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PAPERS.

23. The Geographical Distribution of Orthopterous Insects  
in the Caucasus and in Western Asia. By B. P.  
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(With Map.)

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*Introduction.*

In 1913 I undertook the systematic study of the Orthopteran fauna of the Caucasus and neighbouring countries (Asia Minor, Armenia, Northern Persia), based on the large collections of the Caucasian Museum in Tiflis and literary sources, as well as upon my own investigations in Northern Caucasus (in 1911-1914) and in Transcaucasia (in 1915-1919). This work offered great difficulties, as our knowledge concerning the systematic and geographical distribution of the Orthoptera, and those of Western Asia in particular, is as yet very incomplete. Besides, the war deprived me of the possibility of referring to Western European scientific centres and of obtaining from them the necessary literature and information. The materials which I have had before me, though not very extensive, give different impressions concerning the faunas of different districts, and some of the latter are still awaiting more careful investigation. I think, however, that it would be of some use for these future investigations if I gave a short summary of the chief zoogeographical results I have gained from my studies, incomplete and insufficient though they

\* Communicated by S. A. NEAVE, F.Z.S.



may be. I hope these results will be of interest to every zoogeographer studying the distribution of animals in the southern parts of the Palæarctic region.

Before investigating more minutely the distribution of Orthoptera in the territory under consideration, it is necessary to give some information concerning the zoogeographical division of the Palæarctic region based on my studies of this group, for this division differs in some respects from those of other authors founded on the distribution of other animal groups.

The subregions into which the Palæarctic region may be divided are four in number: Boreal, Steppe, Mediterranean, and Eremian. The chief characteristics of these are as follows:—

The Boreal subregion includes the whole zone of the forests of Northern Europe and Asia, but some representatives of its characteristic Orthopteran fauna penetrate farther on northwards—into the zone of the Arctic tundras which has not its own Orthopteran fauna. The Orthopteran fauna of the Boreal subregion is very poor, both in species and in specimens; the suborders Mantodea and Phasmodea are entirely absent from it, and of the Gryllodea we only find the *Gryllus domesticus* here. As leading characteristics of Boreal fauna should be regarded: *Chrysochraon dispar*, *Stenobothrus viridulus*, *Gomphocerus sibiricus*, *Mecostethus grossus*, *Psophus stridulus*, and *Podisma pedestris* from Acridiidea, and *Leptophyes punctatissima*, *Meconema thalassinum*, and *Olynthoscelis griseoptera* from Locustodea.

The great distance between our country and the Boreal subregion causes the Boreal fauna to be of very little importance in the composition of our fauna. Nevertheless, in some districts of the Caucasus, as we shall see later on, the influence of the Boreal fauna is rather striking: in some mountainous districts we may find the typical boreal species, which are, at the same time, absent from the intermediate areas between the Caucasus and the Boreal subregion. These species with such discontinuous range of distribution are of great importance to the history of the fauna of the Caucasian mountains, as they give us a hint concerning the former contact of this fauna with that of the Boreal subregion; later on this contact was interrupted, but the cause of this interruption is still unknown to us with certainty; we can only suppose that this immediate connection between the Orthopteran faunas of the Caucasus and of the Boreal subregion took place during the Glacial period, and ceased after this period had given place to a warmer and drier one, when the Boreal elements of the fauna retreated to the North, leaving a few relics in the high mountainous districts of the Caucasus.

The Orthopteran fauna of the Steppe subregion is rather rich and includes many typical forms. The most important character of this fauna is the presence of a large number of species of the genus *Stenobothrus*. The Steppe fauna in Europe shows distinctly marked affinities with the Siberian, and we should suppose that its representatives have migrated into Europe from Asia.



The Steppe fauna penetrates into our country through the steppes of North-western Caucasus, which belong to the Steppe subregion, and through Daghestan some of its elements reach Transcaucasia, as well as the mountainous districts of Caucasus Minor, Armenia, Kurdistan, and Anatolia as far as the northern limits of the Eremian subregion. On the other hand, the Steppe fauna also penetrates into Anatolia through the Balkan Peninsula. It is evident that the influence of this fauna on the fauna of our country must be very great, and so it is, as we shall see later on.

The Mediterranean subregion comprises the north-western mountainous extremity of Africa (Morocco, Algeria, and Tunis—but the mountains only and not the plains, which belong to the Eremian subregion), Spain, the southern coast of France, Italy, the shores of the Adriatic Sea, the Balkan Peninsula south of the Balkan Mountains, the islands of the Mediterranean Sea, and Anatolia. The Mediterranean fauna of Orthoptera is extremely rich, including about 16 Mantodea, 7 Phasmodea, 162 Acridiidea, 317 Locustodea, and 62 Gryllodea. Besides its richness this fauna is remarkable for a large number of peculiar species: out of 564 species which are known of it, 424 or 75 per cent. are endemic. Some large families of Locustodea have their centre of development and distribution here, for example Sagidæ, Decticidæ, Bradyporidæ, and, partly, Phaneropteridæ.

The more detailed study of the Mediterranean fauna allows us to conclude that it may be divided into two very distinct groups of species: Western and Eastern. The first has its centre in Spain and North-western Africa, from where its representatives disperse to the East and North-east; while the second flourishes in the southern part of the Balkan Peninsula and in adjacent parts of Anatolia, sending its migrants into north-western, northern, north-eastern (into the Steppe subregion), and eastern directions. According to this distinction of the faunas we may divide the Mediterranean subregion into two zoogeographical provinces—Western or Tyrrhenian and Eastern or Balkano-Anatolian. The Tyrrhenian fauna is of no importance to us, as it cannot influence the composition of the fauna of the Caucasus, but of much greater value is the Balkano-Anatolian fauna. This fauna is very rich and has many characteristic points: here we find exceedingly rich development of endemic Sagidæ, of apterous Phaneropteridæ (*Isophya*, *Pæcilimon*), of the genera *Platycleis*, *Olynthoscelis*, *Drymadusa*, *Dolichopoda*; some species of *Stenobothrus* and the genera *Nocarodes* (with six species) and *Callimenus* (with two species) are peculiar to it.

