AN ASSAY ON ZOOGEOGRAPHIC REGIONS OF THE EARTH: PALAEARCTIC LONGHORNED AND LEAF BEETLES SAY THAT ...

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ABSTRACT: The paper presents a different perspective on familiarities of zoogeographic regions of the earth based on Palaearctic Chrysomeloidea. Consequently, Manchurian subregion proposed as a separate zoogeographic region from Palaearctic.

KEY WORDS: Zoogeography, Manchurian, Palaearctic Chrysomeloidea.

Different parts of the earth are inhabited by different kinds of animals, or, in other words, by different faunas. At the present, the most widely accepted units of zoogeographic regionalization are realm, region, subregion, province, district and sector. In many cases, these differences, at any rate, are not due to differences of temperature, humidity or climate. It is true that temperature and humidity within the limits of the different zoological regions have had an important influence on the distribution of animals, and has resulted in certain cases in the formation of life-zones. However, the laws of temperature and humidity do not define transcontinental zones. These zones are secondary divisions of vertical life areas. These local restrictions of range have nothing to do with the wider problems of distribution.

The differences also do not depend on the distance of one place from another. When the boundaries are based on certain physicogeographic characteristics, sharp boundaries between these divisions occur, for example, the barriers formed by mountain ranges, the boundary between water and dry land, and sharp boundaries between natural regions. The greatest barriers of all are formed by the ocean and the larger rivers. Thus, zoological regions coincide to a considerable extent with the main geographical divisions of the earth. Hence it results that oceanic islands are usually devoid of such forms of life. The conditions of existence and the composition of the fauna in the sea and on land are so different. The distribution of freshwater fauna, however, is generally similar to that of terrestrial fauna. Hence it is subdivided according to the system used for terrestrial fauna. In the zoogeographic regionalization of the ocean, separate systems have been adopted, on the one hand, for the water strata and the sea bottom and, on the other hand, for each vertical zone.

As a general rule, the existence of nearly allied types of terrestrial animals in countries now separated by stretches of sea implies a former land connexion between them. In many cases, however, there are great difficulties in determining the nature of such connexions. Transitional areas that are different widths in general, between zoogeographic regions, and here the faunal elements such as species and species groups mix and overlap. So, the barriers to the free dispersal of terrestrial animals may be grouped under two main titles, namely, climatic and geographical, of which the second is more important. Also, the case with regard to geographical barriers to the free dispersal of terrestrial animals is very different. It

should be observed, however, that even these act with different degrees of intensity in the case of different groups.

The large and small faunal areas identified by zoogeographic regionalization differ in rank and in degree of endemism, as well as in the historical development of their faunas. The largest subdivisions (realms) are characterized by endemism of orders and by a large proportion of endemic forms, the regions by endemism of families, the subregions by endemism of genera, and the provinces by the presence of endemic species.

On the other side, the zoological regions indicated by the present geographical distribution of the former groups are very different from those suggested by the distribution of the earlier groups. In this case, the first question is that which animals (higher or lower animals) must be used for exact zoogeographic regionalization? As known, the lower animals (e.g. arthropods) are earlier than higher animals (e.g. birds or mammals). Some zoologists are argued that if zoological regions are based on the evidence of the existing distribution of animals, groups with a relatively late radiation are clearly to be preferred to those the dispersal of which was earlier. The higher animals, therefore, are of greater value from this point of view than the lower animals. But, further testimony in the same direction is afforded by the distribution of certain other groups, more especially spiders (Arachnida). It is also noteworthy that the distribution of the three main divisions of the human race accords to a certain extent with the boundaries of some of the zoological regions based on the distribution of the lower animals.

Zoogeography intimately connected with geography and geology. The division of earth into zoogeographical areas is based on zoogeographic data. Therefore, we can expect to understand and explain the present distribution of terrestrial animals only by taking into account what geology teaches us as to past changes in the configuration of the earth's lands, accompanied by investigations into the past history of animals themselves, as revealed by their fossil remains. It is essential to study fossil faunas to understand the reason of many facts in the present distribution of animals.

In the division of land on the earth into zones, the highest zoogeographic categories, the vertebrates (chiefly mammals) form the main groups according to the traditional acception. Three realms are usually distinguished, according to the presence or absence of representatives of certain subclasses of mammals: Notogea (comprising Australian region, with oviparous mammals, many marsupials, and few placental mammals); Neogea (consisting of Neotropical region, with no oviparous mammals and few marsupials) and Arctogea (comprising all other regions, with only placental mammals). This case is agreed with the findings in the present text.

Many different systems of zoogeographic subdivision of land into regions have been proposed from time to time.

In 1858, Dr. P. L. Sclater, who in a paper on the geographical distribution of birds, was enabled to define and name six of such zoological regions firstly. Two years later Dr. A. Rassel Wallace discussed in some detail the problems presented by the distribution of animals in the Malay Archipelago and Australasia. With some slight modifications, the names proposed for the six zoological regions by Dr. Sclater were adopted by Dr. Wallace. Certain changes in regard to the limits and number of the zoological regions adopted by Sclater and Wallace have been proposed. T. H. Huxley who has proposed more or less important modifications of the original scheme special mention may be made of Dr. W. T. Blanford, Dr. A. Heilprin, Prof. P. Matschie and Prof. Max Weber. The zoological regions proposed

by Dr. Sclater were based mainly on the distribution of the perching birds; but in the writings of Dr. Wallace and of later authors mammals were very largely taken into consideration, and in later schemes there has been a similarly extensive use of the evidence afforded by mammalian distribution.

The zoological regions recognized by Dr. A. R. Wallace in 1876, which are in the main identical with those proposed by Dr. P. L. Sclater in 1858, and are chiefly Regions, based on the distribution of birds and mammals, are as follows:

1. Palaearctic, which includes Europe to the Azores and Iceland, temperate Asia from the high Himalaya and west of the Indus, with Japan, and China from Ningpo and to the north of the watershed of the Yang-tse-kiang; also North Africa and Arabia, to about the line of the tropic of Cancer.
2. Ethiopian, including Africa south of the tropic of Cancer, as well as the southern part of Arabia, with Madagascar and the adjacent islands.
3. Oriental or Indo-Malay, comprising India and Ceylon, the Indo-Chinese countries and southern China, and the Malay Archipelago as far as the Philippines, Borneo and Java.
4. Australian, composed of the remainder of the Malay Archipelago, Australia, New Zealand and all the tropical islands of the Pacific, as far east as the Marquesas and the Low Archipelago.
5. Neotropical, which comprises South America and the adjacent islands, the West Indies or Antilles, and Central America and Mexico?
6. Nearctic, consisting of temperate and arctic North America, with Greenland.

