THE CENTER OF ORIGIN THEORY

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Plates 23–41

The science of zoology is like a living organism in that its proper growth and development is dependent not only upon the expansion of the subsciences which compose it but also upon the proper coordination and correlation of these subsciences. Too frequently in these days of specialization the specialists in various areas proceed as if it were possible to ignore this fundamental law. Systematic zoology cannot develop properly without careful consideration of the recent advances in morphology, genetics, ecology, physiology, zoogeography, embryology and phylogeny.

The reverse is equally true. There can be no substantial progress in the other branches of zoology unless the work is based on sound systematics. Occasionally workers in other branches of zoology attempt to belittle the work and the workers in systematic zoology, and not infrequently taxonomists are urged to return to the principles enunciated by Linnaeus nearly two centuries ago. The fundamental fallacy in this plea is, of course, the indisputable fact that we are much nearer the truth today in systematic zoology than we were in the time of Linnaeus. This is asserted in spite of the fact that systematic zoology has become almost completely bogged down in a morass of nomenclature from which I am by no means sure it can extricate itself. The fact that some of our common animals have been known by anywhere from ten or a dozen to fifty or more different names during the last century should give us pause. The further fact that not even the specialists in mammalogy, ornithology, herpetology, ichthyology or entomology can give us the correct scientific names for common species in their special groups without long and laborious research through the literature is somewhat of a disgrace. Various and sundry abortive attempts have been made by fiat or decree to fix names but I believe we will make no permanent advance toward this much to be desired goal until we re-adopt as the basic principle the law of priority and stick to it through thick and thin. For the moment it might seem best to most of us to adopt the name we learned for a given species or even the last name used but in the long run I am sure this will not be true. Coupled with this must be a careful consideration of the facts based upon a restudy of the evidence in the light of the times when the work was produced. Linnaeus' and other early writers' descriptions of genera and species are totally inadequate, their concepts of the higher categories are entirely different when judged by modern standards. Yet these names must stand and must be adapted to our modern concepts, just as our concepts of today will have to be modified to fit the needs a century or two hence. Such a return to basic concepts will of necessity mean a more careful restudy of the literature of zoology than any thus far made.

It is going to mean that we must have more careful and more complete catalogues of all groups of animals than any which have been published up to the present time.

Furthermore, the desirable end of a better systematic zoology is not going to be met without the systematists doing a more systematic job than they have done. This involves not only more care in our study of nomenclature, but as I have attempted to point out in another connection, it involves a more studied attention to the details of the making of keys to, descriptions of, and illustrations of the prime categories of the animal kingdom. And, lastly, and perhaps more important, it involves the careful correlation of advances in all fields of zoology with systematic zoology by the systematists and in turn the correlation of systematics with the other branches of zoology by the specialists in these fields. (Metcalf, 1937c).

Gone are the happy days of the early taxonomists, like Linnaeus, who could describe a species of animal by a single line of Latin words which referred to external characters only. The systematist who hopes to make a lasting contribution to science in the future must know not only the basic laws of nomenclature, he must have also the ability to write descriptions that characterize, make drawings that delineate and construct keys that guide other students unerringly on the right path to the correct name. But above these cardinal virtues of all good systematic zoologists he must understand the basic principles of morphology, genetics, ecology, embryology, phylogeny, paleontology, physiology, zoogeography and other branches of zoology so that he is able to trace the basic truths through the maze and confusion of tongues which is the science of modern zoology. On the other hand it is equally the responsibility of the specialists in these other areas to understand the fundamental principles of systematic zoology. It will not do to try to shrug off all work in systematics because some work in this field has been superficial or because much of the work in nomenclature is apparently unnecessary. Neither can we ever hope to have again a simple system such as we had in the days of Linnaeus. But even a cursory examination of the estimated figures for genera and species of animals known in the middle of the Eighteenth Century and known today cannot fail to impress the reader with the tremendous advances that have been made in systematic zoology in less than two centuries. In 1758 Linnaeus described some 300 genera and 4,200 species, but as near as I can estimate there have been described, as of today, at least 200,000 genera and 2,500,000 species (Metcalf, 1940a).

With these thoughts in mind, I desire to emphasize in the present paper the interrelations between zoogeographic regions and genera. In a previous paper (Metcalf, 1933) I tried to point out that there was a close correlation between zoogeographic regions and taxonomic groups.

The practical completion of the card catalog of the Homoptera of the world makes it possible for us to study the interrelations between systematics and zoogeography. This catalog was set up so as to show the geographical distribution of the species of each genus strikingly.

The sample is large enough, about 30,000 species in approximately 3,000 genera, to make any tentative conclusions worthy of considerations. The Homoptera are very valuable as geographic indices. In the first place they are insects of relatively small size, without strong powers of locomotion. This together with the fact that for the most part species are limited to a single host plant or a very narrow range of food plants results in their being limited to a very gradual spread in nature. Many species not limited to a single species of host plant are limited to a relatively narrow range of host plants. Others not limited by food preference seem to be restricted to ecological niches. In addition, their distribution is apparently greatly influenced by other ecological factors not too clearly understood at the present time (Metcalf, 1924a; Metcalf and Osborn, 1920a). This makes these insects, popularly known as cicadas, tree hoppers, leaf hoppers, plant hoppers and frog hoppers or spittle insects, excellent indicators of zoogeographic regions. The apparent limitations in the use of these forms for this purpose are the fact that most of these forms are small or very small inconspicuous insects and have not been as generally collected as the larger and more conspicuous vertebrates. In the second place this order of insects is one of the least known, taxonomically speaking, of all the orders of insects. This is due to a combination of circumstances. Prominent factors in this lack of knowledge are the facts that generic limits are poorly understood and that specific characters are often obscured and it is only recently that some of these characters have been appreciated and studied. The following purely tentative conclusions are advanced for consideration.

If the terms genus and species are phylogenetic as well as systematic concepts, the species composing the genus will be closely related. They will have similar morphological characters, not merely similar appearing characters. In other words if living organisms have evolved from preexisting organisms, or if evolution be accepted as a natural law in the organic world, and if there is any reality in the taxonomist's concepts of the individual, the species, the genus, the family, the order and phylum; then there is a spot on the earth's surface where each category originated. For the lowest category, we call this place the birthplace of the individual. For the higher categories, we call this area the center of origin for the group under consideration, be it species, genus, family, order or phylum. Each species will have a center of origin and each genus will also have a center of origin. These centers of origin will bear the same relation to the species or the genus zoogeographically as his birthplace bears to the history of the individual. The center of origin of a group has a geographic location, which will be more definite for the lower categories, such as species and genera, than it will be for the higher categories, such as families and orders; just as the birthplace of an individual, if it can be determined, is more definite than the center of origin for a species even if the center of origin can be approximated. In the same way, in general, the center of origin for a species will be more recent, geologically speaking, than it will be for the higher groups.

Usually the center of origin for a species will be within the present range of the species, but not necessarily so. The center of origin of a genus may be within the range of the known species; but is more apt to be beyond the range of the included species, than the center of origin for a species is apt to be beyond the known range of this species.

In the highest categories the center of origin is frequently very remote geologically and geographically; and may have no apparent relation to the present distribution of the recent forms. In fact only a very few of these racial histories have been traced. But the generalized histories of the horse family and elephant family make one of the most interesting chapters in paleontology. These somewhat fictionalized histories are developed in the illustrations (Pls. 23 and 24) and are repeated here not because they are not well known; but only because they may help us to an understanding of the theory of centers of origin which I wish to apply to certain generic groups later.

In the same way the spread of certain introduced species may help us to a better understanding of this theory. The spread of the English sparrow, the starling (Pl. 25), and the cotton boll weevil (Pl. 26), reveal the same fundamental pattern. For a period after introduction there is very little spread, then gradually the rate of spread increases and reaches a climax when the animal has occupied all the territory available to it, that is, to all the territory to which it is adapted ecologically. With the cotton boll weevil this would mean all that area in the southeastern United States where cotton is grown except certain upland areas where either winter temperature or low humidity seems to be a determining factor. From this climax of wide distribution there may be a gradual recession until the species occupies only the most favorable islands in the territory that it has occupied. Eventually the enemies of this species may gain the upper hand and it may disappear entirely from the territory that it once occupied.

There are usually seven fairly distinct stages in the spread of introduced species. First, a period when it is becoming established, typically restricted to a very limited area; then a period when it commences to spread; third, a period of increased dispersal; fourth, a period of maximum development; fifth, a slight and gradual recession; then a period of rapid recession; and finally a period of great reduction in range or complete elimination.

It may be argued that these accidental introductions have no resemblance to the dispersal of a species in nature. That in the latter case the spread is slow; occupying periods that are measured by geological epochs not in years; but let's not be too sure that this is the case. Is it not possible that the spread of species in nature is fully as rapid as that of introduced species? Introduced forms which find themselves in a new but favorable environment usually find no great numbers of enemies arrayed against them. May this not be equally true of newly evolved forms? I rather suspect, if we knew the complete history of a species, that we would find that it runs about the same course that we have seen repeated in this country by several introduced forms.

From its center of origin a species will spread until it occupies all the territory, ecologically speaking, to which it is adapted. But sooner or later any species in its dispersal will presumably meet with impassible barriers: the ocean for terrestrial species, high mountains for lowland species, temperate climates for tropical species; and many other ecological and physical barriers. Within the continental range of a species there will be many areas which a highly modified species cannot occupy. If the species is restricted to a single host plant species, obviously it will not be able to live on other host plant species of the same genus which may be available. If the given species is restricted to a single ecological niche, then other ecological areas may be available in the area occupied by the species under consideration. Other species may develop for the food plants which are not used or the ecological areas which are not occupied. In this way an area may support many closely related species. Such a group of species would constitute a phylogenetic genus. The geographic extent of such a phylogenetic group becomes of special interest not only to the systematist but to the student of zoogeography, for it too will have a center of origin. Tentatively we will advance the idea that the extent of such a genus would be bounded by a zoogeographic region. If this is true, a group of genera may be used to delimit a zoogeographic region and a zoogeographic region may be used to define a genus. Any such concept must be used in the broadest sense until we are much surer of our facts than we are at the present time.

Such a concept is based upon a number of assumptions which may or may not be true. Some of the assumptions may apply to animals with limited powers of locomotion, such as the Homoptera, and not to other animals like birds with practically unlimited powers of flight. Some of the assumptions on the other hand may not be true for recently evolved groups like the mammals which may be in a state of flux, evolutionarily speaking, but could be true for animals like the ancient insects with their external armor of inflexible chitin which may have settled into evolutionary grooves. Some may apply to animals which have only limited powers of adaptation to the environment while not applying to other animals which have a wide range, ecologically speaking.

For the present, at least, it is my belief that it is not possible to develop a single zoogeographic map for all groups of the animal kingdom. The attached map (Pl. 27) has been developed during the past twenty-five years and fits my present classification of the Homoptera better than any other scheme I have been able to advance.