The Balkano-Anatolian fauna occupies the greatest part of the country which we are now studying. Through Asia Minor, which belongs entirely to this zoogeographical province, through Armenia, and along the southern and eastern shores of the Black Sea, the Balkano-Anatolian fauna penetrates into the forest districts of Transcaucasia, giving place to the Eremian fauna in



the desert plains of Eastern Transcaucasia and in the dry rocky districts of Persia; we meet it again on the southern shore of the Caspian Sea—in the district of Talysh, which is remarkable for its wet subtropical climate. Some typical Balkano-Anatolian faunistic elements also reach the Caucasus from the north, wandering from their native home along the western and northern shores of the Black Sea through the adjacent steppes of South Russia.

To the south of the Mediterranean subregion lies the vast Eremian subregion, which includes all the deserts of North Africa (Sahara, Libyan desert, Egypt), Sinai peninsula, Northern Arabia, Mesopotamia, Persia, the whole of the Aralo-Caspian impression; perhaps, also, the great deserts of Chinese Turkestan and Mongolia, the Orthopteran fauna of which is but little investigated as yet, belong to it. The Orthopteran fauna of the Eremian subregion has many peculiarities if compared with the Mediterranean, and I cannot agree with most of the zoogeographers\* who usually unite them together. In support of my opinion I give the following table:—

	Mantodea.	Phasmodea.	Acridodea.	Locustodea.	Gryllodea.	Total.
<i>Mediterranean fauna.</i>						
Total number of species .....	16	7	162	317	62	564
Number of species which do not penetrate into the Eremian subregion ..	9	7	130	299	51	496
Endemics .....	9	7	108	259	41	424
Percentage of endemism .....	56 0/0	100 0/0	67 0/0	82 0/0	66 0/0	75 0/0
Common with the Eremian subregion.	7	0	32	18	12	69
<i>Eremian fauna.</i>						
Total number of species .....	53	9	137	45	31	275
Number of species which do not penetrate into the Mediterranean subregion .....	46	9	105	27	19	206
Endemics .....	42	9	99	24	16	190
Percentage of endemism .....	79 0/0	100 0/0	72 0/0	53 0/0	51 0/0	70 0/0

It is evident from this table that the affinity between the Eremian and the Mediterranean faunas is restricted to 69 species only. Out of these we must, however, not take into consideration 48 very widely distributed species (such as *Paratettix meridionalis*, *Acrotylus insubricus*, *Conocephalus nitidulus*, etc.) and 10 species with great power of flying, which may have wandered from one subregion to another in recent times; there are, therefore, only 11 species common to the Eremian and Mediterranean

\* W. L. Slater was the first who recognised the difference between the Eremian and his "Europasian" (Boreal + Steppe + Mediterranean) subregions, but he included in it the whole of Northern Africa, the western part of which (Morocco, Algeria, and Tunis) must be united with the Mediterranean subregion.



faunas, *i. e.* but 4 per cent. of the second and less than 2 per cent. of the first of these. These eleven species are as follows: *Fischeria bætica*, *Ameles abjecta*, *Stauronotus hauensteini*, *Ædipoda schochi*, *Nocarodes serricollis*, *Callimene dilatatus*, *Paradrymadusa sordida*, *Olynthocelis punctifrons*, *Isophya triangularis*, *Gryllus* (*Gryllodes*) *kerkennensis*, and *Gr. lateralis*. Only two of them (both species of *Gryllus*) may be considered as having originated in the Eremian subregion, and they are both to be found in the Mediterranean subregion (in Spain, in Transcaucasia) in proximity to its southern boundaries and on spots with clearly defined desert soil and vegetation; we have the right to believe them to be comparatively recent invaders from the deserts of the Eremian subregion. The remaining nine species are of Balkano-Anatolian origin and do not penetrate deeply into the Eremian subregion, being restricted to its northern mountainous parts with mixed fauna. The relationship of the Mediterranean and of the Eremian faunas is, consequently, practically absent. On the contrary, the same table shows us that the difference between them is a very striking one; 496 species (out of the whole number 564) of Mediterranean Orthoptera do not reach the Eremian subregion, and 206 Eremian species (out of 275) do not go through the northern boundary of this subregion into the Mediterranean. This difference is not numerical only; the family Orthoderidæ is peculiar to the Eremian subregion\*, where there are 35 species belonging to it; the family Pamphagidæ is represented in the Mediterranean subregion by 52 species, of which only five penetrate into the neighbouring parts of the Eremian subregion; the family Phaneropteridæ has more than 80 Mediterranean representatives, and only three of them are to be found among the Eremian fauna; two families of Locustodea—Ephippigeridæ (85 species) and Meconematidæ (4 species)—and three of Gryllodea—Gryllomorphidæ (7 species), Myrmecophilidæ (4 species), and Mogisoplastidæ (6 species), which are very important in characterising the Mediterranean fauna, do not extend into the Eremian subregion at all. The generic and specific differences between these two faunas are yet more considerable, but I shall not go into details here, as I suppose the above mentioned facts are sufficient to support my statement that the Eremian subregion is of the same zoogeographical value as the Mediterranean†.

There are only two provinces of the large Eremian subregion which are particularly interesting to us: the Iranian and the

\* With but one exception—*Geomantis larvoides*—which is Mediterranean endemic.

† I even suppose that, when studying the distribution of Orthoptera, we are right in considering the Eremian subregion of the same value as the whole Palæarctic region: this problem is, however, too great a one to be discussed here, and I hope to return to it at some other time; I am supported in my supposition by the statements of Mr. A. Birula, who, after his studies of the distribution of scorpions, made an Africano-Asiatic region nearly with the same limits as my Eremian subregion (see A. A. Bialynicki-Birula, *Arachnoidea Arthrogastra Caucasica*, Pars I. *Scorpiones*.—Mémoires du Musée du Caucase, sér. A, N. 5, 1917).



