
? <i>Arctomys prunosus</i> ,	<i>Phoca vitulina</i> ,
? <i>Urotrichus Gibbsi</i> ,	<i>Cystophora cristata</i> ,
<i>Cervus Canadensis</i> ,	<i>Callorhinus ursinus</i> ,
<i>Alce malchis</i> ,	<i>Zalophus Gillespii</i> ,
<i>Tarandus rangifer</i> ,	<i>Trichecus rosmarus</i> ,
<i>Gulo luscus</i> ,	<i>Pagophilus Groënlandicus</i> ,
? <i>Mustela Americana</i> ,	<i>Halichærus sp.</i>
<i>Putorius vulgaris</i> .	

And perhaps a little less certain,

*Ovis montana*.

*Bison Americanus*.

From the preceding facts it may be considered as shown, 1st, that by family, generic and specific characters, as far as the mammalia are concerned, the Nearctic and Palæarctic faunas taken collectively are more clearly defined from any or all of the other regions than either the Nearctic or Palæarctic taken individually; and 2d, that by the community of family, generic, and specific characters the Nearctic region is indisputably united to the Palæarctic, of which it only forms a lateral extension.

#### EVIDENCE AFFORDED BY THE BATRACHIA AND REPTILIA.

If we now turn to the evidence afforded by the batrachians and reptiles, we will find the conclusions drawn from the study of the mammals to be strikingly confirmed.<sup>1</sup>

##### *Batrachia Urodela.*

The following families are enumerated in the Nearctic fauna (as usually recognized):

<sup>1</sup> In the following zoögeographical considerations the "Sonoran" sub-region of Prof. Cope, including "parts of Nevada, New Mexico, Arizona, and Sonora in Mexico" (Bulletin U. S. National Museum, i, p. 68, 1875), is taken to represent a portion of the Neotropical region, and for reasons that will be stated further on. To this section detached from the Nearctic region will probably have to be added the peninsula of Lower California (the "Lower Californian" subregion of Cope), and portions of California and Texas.

- Sirenidæ, . . . . . Peculiar to the Nearctic.  
 Siren, 1 species.  
 Pseudobranchus, 1 sp.
- Proteidæ, . . . . . Palæarctic.  
 Menobranchus, 2 sp.  
 [Palæarctic, *Proteus*.]
- Amphiumidæ, . . . . . Peculiar to the Nearctic.  
 Amphiuma, 1 sp.  
 Murænopsis, 1 sp.
- Menopomidæ, . . . . . Palæarctic.  
 Menopoma, 2 sp.  
 [Palæarctic, *Sieboldia*.]
- Amblystomidæ, . . . . . Palæarctic.  
 Amblystoma,<sup>1</sup>  
 Dicamptodon, 1 sp.  
 [Palæarctic, *Onichodactylus*, *Ranodon*.]
- Plethodontidæ, . . . . . Neotropical, . . Palæarctic.  
 7-8 genera, with about 22 species. The genus *Spe-  
 llerpes*, with about 8 species, descends beyond the  
 Nearctic boundary into northern South America ;  
 it is also represented by a solitary species in  
 southern Europe.
- Desmognathidæ, . . . . . Peculiar to the Nearctic.  
 Desmognathus, 3 sp.
- Pleurodelidæ, . . . . . Palæarctic.  
 Diemictylus, 2 sp.

We have here, therefore, 8 families represented, 5 of which are also Palæarctic, and only one Neotropical. The 3 families restricted to the Nearctic region are represented by only 7 species. If it be urged that the presence of these 3 peculiar, but very narrowly circumscribed families is sufficient to characterize the region in which they occur, and consequently to render it distinct, it may, for similar reasons, and with almost equal force, be urged that the eastern extremity of the Eur-Asiatic region—China, Japan—should be detached from the rest of the Palæarctic by virtue of its containing representatives of two equally characteristic families, the *Menopomidæ* and *Amblystomidæ*, found nowhere else in the region.

<sup>1</sup> About 18 species, all of which, with one or two exceptions, are found outside of the Sonoran subregion.