This map indicates my present conception of the zoogeographic regions of the world as delimited by the Homoptera. This would not be the regions of the world for mammals or any other group of animals which have better methods of locomotion, or different sets of ecological factors limiting their ranges, or different centers of origin, or different rates of spread. It should be recalled, also, that it is difficult to locate boundaries between regions in nature. Regions for land animals unless separated from each other by large bodies of water, merge gradually into each other. Therefore, on this map I have drawn the boundaries as broad areas in certain parts of the world, and by narrow lines in other places. This lack of definiteness may be due, also, to lack of knowledge, for it must be emphasized repeatedly that our knowledge of the Homoptera is far from complete. Our knowledge of genera and species, especially in certain families, is fairly complete. Such regions as Europe and the United States have been fairly well studied for many groups. But, for other groups, even these regions are poorly known. The recent studies of three genera of North American leaf hoppers, *Empoasca*, *Typhlocyba* and *Erythroneura*, by such students as Beamer, De Long, Knull, Oman and others, illustrate the results that may be expected when other genera are as carefully studied. The species of these three genera are almost exclusively pale green insects, sometimes with varieties that are vittate, fasciate or spotted with bright red, but for the most part without evident external specific characters. Using the characters of the male genitalia as criteria in the study of specific limits in these genera these students have revealed that what were considered as small genera with only a few species a quarter of a century ago, now stand revealed as genera with a large number of species. Gillette (1898) in his monographic study of this group of leaf hoppers described 28 species of *Empoasca* and 21 species of *Typhlocyba* and *Erythroneura*. In 1917 Van Duzee cataloged 32 species of the genus *Empoasca*, 11 species of *Typhlocyba* and 14 species of *Erythroneura*; but today we know no less than 99 species of *Empoasca*, 57 species of *Typhlocyba* and 296 species of *Erythroneura*. Therefore, any theories that are advanced today about genera and species of Homoptera are purely tentative and will be subject to constant revisions until that happy day when we know more thoroughly their taxonomic and geographic limits. Homoptera from the other regions of the world have been studied only superficially. Many genera have been poorly defined. This is in part due to a failure to appreciate true morphological characters. It is due in part, at least, to the fact that the generic characters inherent in phallic structures have not been recognized. And it arises from a lack of consideration of the importance of delineations of zoogeographic regions as fundamental characters in the definition of genera.

This map differs from the conventional map in the following respects: New regions proposed are Caribbean, embracing Mexico, Central America and the West Indies; Malaysian, embracing the Sunda Islands, the Philippines and Celebes; Austromalayan, comprising New Guinea, Solomon Islands, New Hebrides and New Caledonia; Maorian, including New Zealand and the nearby islands.

Whether any of these regions are real zoogeographic regions in the best sense of the word must depend upon more evidence than is now at hand.

In studying this map it must be borne in mind that nature draws no hard and fast lines. The low tide mark may be the extent of the spread of a strictly terrestrial species but no land area is separated from a contiguous land area by sharp boundaries. In such areas species from adjoining areas may tend to overlap, and all boundaries on the map are subject to modification as more evidence is produced. But as indicated on the map there are three great areas where it is practically impossible to define boundaries with our present knowledge of the Homoptera. These areas are indicated on the map by solid black. One is the boundary between the Nearctic Region and the proposed Caribbean Region. This is a semiarid region with many high mountains. Many Mexican species extend northward into the southwestern United States and on the other hand many species from the southwestern United States especially in the mountains and I suspect equally along the gulf coast tend to extend into Mexico. On the other hand, if we are to establish a Caribbean Region, its southern border is equally hard to define. The great valley of the Orinoco has many close ties with the Caribbean Region but many species from the Amazon subregion tend to extend northward into the valley of the Orinoco.

The other trouble spot on our zoogeographic map is the area in southeastern Asia including southern China, Formosa and Hainan Islands where it is difficult to draw a boundary between the Oriental Region on the one hand and the Palearctic Region on the other. Elsewhere this boundary seems to be fairly sharp across the Himalayas and the Persian Desert.

Most of the other boundaries seem fairly stable with our present knowledge of the Homoptera. The oceans and deserts dividing the great geographic regions are usually effective barriers against land animals such as the Homoptera. Narrow straits, on the other hand, may not be effective barriers to the spread of strictly terrestrial species. The Straits of Florida and Malacca Straits, separating the Nearctic from the Caribbean and the Oriental from the Malaysian, are examples. The southern tip of Florida shows some Caribbean elements and the southern end of the Malay Peninsula contains a mixture of Oriental and Malaysian elements. But what will emerge from the studies now in progress of extensive collections from the Malaysian Region and Austromalayan Region is entirely problematical. Such studies might modify our present concepts of the boundaries between the Oriental Region and the Malaysian Region, on the one hand, and the boundaries between the Malaysian Region and the Austromalayan Region, on the other hand. In fact, further studies may eliminate both the Caribbean Region and the Malaysian Region entirely but for the present they are useful concepts.

From this map has been developed the concept that zoogeographic areas may be used to correct our ideas of systematic relationships and, vice versa, that our ideas of systematic relationships may be used to modify our concepts of zoogeographic map-making. These ideas may be expressed by the following parallel columns:

Zoogeographic Regions	Taxonomic Groups
Superrealm or Realm	Families
Realm or Subrealm	Subfamilies
Region	Genera and Subgenera
Subregion	Species and Subspecies

This classification, if correct, means that it should work both ways. Superrealms or realms should be defined by families (Pl. 29); realms or subrealms by subfamilies (Pls. 30 and 31); and genera should be confined to regions (Pl. 29, *Tragopa*; Pl. 30, *Tettigometra*; Pl. 33, *Sextius*; Pl. 39 and Pl. 41); species to subregions, *et cetera*. Now such a broad generalization does not mean that some species do not have a broader distribution than a subregion, or that some genera are not distributed over two, three, or more regions. Some species are found in more than one region; in some cases being distributed by man in connection with his cultivated crops. Thus, the corn plant hopper (*Peregrinus maidis* Ashmead) (Pl. 28) was described from Florida, and occurs in the southern states from North Carolina to Texas, and has been found wherever maize is grown in the tropical and warm temperate regions of the world: Ceylon, Hawaii, Queensland, Fiji, Java, throughout the West Indies, India, New South Wales, Mexico, Nicaragua, Brazil, Nigeria, Philippine Islands, Formosa, Malay Peninsula, Amboyna, Borneo, Natal and Polynesia. Certain genera have a wider distribution than a single zoogeographic region. What I am trying to say is that the taxonomist and systematist should look with suspicion on all such cases of wide distribution, especially of uncorrelated distribution. Genera may have isolated species in South America and in India, or in China and South Africa, but such cases are open to very grave suspicion. There may be cases of genera having species which have lost connections with their centers of origin as in the case of the elephant and horse tribes; but such cases should be established only by careful consideration of all the facts. At the present time we have many genera, especially the older established genera, which were very vaguely defined and which have become the dumping ground for a vast host of species simply because the generic descriptions are too all-inclusive. For example, the genus *Delphacodes* Fieber, as at present constituted, contains no less than 48 species in the Nearctic Region, 105 species in the Palearctic Region, 17 species in the Ethiopian Region, 13 species in the Oriental Region, 19 species in the Caribbean Region, 40 species in the Neotropical Region, 6 in the Australian Region, 1 species in the Austromalayan Region, 1 species in the Maorian Region, and 5 species in the Oceanic Region. Now I have no more reason for believing that the genus *Delphacodes* represents the correct systematic position of these 255 species than that the genus *Cicada* represented the correct position of the 42 species described by Linnaeus in 1758. These 42 species are today distributed among 9 families and 16 genera. The correct solution of such taxonomic problems as presented by the complex genus *Delphacodes*, awaits a better understanding of taxonomic characters, zoogeographic distribution, *et cetera*. It is, of course, barely possible that this genus is a very ancient one of world-wide distribution; but it is certainly a safer assumption that it represents a vague complex with poorly defined and very generalized characters of polyphyletic origin. All such cases should be carefully reconsidered and the boundaries of such taxonomic groups should be redefined and modernized. By these and similar methods only will it be possible to make taxonomy a more exact science.

This belief that there is a mutual interrelation between a true genus and a real zoogeographic region is dependent upon our definition of both terms. That both terms need clearer definitions requires no extended argument at this time.

Having laid down certain zoogeographic concepts, let us examine in more detail the relation between these concepts and our knowledge of the Homoptera as a group, systematically speaking. There are two ways in which the genera of the Homoptera may be classified. First, numerically based on the number of species included in each genus. For this classification we have taken purely arbitrary ranges as follows: genera with a single species; genera with a small number of species, 2-9 inclusive; genera with a moderate number of species, 10-49 inclusive; large genera, with 50-99 species; and very large genera with more than 100 species each.

In the same way we can classify genera on the basis of the geographic distribution of the species included. These would include genera found in a single region only; those found in two or three contiguous regions; genera with most of the species in a single region with a few species in remote regions; and cosmopolitan genera with species in four or more regions.

The relation of these two concepts is clearly shown in the attached Table I.

TABLE I

Size of genera correlated with geographic distribution of species

	NUMBER OF SPECIES IN EACH GENUS				
	1	2–9	10–49	50–99	100
Species confined to a single region	1163	685	65	4	—
Species confined to 2 or 3 contiguous regions	—	454	215	10	1
Species found mainly in one region with scattered species in noncontiguous areas	—	34	63	3	—
Cosmopolitan genera	—	38	67	25	29

Characteristic genera for the various regions are indicated below. Each genus is followed by a number indicating the number of species which have been catalogued from the given region followed by a number or numbers in parentheses indicating the number of doubtful species from other regions.

NEARCTIC REGION

ARAEOPIDAE (formerly DELPHACIDAE)

Laccocera 7

Megamelanus 8 (1 Caribbean, Bermuda)

DERBIDAE

Otiocerus 9 (4 Caribbean)

DICTYOPHARIDAE

Phylloscelis 4

Scolops 31

Deserta 4

ISSIDAE

Fitchiella 8

Bruchomorpha 19 (2 Caribbean, 1 Mexico, 1 Costa Rica)

Neaethus 16

Dictyssa 15

Dictyobia 4

Dyctidea 7

Danepteryx 5

TIBICINIDAE

Tibicinoides 4
Platypedia 17
Okanagana 44
Clidophleps 9

TETTIGELLIDAE (formerly TETTIGONIDAE, TETTIGONIELLIDAE or CICADELLIDAE)

Neokolla 16
Errhomus 6

GYPONIDAE

Xerophloea 12
(1 Caribbean, Puerto Rico)
Gyponana 64
(2 Mexico)

MEGOPHTHALMIDAE

Tiaja 6

COELIDIIDAE (formerly JASSIDAE)

Memnonia 4
Osbornellus 28
Platymoideus 16
Polyamia 32
Amphipyga 9
Commellus 5
Ballana 66 (Pl. 30)
Arundanus 12
Colladonus 19
Idiodonus 18
Tinobregmus 6
Aligia 14
Flexamia 27
Latalus 10
(1 Palearctic)
Hebecephalus 32
Athysanella 11
Ophiola 16
Cyperana 13
Graminella 11
Conodonus 5
Pasadenus 8
Twiningia 10
Alapus 7
Palus 8
Amplicephalus 8
Gladionura 10
Norvellina 26
Elymana 5
Allygianus 4
Gloridonus 8
Acinopterus 21

IASSIDAE (formerly BYTHOSCOPIDAE)

Acertagallia 22

CICADELLIDAE (formerly TYPHLOCYBIDAE or EUPTERYGIDAE)

Forcipata 9
Hymetta 5

MEMBRACIDAE

Publilia 4
(1 Caribbean, Mexico)
Glossonotus 5
Telamona 24
(1 Caribbean, 1 Neotropical)
Cyrtolobus 38 (Pl. 41)
(2 Caribbean)
Carynota 5
Xantholobus 10
Archasia 4

PALEARCTIC REGION

TETTIGOMETRIDAE (Pl. 30)

Tettigometra 34

CIXIIDAE

Hyalesthes 9
Hemitropis 8
(1 Oriental)

ARAEOPIDAE (formerly DELPHACIDAE)

Stiroma 6
Unkana 13
Metropis 8

DICTYOPHARIDAE

Dorysarthrus 4
Sphenocratus 6
Orgerius 21
(1 Nearctic)
Saigona 4
Anorgeriopus 6
Bursinia 14
Nymphorgerius 8

FLATIDAE

Phantia 11
(1 Ethiopian, Eritrea)
Cyphopterum 6

ISSIDAE

Caliscelis 15
(1 Oriental, Ceylon; 1 Neotropical, Rio de Janeiro)
Conosimus 6
(1 Neotropical, Argentina)
Ommatidiotus 12
Mycterodus 10