Turanian. The first of these has some peculiarities in its fauna which are of the greatest interest and value: there are among the rather numerous endemics of the Iranian fauna some very ancient forms (*Paradrymadusa bocquilloni*, *P. persa*, *P. pastuchovi*, *Tropidauchen*, *Platycleis persica*, *Olynthoscelis satunini*, etc.), which belong to the groups characteristic of the Balkano-Anatolian province of the Mediterranean subregion. The presence of these species in the Iranian fauna allows us to conclude that this fauna was in some ancient time in close connection with the Balkano-Anatolian fauna, but afterwards (from the beginning of the dry climatic period in Iranian table-lands) this connection was interrupted, and the further development of the Balkano-Anatolian and of the Iranian fauna went in different directions; the remnants of the "Ancient Mediterranean" fauna in Iran partially died out, partially adapted themselves to the new conditions of life (the "desert" coloration of *Paradrymadusa bocquilloni* and *P. persa*, etc.); and the recent faunas of the Iranian and the Balkano-Anatolian provinces, being of the same origin, are entirely different and belong to the different subregions.

The Iranian fauna occupies a rather large part of Transcaucasia reaching along the western shore of the Caspian Sea as far as the neighbourhood of Petrovsk, as we shall see later on.

The Turanian province of the Eremian subregion comprises Transcaspia and the southern steppes of Kirghizes and Kalmyks along the northern and north-western shores of the Caspian Sea; its Orthopteran fauna is a rather recent derivate of the Iranian which has migrated in northern and north-western directions, invading the parts of land from which the Caspian Sea has recently withdrawn. West of the Caspian Sea (in the Ciscaucasia) the Turanian fauna spreads southwards, coming in contact with direct Iranian migrants somewhere near Petrovsk.

To the south of the Eremian subregion lies the Indo-Ethiopian region, the fauna of which is of some importance for the composition of the fauna of the country we are studying now, where we may find a rather large number of species of undoubtedly Indo-Ethiopian origin, for example: genera *Gelastorrhinus*, *Hierodula*, *Duronina*, *Pyrgomorpha*, *Sphodromerus*, and species—*Tropidopola cylindrica*, *Liogryllus bimaculatus*, etc. All these Indo-Ethiopian elements came into the country under consideration through the Eremian subregion, of which fauna they are very characteristic.

#### *The Zoogeographical Divisions of the Caucasus and neighbouring countries.*

Before continuing the study of zoogeographical districts into which the country in question may be divided, I ought to point out that all my conclusions are based exclusively on the study of the geographical distribution of Orthoptera, though I have also taken into consideration the conclusions drawn by the late K. A. Satunin from his study of Caucasian mammals; by Nikolsky—



reptiles and amphibians; Birula (*l. c.*)—scorpions; as well as by other zoologists.

A full list of the Orthoptera, which are known to me from the Caucasus and the neighbouring countries, will be given by me elsewhere.

### 1. *South Russian Steppe district (R.M.)\*.*

The Orthopteran fauna of the open grassy steppes lying to the east of Azov Sea has not yet been sufficiently investigated, and we know but 69 species (3 M† + 32 A + 27 L + 7 G) from it. Notwithstanding, it is evident that this fauna cannot be separated from that of the steppes north of the said sea and of the Black Sea—the steppes of Southern Russia, and it has nothing to do with the fauna of the Caucasus proper. In fact, there is only one species in this fauna which is unknown from the South Russian steppes; it is *Pezotettix giornai*, a Mediterranean species which I think has quite recently penetrated here from the neighbouring Novorossiisk district, and is only restricted to the south-western part of the Azov steppes. We are right, therefore, in regarding the latter as simply being the southern part of the vast South Russian Steppe district. The boundaries of this district, as far as they are lying within the limits of country we are interested in, are not quite defined yet; the southern boundary of it coincides with the northern limit of the forests growing on northern slopes of the Caucasus; its eastern limit is not so sharply marked and is dependent on the westward progression of the Aralo-Caspian (Turanian) flora and fauna along the Valley of Manytsh (see below).

### 2. *The Kuban-Terek district (K.-T.).*

As I have had the opportunity of studying this district for a rather long time (1911–1914, *i. e.* four years), its fauna is well known to me‡. The number of species known from this district is 77 (2 M + 33 A + 33 L + 9 G) and may be regarded as being very nearly exact. The bulk of this fauna—68 species—is common to it and to the foregoing district, which leads us to the conclusion that the Kuban-Terek district ought to be regarded as belonging to the Steppe subregion. The distinction between the South-Russian fauna and the fauna of this district is based on 13 species. Out of these seven are of well-defined boreal origin: *Stenobothrus nigromaculatus*, *St. ventralis*, *St. scalaris*, *Gomphocerus variegatus*, *Psophus stridulus*, *Leptophyes punctatissima*, and *Olynthoscelis griseoaptera*; they form, no doubt, a rearguard of the relic group of boreal species which retreated from South-Russian steppes,