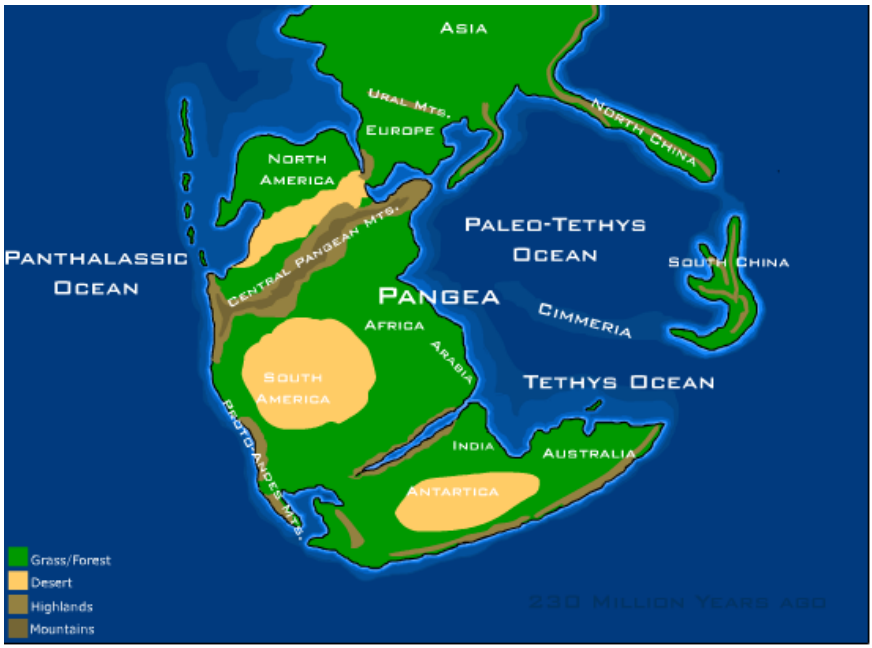
Emendations on the original scheme also included modifications in the limits of the regions themselves. In 1878, for instance, Dr. A. Heilprin (in accordance with a suggestion of Prof. A. Newton) proposed to unite the Nearctic with the Palaearctic region under the name of Holarctic.

After all, it is clear that the main problem is “origin of life”. With regard to the theory of the polar, the gradual dispersal of animals from the arctic regions, it may be briefly stated that the presumed series of radiations of life southward from the northern pole can have nothing to do with the present geographical distribution of animals. Since, we have abundant evidence that mammals have been spread over the whole of the warmer parts of the earth since, at any rate, the commencement of the Tertiary period, while the radiation of reptiles commenced at a much earlier epoch. The same problem is in the question also for equatorial approaches.

As known, multicellular life appeared firstly at the end of Proterozoic era in Precambrian Time (in Vendian period 560 million years ago) after primitive life in our planet. The radiations of these life forms and new multicellular life forms also appeared in Palaeozoic era. Shortly, the Palaeozoic era ("time of ancient life”) lasted from 544 to 245 million years ago. It is divided into six periods as Cambrian (544 to 505 mya - Most major animal groups appear), Ordovician (505 to 440 mya - Massive marine life diversification), Silurian (440 to 410 mya - Life gains a foothold on land), Devonian (410 to 360 mya - "The Age of Fishes" - Colonization of the land), Carboniferous (360 to 286 mya - "The Age of Plants" - Reptiles and the amniotic egg appear) and Permian (286 to 245 mya - The formation of the supercontinent of Pangea). These 300 million years of the Paleozoic era realized many critical events, including the development of most invertebrate groups, life's conquest of land, the emergence of fish, reptiles, insects

(including grasshoppers, cockroaches, silverfish, termites, **beetles** and giant dragonflies) and vascular plants, the formation of the supercontinent of Pangea. Also importantly, there were also no less than two ice ages in the Palaeozoic. The Palaeozoic era was ended by the greatest mass extinction event in geologic history, the Permian/Triassic extinction, when some 95% of all marine species and 70% of all terrestrial organisms met extinction.

It is clear that the accumulated changes along the 300 million years and eventually the happened changes due to the formation of the supercontinent of Pangea caused major extinction of invertebrates (95% of all marine species and 70% of all terrestrial organisms). Therefore, I think that we must be urged the studies on events after the formation of Pangea to understand the reason of many facts in the present distribution of animals.



Map 1. Pangea (235 mya) (from: http://en.wikipedia.org/wiki/File:Pangaea_(230_million_years_ago) .png).

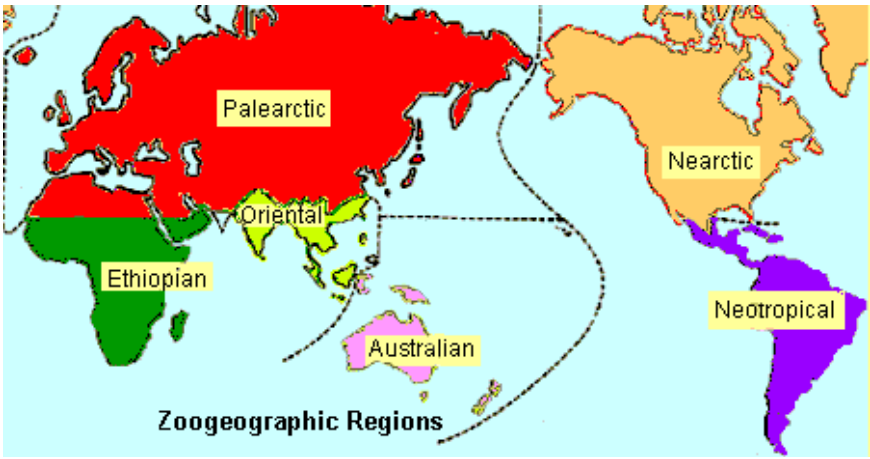
With respect to many facts, the mammals are the most useful among nonvolant terrestrial animals for exact zoogeographic regionalization on the earth. Since the first mammals appeared in Triassic period (245-208 mya) that was the beginning of the Mesozoic era. The second period of Mesozoic era is Jurassic period (208-146 mya) which was the first period to have birds. Simultaneously, modern insect forms and early mammals (placental animals) radiated in Crataceous period (146-65 mya) that is the third period of Mesozoic era. Tertiary period (65-1.8 mya) that is the first period of Cenezoic era, is split into 5 epochs. This period called as “mammals’ era”. Importantly, towards the end of this period, the ancestors of humans appeared in Africa. Quaternary is the last period (1.8 mya - today) of Cenezoic era. This period (modern time) called as “insects’ era”. They are dominant animal group today due to their accumulated

diversities on the earth over the millions years. It is believed there may be some 10.000.000 species of insects on Earth today (with beetles predominating).

Consequently, six zoogeographic regions are more or less generally accepted now:

1. Australian region (Australia and the Pacific islands)
2. Neotropical region (South and Central America)
3. Ethiopian region (Africa below the Sahara and Madagascar)
4. Oriental or Indo-Malay region (Hindustan, Indochina, Malay Archipelago)
5. Holarctic region (North America, Asia, excluding the area occupied by the Indo-Malay region, Europe, and North Africa, including the Sahara). The Holarctic region is sometimes divided into two regions:
   - 5.1. Nearctic (North America) and
   - 5.2. Palaearctic (the remaining parts)
6. Antarctic region (Antarctica and adjacent islands)

Among them, Holarctic fauna is the youngest, preserves features of the Pleistocene, while, the fauna of Australian region is the most ancient, preserves features of the Cretaceous.