CICADIDAE

Euterpnosia 13

TIBICINIDAE

Tibicina 10
(1 Neotropical, Chile)
Adeniana 5

TOMASPIDAE

Pseudaufidus 4

CERCOPIDAE

Mesoptyelus 8
Jembropsis 5
Neophilaenus 9

EVACANTHIDAE

Oniella 4

COELIDIIDAE (formerly JASSIDAE)

Distomotettix 7
Stictocoris 4
Doratura 15

IASSIDAE (formerly BYTHOSCOPIDAE)

Symphypyga 5

MEMBRACIDAE

Arisangargara 8

ETHIOPIAN REGION

TETTIGOMETRIDAE

Hilda 10
(1 Palearctic)

CIXIIDAE

Achaemenes 10
Volcanalia 11

Derbidae

Lydda 6 (1 Australian)	*Diostrombus* 18 (2 Oriental, 1 Palearctic, 1 Locality unknown)	*Paraphenice* 8
Phenice 5		*Nicerta* 6

Dictyopharidae

Raphiophora 5

Fulgoridae

Eddara 5	*Metaphaena* 10	*Anecphora* 14
Holodictya 8		

Tropiduchidae

Mulucha 4	*Numicia* 9	

Flatidae

Flatina 10	*Latois* 4	*Gyaria* 6
Chaetormenis 4	*Flatosaria* 7	*Uysanus* 9
Flatoidessa 14	*Paraflatoides* 6	*Dendrona* 5

Issidae

Trienopa 15	*Durium* 5	*Heinsenia* 4

Ricaniidae

Epitemna 9	*Ricanopsis* 4	*Pocharica* 11
Pochazoides 13	*Privesa* 12 (1 Australian)	

Eurybrachidae

Paropioxys 19	*Aspidonitys* 14	*Metoponitys* 8

Cicadidae

Munza 12 (1 Loochoo Island)	*Ugada* 13	*Yanga* 13

Tibicinidae

Quintilia 21 (1 Australian, 1 Locality unknown)	*Lycurgus* 6 (1 Oriental)	*Psilotympana* 4
Taipinga 9 (1 Palearctic, China)	*Trismarcha* 8	*Malagasia* 4
Stagira 8	*Xosopsaltria* 5	*Inyamana* 5
Lacetas 7		

Tomaspidae

Locris 83 (Pl. 39)	*Bandusia* 4	*Rhinaulax* 4
Literna 23	*Amberana* 5	

CERCOPIDAE

Sepullia 14

TETTIGELLIDAE (formerly TETTIGONIDAE, TETTIGONIELLIDAE or CICADELLIDAE)

Wolfella 5

COELIDIIDAE (formerly JASSIDAE)

Palicus 5

MEMBRACIDAE

Xiphopoeus 8
Tricoceps 4
Gongroneura 7
Congellana 4
Platybelus 10
Monocentrus 7
Evanchon 4

AETALIONIDAE

Coloborrhis 4

ORIENTAL REGION

FULGORIDAE

Saiva 9
(1 Malaysian, Borneo)

FLATIDAE

Hilavrita 4

LOPHOPIDAE

Pitambara 6
(1 Malaysian, Borneo)

EURYBRACHIDAE

Eurybrachys 14
(1 Malaysian, Sumatra;
1 Neotropical, French Guiana)
Ancyra 6
Thessitus 4
Loxocephala 4

CICADIDAE

Haphsa 7
(1 Palearctic, Yunnan; 1 Palearctic, Macao; 1 Austromalaysian, New Guinea)
Balinta 6
Khimbya 5

TOMASPIDAE

Callitettix 8 (Pl 39)
Abidama 5
(1 Palearctic; Szechwan)

GYPONIDAE

Tambila 5

CICADELLIDAE (formerly TYPHLOCYBIDAE or EUPTERYGIDAE)

Empoanara 5

MEMBRACIDAE

Hypsauchenia 7
(1 Malaysian)

Coccosterphus 8

Parayasa 11
(1 Malaysian)

MALAYSIAN REGION

DERBIDAE

Zoraida (*Peggiopsis*) 18
(1 Ethiopian; 2 Oriental; 1 Austromalayan)

Leomelicharia 6

Zeugma 6
(1 Palearctic, Formosa; 1 Oriental, Malay Peninsula)

Kaha 10
(1 Palearctic, Formosa; 1 Australian)

Nesokaha 5
(1 Palearctic, Formosa)

TROPIDUCHIDAE

Neocatara 4

FLATIDAE

Bythopsyrna 14

ISSIDAE

Eupilis 5

Syrgis 5

RICANIIDAE

Pochazina 8

LOPHOPIDAE

Menosca 7
(1 Oriental)

Lapithasa 4

CICADIDAE

Maua 9
(1 Palearctic, China)

Ayesha 4

Psithyristria 5

TIBICINIDAE

Prasia 5

TOMASPIDAE

Considia 7
(3 Oriental, Malacca)

Keducarta 4
(2 Oriental, Malacca, Singapore)

Phlebarcys 5

Poeciloterpa 8

Sialoscarta 7

CERCOPIDAE

Flosshilda 5

Plinia 6

MEMBRACIDAE

Pyrgauchenia 9

Pyrgonota 14

Centrochares 5
(1 Oriental, Singapore)

Cryptaspidia 9

AUSTROMALAYAN REGION

Fulgoridae

Myrilla 7
(1 Malaysian, Buru Island)

Cicadidae

Sawda 5
(1 Oceanic, Fiji)

Tibicinidae

Ueana 8
Mouia 4

AUSTRALIAN REGION

Flatidae

Massila 4
Dascalina 5

Eurybrachidae

Platybrachys 16
Olonia 9
Dardus 6

Cicadidae

Thopha 4
Psaltoda 10
Macrotristria 17

Tibicinidae

Burbunga 6
Kobonga 4
Pauropsalta 13
(1 Palearctic, Mediterranean, 1 Oriental)
Urabunana 8

Cercopidae

Bathyllus 4

Gyponidae

Vulturnus 7
(2 Oriental, Ceylon)

Megophthalmidae

Stenocotis 9

Coelidiidae (formerly Jassidae)

Rhotidus 15

Eurymelidae

Eurymela 5
Eurymeloides 10

Iassidae (formerly Bythoscopidae)

Austroagalloides 7

Membracidae

Ceraon 8
Sextius 14 (Pl. 33)
Acanthuchus 16
(1 Oriental)
Eutryonia 4
Sertorius 10

MAORIAN REGION

CIXIIDAE

Koroana 2
Malpha 4
Semo 1
Huttia 2

OCEANIAN REGION

CIXIIDAE

Oliarus (*Nesoliarus*) 52

ARAEOPIDAE (formerly DELPHACIDAE)

Leialoha 11
Ilburnia 79 (Pl. 33)
(1 Ethiopian, St. Helena; 1 Neotropical, Galapagos)
Nesodryas 24
Aloha 10

TROPIDUCHIDAE

Vanua 7

CERCOPIDAE

Lallemandana 14 (Pl. 30)
(1 Austromalayan, Loyalty Islands)

COELIDIIDAE (formerly JASSIDAE)

Nesophrosyne 36
Nesophyla 8

NEOTROPICAL REGION

ARAEOPIDAE (formerly DELPHACIDAE)

Canyra 8
(1 Locality unknown)
Columbisoga 10
(2 Oriental; 1 Palearctic, Formosa)

DICTYOPHARIDAE

Diacira 6
Dictyopharoides 7
(1 Caribbean)
Taosa 15

FULGORIDAE

Lystra 6
(1 Caribbean)
Fulgora 6
(1 Caribbean, Mexico)
Poiocera 18
(2 Locality unknown)
Phrictus 12
(2 Caribbean, Panama)
Dilobura 6

TROPIDUCHIDAE

Alphesiboea 6

NOGODINIDAE

Vutina 5
(1 Caribbean, Panama)
Bladina 5

FLATIDAE

Poekilloptera 5
Phalaenomorpha 8

ACANALONIDAE

Philatis 6	*Thiscia* 4	

ISSIDAE

Plagiopsis 4	*Acrisius* 5	*Heremon* 6

CICADIDAE

Zammara 7	*Tympanoterpes* 8 (1 Locality unknown)	*Ariasa* 8
Majeorona 6		

TIBICINIDAE

Calyria 6	*Parnisa* 8	*Tettigades* 7 (1 Palearctic and Caribbean, Arizona and Mexico)

TOMASPIDAE

Baetkia 4	*Laccogrypota* 12 (Pl. 39)	*Homalogrypota* 4
Ischnorhina 8	*Mahanarva* 4	*Tomaspisinella* 13
Hyboscarta 8		

CERCOPIDAE

Sphodroscarta 7	*Balsana* 8	*Avernus* 4

TETTIGELLIDAE (formerly TETTIGONIELLIDAE, TETTIGONIDAE or CICADELLIDAE)

Dilobopterus 14 (2 Caribbean, Mexico)	*Acrogonia* 4	*Ciccus* 8
Proconia 23 (2 Caribbean, St. Vincent Island)	*Heterostemma* 4	*Acrocampsa* 5
Teletusa 9	*Raphirhinus* 7	*Stictoscarta* 8
Homoscarta 4	*Coelopola* 4	*Abana* 11 (1 Caribbean, Costa Rica)
Myogonia 4		

GYPONIDAE

Scaris 6		

MEMBRACIDAE

Lycoderes 18 (2 Caribbean)	*Stegaspis* 8	*Bocydium* 5
Alchisme 12	*Cymbomorpha* 9	*Iria* 6
Rhexia 10	*Sundarion* 5	*Hemikyptha* 5
Anchistrotus 6	*Cyphonia* 9	*Antonae* 7
Centrogonia 12	*Penichrophorus* 7	*Hille* 5
Gelastogonia 11	*Maturna* 7	*Aphetea* 7 (1 Caribbean, Guatemala)
Tragopa 48 (Pl. 29) (2 Caribbean)	*Erechtia* 30 (1 Caribbean, Mexico)	
Membracis 31 (3 Caribbean)		

AETALIONIDAE

Biturritia 6	*Tolania* 11 (1 Caribbean, Cuba)	

CARIBBEAN REGION

DERBIDAE

Neocenchrea 4 (1 Nearctic)		

FLATIDAE

Antillormenis 9	*Flatormenis* 9 (1 Neotropical, Ecuador)	

ISSIDAE

Colpoptera 13	*Picumna* 7 (2 Nearctic, Arizona)	

CERCOPIDAE

Leocomia 11		

TETTIGELLIDAE (formerly TETTIGONIDAE, TETTIGONIELLIDAE or CICADELLIDAE)

Arezzia 6	*Hadria* 6	*Hortensia* 4

COELIDIIDAE (formerly JASSIDAE)

Omanana 12		

MEMBRACIDAE

Nessorhinus 4	*Monobelus* 8	*Callicentrus* 6
Poppea 8 (1 Neotropical, Peru)		

Extended discussion of the genera with only a single species which are confined to a single geographic region is not needed. Whether they are valid or not would depend upon other factors than the geographic distribution. As may be noted from Table I these constitute more than one third of the known genera.

My belief is that the vast majority of the larger genera which include species from only a single region are true phylogenetic genera. As noted in Table I these constitute more than one eighth of the known genera. Examples of genera of this type may be found in the table of genera characteristic for the zoogeographic regions.