## Batrachia Anoura.

- Bufonidæ, . . . . . Nearly cosmopolitan.  
*Bufo*.
- Engystomidæ, . . . . . Tropical, Old and New World.  
*Engystoma*, 1 species.
- Hylidæ, . . . . . Essentially tropical, Old and New World.  
*Acris*, 1 sp.  
*Chorophilus*, 4 sp.  
*Hyla*, about 12 species, several of which occur in the  
 Sonoran region or along the Neotropical boundary.
- Scaphiopidæ, . . . . . Palæarctic.  
*Spea*.  
*Scaphiopus*.
- Cystignathidæ, . . . . . Neotropical, . . Australian.  
 2 species, both in the Sonoran subregion.
- Ranidæ, . . . . . Essentially Old World.  
*Rana*, 8 sp.

The above data will show that the anourous or tailless batrachians scarcely afford any positive indications as to the zoögeographical position of the region in which they occur. Yet in several respects there is a very decided leaning toward the Palæarctic. Thus it agrees with the Palæarctic in the paucity of its Bufonic element, the genus *Bufo*, which comprises about 80 species, having only about 4-5 Nearctic specific representatives (if we exclude the 6-7 species found in the Sonoran districts), and about an equal number in the Palæarctic region.

Again, in the case of the *Ranidæ*, an eminently Old World family of batrachians, we have, just as in the Palæarctic region, only one generic representative—*Rana*—which, with about 5-6 species, but barely penetrates within the Neotropical region. Of about 108 species comprised by the genus, 8-9 belong to the Nearctic fauna, and about an equal number, 10-11, to the Palæarctic.<sup>1</sup> In addition to this general similarity existing between the Nearctic and Palæarctic faunas as exemplified by the *Ranidæ*, we have the further one that at least one species of the genus *Rana*<sup>2</sup> is common to both regions; and another Palæarctic species

<sup>1</sup> Boulenger, "Catalogue of the Batrachia Salientia" of the British Museum, 2d ed., 1882.

<sup>2</sup> *Rana temporaria* (*R. sylvatica*).

has a closely related Nearctic representative.<sup>1</sup> On the other hand, in the peculiarly Neotropical or tropical (in general) groups of anourous batrachians the Nearctic province is remarkably deficient. Thus of the *Engystomidæ* we have but a solitary representative, *Engystoma Carolinense*. Of the *Cystignathidæ*, which comprises upwards of 130 Neotropical forms, we have only two<sup>2</sup> Nearctic species, and both of these are found just beyond the confines of the region—southern Florida and along the lower Rio Grande. There is a somewhat greater development of the genus *Hyla* of the *Hylidæ* than might have been looked for, but the genus, while it may have but one really good species, is at least represented by several very well marked varieties (variously considered to be distinct species) also in the Palæarctic region.

#### Ophidia.

The Nearctic serpents are comprised in 4 or 5 families—*Crotalidæ* (with about 19 species), *Colubridæ*, *Elapidæ*, *Boidæ*, and *Lichanuridæ*. The first of these being an essentially American and Oriental (!) group (a few species penetrating within the Palæarctic region), can scarcely carry much weight in the matter of zoögeographical classification. The *Elapidæ* and *Boidæ* (with 3 and 2 species respectively) are tropicopolitan, and their North American representatives but barely enter the Nearctic region. The two species of the genus *Charina* (*Boidæ*) are moreover found in that section of the United States—Nevada and Lower California—which in our estimation ought to be separated from the Nearctic region. This is likewise the case with the 3 species of *Lichanura* (Lower California), which constitute the family *Lichanuridæ*. The only and most important family that remains to be specially considered is that of the *Colubridæ*. Of this cosmopolitan family we have about 107 Nearctic species; of this number about 30 belong to genera almost exclusively restricted to the Sonoran and Californian regions. Of the remaining 77, a very large proportion (more than one-half) belong to essentially Old World genera—*Coluber*, *Tropidonotus* (*Eutaenia*), and *Coryphodon* (*Bascanion*)—and principally to such as have no South American representatives, as *Coluber* and *Tropidonotus*.<sup>3</sup>

<sup>1</sup> *Rana esculenta* in *R. halscinea*.

<sup>2</sup> *Lithodytes Ricordii* and *Epirhesis longipes*.

<sup>3</sup> The range of *Tropidonotus* extends to Guatemala.