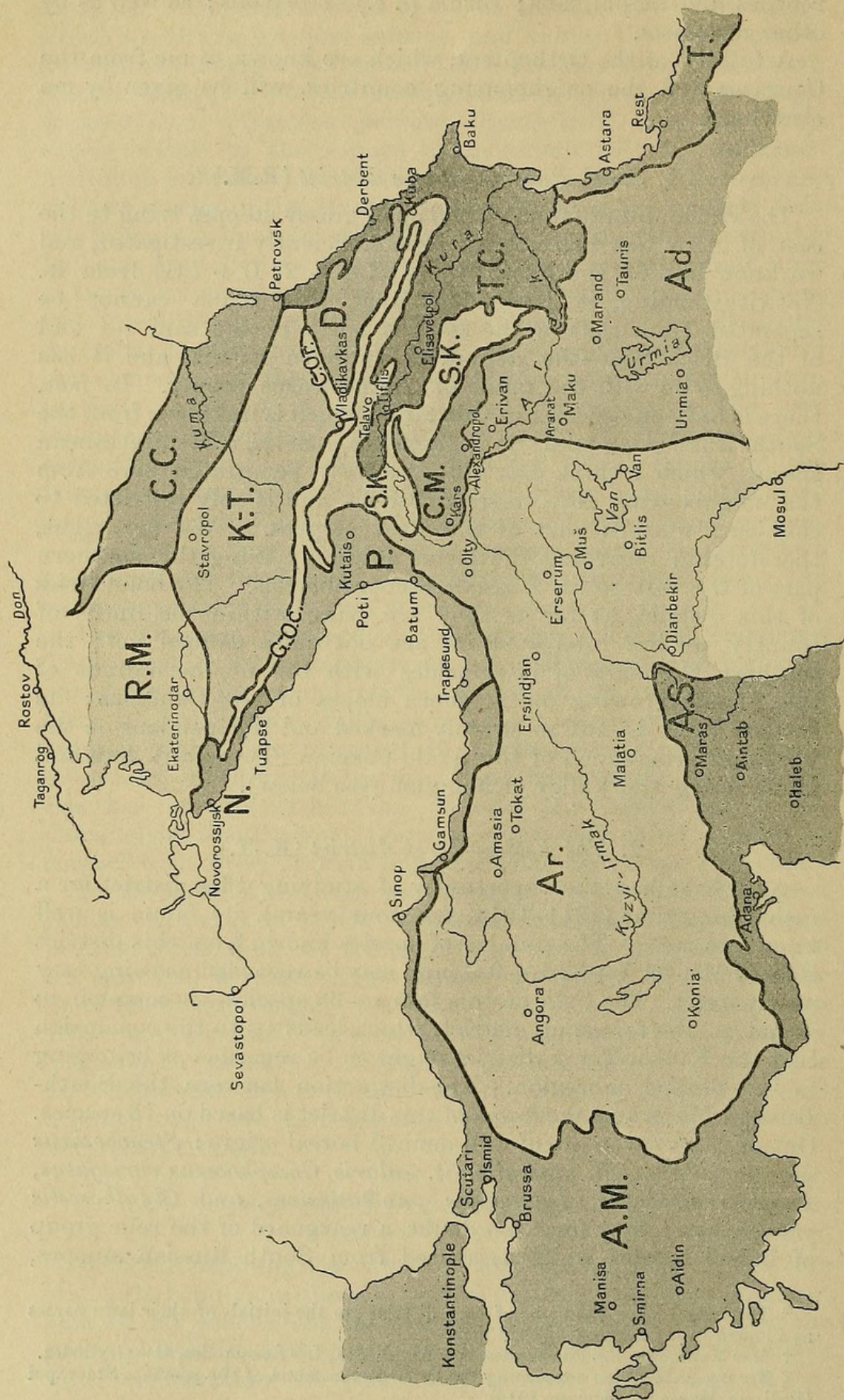
\* The letters after the name of each district are the initials of their latin names as adopted in my zoogeographical map.

† M=Mantodea, P=Phasmodea, A=Acridiodea, L=Locustodea, G=Gryllodea.

‡ See my publication concerning the Orthopteran fauna of the province Stavropol (Bull. du Musée du Caucase, 1915).



Text-figure 1.



Zoogeographical map of the Caucasus and Western Asia. (For explanation, see p. 472.)



after the end of the Ice age, southwards into the mountains of the Caucasus (see p. 448). Of the remaining six species, four are of Mediterranean (resp. Balkano-Anatolian) origin; these are: *Pæcilimon similis*, *Paradrymadusa beckeri* (peculiar to the Kuban-Terek district, but belonging to a Balkano-Anatolian genus), *Platycleis fusca*, and *Myrmecophila ochracea*, which are to be regarded as immigrants from Transcaucasia. The ways of this migration, doubtless, do not lead across the chain of the Great Caucasus, but I think they go on the west along the shores of the Black Sea, and on the east through the Somkheto-Kakhetian and Daghestan districts (see below). The remaining two species are: firstly, *Gampsocleis schelkovnikovæ*, which has just been described and the zoogeographical physiognomy of which is as yet uncertain; secondly, *Nemobius tartarus*, which has recently penetrated into the Kuban-Terek district from the neighbouring deserts of the Caspian Ciscaucasia.

Thus the Orthopteran fauna of the Kuban-Terek district may be characterised as derived from the South-Russian Steppe fauna, with well-marked indications of southern influences—from Caucasus (forms of boreal origin) and from Anatolia (Balkano-Anatolian species).

The Kuban-Terek district comprises all the northern slopes of the Caucasian mountains, including the adjacent hilly country with insular forests; its northern boundary coincides with the northern limit of these forests on the west and of the grass steppe on the east; while the southern is formed by the upper limit of the forests on the main chain of the Caucasus.

### 3. The Daghestan district (D.).

The fauna of this interesting district has as yet been very little investigated: the whole number of species known from it is only 43 (2 M + 23 A + 12 L + 6 G), which is, certainly, not more than one third of the real number. Notwithstanding, a careful analysis of this fauna allows us to draw some very interesting conclusions as to its composition and origin.

The Daghestanian Orthopteran fauna is in direct contact with the faunas of four districts: Kuban-Terek, Somkheto-Kakhetian, Caspian Transcaucasia, and the Eastern Caucasus. But we find the closest resemblances between our fauna in the two first named districts, and as they belong to distinct subregions (Steppe and Mediterranean respectively), it is an interesting problem to be solved—in which of them the Daghestan should be included.

Out of 39 Daghestanian Orthoptera 34 are common to Daghestan and to the Kuban-Terek district, and only five are distinct, as follows: *Nocarodes serricollis*, *Orphania scutata zacharovi*, *Locusta caudata caudata*, *Decticus verrucivorus verrucivorus*, and *Platycleis daghestanica*. The last named species is peculiar to the Daghestan and of no interest to us; *Nocarodes serricollis* is not to be considered as being characteristic of



Daghestan, since it is not distributed all over this district but confined to its eastern parts; finally, *Locusta caudata caudata*, *Decticus verrucivorus verrucivorus*, and *Orphanina scutata zacharovi* are the typical mountain forms and, doubtless, came to Daghestan from the adjacent mountainous district of Eastern Caucasus. It is evident, therefore, that there exists but very little difference between the Daghestanian fauna and that of the Kuban-Terek district, and that this difference is of a recent date and of an accidental origin. On the contrary, the resemblances between them are far deeper, for nearly all the chief characteristic steppe forms (such as *Arcyptera flavicosta flavicosta*, *Celes variabilis variabilis*, *Stauronotus brevicollis*) range into Daghestan, but not farther southwards where (in the Somkheto-Kakhetian district) they are either entirely absent or replaced by other subspecies. Thus, the steppe *Arcyptera flavicosta flavicosta* gives place in the Somkheto-Kakhetian district to the distinct race *A. flavicosta transcaucasica*; *Celes variabilis variabilis* is represented there by the subspecies *C. variabilis carbonaria* and so on. But the most striking difference of the Daghestanian fauna from the Somkheto-Kakhetian (resp. Balkano-Anatolian and even Mediterranean) is in the negative features of the first: the numerous non-flying Phaneropteridæ, which are very characteristic of the Somkheto-Kakhetian fauna, are strange to the Daghestan, where only three of them exist: one *Orphanina*, one *Pecilimon*, and *Leptophyes albovittata* — all three not characteristic of the Somkheto-Kakhetian district; the numerous endemics of the latter do not range into Daghestan at all.