In the same way we may conclude that the vast majority of the genera that are confined to two or three contiguous areas represent true phylogenetic genera. These represent more than one fifth of the known genera. Even though we assume that these genera are valid phylogenetic concepts, we should nevertheless bear in mind that all of them need careful reconsideration to determine whether this validity is anything more than geographic propinquity. Some of the larger genera of this group with their known distribution may be listed as follows:

LARGE GENERA FROM 2 OR 3 CONTIGUOUS REGIONS

CIXIIDAE

Pintalia: 22 Caribbean, 40 Neotropical, 1 Nearctic
Oecleus: 26 Nearctic, 19 Caribbean
Bothriocera: 19 Caribbean, 10 Nearctic, 5 Neotropical

ARAEOPIDAE (formerly DELPHACIDAE)

Stobaera: 7 Nearctic, 6 Caribbean

DERBIDAE

Mysidia: 20 Neotropical, 15 Caribbean

FULGORIDAE

Scamandra: 20 Malaysian, 4 Oriental (Malay Peninsula)
Laternaria: 31 Malaysian, 24 Oriental, 3 Palearctic, 12 Formosa, 1 China

ACHILIDAE

Catonia: 33 Nearctic, 11 Caribbean

FLATIDAE

Anormenis: 15 Neotropical, 6 Caribbean, 3 Nearctic
Neomelicharia: 21 Malaysian, 5 Austromalayan, 3 Australian

ACANALONIIDAE

Acanalonia: 21 Caribbean, 20 Nearctic, 8 Neotropical

ISSIDAE

Bruchomorpha: 20 Nearctic, 4 Caribbean
Aphelonema: 16 Nearctic, 10 Palearctic, 2 Caribbean
Gergithus: 18 Palearctic, 17 Oriental, 7 Malaysian
Hemisphaerius: 54 Malaysian, 17 Oriental, 9 Austromalayan, 7 Palearctic (Pl. 36)
Thionia: 32 Neotropical, 20 Caribbean, 10 Neartic (Pl. 37)

CICADIDAE

Diceroprocta: 22 Nearctic, 18 Caribbean, 2 Neotropical
Cryptotympana: 21 Palearctic, 17 Oriental, 11 Malaysian, 1 Australian
Proarna: 15 Neotropical, 9 Caribbean, 1 Nearctic
Fidicina: 31 Neotropical, 4 Caribbean
Terpnosia: 17 Oriental, 8 Palearctic, 2 Malaysian
Cosmopsaltria: 12 Malaysian, 9 Oriental, 6 Palearctic, 1 Austromalayan
Platylomia: 18 Oriental, 11 Malaysian, 8 Palearctic, 1 Austromalayan
Meimuna: 17 Palearctic, 11 Oriental, 3 Malaysian
Cicadatra: 20 Palearctic, 8 Oriental
Pomponia: 13 Malaysian, 12 Oriental, 2 Palearctic, 1 Austromalayan
Mogannia: 25 Palearctic, 16 Malaysian, 15 Oriental

TIBICINIDAE

Carineta: 39 Neotropical, 5 Caribbean

TOMASPIDAE

Monecphora: 62 Neotropical, 11 Caribbean, 2 Nearctic (Pl. 38)
Trichoscarta: 20 Malaysian, 3 Oriental, 3 Austromalayan

Phymatostetha: 38 Oriental, 25 Malaysian, 1 Palearctic
Cosmoscarta: 78 Oriental, 60 Malaysian, 16 Palearctic, 10 Austromalayan
Ectemnonotum: 34 Malaysian, 5 Oriental
Megastethodon: 26 Austromalayan, 12 Malaysian, 1 Australian
Leptataspis: 63 Malaysian, 38 Oriental, 21 Austromalayan, 2 Palearctic

CLASTOPTERIDAE

Clastoptera: 30 Nearctic, 30 Neotropical, 16 Caribbean

TETTIGELLIDAE (formerly TETTIGONIDAE, TETTIGONIELLIDAE or CICADELLIDAE)

Poeciloscarta: 67 Neotropical, 28 Caribbean
Oncometopia: 51 Neotropical, 21 Caribbean, 13 Nearctic
Aulacizes: 31 Neotropical, 13 Caribbean, 2 Nearctic
Graphocephala: 22 Neotropical, 9 Caribbean, 5 Nearctic

COELIDIIDAE (formerly JASSIDAE)

Laevicephalus: 57 Nearctic, 4 Palearctic, 1 Caribbean
Chlorotettix: 51 Nearctic, 10 Caribbean, 8 Neotropical
Ballana: 66 Nearctic, 2 Caribbean (Pl. 30)

MEMBRACIDAE

Aconophora: 19 Caribbean, 12 Neotropical
Ceresa: 19 Nearctic, 16 Neotropical, 9 Caribbean (Pl. 31)
Cyrtolobus: 36 Nearctic, 2 Caribbean (Pl. 41)
Micrutalis: 13 Caribbean, 10 Neotropical, 6 Nearctic
Enchenopa: 20 Neotropical, 11 Caribbean, 2 Nearctic

The genera with most of their species from one region or contiguous regions, with scattered species from other non-contiguous areas, would not be valid under the present assumptions. Two explanations may be advanced for these. Either they represent genera which have a wide distribution with the intermediate areas poorly surveyed; or they represent genera which are poorly defined and have received species which should not be included. In the majority of cases, I believe the latter is the better explanation. Striking examples of genera that fall in this category are the following:

LARGE GENERA WITH MOST OF SPECIES FROM 1 REGION OR CONTIGUOUS REGIONS PLUS ISOLATED SPECIES

ARAEOPIDAE (formerly DELPHACIDAE)

Ilburnia: 82 Hawaiian Islands, 1 Galapagos Islands, 1 St. Helena Island (Pl. 33)

DICTYOPHARIDAE

Orgerius: 21 Palearctic, 1 Nearctic (Pl. 34)

TIBICINIDAE

Quintilia: 21 Ethiopian, 1 Australian

TOMASPIDAE

Tomaspis: 76 Neotropical, 27 Caribbean, 2 Ethiopian (Pl. 36)
Sphenorhina: 72 Neotropical, 14 Caribbean, 1 Ethiopian (Pl. 33)

CERCOPIDAE

Cercopis: 45 Palearctic, 2 Caribbean, 2 Nearctic, 1 Ethiopian, 1 Oriental

Lastly there are the genera which have, at the present time, a more or less cosmopolitan distribution. Again two ideas may be advanced to account for this wide distribution. Either these are true cosmopolitan genera at the height of their development; or they are an assemblage of species which resemble each other superficially, but not fundamentally. The latter again seems to be the more logical explanation.

If we examine the history of the spread of the horselike animals, they had a nearly world-wide distribution as represented by fossil remains of their close kin; but living species of the genus *Equus* were confined to restricted areas in central Asia and central Africa.

The elephant-like animals spread through the ages from their center of origin in the lower Nile Valley to all regions of the world except Australia. But, the living elephant-like animals are confined to the genus *Elaphas* of the Oriental Region and its close relative *Loxodonta* of Africa.

If this is true of animals of fairly recent origin, it is more than likely true for animals of very ancient origin.

Outstanding examples of so-called cosmopolitan genera are the following:

COSMOPOLITAN GENERA

CIXIIDAE

Andes: 27 Malaysian, 6 Oriental, 1 Austromalayan, 1 Ethiopian
Oliarus: 67 Palearctic, 36 Nearctic, 34 Malaysian, 31 Ethiopian, 22 Oriental, 12 Caribbean, 16 Australian, 9 Oceanic, 4 Neotropical, 1 Austromalayan (Pl. 32)
Myndus: 23 Nearctic, 11 Malaysian, 6 Oceanic, 6 Caribbean, 1 Oriental
Cixius: 62 Palearctic, 18 Nearctic, 18 Neotropical, 9 Ethiopian, 14 Malaysian, 5 Caribbean, 4 Austromalayan, 9 Ethiopian, 3 Australian, 3 Oceanic, 2 Oriental, 2 Maorian

ARAEOPIDAE (formerly DELPHACIDAE)

Ugyops: 14 Malaysian, 9 Oceanic, 6 Austromalayan, 3 Ethiopian, 2 Oriental, 2 Australian, 2 Caribbean, 2 Palearctic
Tropidocephala: 12 Palearctic, 11 Malaysian, 5 Ethiopian, 4 Oriental, 3 Austromalayan, 4 Australian
Perkinsiella: 22 Malaysian, 8 Australian, 8 Austromalayan, 7 Oceanic, 3 Oriental, 2 Palearctic, 1 African
Stenocranus: 22 Palearctic, 6 Nearctic, 6 Malaysian, 1 Australian, 1 Ethiopian, 1 Neotropical, 1 Oceanic
Kelisia: 20 Palearctic, 10 Neotropical, 4 Nearctic, 4 Oceanic, 3 Ethiopian, 1 Malaysian, 1 Oriental
Megamelus: 12 Nearctic, 7 Palearctic, 6 Australian, 4 Neotropical, 3 Malaysian, 1 Oceanic, 1 Austromalayan
Dicranotropis: 13 Palearctic, 11 Ethiopian, 7 Malaysian, 3 Australian, 1 Nearctic, 3 Neotropical, 2 Caribbean, 10 Oceanic
Liburnia: 13 Palearctic, 13 Ethiopian, 9 Neotropical, 7 Australian, 6 Malaysian, 5 Oceanic, 5 Oriental, 4 Nearctic, 4 Caribbean
Delphacodes: 111 Palearctic, 52 Nearctic, 42 Neotropical, 23 Caribbean, 21 Ethiopian, 12 Oriental, 8 Malaysian, 7 Australian, 6 Oceanic, 1 Austromalayan

DERBIDAE

Zoraida: 49 Malaysian, 16 Oriental, 16 Ethiopian, 7 Australian, 5 Palearctic, 5 Austromalayan, 1 Oceanic

Cedusa: 16 Nearctic, 11 Caribbean, 9 Ethiopian, 3 Australian, 2 Palearctic, 2 Neotropical

DICTOPHARIDAE

Dictyophara: 26 Palearctic, 17 Ethiopian, 12 Neotropical, 9 Malaysian, 9 Oriental, 5 Australian, 1 Caribbean

FLATIDAE

Flata: 11 Malaysian, 11 Oriental, 9 Ethiopian, 3 Austromalayan, 2 Palearctic
Lawana: 14 Malaysian, 5 Oriental, 5 Ethiopian, 1 Palearctic, 1 Neotropical
Ormenis: 19 Caribbean, 8 Neotropical, 4 Nearctic, 2 Ethiopian, 1 Oriental
Atracis: 22 Oriental, 18 Malaysian, 9 Caribbean, 16 Palearctic, 8 Ethiopian, 3 Neotropical
Flatoides: 16 Caribbean, 5 Nearctic, 4 Neotropical, 2 Ethiopian, 1 Malaysian

ISSIDAE

Hysteropterum: 76 Palearctic, 8 Nearctic, 6 Caribbean, 2 Australian, 2 Ethiopian, 2 Neotropical, 1 Malaysian (Pl. 35)

Issus: 18 Palearctic, 5 Malaysian, 1 Nearctic, 1 Caribbean, 1 Australian

RICANIIDAE

Pochazia: 17 Malaysian, 14 Oriental, 6 Ethiopian, 4 Palearctic, 1 Austromalayan
Ricania: 25 Malaysian, 16 Oriental, 13 Ethiopian, 12 Austromalayan, 11 Palearctic, 11 Australian (Pl. 38)

Ricanula: 12 Austromalayan, 12 Malaysian, 7 Ethiopian, 5 Oriental, 2 Palearctic, 1 Neotropical

CICADIDAE

Platypleura: 29 Ethiopian, 17 Palearctic, 20 Oriental, 4 Malaysian, 1 Australian, 1 Oceanic
Chremistica: 11 Malaysian, 7 Oriental, 6 Palearctic, 4 Ethiopian
Tibicen: 46 Nearctic, 17 Palearctic, 4 Caribbean, 2 Neotropical, 2 Oceanic, 1 Oriental, 1 Ethiopian, 1 Malaysian

TIBICINIDAE

Cicadetta: 61 Australian, 38 Palearctic, 29 Oriental, 8 Ethiopian, 7 Austromalayan, 4 Nearctic, 1 Malaysian, 1 Neotropical, 1 Oceanic

TOMASPIDAE

Triecphora: 25 Ethiopian, 9 Palearctic, 8 Neotropical (Pl. 40)
Aufidus: 21 Austromalayan, 13 Malaysian, 5 Oriental, 3 Australian, 2 Oceanic, 1 Palearctic