## Lacertilia.

The following are the lacertilian families occurring in the Nearctic region (as recognized):—

Amphisbænidæ, . . . . . Almost cosmopolitan.  
1 species in the Florida subregion.

Anniellidæ, . . . . . Peculiar to the Nearctic?  
1 sp. in California.

Scincidæ, . . . . . Cosmopolitan.  
14 species, 13 of which belong to the Old World  
genus *Eumeces* (or *Plestiodon*).

? Lacertidæ, . . . . . Old World.  
*Xantusia*, 1 sp. on the Pacific coast.

Zonuridæ (*Anguidæ, pars*), . . . . . Old World.  
*Opheosaurus*, 1 sp.

Teidæ, . . . . . Essentially Neotropical.  
A South American family of about 12 genera and  
75 species, represented in the Nearctic region by  
7 species, all of which, with one or two exceptions,  
are confined to the Sonoran and Californian  
provinces.

Gerrhonotidæ, . . . . . Neotropical.  
7 sp., confined to the Sonoran, Californian and  
Pacific subregions, and Western Texas.

Helodermidæ.  
1 sp., confined to the Sonoran subregion.

Iguanidæ, . . . . . Neotropical.  
An essentially Neotropical family, with about 50  
genera and 150 species. Represented in the  
Nearctic region by about 40 species, *all of which,*  
*with two or three exceptions,* are confined to the  
Sonoran and Californian regions, or but just pass  
beyond the limits of these.

Anolidæ, . . . . . Neotropical.  
An essentially Neotropical family, with upwards of  
70 species, and with only 1 or 2 Nearctic represen-  
tatives.



Geckotidæ, . . . . . Essentially tropical.

But sparingly represented in either the Palæarctic or Nearctic regions; the 5 Nearctic species being all restricted to the Sonoran and Lower Californian subregions, and the extremity of the peninsula of Florida.

An analysis of the above table shows two facts very distinctly: 1. That the South American (Neotropical) forms of lacertilians—*Teidæ*, *Iguanidæ*, *Anolidæ*—stop almost immediately on the borders of the Nearctic region, sending but an extremely limited number of representatives beyond the Sonoran subregion; and 2. The very great paucity of lacertilian forms in general throughout the great mass of the North American continent. Excluding the Sonoran and Californian provinces, and the immediate border-line of the region, there would appear to be in all but about 20 species of Nearctic saurians, 13 of which belong to the Old World genus *Eumeces*! The most widely diffused form of North American *Eumeces*, moreover, is a Palæarctic species!<sup>1</sup> A further relationship with the Palæarctic fauna is maintained by *Opheosaurus*, the only New World representative of the "glass snakes."

#### Chelonia.

The special leaning of the Nearctic fauna to that of the Old World is as clearly indicated by the chelonians as by any of the other groups of animals that have thus far been considered. Of the 7 non-marine families represented,<sup>2</sup> 3—*Trionychidæ*, *Malaclemmydæ*, *Cistudinidæ*—are distinctively Old World groups, and two of the others, *Emydidæ* and *Testudinidæ*, are essentially so. One family, the *Cinosternidæ*, is peculiar to the North American continent. The *Chelydridæ* have one generic representative in the Palæarctic region (China), if *Platysternum* be considered (as by Agassiz) to belong to that family.<sup>3</sup>

<sup>1</sup> *Eumeces fasciatus*. Japan.

<sup>2</sup> *Trionychidæ*, *Chelydridæ*, *Cinosternidæ*, *Emydidæ*, *Malaclemmydæ*, *Cistudinidæ*, *Testudinidæ*.

<sup>3</sup> Constituted the type of a distinct family, *Platysternidæ*, by Gray ("Supplement to the Catalogue of Shield Reptiles," p. 69, 1870).

*Faunal characters defining the Sonoran and Lower Californian subregions of Prof. Cope as distinct from the Nearctic region proper, and as a portion of the Neotropical.*

1. Of the 8 families of Nearctic (so-called) urodele batrachians, only 2 are represented in this portion of the continent—*Amblystomidæ* and *Plethodontidæ*—and each of these only by one or two species. Out of a total of about 54 species, therefore, this region has only about 3!