All the above-mentioned facts lead us to the conclusion that the recent Orthopteran fauna of the Daghestan is in more intimate relation to the fauna of the Kuban-Terek district than to that of the Somkheto-Kakhetian. I think, therefore, it should be right to regard Daghestan as an independent zoogeographical district of the Steppe subregion, characterised by the purely steppe Orthopteran fauna with but slight admixture of mountainous forms and of endemics as well as of some "ancient-Mediterranean" species (see p. 452), like *Nocarodes serricollis*, or an undescribed species of *Paradrymadusa*, known to me from Daghestan only in females. I think that further investigations of this interesting district may clear up some details concerning the composition and origin of its fauna but will not change the views expressed above.

Turning to the establishment of the boundaries of this district, we can only definitely state the north-western and south-western ones, which coincide with the lower limits of the alpine district of the Eastern Caucasus. As for the eastern boundary of the Daghestan it should be presumed to go along the extreme eastern chains nearly parallel to the Caspian Sea shore, leaving a narrow strip along the shore itself bearing quite a different Iranian fauna of the district of Caspian Transcaucasia. The most obscure are the boundaries between Daghestan and the districts of Kuban-Terek and of Somkheto-Kakhetia.



4. *The Western Anatolian district (A.M.).*

There are known to us from this district, little investigated though it is, as many as 103 forms of Orthoptera (7 M + 37 A + 48 L + 11 G), which gives evidence that its fauna is a very rich one. As for the composition of this fauna, it may be regarded as the purest expression of the Balkano-Anatolian fauna, which has here its original home.

The most characteristic families of Locustodea for this fauna are the Decticidæ and the Phaneropteridæ: here we find 23 species belonging to the first named family, and 19 to the second. Among the Phaneropteridæ the flightless species are 15 in number; 16 species of Decticidæ are also flightless. It is not surprising, therefore, that we find many endemics in this district: 13 species are peculiar to it. Among these endemics there are no fewer than 6 species of *Pæcilimon*, all belonging to the group with non-denticulate cerci, which group presents one of the most characteristic features of the Balkano-Anatolian fauna having its centre of origin and distribution in this and in the neighbouring Armenian district. One species of *Isophya* (*I. paveli*) is also peculiar to Western Anatolia. Of Decticidæ two species of *Platycleis* (*P. truncata* and *P. schereri*), two *Olynthoscelis* (*Ol. signata* and *Ol. prasina*), *Drymadusa spectabilis*, and *Gampsocleis recticauda* are also Western Anatolian endemics. Considering all these endemics, it is noticeable that their specific features are very well marked and very constant, which gives us the evidence that these species are ancient and undoubtedly autochthonous forms. Thus we come to the conclusion that the Locustodean fauna of the Western Anatolia bears some peculiar features and is of great age. The composition of the other suborders of this fauna is of a rather mixed and indeterminate character.

As for the more recent elements of the Western Anatolian Orthopteran fauna, we may distinguish amongst them the forms of the Steppe fauna (*Stenobothrus* spp., *Stauronotus brevicollis*, etc.) which came here through the Balkan peninsula, and, what is more interesting, some species characteristic for the Western Mediterranean (Tyrrhenian) province, which are six in number, as follows: *Geomantis larvoides*, *Acrotylus longipes*, *Paracaloptenus caloptenoides*, *Platycleis nigrosignata*, *Olynthoscelis chabrieri*, and *Anterastes serbicus*. All of them, except *Acrotylus longipes*, are wingless and doubtless very ancient in their origin; the careful study of their distribution shows that it is discontinuous, which allows us to think that a connection between the Tyrrhenian and Balkano-Anatolian has been ancient also and ceased long ago.

The limits of this district are not yet sufficiently known to us. It is certain, however, that the north-western limit does not coincide with the recent natural limit of the Anatolia—with the Bosphorus and the Sea of Marmora, but it is to be looked for somewhere in the Balkanian peninsula. The Western Anatolian district occupies, conclusively, the more southern part of the last



named peninsula, the western part of Anatolia from the Mediterranean Sea to the western borders of the interior Anatolian plateau, extending along the southern shore of the Black Sea as far eastwards as the neighbourhood of Trebizond.

### 5. *The Armenian district (Ar.).*

The whole number of species known from this district is larger than that of any other, being 134 (8 M + 62 A + 54 L + 10 G), which indicates the exceptional richness of its fauna.

The analysis of this fauna shows its affinity with the fauna of the preceding district, since 62 species are in common with the latter; it is of interest that many species are peculiar to both these districts, being unknown beyond their limits. This affinity is certainly due to the fact that they both belong to the same (Balkano-Anatolian) province. Far more interesting is the difference between them: out of 134 Armenian Orthoptera no fewer than 74 do not penetrate into Western Anatolia. This group is composed of very different elements. First of all we can distinguish in it an admixture of the more northern (steppe and boreal) forms, which are 12 in number, as follows:

<i>Parapleurus alliaceus.</i>	<i>Stenobothrus pulvinatus.</i>
<i>Stenobothrus fischeri.</i>	„ <i>scalaris.</i>
„ <i>nigromaculatus.</i>	<i>Gomphocerus sibiricus caucasicus.</i>
„ <i>apricarius.</i>	<i>Arcyptera fusca.</i>
„ <i>macrocerus.</i>	<i>Locusta caudata kolenatii.</i>
„ <i>hæmorrhoidalis.</i>	<i>Olynthoscelis grisea.</i>

The absence of these forms from Western Anatolia may indicate that they did not come to Armenia through the Balkanian peninsula but across the Caucasian isthmus. Some of them, for example *Arcyptera* and *Gomphocerus*, are absent from Western Anatolia simply because in this latter district there are no places (high mountains) suitable for their habitation. The same cause explains to us why the following four alpine species: *Orphania scutata zacharovi*, *Psorodonotus brunneri*, *Ps. fieberi*, and *Ps. specularis*, do not penetrate into Western Anatolia.