CERCOPIDAE

Ptyelus: 22 Ethiopian, 14 Oriental, 11 Austromalayan, 5 Palearctic, 1 Maorian
Clovia: 67 Malaysian, 49 Austromalayan, 34 Ethiopian, 17 Oriental, 6 Palearctic, 6 Australian (Pl. 34)

Aphrophora: 70 Palearctic, 11 Nearctic, 11 Oriental, 4 Neotropical, 4 Caribbean, 1 Ethiopian
Philagra: 16 Palearctic, 7 Oriental, 3 Malaysian, 4 Australian
Cercopis: 45 Palearctic, 1 Oriental, 2 Caribbean, 1 Ethiopian, 2 Nearctic

TETTIGELLIDAE (formerly TETTIGONIDAE, TETTIGONIELLIDAE or CICADELLIDAE)

Tettigella (formerly *Cicadella* or *Tettigonia*): 238 Neotropical, 69 Caribbean, 52 Oriental, 53 Malaysian, 40 Palearctic, 35 Ethiopian, 10 Austromalayan, 6 Nearctic, 1 Oceanic

Kolla: 20 Oriental, 9 Malaysian, 4 Nearctic, 3 Palearctic, 3 Ethiopian, 3 Caribbean, 3 Neotropical, 1 Australian

GYPONIDAE

Gypona: 112 Neotropical, 41 Caribbean, 7 Nearctic, 1 Oriental, 1 Australian
Penthimia: 21 Oriental, 12 Malaysian, 8 Ethiopian, 8 Palearctic, 3 Neotropical, 2 Nearctic, 1 Australian, 1 Austromalayan

LEDRIDAE

Ledra: 13 Oriental, 13 Malaysian, 8 Australian, 6 Palearctic, 1 Neotropical
Petalocephala: 27 Oriental, 12 Palearctic, 9 Malaysian, 7 Ethiopian, 2 Austromalayan, 2 Australian

COELIDIIDAE (formerly JASSIDAE)

Xestocephalus: 15 Nearctic, 8 Palearctic, 8 Caribbean, 6 Oriental, 5 Neotropical, 5 Malaysian, 4 Oceanic, 2 Australian, 1 Austromalayan
Selenocephalus: 18 Ethiopian, 6 Palearctic, 4 Oriental, 2 Malaysian, 2 Austromalayan
Hecalus: 9 Palearctic, 7 Malaysian, 6 Ethiopian, 5 Oriental, 4 Nearctic, 1 Neotropical, 1 Australian
Parabolocratus: 15 Nearctic, 13 Palearctic, 4 Oriental, 4 Ethiopian, 3 Malaysian, 1 Neotropical
Scaphoideus: 49 Nearctic, 18 Oriental, 10 Palearctic, 8 Neotropical, 5 Ethiopian, 2 Caribbean, 1 Malaysian, 1 Australian
Platymetopius: 23 Palearctic, 5 Neotropical, 3 Caribbean, 2 Nearctic, 1 Oriental
Deltocephalus: 172 Palearctic, 42 Nearctic, 24 Oriental, 19 Caribbean, 15 Neotropical, 5 Ethiopian, 4 Australian, 3 Malaysian
Euscelis: 20 Palearctic, 11 Nearctic, 4 Caribbean, 4 Neotropical, 5 Oriental, 4 Australian, 1 Ethiopian
Athysanus: 100 Palearctic, 17 Neotropical, 6 Nearctic, 5 Ethiopian, 3 Caribbean, 3 Oriental
Eutettix: 13 Nearctic, 12 Neotropical, 6 Oriental, 6 Malaysian, 5 Palearctic, 4 Ethiopian, 3 Australian, 1 Oceanic
Phlepsius: 70 Nearctic, 13 Neotropical, 10 Palearctic, 8 Caribbean, 6 Ethiopian, 2 Oriental
Thamnotettix: 104 Palearctic, 35 Nearctic, 23 Neotropical, 11 Ethiopian, 6 Caribbean, 4 Oriental, 4 Malaysian, 2 Oceanic
Coelidia: 71 Neotropical, 31 Palearctic, 25 Oriental, 7 Caribbean, 5 Nearctic, 31 Malaysian, 13 Ethiopian, 11 Austromalayan
Balclutha: 26 Palearctic, 7 Oriental, 7 Caribbean, 7 Nearctic, 2 Neotropical, 6 Ethiopian, 4 Malaysian, 1 Austromalayan
Cicadula: 28 Palearctic, 4 Oceanic, 2 Nearctic, 2 Caribbean, 2 Oriental, 1 Neotropical, 1 Malaysian, 1 Australian, 1 Ethiopian

IASSIDAE (formerly BYTHOSCOPIDAE)

Macropsis: 47 Palearctic, 32 Nearctic, 12 Ethiopian, 11 Australian, 8 Malaysian, 3 Oriental, 1 Caribbean
Agallia: 28 Palearctic, 24 Caribbean, 19 Neotropical, 10 Nearctic, 5 Oriental, 2 Ethiopian, 1 Oceanic
Iassus (formerly *Bythoscopus*): 17 Palearctic, 16 Neotropical, 6 Oriental, 6 Oceanic, 6 Australian, 5 Malaysian, 5 Ethiopian, 2 Caribbean, 1 Nearctic
Idiocerus: 70 Palearctic, 40 Nearctic, 29 Neotropical, 17 Australian, 6 Oriental, 4 Ethiopian, 2 Caribbean, 2 Malaysian, 1 Oceanic

CICADELLIDAE (formerly EUPTERYGIDAE or TYPHLOCYBIDAE)

Dikraneura: 36 Nearctic, 14 Palearctic, 13 Neotropical, 11 Caribbean, 2 Australian, 1 Maorian

PLATE 24

The phylogeny and dispersal of the elephant-like animals from a hypothetical center in northern Africa. The present distribution of elephants is indicated by the heavy shading. Each animal has a scale indicating its height in feet and a geological column indicating its distribution in time by black. 1. A mastodon, *Gomphotherium*. 2. A four-tusked mastodon, *Triphodon*. 3. The Columbian elephant, *Parelephas*. 4. A serrate-toothed mastodon, *Serridentinus*. 5. The woolly mammoth, *Mammonteus*. 6. A mammoth, *Stegodon*. 7. The Indian elephant, *Elephas*. 8. A long-jawed mastodont, *Dinotherium*. 9. A long-jawed mastodont, *Phiomia*. 10. An amphibious mastodont, *Moeritherium*. 11. A long-jawed mastodon, *Palaeomastodon*. 12. A true mastodon, *Mastodon*. 13. The African elephant, *Loxodonta*.

PLATE 25

The dispersal of the starling from the time of its introduction in New York in 1890. Based on Goode's Base Map No. 9 by permission of The University of Chicago Press.

PLATE 26

The dispersal of the boll weevil from the time of its introduction in Texas in 1892. The dotted line indicates the approximate northern limit of the growth of cotton. Based on Goode's Base Map No. 9 by permission of The University of Chicago Press.

PLATE 27

The zoogeographic map of the world based on a study of the distribution of genera and species of Homoptera. Solid lines indicate the approximate boundaries of regions. Dotted lines of subregions. Solid black indicates areas with indefinite boundaries. New regions proposed are as follows: Caribbean, including Mexico, Central America and West Indies; Malaysian, including the East Indies and the Philippines; Austromalayan, including New Guinea and Melanesia; and Maorian, with New Zealand and the adjacent islands. Based on Goode's Base Map No. 101M by permission of the University of Chicago Press.

PLATE 28

Known distribution of the corn plant hopper, *Peregrinus maidis* Ashmead, indicated by crosshatched areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 29

The distribution of the species of the genus *Tragopa*, indicated by the crosshatched areas. Known distribution of species of the Family MACHAEROTIDAE, indicated by the stippled areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 30

Distribution of the species of the genus *Lallemandana*, indicated by the stippled areas. Distribution of the species of the genus *Ballana*, indicated by vertically lined areas. Distribution of the species of the Subfamily TETTIGOMETRINAE, indicated by the crosshatched areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 31

Distribution of the species of the Subfamily EGROPINAE, indicated by the vertically lined areas. Distribution of the species of the genus *Ceresa*, indicated by the stippled areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 32

Distribution of the species of the genus *Oliarus*, indicated by the vertically lined areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 33

Distribution of the species of the genus *Ilburnia*, indicated by the crosshatched areas. Distribution of the species of the genus *Sphenorhina*, indicated by the stippled areas. Distribution of the species of the genus *Sextius*, indicated by the vertically lined areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 34

Distribution of the species of the genus *Orgerius*, indicated by the crosshatched areas. Distribution of the species of the genus *Clovia*, indicated by the stippled areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 35

Distribution of the species of the genus *Hysteropterum*, indicated by the stippled areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 36

Distribution of the species of the genus *Tomaspis*, indicated by crosshatched areas. Distribution of the species of the genus *Hemisphaerius*, indicated by the stippled areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 37

Distribution of the species of the genus *Thionia*, indicated by the vertically lined areas. Based on Goode's Base No. 101M by permission of The University of Chicago Press.

PLATE 38

Distribution of the species of the genus *Monecphora*, indicated by the stippled areas. Distribution of the species of the genus *Ricania*, indicated by the vertically lined areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 39

Distribution of the species of the genus *Laccogrypota*, indicated by the vertically lined areas. Distribution of the species of the genus *Locris*, indicated by the stippled areas. Distribution of the species of the genus *Callitettix*, indicated by the crosshatched areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 40

Distribution of the species of the genus *Triecphora*, indicated by the stippled areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

PLATE 41

Distribution of the species of the genus *Cyrtolobus*, indicated by the vertically lined areas. Distribution of the oaks of the genus *Quercus*, upon which most of the species of the genus *Cyrtolobus* feed, is shown by the stippled areas. Based on Goode's Base Map No. 101M by permission of The University of Chicago Press.