Map 2. Zoogeographic regions.

The above map is based on animals, so it is a "zoogeographic" map. It shows the zoogeographic regions on earth according to traditional acceptation.

This time, however, is called “Insect era”. When consider diversities of insects, they (nonvolant insects) are undoubtedly the most useful animal group to determine of real zoogeographic regions on earth. Unfortunately, whole insects of our planet have not been determined until now. On the other hands, some regional works on the earth have been published related to different insect orders. One of the studies was published by Löbl & Smetana (2010) for Palaearctic Region. In the present text, some zoogeographic remarks will present based on given information in Löbl & Smetana (2010) on Cerambycidae and Chrysomelidae.

Under these circumstances, we have to accept the traditional approaches about zoogeographic regions now.

So, to match my requirements, I have divided "Zoogeographic Regions" in 7 areas on the earth in accordance with the traditional acceptation:

- Australian
- Ethiopian
- Nearctic
- Neotropical
- Oriental
- Palaearctic
- Antarctic

Löbl & Smetana (2010) regarded Palaearctic region as larger than the traditional acceptation. Thereby, some parts of Ethiopian and Oriental regions according to the traditional acceptation were regarded by them in Palaearctic region. Australian, Nearctic and Neotropical regions are the same areas with the traditional acceptation.

According to Löbl & Smetana (2010), Palearctic region is larger than the traditional acception. For the Palearctic Catalogue, it includes European (whole Europe), Mediterranean (Sothern Europe, Turkey, Caucasus, Iran, Afghanistan, Middle East, Saudi Arabia and Northern Africa), Siberian (whole Asia except China and Japan), Manchurian (China and Japan) areas and Pakistan, China, Nepal, Bhutan, Tibet, Southern Japanese Islands and Taiwan.

So, they gave 942 species of 9 subfamilies for Cerambycidae and 4149 species of 13 subfamilies for Chrysomelidae from Palaearctic-all other zoogeographic regions in their catalogue.

Palaearctic-all other zoogeographic regions (for Cerambycidae):
9 subfamilies, 942 species:
subfamily Philinae 3 species
subfamily Disteniinae 2 species
subfamily Parandrinae 1 species
subfamily Prioninae 54 species
subfamily Lepturinae 39 species
subfamily Spondylidinae 7 species
subfamily Necydalinae 1 species
subfamily Cerambycinae 347 species
subfamily Lamiinae 488 species

Palaearctic-all other zoogeographic regions (for Chrysomelidae):
13 subfamilies, 4149 species:
subfamily Donaciinae 12 species
subfamily Criocerinae 154
subfamily Cryptocephalinae 449 species
subfamily Lamprosomatinae 18 species
subfamily Eumolpinae 418 species
subfamily Chrysomelinae 215 species
subfamily Galerucinae 1008 species
subfamily Alticinae 1046 species
subfamily Cassidinae 506 species
subfamily Sagrinae 9 species
subfamily Bruchinae 254 species
subfamily Zeugophorinae 29 species
subfamily Megalopodinae 32 species

To match my requirements, I have divided the Palearctic Region in 4 areas now:

- European (whole Europe)
- Mediterranean (Sothern Europe, Turkey, Caucasus, Iran, Afghanistan, Middle East, Saudi Arabia and Northern Africa)
- Siberian (whole Asia except China and Japan)
- Manchurian (China and Japan)

With regard to this, I determined 881 species of 9 subfamilies for Cerambycidae from Palaearctic-all other zoogeographic regions according to the catalogue of Löbl & Smetana (2010).

Palaearctic-all other zoogeographic regions (for Cerambycidae):
9 subfamilies, 881 species:
subfamily Philinae 4 species
subfamily Parandrinae 2 species
subfamily Prioninae 31 species
subfamily Lepturinae 82 species
subfamily Spondylidinae 18 species
subfamily Necydalinae 1 species
subfamily Apatophyseinae 3 species
subfamily Cerambycinae 304 species
subfamily Lamiinae 436 species

Also, I determined 1272 species of 13 subfamilies for Chrysomelidae from Palaearctic-all other zoogeographic regions according to the catalogue of Löbl & Smetana (2010).

Palaearctic-all other zoogeographic regions (for Chrysomelidae):
13 subfamilies, 1272 species:
subfamily Donaciinae 7 species
subfamily Criocerinae 41 species
subfamily Cryptocephalinae 96 species
subfamily Lamprosomatinae 5 species
subfamily Eumolpinae 107 species
subfamily Chrysomelinae 70 species
subfamily Galerucinae 319 species
subfamily Alticinae 337 species
subfamily Cassidinae 99 species
subfamily Sagrinae 4 species
subfamily Bruchinae 173 species
subfamily Zeugophorinae 5 species
subfamily Megalopodinae 10 species

The separation to the zoogeographic regions of the taxa is presented as follows:

I. AUSTRALIAN REGION:

Australian region is the same area according to both traditional acceptation and Löbl & Smetana (2010). So, they gave 13 species of 11 genera of 2 subfamilies for Cerambycidae and 35 species of 19 genera of 5 subfamilies for Chrysomelidae from Australian-Palaearctic regions in their catalogue.

Australian-Palaearctic (for Cerambycidae): 2 subfamilies, 11 genera, 13 species:
subfamily Cerambycinae 5 genera 6 species
subfamily Lamiinae 6 genera 7 species

Australian-Palaearctic (for Chrysomelidae): 5 subfamilies, 19 genera, 35 species:
subfamily Chrysomelinae 1 genus 2 species
subfamily Alticinae 8 genera 16 species
subfamily Cassidinae 2 genera 2 species
subfamily Sagrinae 1 genus 1 species
subfamily Bruchinae 7 genera 14 species

To match my requirements, I have divided the Australian Region in 4 areas:

- Austro-Malayan
- Australian
- Polynesian
- New Zealand

According to the traditional acceptation, totally 7 species of 6 genera distributes in Australian region but not in Palaearctic region. So, only 6 species of 5 genera of 2 subfamilies for Cerambycidae are distributed in both Palaearctic and Australian regions.

Australian-Palaearctic (for Cerambycidae): 2 subfamilies, 5 genera, 6 species:
subfamily Cerambycinae 4 genera 5 species
subfamily Lamiinae 1 genera 1 species

For Chrysomelidae, the number of taxa is the same with that in Löbl & Smetana (2010) according to the traditional acceptation.

II. ETHIOPIAN (=AFROTROPICAL) REGION:

According to Löbl & Smetana (2010), the Afrotropical region (=Ethiopian region) includes only Africa and Madagascar except South of Saudi Arabia, Yemen, Oman and Arab Emirates. So, they gave 40 species of 28 genera of 3 subfamilies for Cerambycidae and 212 species of 73 genera of 8 subfamilies for Chrysomelidae from Ethiopian region (=Afrotropical region)-Palaearctic Region in their catalogue.