A very characteristic group of the Armenian Orthoptera is formed by the 13 species belonging to the true Eremian fauna. Their list is as follows:

<i>Eremiaphila genei.</i>	<i>Sphingonotus balteatus.</i>
<i>Acrida robusta.</i>	<i>Sphodromerus celosyriensis.</i>
<i>Stenobothrus simplex.</i>	<i>Platycleis escaleraei.</i>
<i>Staurotus anatolicus.</i>	<i>Medecticus assimilis.</i>
<i>Pallasiella truchmana.</i>	<i>Gryllus tartarus obscurus.</i>
<i>Pyrgodera armata.</i>	„ <i>hebraeus.</i>
<i>Edaleus mlokosiewitchi.</i>	

Since all these species are good flyers it is evident that they came into Armenia in recent times from the neighbouring deserts of Persia and Mesopotamia; this view is supported by



the fact that most of them are restricted to the eastern parts of the Armenian district.

But the majority in the group of Armenian Orthoptera which do not reach Western Anatolia belong to species peculiar to Armenia (or to both Armenia and Syrian Anatolia). They are 23 in number, as follows :

<i>Stauronotus hauensteini</i> kurda.	<i>Isophya rodsjankoi</i> .
* <i>Cuculligera maculinervis</i> .	* „ <i>poltoratskyi</i> .
* <i>Pamphagus yersini</i> .	<i>Saga cappadocica</i> .
* „ <i>brunnerianus</i> .	* <i>Drymadusa curvicercis</i> .
* <i>Eunothrotes derjugini</i> .	* „ <i>recticauda</i> .
<i>Pæcilimonella armeniaca</i> .	* „ <i>konowi</i> .
<i>Pæcilimon tschorochensis</i> .	* <i>Olynthoscelis annulipes</i> .
„ <i>kutahiensis</i> .	* „ <i>signata</i> .
„ <i>syriacus</i> .	* „ <i>zebra</i> .
„ <i>concinus</i> .	„ <i>kurda</i> .
* <i>Kurdia nesterovi</i> .	* <i>Troglophilus escaleraei</i> .
* <i>Phonochorion satunini</i> .	

No fewer than one half of them should be regarded as the relics of the "ancient Mediterranean" fauna (these are marked with an asterisk), to which also belong the following 13 species whose area of distribution extends also beyond Armenian limits, as they are to be found in the neighbouring districts of Aderbeidzhan, Caspian Transcaucasia, and Somkheto-Kakhetia :

<i>Ædipoda schochi schochi</i> .	<i>Tmethis escherichi</i> .
<i>Thalpomena ledereri</i> .	„ <i>holtzi</i> .
<i>Heliapteryx humeralis</i> .	<i>Nocarodes serricollis</i> .
<i>Tmethis saussurei</i> .	<i>Pezotettix rugulosa</i> .
„ <i>carinatus</i> .	<i>Platycleis squamiptera</i> .
„ <i>cisti</i> .	<i>Paradrymadusa sordida</i> .
„ <i>bilobus</i> .	

We find, thus, in Armenia 27 relics of the "ancient Mediterranean" fauna which find here their western limit of distribution and do not reach Western Anatolia.

The remaining 7 species of Armenian Orthoptera which do not range farther westwards (*Empusa pennicornis*, *Acrida nasuta*, *Isophya triangularis*, *I. acuminata*, *Olynthoscelis indistincta*, *Dolichopoda euxina*, and *Gryllus frontalis*) are partly of indeterminate zoogeographical value, or their absence from Western Anatolia may be explained as a result of insufficient investigations.

Summarizing the results of our analysis of the Armenian fauna we may conclude that it is a Balkano-Anatolian fauna in its chief characters but well distinguished from it by (1) the well expressed influence of the Eremian fauna, (2) the great number of endemics and relics of the "ancient Mediterranean" fauna, and (3) some admixture of boreal and steppe forms.

I think the frontiers of the Armenian district should be drawn in the following manner.



The northern boundary coincides with the chain of Pontus, coming on the east very near to Batoum and embracing a narrow strip of the Adzharian chain; from here it runs southwards along the Arsian chain as far as Arax, where the contact of Armenian and Aderbaidzhan fauna takes place; farther on the boundary turns eastwards along the chain of Aghridagh as far as Ararat, from where it goes southwards along the watershed of the basins of Urmiah and Tigris. The western boundary is presented by the margin of the central plateau of Anatolia, and the southern one goes in its western part along the Cilician Taurus and Antitaurus, not yet being satisfactorily known farther eastwards owing to the lack of investigation. I suppose it coincides with the Armenian Taurus.

As the territory of this district is far more extensive than that of any other, it causes us to suppose that it should be divided into two or more separate districts. Some modifications of the Orthopteran fauna of different parts of Armenia support this conclusion, but I cannot offer any satisfactory division, as our knowledge of the fauna of southern and south-eastern parts of Armenia is extremely limited. Further investigations of this district should be, therefore, of the greatest zoogeographical interest.

#### 6. *The Syrian Anatolia (A.S.)*

This district belongs to those which have been less investigated, as is evident from the small number of species known of it, this being only 106 (9 M + 50 A + 38 L + 9 G), though its southern position and dry climate offer the best conditions for the development of the richest Orthopteran fauna.

As for the composition of its fauna, it may be regarded as very closely related to the fauna of Syria proper, all differences being of an accidental nature. On the contrary, the difference existing between this fauna and that of Armenia is rather well defined in the lack of the most characteristic Armenian endemics and in the evident influence of the Eremian fauna which is a typical feature of the fauna of Syria.

The boundary between this district and the Armenian one coincides with the southern limit of the latter district following the chain of the Cilician Taurus; along the Euphrat valley this district penetrates into Armenia, as is to be seen on the map. All the other boundaries of this district lie beyond the limits of the country which we are studying now and are entirely unknown as yet.

#### 7. *The Pontian district (P.).*

The fauna of this district includes 59 species of Orthoptera (1 M + 27 A + 20 L + 11 G); having been well investigated it cannot be considered very rich.