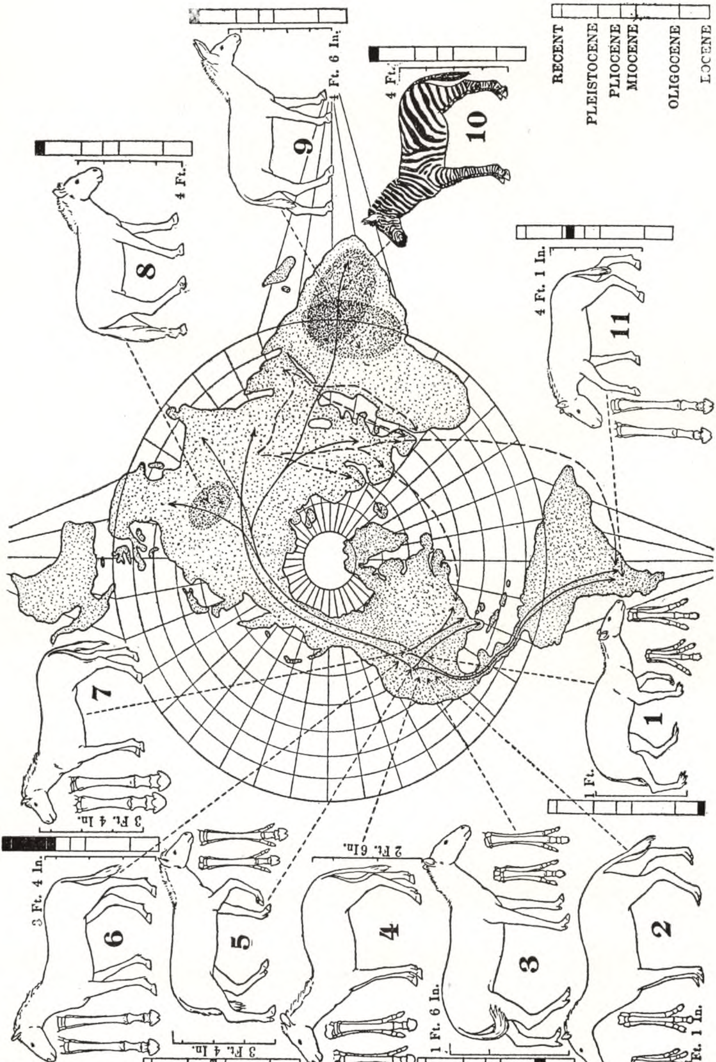
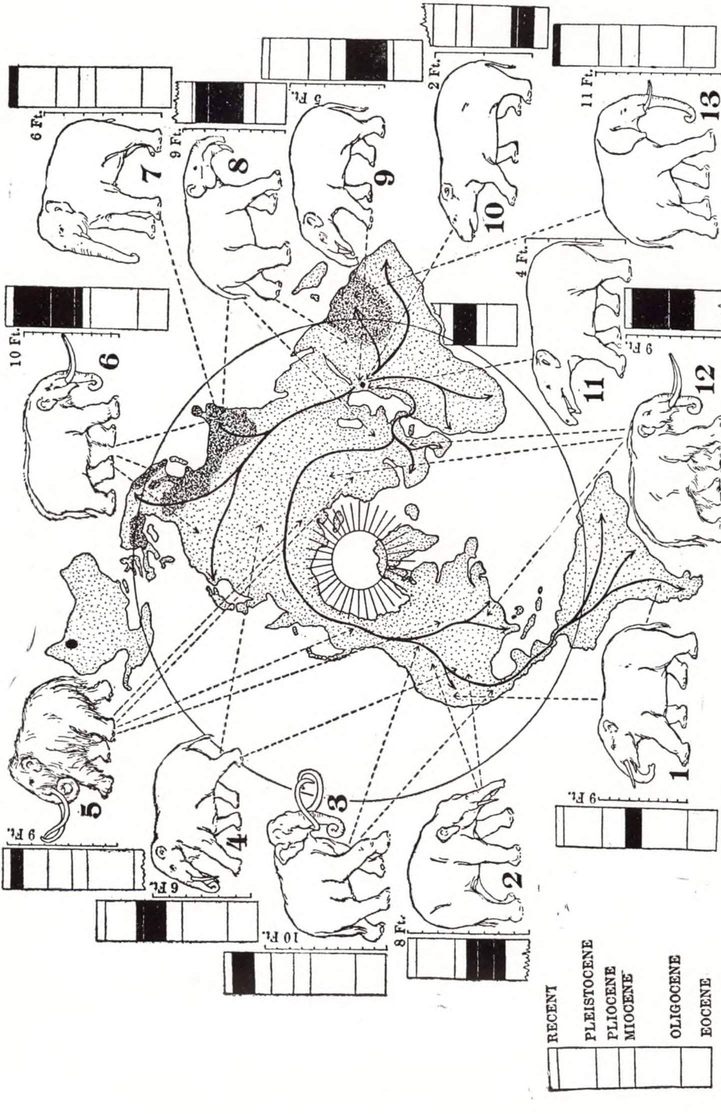

RECENT
PLEISTOCENE
PLIOCENE
MIOCENE
OLIGOCENE
1
2
3
4
5
6
7
8
9
10
11
1 Ft.
1 Ft. 1 In.
1 Ft. 6 In.
2 Ft. 6 In.
3 Ft. 4 In.
4 Ft.
4 Ft. 1 In.

PLATE 24


RECENT
PLEISTOCENE
PLIOCENE
MIOCENE
OLIGOCENE
EOCENE
1
2
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7
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12
13
9 Ft.
8 Ft.
10 Ft.
6 Ft.
9 Ft.
10 Ft.
6 Ft.
9 Ft.
5 Ft.
2 Ft.
4 Ft.
9 Ft.
11 Ft.

PLATE 25

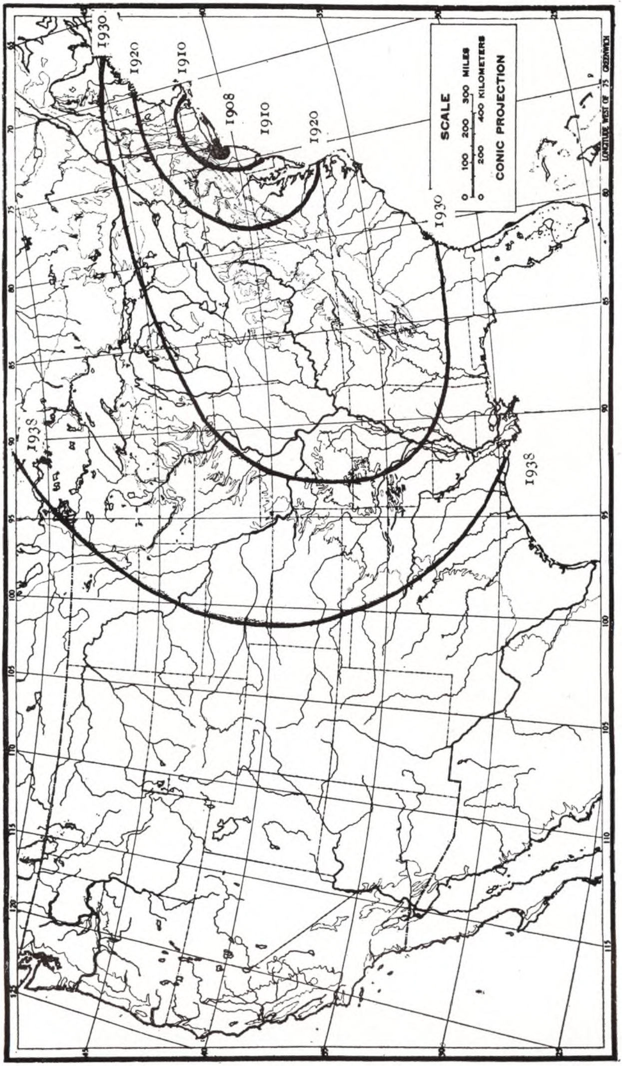
1930
1920
1910
1908
1910
1920
1930
1938
1938
SCALE
0 100 200 300 MILES
0 200 400 KILOMETERS
CONIC PROJECTION

PLATE 26

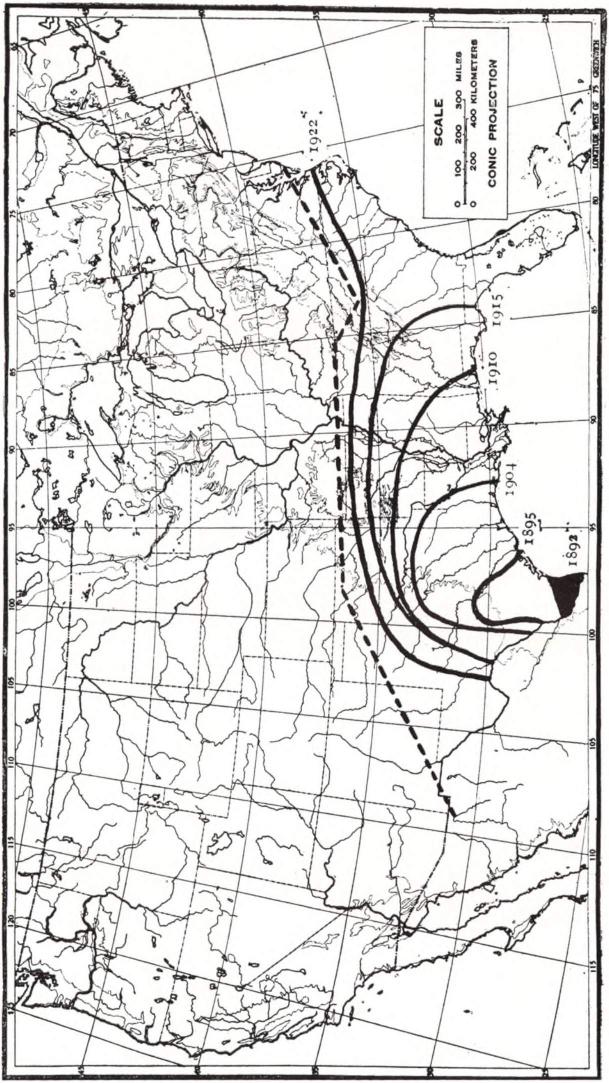
SCALE
0 100 200 300 MILES
0 200 400 KILOMETERS
CONIC PROJECTION
1892
1895
1904
1910
1915
1922
LONGITUDE WEST OF 75 GREENWICH

PLATE 27

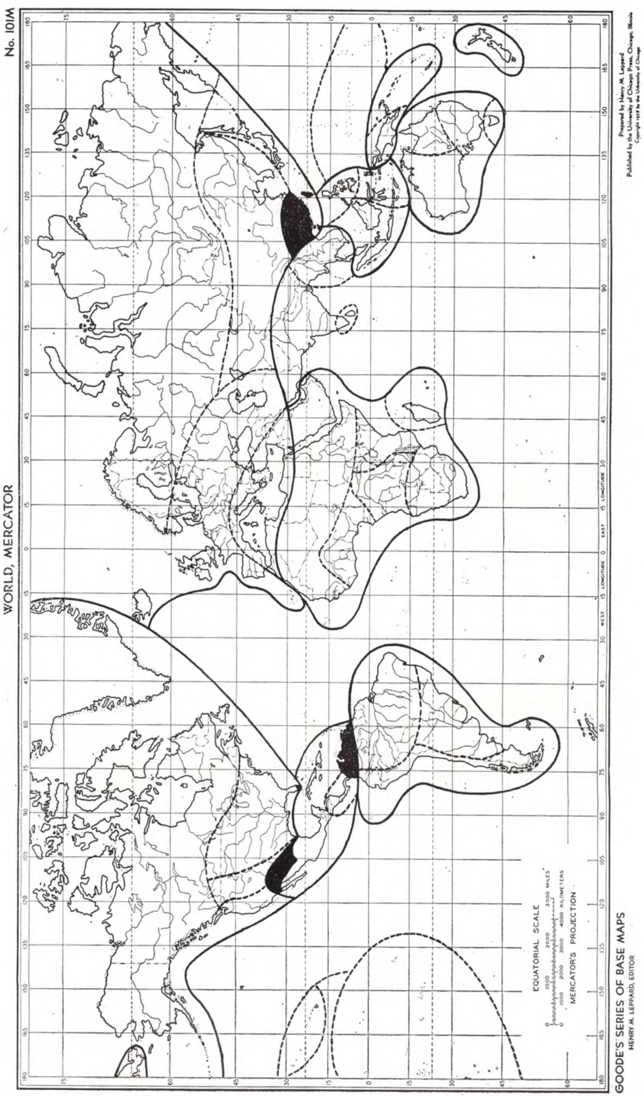
No. 101M
WORLD, MERCATOR
EQUATORIAL SCALE
MERCATOR'S PROJECTION
GOODE'S SERIES OF BASE MAPS
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PLATE 28