Ethiopian (=Afrotropical)-Palaearctic (for Cerambycidae):
3 subfamilies, 28 genera, 40 species:
subfamily Prioninae 6 genera 6 species
subfamily Cerambycinae 12 genera 15 species
subfamily Lamiinae 10 genera 19 species

Ethiopian (=Afrotropical)-Palaearctic (for Chrysomelidae):
8 subfamilies, 73 genera, 212 species:
subfamily Criocerinae 2 genera 2 species
subfamily Cryptocephalinae 11 genera 30 species
subfamily Eumolpinae 11 genera 22 species
subfamily Chrysomelinae 2 genera 2 species
subfamily Galerucinae 9 genera 14 species
subfamily Alticinae 18 genera 69 species
subfamily Cassidinae 9 genera 12 species
subfamily Bruchinae 11 genera 61 species

To match my requirements, I have divided the Ethiopian Region in 4 areas:

- East African (Central and East Africa + South of Saudi Arabia, Yemen, Oman and Arab Emirates)
- West African
- South African
- Malagasy (Madagascar)

With regard to this, I determined 73 species of 45 genera of 3 subfamilies for Cerambycidae and 141 species of 55 genera of 8 subfamilies for Chrysomelidae from Ethiopian (=Afrotropical)-Palaearctic regions according to the catalogue of Löbl & Smetana (2010).

Ethiopian (=Afrotropical)-Palaearctic (for Cerambycidae):
3 subfamilies, 45 genera, 73 species:
subfamily Prioninae 6 genera 7 species
subfamily Cerambycinae 21 genera 30 species
subfamily Lamiinae 18 genera 36 species

Ethiopian (=Afrotropical)-Palaearctic (for Chrysomelidae):
8 subfamilies, 55 genera, 141 species:
subfamily Criocerinae 1 genus 1 species
subfamily Cryptocephalinae 11 genera 17 species
subfamily Eumolpinae 6 genera 11 species
subfamily Chrysomelinae 2 genera 2 species
subfamily Galerucinae 4 genera 6 species
subfamily Alticinae 14 genera 46 species
subfamily Cassidinae 6 genera 8 species
subfamily Bruchinae 11 genera 50 species

On the other side, totally 11 species of 10 genera distributes in Ethiopian region according to the traditional acceptation, but not in Palaearctic region for Cerambycidae. So, 62 species of 35 genera of 3 subfamilies are distributed both Palaearctic and Ethiopian regions.

Ethiopian (=Afrotropical)-Palaearctic (for Cerambycidae):
3 subfamilies, 35 genera, 62 species:
subfamily Prioninae 6 genera 6 species
subfamily Cerambycinae 12 genera 21 species
subfamily Lamiinae 17 genera 35 species

III. NEARCTIC REGION:

Nearctic region is the same area according to both traditional acceptation and Löbl & Smetana (2010). So, they gave 31 species of 28 genera of 6 subfamilies for Cerambycidae and 92 species of 45 genera of 8 subfamilies for Chrysomelidae from Nearctic-Palaearctic regions in their catalogue.

Nearctic-Palaearctic (for Cerambycidae): 6 subfamilies, 28 genera, 31 species:
subfamily Parandrinae 1 genus 1 species
subfamily Prioninae 1 genus 1 species
subfamily Lepturinae 3 genera 3 species
subfamily Spondylidinae 2 genera 3 species
subfamily Cerambycinae 16 genera 18 species
subfamily Lamiinae 5 genera 5 species

Nearctic-Palaearctic (for Chrysomelidae): 8 subfamilies, 45 genera, 92 species:
subfamily Criocerinae 3 genera 3 species
subfamily Eumolpinae 3 genera 3 species
subfamily Chrysomelinae 11 genera 18 species
subfamily Galerucinae 3 genera 5 species
subfamily Alticinae 10 genera 33 species
subfamily Cassidinae 1 genus 2 species
subfamily Bruchinae 13 genera 28 species
subfamily Zeugophorinae 1 genus 1 species

To match my requirements, I have divided the Nearctic Region in 4 areas:

- Californian (only Western part of North America)
- Rocky Mountain (Central and Southern parts of North America)
- Allechamy (Central and Eastern parts of North America)
- Canadian (only whole Northern part of North America)

According to the traditional acceptation, all above mentioned taxa are distributed both Palaearctic and Nearctic regions.

IV. NEOTROPICAL REGION:

Neotropical region is the same area according to both traditional acceptation and Löbl & Smetana (2010). So, they gave 15 species of 14 genera of 4 subfamilies for Cerambycidae and 29 species of 16 genera of 3 subfamilies for Chrysomelidae from Neotropical-Palaearctic regions in their catalogue.

Neotropical-Palaearctic (for Cerambycidae): 4 subfamilies, 14 genera, 15 species:
subfamily Spondylidinae 1 genus 1 species
subfamily Lepturinae 1 genus 1 species
subfamily Cerambycinae 9 genera 10 species
subfamily Lamiinae 3 genera 3 species

Neotropical-Palaearctic (for Chrysomelidae): 3 subfamilies, 16 genera, 29 species:
subfamily Chrysomelinae 1 genus 1 species
subfamily Alticinae 3 genera 4 species
subfamily Bruchinae 12 genera 24 species

To match my requirements, I have divided the Neotropical Region in 4 areas:

- Ohilian (only Southern part of South America)
- Brasilian (Central and Northern parts of South America)
- Mexican (Western part of Central America)
- Antillean Eastern part of Central America)

On the other side, totally 1 species of 1 genus distributes in Neotropical region but not in Palaearctic region for Cerambycidae according to the traditional acceptation. So, 14 species of 13 genera of 4 subfamilies are distributed both Palaearctic and Neotropical regions.

Neotropical-Palaearctic (for Cerambycidae): 4 subfamilies, 13 genera, 14 species:
subfamily Spondylidinae 1 genus 1 species
subfamily Lepturinae 1 genus 1 species

subfamily Cerambycinae 8 genera 9 species
subfamily Lamiinae 3 genera 3 species

V. ORIENTAL REGION:

According to Löbl & Smetana (2010), the Oriental region includes India, Ceylon, Bangladesh, Myanmar (=Burma), Thailand, Laos, Vietnam, Cambodia, Malaysia, Philippines, Indonesia except Pakistan, China, Nepal, Bhutan, Thibet, Southern Japanese Islands and Taiwan. So, they gave 843 species of 248 genera of 8 subfamilies for Cerambycidae and 3781 species of 422 genera of 13 subfamilies for Chrysomelidae from Oriental-Palaearctic regions in their catalogue.