2. More than one-half of all the Nearctic *Bufo**idæ* are found in this region, "this being the headquarters of that genus [*Bufo*] in the Regnum Nearcticum."<sup>1</sup> Of about 20 Nearctic representatives of the *Hylidæ* we have here but 3; and likewise only one or two of the *Ranidæ*. The Sonoran and Lower Californian tailless batrachian fauna is thus shown to be distinct by both positive and negative characters from that of the Nearctic in general.

3. The serpent fauna comprises 22 genera, of which 10–11 are peculiar.<sup>2</sup> 11 out of the 13 species and subspecies of Nearctic rattlesnake (*Crotalus*) are found here, and 7 of these nowhere else. *Coluber* is not represented.

4. Of about 55 species of lacertilians, about 46 belong to the Neotropical families *Iguanidæ*, *Teidæ*, and *Gerrhonotidæ*, and 4 to the tropical *Geckotidæ*. 11 out of the 20 genera represented are not found in any other portion of the Nearctic realm, or, at any rate, at no distantly removed part.<sup>3</sup>

5. Only 4–5 species of non-marine *Testudinata* are recorded,<sup>4</sup> 2 of which (*Cinosterna*) "are of Mexican type."

#### CONCLUSION.

In conclusion it may be briefly stated that, by the community of its mammalian, batrachian and reptilian characters, the Nearctic fauna (excluding therefrom the local faunas of the Sonoran and

<sup>1</sup> Cope, Bull. U. S. National Museum, i, p. 74, 1875.

<sup>2</sup> *Gyalopium*, *Chtonactis*, *Sonora*, *Rhinochilus*, *Chilopoma*, *Trimorphodon*, *Hypsiglena*, *Phimothyra*, *Chilomeniscus*, *Lichanura*, and *Charina* (one species of the last passes into the adjoining "Pacific" subregion).

<sup>3</sup> *Heloderma*, *Sauromalus*, *Uma*, *Coleonyx*, *Verticaria*, *Diplodactylus*, *Cyclura*, *Dipsosaurus*, *Callisaurus*, *Uta*, and *Phyllodactylus*.

<sup>4</sup> Up to the time of the publication of Prof. Cope's "Check List," 1875.

Lower Californian subregions, which are Neotropical<sup>1</sup>) is shown to be of a distinctively Old World type, and to be indissolubly linked to the Palæarctic (of which it forms only a lateral extension).

The Palæarctic (Old World) affinities are further maintained in the land and fresh-water mollusca, and not only by a considerable number of representative (identical) specific types common to both regions, circumpolar, subboreal, and otherwise, but by the presence (and extensive development in most cases) of the characteristic genera *Physa*, *Planorbis*, *Limnæa*, *Paludina*, *Vivipara*, *Valvata*, and *Bythinella*, forms not at all, or but very sparingly, represented in the Neotropical realm.<sup>2</sup> The *Lepidoptera* among insects carry equally strong evidence in this direction, for, as Wallace justly remarks,<sup>3</sup> while the Nearctic fauna embraces a number of distinct types, and the Neotropical element is sufficiently well represented in the southern United States, "still, we must acknowledge, that if we formed our conclusions from the butterflies alone, we could hardly separate the Nearctic from the Palæarctic region."<sup>4</sup>

<sup>1</sup> It is very probable that portions of California, Texas, and Florida will have to be relegated to the Neotropical realm.

<sup>2</sup> The very great development of the *Strepomatida*, or New World melanians, in the waters of the Nearctic region, might be urged as a claim for recognizing the independence of this region. But for this reason alone an equal claim might be set up for considering the eastern and western United States as constituting two distinct realms, since this group of mollusks is pretty effectually limited in its distribution by the Mississippi River, none or but very few of the forms passing west of the river, except in the region of its upper course.

<sup>3</sup> Geog. Distr. of Animals, ii, p. 123.

<sup>4</sup> It is proposed to designate the combined Nearctic (as restricted) and Palæarctic regions as the *Triarctic*, from the limitation of its fauna to the three continents bordering on the Arctic Sea. Under this acceptation the Nearctic, as hitherto recognized, completely disappears, and the Sonoran and Lower Californian subregions (to which must also be added parts of California, Texas, and Florida) of the former Nearctic become a portion of the Neotropical realm.