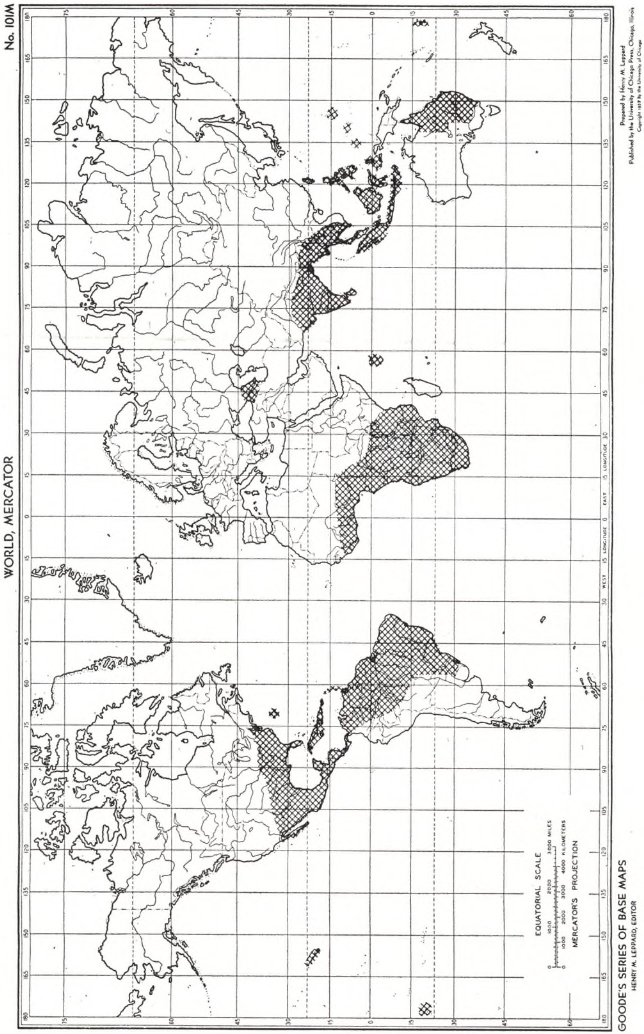
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PLATE 29

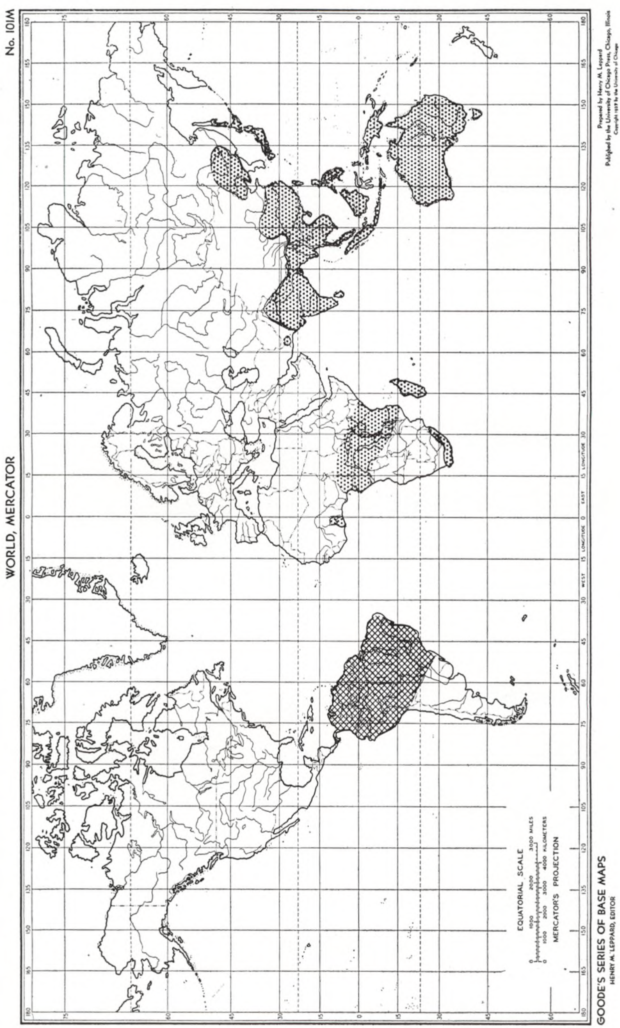
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PLATE 30

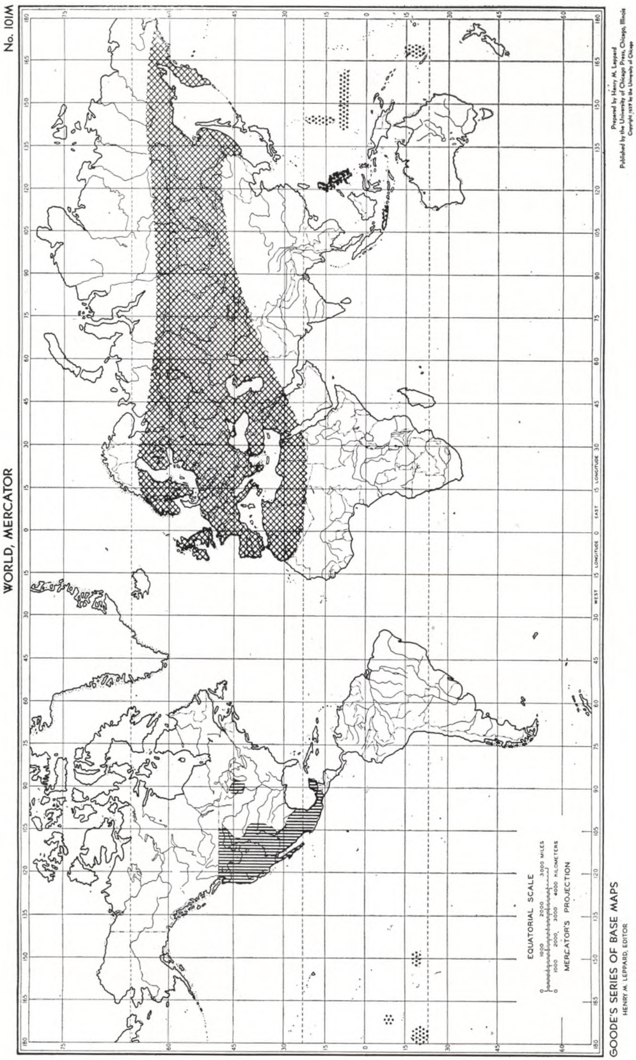
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PLATE 31

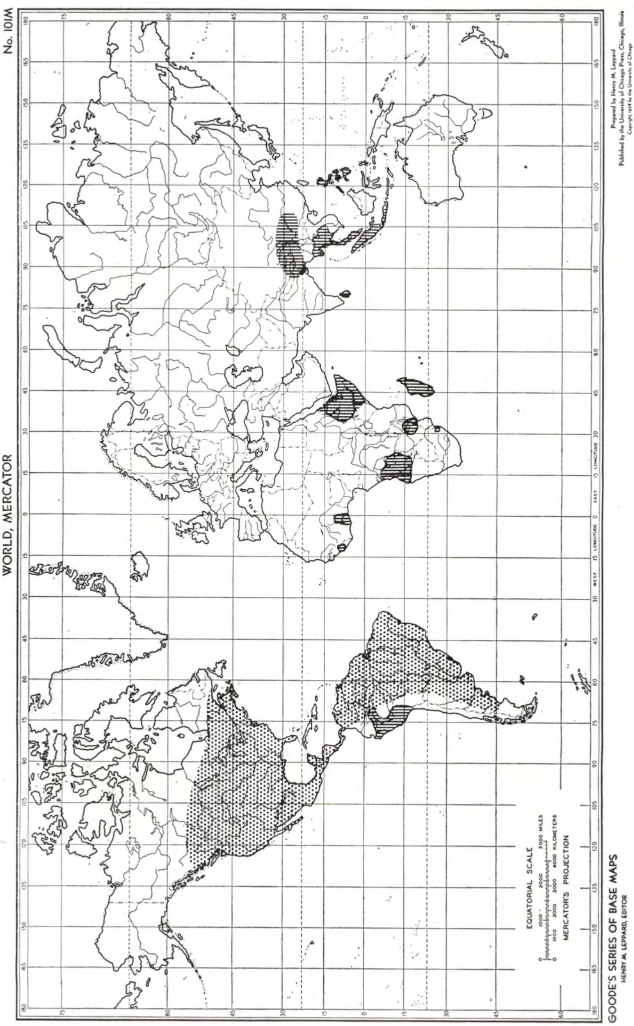
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PLATE 32

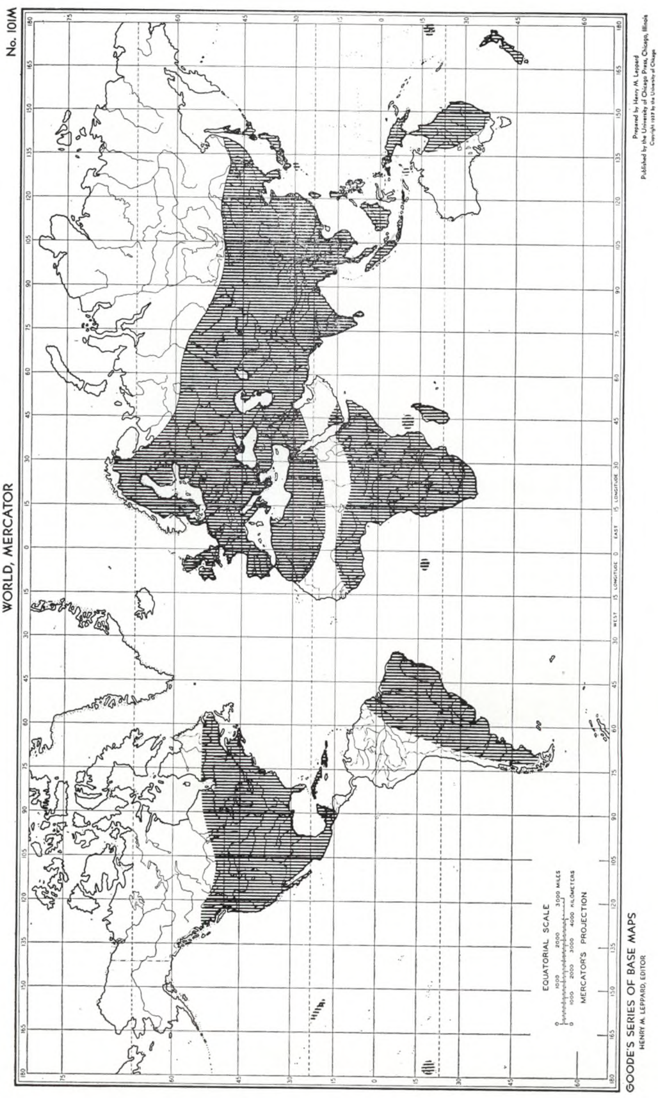
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PLATE 33

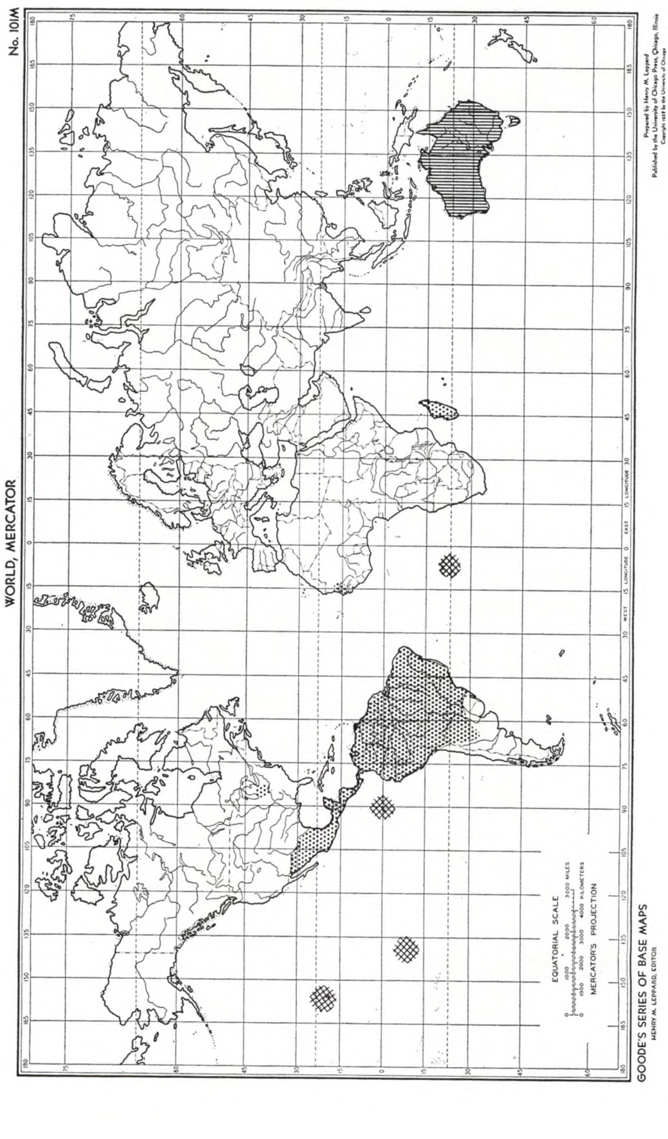
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PLATE 34