Oriental-Palaearctic (for Cerambycidae): 8 subfamilies, 248 genera, 843 species:
subfamily Philinae 1 genus 3 species
subfamily Disteniinae 1 genus 2 species
subfamily Prioninae 23 genera 47 species
subfamily Lepturinae 23 genera 35 species
subfamily Spondylidinae 3 genera 3 species
subfamily Necydalinae 1 genus 1 species
subfamily Cerambycinae 45 genera 298 species
subfamily Lamiinae 151 genera 454 species

Oriental-Palaearctic (for Chrysomelidae): 13 subfamilies, 422 genera, 3781 species:
subfamily Donaciinae 3 genera 12 species
subfamily Criocerinae 6 genera 149 species
subfamily Cryptocephalinae 27 genera 419 species
subfamily Lamprosomatinae 2 genera 18 species
subfamily Eumolpinae 48 genera 393 species
subfamily Chrysomelinae 26 genera 192 species
subfamily Galerucinae 130 genera 989 species
subfamily Alticinae 107 genera 924 species
subfamily Cassidinae 46 genera 490 species
subfamily Sagrinae 1 genus 8 species
subfamily Bruchinae 21 genera 127 species
subfamily Zeugophorinae 2 genera 28 species
subfamily Megalopodinae 3 genera 32 species

To match my requirements, I have divided the Oriental Region in 4 areas:

- Indian (Pakistan and India)
- Ceylonese (Southern India and Ceylon)
- Indo-Chinese (Bangladesh, Myanmar (=Burma), Thailand, Laos, Vietnam, Cambodia, Nepal, Bhutan, Southern Chinese provinces (North-West: Gansu, Nei Mongol, Xinjiang; South-West: Guizhou, Sichuan, Yunnan; South: Fujian, Guandong, Guangxi, Hainan), Southern Japanese Islands and Taiwan.)).
- Indo-Malayan (Malaysia, Philippines, Indonesia)

With regard to this, I determined 768 species of 304 genera of 9 subfamilies for Cerambycidae and 975 species of 240 genera of 13 subfamilies for Chrysomelidae from Oriental-Palaearctic regions in the catalogue of Löbl & Smetana (2010) according to the traditional acceptation.

Oriental-Palaearctic (for Cerambycidae): 9 subfamilies, 304 genera, 768 species:
subfamily Philinae 2 genus 4 species
subfamily Parandrinae 1 genus 1 species
subfamily Prioninae 10 genera 24 species
subfamily Lepturinae 39 genera 78 species
subfamily Spondylidinae 7 genera 14 species
subfamily Necydalinae 1 genus 1 species
subfamily Apatophyseinae 1 genus 3 species
subfamily Cerambycinae 97 genera 251 species
subfamily Lamiinae 146 genera 392 species

Oriental-Palaearctic (for Chrysomelidae): 13 subfamilies, 240 genera, 975 species:
subfamily Donaciinae 2 genera 7 species
subfamily Criocerinae 5 genera 37 species
subfamily Cryptocephalinae 14 genera 79 species
subfamily Lamprosomatinae 1 genus 5 species
subfamily Eumolpinae 29 genera 93 species
subfamily Chrysomelinae 17 genera 47 species
subfamily Galerucinae 74 genera 308 species
subfamily Alticinae 53 genera 238 species
subfamily Cassidinae 23 genera 87 species
subfamily Sagrinae 1 genus 3 species
subfamily Bruchinae 18 genera 57 species
subfamily Zeugophorinae 1 genus 4 species
subfamily Megalopodinae 2 genera 10 species

Among them, totally 393 species of 188 genera of 6 subfamilies for Cerambycidae distributes in Oriental region and only China in Palaearctic region.

China-Oriental (for Cerambycidae): 6 subfamilies, 188 genera, 393 species:
subfamily Philinae 2 genus 4 species
subfamily Prioninae 5 genera 9 species
subfamily Lepturinae 21 genera 28 species
subfamily Spondylidinae 4 genera 4 species
subfamily Cerambycinae 67 genera 140 species
subfamily Lamiinae 99 genera 248 species

Also among them, totally 569 species of 154 genera of 11 subfamilies for Chrysomelidae distributes in Oriental region and only China in Palaearctic region.

China-Oriental (for Chrysomelidae): 11 subfamilies, 154 genera, 569 species:
subfamily Donaciinae 2 genera 2 species
subfamily Criocerinae 3 genera 18 species
subfamily Cryptocephalinae 7 genera 44 species
subfamily Lamprosomatinae 1 genus 4 species
subfamily Eumolpinae 18 genera 62 species
subfamily Chrysomelinae 9 genera 21 species
subfamily Galerucinae 64 genera 254 species
subfamily Alticinae 33 genera 112 species
subfamily Cassidinae 14 genera 40 species
subfamily Zeugophorinae 1 genus 3 species
subfamily Megalopodinae 2 genera 9 species

With respect to this, I determined 335 species of 8 subfamilies for Cerambycidae and 546 species of 13 subfamilies for Chrysomelidae from Oriental-Palaearctic regions except above mentioned China-Oriental taxa in the catalogue of Löbl & Smetana (2010) according to the traditional acceptation. So, ratio of the

species for Cerambycidae and Chrysomelidae is 51 % and 60 % of all determined species from Oriental-Palaearctic regions in the catalogue of Löbl & Smetana (2010) according to the traditional acceptation respectively. As a result of this, it is a clear that China is a specific area between Palaearctic and Oriental regions.

Oriental-Palaearctic except China-Oriental (for Cerambycidae):
8 subfamilies, 335 species:
subfamily Parandrinae 1 species
subfamily Prioninae 15 species
subfamily Lepturinae 50 species
subfamily Spondylidinae 10 species
subfamily Necydalinae 1 species
subfamily Apatophyseinae 3 species
subfamily Cerambycinae 111 species
subfamily Lamiinae 144 species

Oriental-Palaearctic except China-Oriental (for Chrysomelidae):
13 subfamilies, 546 species:
subfamily Donaciinae 5 species
subfamily Criocerinae 19 species
subfamily Cryptocephalinae 35 species
subfamily Lamprosomatinae 1 species
subfamily Eumolpinae 31 species
subfamily Chrysomelinae 26 species
subfamily Galerucinae 254 species
subfamily Alticinae 126 species
subfamily Cassidinae 47 species
subfamily Sagrinae 3 species
subfamily Bruchinae 57 species
subfamily Zeugophorinae 1 species
subfamily Megalopodinae 1 species

Consequently, shared taxa between Palaearctic region and all other zoogeographic regions according to the traditional acceptation can give chiefly as follows:

FOR CERAMBYCIDAE:

Australian-Palaearctic: 2 subfamilies, 5 genera, 6 species:
subfamily Cerambycinae 4 genera 5 species
subfamily Lamiinae 1 genus 1 species
Ethiopian (=Afrotropical)-Palaearctic: 3 subfamilies, 35 genera, 62 species:
subfamily Prioninae 6 genera 6 species
subfamily Cerambycinae 12 genera 21 species
subfamily Lamiinae 17 genera 35 species
Nearctic-Palaearctic: 6 subfamilies, 28 genera, 31 species:
subfamily Parandrinae 1 genus 1 species
subfamily Prioninae 1 genus 1 species
subfamily Lepturinae 3 genera 3 species
subfamily Spondylidinae 2 genera 3 species
subfamily Cerambycinae 16 genera 18 species
subfamily Lamiinae 5 genera 5 species
Neotropical-Palaearctic: 4 subfamilies, 13 genera, 14 species:
subfamily Spondylidinae 1 genus 1 species
subfamily Lepturinae 1 genus 1 species
subfamily Cerambycinae 8 genera 9 species
subfamily Lamiinae 3 genera 3 species

Oriental-Palaearctic: 9 subfamilies, 304 genera, 768 species:
subfamily Philinae 2 genera 4 species
subfamily Parandrinae 1 genus 1 species
subfamily Prioninae 10 genera 24 species
subfamily Lepturinae 39 genera 78 species
subfamily Spondylidinae 7 genera 14 species
subfamily Necydalinae 1 genus 1 species
subfamily Apatophyseinae 1 genus 3 species
subfamily Cerambycinae 97 genera 251 species
subfamily Lamiinae 146 genera 392 species

Among the zoogeographic regions, Oriental region shared the most number of **subfamilies** with Palaearctic region. Nearctic, Neotropical, Ethiopian and Australian regions follow it respectively.