The analysis of the Pontian fauna shows us that it is very closely related to the fauna of Western Anatolia, including only



15 species which do not range into the latter district. Of these 15 species no fewer than three or four (*Gryllus frontalis*, *Stenobothrus macrocerus*, *Arachnocephalus vestitus* and, perhaps, *Dolichopoda euxina*) should be regarded as not having been found as yet in Western Anatolia owing to the lack of investigations only; one—*Edaleus mlokosiewitchi*, being a very strong flyer, doubtless came to the Pontian district from the east in recent times; the presence of *Edipoda schochi schochi* may be satisfactorily explained by the influence of the neighbouring Armenia; and, finally, three species are peculiar to the Pontian district—*Podisma koenigi* (Pontian endemic ranging also into the adjacent western portion of the Somkheto-Kakhetian district), *P. satunini*, and *Olynthoscelis kerketa*. The remaining six species are of great interest: three of them are definitely boreal in their origin and inhabit the alpine district of Western Caucasus, from whence they come into the Pontian district; this descent of the representatives of alpine fauna to the sea-level is due to the great humidity of the Pontian climate, this fact being very characteristic for the fauna of this district. The last three species are *Pecilimon schmidtii*, *Isophya pyrenaea*, and *Olynthoscelis fallax*—all northern Balkanian in their origin and sylvan in their habitation, which leads us to the conclusion that they come to the Pontian district from the north—through the Crimea.

Thus, we may consider the Pontian fauna as an impoverished Balkano-Anatolian one, with the admixture of peculiar and boreal forms and species of northern Balkanian origin which came here from the north.

The eastern limit of the Pontian district is formed by the chain of Suram; the southern boundary goes along the Adzharo-Imeretian chain, approaching the Black Sea near Kobulety and turning from here westwards along the chain of Pontus; the western boundary is rather obscure and is to be looked for somewhere near Trebizond; the north-eastern boundary coincides with the upper limit of the forests on the Western Caucasus; and the north-western separating the Pontian district from that of Novorossiisk is indefinite, as we shall see later on.

#### 8. *The Novorossiisk district (N.).*

This district is one of the less investigated ones, the whole number of Orthoptera known from it being 50 (4 M + 21 A + 18 L + 7 G).

Analysing its fauna we observe the very close resemblance of it to that of the South Russian steppe fauna and, on the other hand, to that of the Pontian district. This intermediate character of the Novorossiisk fauna is to be explained by the geographical position of the Novorossiisk district between the steppe of South Russia and the district of Pontus. The differences of the Novorossiisk fauna from that of the South Russian steppes are expressed in seven species, three of them being boreal in their origin (*Stenobothrus scalaris*, *Psophus stridulus*, and *Olynthoscelis*



*griseoptera*) and penetrating hence from the mountains of Western Caucasus; one (*Platycleis sepium*) is a Balkano-Anatolian species coming from the Pontian district; and three remaining ones (*Parameles taurica*, *Olynthoscelis pontica*, and *Pezotettix giornai*) are of special interest. The first two of them are peculiar to the southern part of the Crimea, and the *Pezotettix* is a characteristic Mediterranean species, unknown as yet in the Crimea, though doubtless present there. The presence in the Novorossiisk district of these three species, which are absent from all other districts of the Caucasus, indicates that this district was once in a direct connection with the south of the Crimean peninsula, the time and place of this connection being at present unknown to us.

As to the boundaries of the Novorossiisk district, its intermediate position and the transitional character of its fauna render them very obscure; I think they are not very markedly defined; its southern boundary separating it from the Pontian district is to be looked for somewhere between Tuapse and Sotchi.

#### 9. *The Somkheto-Kakhetian district (S.-K.).*

The Orthopteran fauna of this extensive district, though fairly well investigated, is not yet fully known, as is evidenced by the fact of the recent description of some new species and subspecies inhabiting it. The whole number of the known Somkheto-Kakhetian Orthoptera reaches 79 (7 M + 35 A + 24 L + 13 G), which should be less than the real number by some 10-12 forms.

The first problem to be solved is whether this district belongs to the Steppe or to the Balkano-Anatolian province. Let us consider its affinities to both of them.

This district has in common with the Steppe province (districts of Southern Russia and of Kuban-Terek) 69 species, the difference being 21. Temporarily setting aside eight Somkheto-Kakhetian endemics, the remaining 13 are as follows:

* <i>Empusa pennicornis</i> .	* <i>Isophya pyrenæa</i> .
* <i>Tettix depressa</i> .	* „ <i>amplipennis</i> .
* <i>Paratettix meridionalis</i> .	* „ <i>acuminata</i> .
* <i>Thalpomena ledereri</i> .	* <i>Paradrymadusa sordida</i> .
* <i>Pæcilimon distinctus</i> .	<i>Nemobius heydeni</i> .
* „ <i>bosphoricus</i> .	<i>Gryllus lateralis</i> .
* <i>Isophya adelungi</i> .	

No fewer than eleven of these (marked with an asterisk) are Balkano-Anatolian species or belonging to the characteristic Balkano-Anatolian genera, and two Gryllids only are recent invaders from the adjacent deserts of the Caspian Transcaucasia. Thus it is evident that the difference between the Somkheto-Kakhetian and the Steppe fauna is very well expressed and indicates the entirely different sources of their origin.

Turning to the relation of the Somkheto-Kakhetian fauna to the Balkano-Anatolian one we see, that only 16 species inhabiting



this district are foreign to other districts of the Balkano-Anatolian province, eight of them being peculiar Somkheto-Kakhetian forms. The remaining eight species are:

<i>Stenobothrus lineatus</i> .	<i>Platycleis vittata</i> .
<i>Pæcilimon distinctus</i> .	<i>Olynthoscelis fallax</i> .
<i>Isophya adelungi</i> .	<i>Nemobius tartarus</i> .
„ <i>pyrenæa</i> .	<i>Gryllus lateralis</i> .

Out of these only *Stenobothrus lineatus* and *Platycleis vittata* may be regarded as proofs of the influence of the steppe fauna; two Gryllids are of desert origin; and all others belong to the Balkano-Anatolian genera.