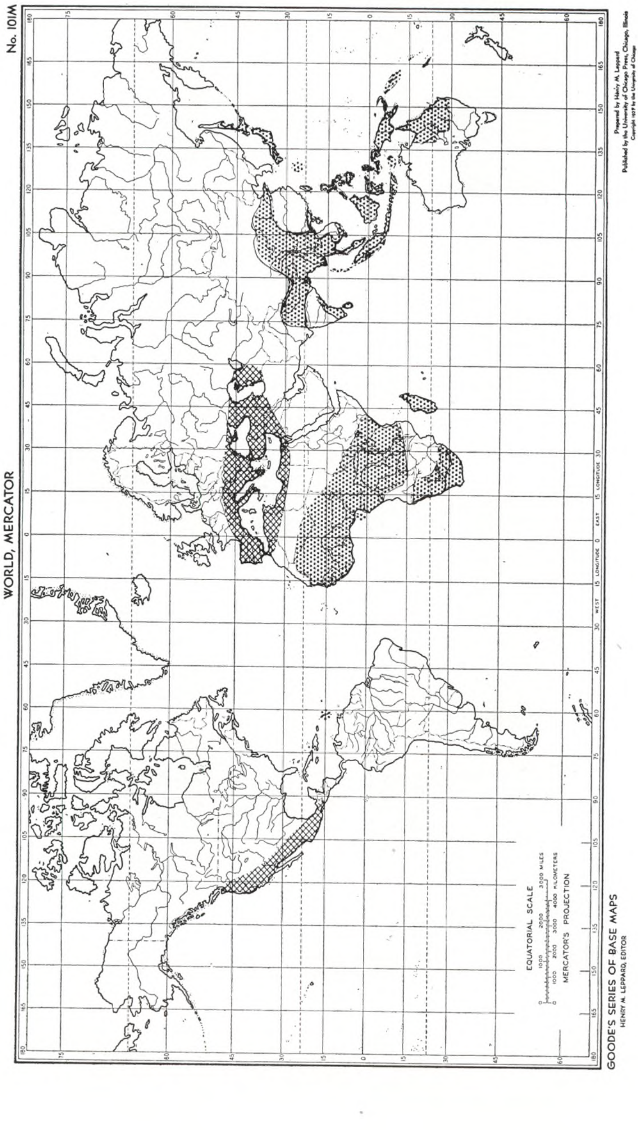
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PLATE 35

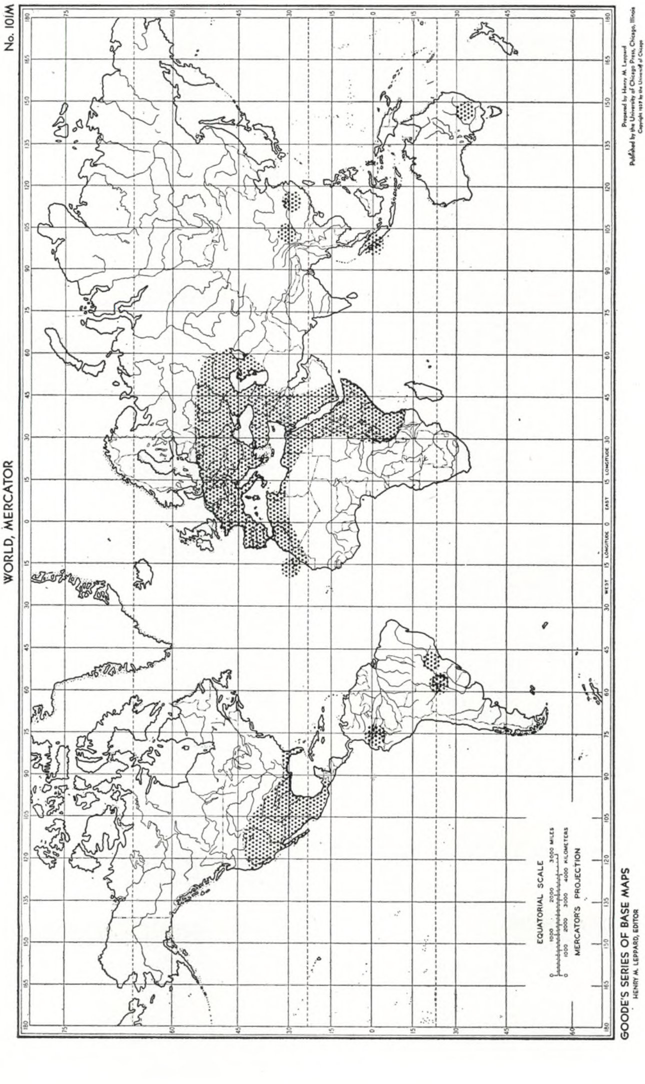
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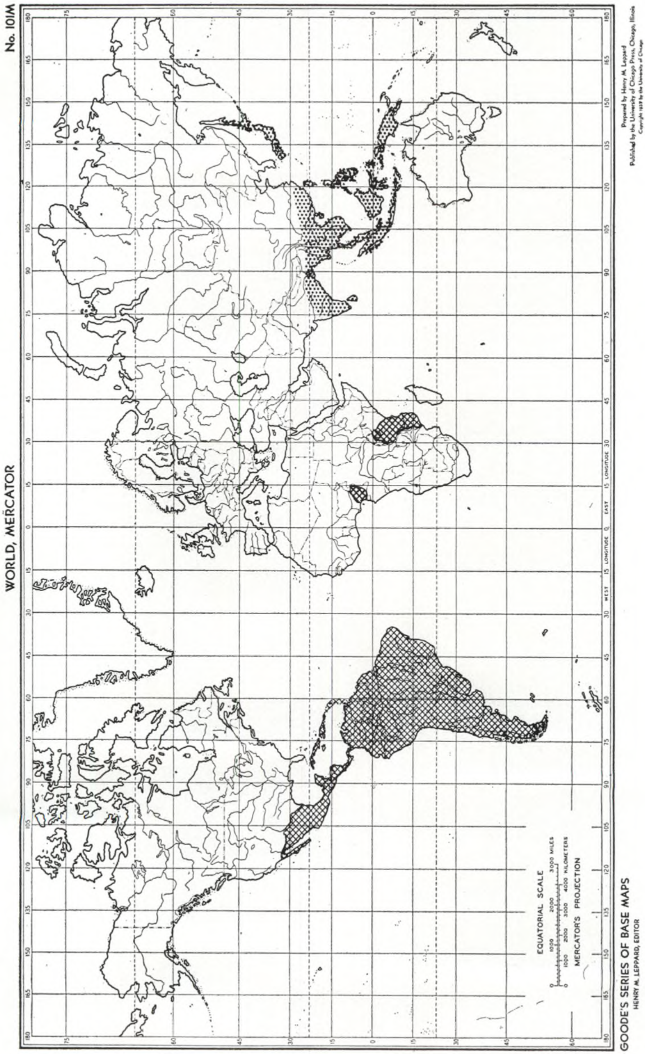
PLATE 36



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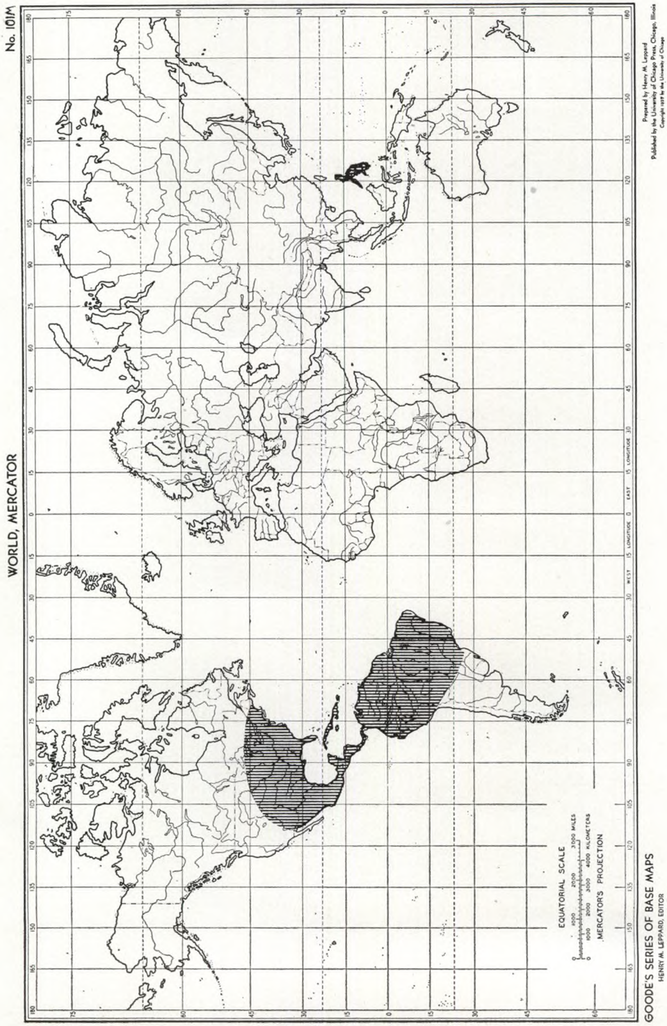
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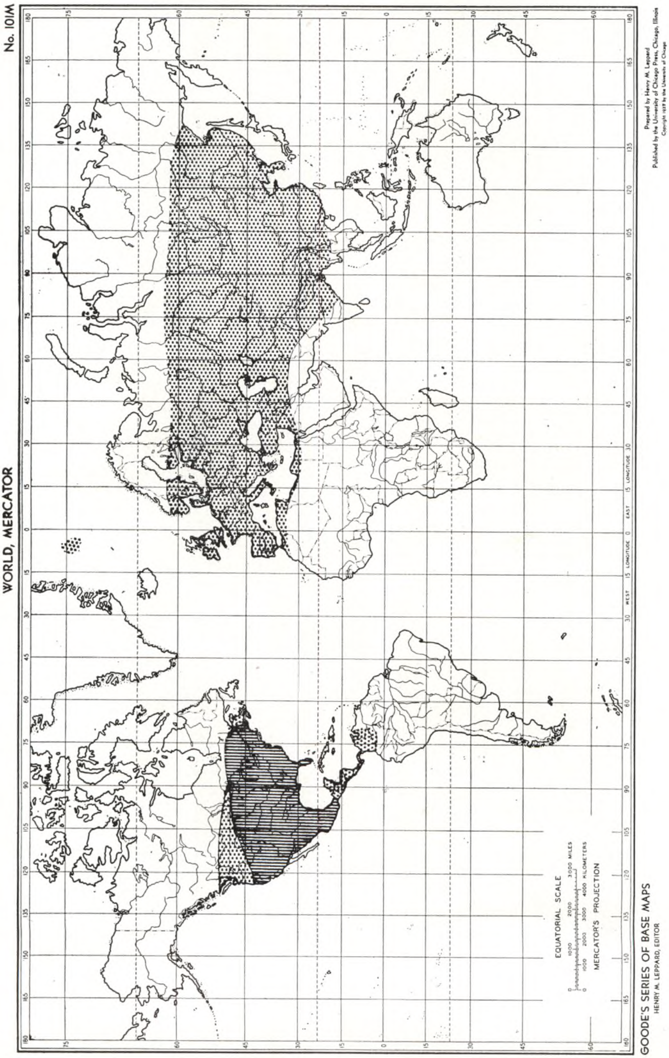
PLATE 41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