Oriental-Palaearctic: 9 subfamilies, 304 genera, 768 species
Nearctic-Palaearctic: 6 subfamilies, 28 genera, 31 species
Neotropical-Palaearctic: 4 subfamilies, 13 genera, 14 species
Ethiopian (=Afrotropical)-Palaearctic: 3 subfamilies, 35 genera, 62 species
Australian-Palaearctic: 2 subfamilies, 5 genera, 6 species

Among the zoogeographic regions, Oriental region shared also the most number of **genera** and **species** with Palaearctic region. Ethiopian, Nearctic, Neotropical and Australian regions follow it respectively.

Oriental-Palaearctic: 9 subfamilies, 304 genera, 768 species
Ethiopian (=Afrotropical)-Palaearctic: 3 subfamilies, 35 genera, 62 species
Nearctic-Palaearctic: 6 subfamilies, 28 genera, 31 species
Neotropical-Palaearctic: 4 subfamilies, 13 genera, 14 species
Australian-Palaearctic: 2 subfamilies, 5 genera, 6 species

FOR CHRYSOMELIDAE:

Australian-Palaearctic: 5 subfamilies, 19 genera, 35 species:
subfamily Chrysomelinae 1 genus 2 species
subfamily Alticinae 8 genera 16 species
subfamily Cassidinae 2 genera 2 species
subfamily Sagrinae 1 genus 1 species
subfamily Bruchinae 7 genera 14 species
Ethiopian (=Afrotropical)-Palaearctic: 8 subfamilies, 55 genera, 141 sp.:
subfamily Criocerinae 1 genus 1 species
subfamily Cryptocephalinae 11 genera 17 species
subfamily Eumolpinae 6 genera 11 species
subfamily Chrysomelinae 2 genera 2 species
subfamily Galerucinae 4 genera 6 species
subfamily Alticinae 14 genera 46 species
subfamily Cassidinae 6 genera 8 species
subfamily Bruchinae 11 genera 50 species
Nearctic-Palaearctic: 8 subfamilies, 45 genera, 92 species:
subfamily Criocerinae 3 genera 3 species
subfamily Eumolpinae 3 genera 3 species
subfamily Chrysomelinae 11 genera 18 species
subfamily Galerucinae 3 genera 5 species
subfamily Alticinae 10 genera 33 species
subfamily Cassidinae 1 genus 2 species
subfamily Bruchinae 13 genera 28 species
subfamily Zeugophorinae 1 genus 1 species

Neotropical-Palaearctic: 3 subfamilies, 16 genera, 29 species:
subfamily Chrysomelinae 1 genus 1 species
subfamily Alticinae 3 genera 4 species
subfamily Bruchinae 12 genera 24 species
Oriental-Palaearctic: 13 subfamilies, 240 genera, 975 species:
subfamily Donaciinae 2 genera 7 species
subfamily Criocerinae 5 genera 37 species
subfamily Cryptocephalinae 14 genera 79 species
subfamily Lamprosomatinae 1 genus 5 species
subfamily Eumolpinae 29 genera 93 species
subfamily Chrysomelinae 17 genera 47 species
subfamily Galerucinae 74 genera 308 species
subfamily Alticinae 53 genera 238 species
subfamily Cassidinae 23 genera 87 species
subfamily Sagrinae 1 genus 3 species
subfamily Bruchinae 18 genera 57 species
subfamily Zeugophorinae 1 genus 4 species
subfamily Megalopodinae 2 genera 10 species

Among the zoogeographic regions, Oriental region shared the most number of subfamilies, genera and species with Palaearctic region. Ethiopian, Nearctic, Australian and Neotropical regions follow it respectively.

Oriental-Palaearctic: 13 subfamilies, 240 genera, 975 species:
Ethiopian (=Afrotropical)-Palaearctic: 8 subfamilies, 55 genera, 141 species
Nearctic-Palaearctic: 8 subfamilies, 45 genera, 92 species:
Australian-Palaearctic: 5 subfamilies, 19 genera, 35 species:
Neotropical-Palaearctic: 3 subfamilies, 16 genera, 29 species:

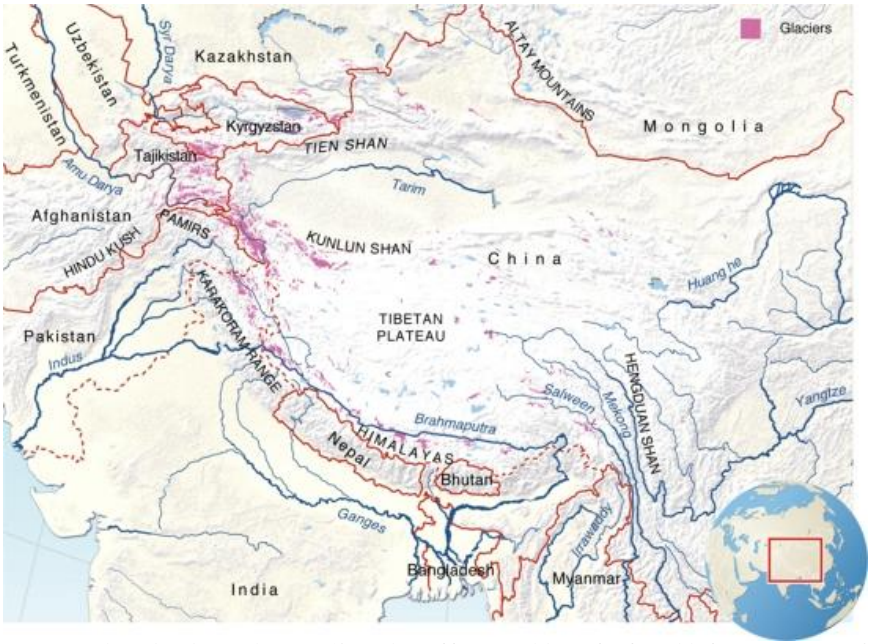
Normally, it should be expected that number of shared taxa must be the most between Nearctic region and Palaearctic region according to the traditional acception (Holarctic approach). However, Nearctic region situated in third line (mostly) or second line (one time) among the all other zoogeographic regions in our findings for Palaearctic longhorned and leaf beetles as seen above. It never situated in the first line.

Oriental-Palaearctic taxa even except Chinese taxa are still the first on account of taxa number (subfamilies, genera and species) among the other zoogeographic regions for both Palaearctic longhorned and leaf beetles.

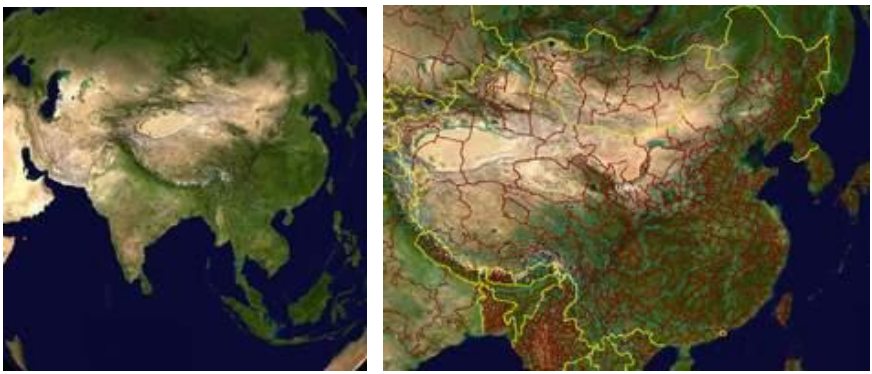
Finally, Palaearctic longicorn beetles say that "***we are the closest relatives with the taxa in Oriental region from the other regions (according to the number of subfamilies, genera and species). Nearctic, Neotropical, Ethiopian and Australian regions follow it (according to the number of subfamilies). Also Ethiopian, Nearctic, Neotropical and Australian regions follow it (according to the number of genera and species)***".

Similarly, Palaearctic leaf beetles say that "***we are the closest relatives with the taxa in Oriental region from the other regions (according to the number of subfamilies, genera and species). Ethiopian, Nearctic, Australian and Neotropical regions follow it (according to the number of subfamilies, genera and species)***".

After all, with regard to our findings, China has a very specific and important status in relationship between Palaearctic and Oriental regions as seen above. Since, there is no any good zoogeographic barrier between Palaearctic China and Oriental region such as Himalayas in Western Oriental region.



Map 3. Oriental-Palaearctic area (from http://maps.grida.no/go/graphic/water-towers-of-asia-glaciers-water-and-population-in-the-greater-himalayas-hindu-kush-tien-shan-tib).

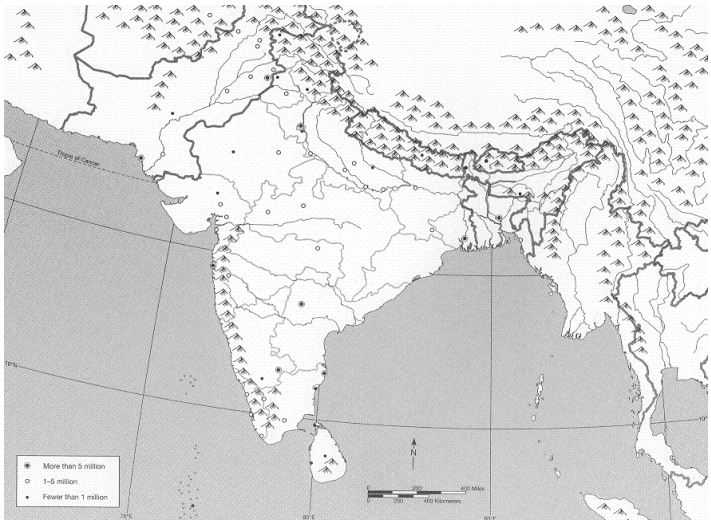


A **B**

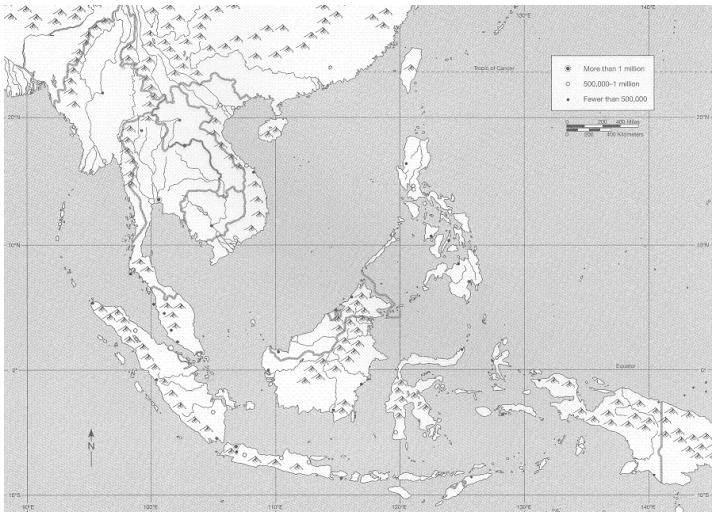
Map 4. A. Satellite map of Asia, B. Satellite map of China (from http://www.motherplanet.com/satellite-map.htm).

As known, Himalayas is a good zoogeographic barrier between Palaearctic and Oriental regions. Himalayas (Himalaya range or Himalaya Mountains) are connected with the countries Bhutan, China (Tibet), India, Nepal, Pakistan, Burma and Afghanistan. It separates the Indian subcontinent from the Tibetan

Plateau. By extension, it is also the name of a massive mountain system that includes the Karakoram, the Hindu Kush, and other, lesser, ranges that extend out from the Pamir Knot. However, Himalayas does not extend to whole territory of Southern China. On the other side, some of the world's major rivers feed by Himalayan glaciers as Ganges, Indus, Brahmaputra, Yangtze, Mekong, Salween, Red River (Asia), Xunjiang, Chao Phraya, Irrawaddy River, Amu Darya, Syr Darya, Tarim River and Yellow River. Some of them and others that are in China can be expected as barriers between Palaearctic China and Oriental region. Unfortunately, it is clear that they are not enough for an effective isolation between both regions.



A



B

Map 5. A.Western parts of Oriental region, B. Eastern parts of Oriental region (from: http://www.uvm.edu/~cemorse/geography050/syllabus.html)

Anyway, it is the question that "**Is China a transition zone between Palaearctic and Oriental regions?**" or ...

With respect to our findings, China and near have a very specific status for Palaearctic region. As known, the Palaearctic region shows wide fluctuations in physical and climatic features. So, it supports a good fauna. Palaearctic region has been divided into 4 subregions.

1. **European subregion**: Northern, Central and East Europe; Black Sea and Caucasus. It is represented by 85 families of vertebrates. Amphibians and Reptiles are represented with six families each. Myogale, only one genus of mammal is present. Bird like Tits, wagtails, mammals like wolf and moles are common in this subregion.

2. **Mediterranean subregion**: Remaining parts of Europe; North Africa and Arabian portions. 124 families of terrestrial vertebrates are present. Birds like Upupa and Pastor, mammals like elephant scurew, Hyaena and porcupine are seen in this subregion.

3. **Siberian subregion**: Northern Asia, Himalayas. 94 families of vertebrates are included in it. Families of Musk deer and Moles are confined to this subregion.

4. **Manchurian subregion**: Mongolia, Japan, Korea and Manchuria (China). Mammals like Tibetan Langur, Great Panda, Tufted deer, Chinese water deer are common.

After all, here is the real problem that "**Are China and near, namely, Manchurian zone a subregion or region?** Interestingly, our findings in the text and known other evidences enforce to say us that China and near, namely, Manchurian zone which includes whole territory of China, Mongolia, Korea and Japan, can be evaluated as a separate region with respect to the Palaearctic Chrysomeloidea.

This approach supports the above "Satellite map of Asia and China" (Map 4). For this region, the main geographic barriers that form by mountain ranges are Himalayas, Tian Shan, Altai and probably Yablonovy, Stanovoy and Dzhugdzhur which last three are in South-Eastern parts of Russia. Baikal Lake probably is another natural barrier for the region. With the regard of geographic barriers, therefore, a small part of SE Russia and even Sakhalin and Kunashir islands can be in Manchurian region.

With regard to our subject, I believe that only a single understandable example about naturalness of our approach will suffice for the present work.

Dorcadiini, a group of nonvolant insects, majority of which are endemics for their inhabiting areas, and, can easily be accepted a rather characteristic animal group for Palaearctic region, can readily be supported this approach.

As known, this tribe includes 6 genera as *Dorcadion* Dalman, 1817; *Neodorcadion* Ganglbauer, 1884; *Trichodorcadion* Breuning, 1942; *Iberodorcadion* Breuning, 1943; *Eodorcadion* Breuning, 1947 and *Politodorcadion* Danilevsky (1996) now. The genus *Trichodorcadion* from India

and Nepal in Oriental region was transfered in Dorcadiini by Danilevsky & Kasatkin (2006) on the base of endophallic characters.

The tribe Dorcadiini have Palaearctic (N Africa to China) and Oriental (India to Nepal) chorotypes now. Since, *Dorcadion* has Palaearctic chorotype (N Africa to China), *Neodorcadion* has W-Palaearctic chorotype (Italy to Turkey, Ukraine and Moldova), *Trichodorcadion* has Oriental chorotype (India and Nepal), *Iberodorcadion* has European (chiefly Iberian) chorotype (Spain to Poland and Latvia), *Eodorcadion* has E-Palaearctic chorotype (Russia, Siberia, Mongolia, and China) and *Politodorcadion* has Asian chorotype (Kazakhstan, W Siberia and China).

In consequence four genera, namely, *Dorcadion*, *Trichodorcadion*, *Eodorcadion* and *Politodorcadion* occur also out of Palaearctic region when we accept Manchurian zone as a separate region. Dorcadiini is represented only by 1 genus as *Trichodorcadion* in Oriental region (only in India and Nepal), and by three genera as *Dorcadion*, *Eodorcadion* and *Politodorcadion* in Manchurian region (only in Mongolia and China).

Dorcadiini, on the other side, is represented only by 1 genus as *Eodorcadion* and its 2 species in Far East Russia normally.

It is represented only by 1 genus as *Eodorcadion* in Mongolia too.

It is represented by 2 genera as *Dorcadion* and *Eodorcadion* in China (mostly in NW China related with Kazakhstan).

Conspicuously, Korea, Japan and, Sakhalin and Kunashir islands, in which absent any member of Dorcadiini, are still accepted in Palaearctic region now.

Hence, it should be stated that the tribe Dorcadiini originated in Palaearctic region, and happened a rather characteristic animal group for the region. Then, their distribution areas enlarged over time. Later, they overcomed the natural barriers, and finally they evolved and changed more or less in their new habitats within the other regions. So, they became into new species and even new genera like *Trichodorcadion* and, *Eodorcadion*.

Accordingly, *Eodorcadion* originated in Manchurian region, while *Trichodorcadion* originated in Oriental region.

Politodorcadion occurs only in China among the Manchurian countries. It is represented only by a few species in China. Most of the species of the genus are distributed in Kazakhstan. So, *Politodorcadion* has still Palaearctic chorotype chiefly.

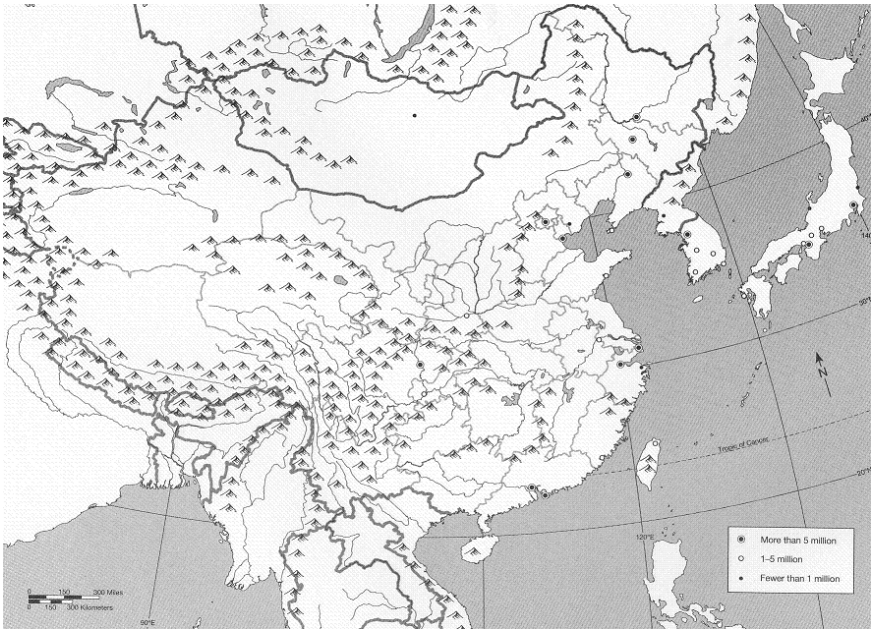
Finally, I propose the Manchurian zone as a new zoogeographic region not subregion now. Anyway, the Manchurian region has natural boundaries and separates by geographic barriers that are the mountain ranges as Himalayas, Tian Shan, Altai and probably Yablonovy, Stanovoy and Dzhugdzhur, and probably Baikal Lake (please see Map 4 and the following maps).

Hence Manchurian region probably includes the whole territories of Mongolia, Korea, Japan, China, Sakhalin island, Kunashir island and a small part of SE Russian Far East (including Buryatia, Chita, Amur and S Khaborovsk).

A

B

Map 6. Manchurian region (from: http://maps.google.com/maps?hl=tr&biw=1003&bih=371&rlz=1W1SUNC_tr&q=Asia+topographic+map&wrapid=tlif129759376901531&um=1&ie=UTF-8&hq=&hnear=Asia&gl=tr&t=p&ei=p7VXTb_IFcnHsgb92bWlCw&sa=X&oi=geocode_result&ct=image& resnum=1&ved=0CBsQ8gEwAA).



Map 7. Manchurian region (from: http://www.uvm.edu/~cemorse/geography050/syllabus.html).

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