The above is sufficient to enable us to come to the conclusion that this district may be regarded as a part of the Balkano-Anatolian province, a conclusion confirmed by the study of the Somkheto-Kakhetian endemics. They are eight in number, as follows:

<i>Arcyptera flavicosta transcaucasica</i> .
<i>Celes variabilis carbonaria</i> .
<i>Tmethis zaitzevi</i> .
<i>Nocarodes rimansonæ</i> .
<i>Podisma koenigi</i> (peculiar to this and Pontian district).
<i>Isophya bivittata</i> .
<i>Leptophyes nigrovittata</i> .
<i>Olynthoscelis distincta</i> .

All these peculiar forms, with the exception of *Arcyptera*, *Podisma*, and *Celes*, belong to the Balkano-Anatolian genera, and are doubtless not recent invaders. This strongly supports my opinion as to the affinities of the Somkheto-Kakhetian district. *Podisma koenigi* presents an evidence of the influence of the Pontian fauna, and two peculiar characteristic steppe species, *Arcyptera flavicosta* and *Celes variabilis* (as well as *Stenobothrus lineatus* and *Platycleis vittata*), are doubtless immigrants from the Kuban-Terek district (through the Daghestan), the somewhat different natural conditions of Transcaucasia causing the sub-specific differences between the Transcaucasian and the primary steppe forms.

We ought, therefore, to consider the Somkheto-Kakhetia as a district of the Balkano-Anatolian province, bearing in its fauna some hints of an influence of the South Russian steppe fauna, migrating from the north around the eastern end of the Caucasus through the Daghestan.

The outlines of the Somkheto-Kakhetian district are very complicated and circuitous. I include in it the southern forest-clad slopes and hills of the Great Caucasus from Svanetia on the west to the south-eastern extremity of this chain: here the district branches around this end on the northern slopes, thus coming in contact with the Daghestanian district; through the Suram meridional chain the northern half of the Somkheto-



Kakhetian district is connected with the southern part, the district thus ranging all over the northern slopes of Minor Caucasus as far eastwards as Karabagh, where its fauna, becoming gradually poorer, comes in contact with the fauna of Aderbaidzhan.

#### 10. *The Talysh district (T.).*

The fact that we only know 45 species of Orthoptera (3 M + 24 A + 8 L + 10 G) from this district is certainly due not to its poverty but to incomplete investigations.

As regards the composition of the Talysh fauna, it gives the impression of bearing resemblance to that of the adjacent Caspian Transcaucasia, being distinguished from it by the presence of five forms only, as follows:

*Acrida turrita turrita.*  
*Parapleurus alliaceus.*  
*Stenobothrus macrocerus.*  
*Epacromia strepens strepens.*  
*Platycleis capitata.*

The latter of these is an endemic species, while the presence of the four remaining ones indicates the close affinity of the Talysh fauna to that of the Balkano-Anatolian province. The most remarkable fact is that *Acrida turrita* and *Epacromia strepens* are represented in the Talysh district, not by the desert subspecies inhabiting the Caspian Transcaucasia and Aderbaidzhan, but by the same races that are met with in the districts belonging to the Balkano-Anatolian province, the range of these subspecies being discontinuous. The affinity of the Talysh fauna with the Balkano-Anatolian one is even more defined by the fact that its difference from the latter can be based upon a single subspecies (leaving the endemic *Platycleis capitata* aside)—*Decticus verrucivorus boldyrevi*, which no doubt came here recently from the neighbouring deserts. The influence of the Eremian fauna on the fauna of Talysh is, generally speaking, very well marked, resulting in the presence of such forms as *Thisoecetrus dorsatus*, *Platycleis escaleraei*, *Liogryllus bimaculatus*, etc., but it should be regarded as of secondary nature. The immediate connection of the Talysh with the other districts of the Balkano-Anatolian province is now absent, but it no doubt existed formerly; I think it should be looked for in the south-eastern (Karabaghian) branch of the Somkheto-Kakhetian district which formerly used to reach the Talysh.

In the district of Talysh I include only the rather narrow strip along the southern shore of the Caspian Sea, the southern boundary of this district being the upper limit of the forests on the northern slopes of the Talysh mountains. The north-western boundary delimitating Talysh from the adjoining deserts of Caspian Transcaucasia is rather indefinite; the north-eastern one is completely unknown.



11. *The district of Aderbaidzhan (Ad.).*

This district possesses a very rich Orthopteran fauna, the number of species known being 125 (9 M + 1 P + 76 A + 24 L + 15 G); the real number should be considerably larger, not less, I believe, than 150–160.

The most interesting features of this fauna are as follows. First of all, the presence of a representative of the suborder Phasmodea (*Gratidia bituberculata*)—which is not to be met with in any other district, except Caspian Transcaucasia—clearly indicates that the Aderbaidzhan fauna belongs to a quite distinct zoogeographical division. This is supported by the large number of Mantodea, Acridiodes, and Gryllodes, while the number of Locustodes is comparatively small. Among the Acridiodes the large number of species belonging to the family *Ædipodidæ* is very conspicuous; there are thirty *Ædipodids* here against ten, for example, inhabiting the neighbouring Somkheto-Kakhetian district. But the fauna of Aderbaidzhan is as remarkable for what it lacks as for what it possesses. Out of these negative features the total absence of the genera *Chrysochraon*, *Gomphoceris*, *Arcyptera*, *Psophus*, *Celes*, and *Podisma* is very remarkable; they are all of northern (boreal or steppe) origin, and do not reach this district. Yet more interesting is the composition of the fauna of Locustodes: out of the whole family *Phaneropteridæ*, so well represented in the districts belonging to the Balkano-Anatolian province, we only find two here—*Phaneroptera falcata* and *Tylopsis thymifolia*, both very strong flyers and doubtless recent immigrants; the highly characteristic for the Balkano-Anatolian fauna family *Sagidæ* is represented in Aderbaidzhan by one species only, the most widely distributed *Saga ephippigera*; the majority of Locustodean fauna being thus formed by the *Decticidæ*, which are sixteen in number, mostly species of distinct “ancient Mediterranean” origin.

The originality of the Aderbaidzhan fauna is most clearly demonstrated by the large number of peculiar species (some of them also ranging into Caspian Transcaucasia); nearly one third of them are not to be found in any other district of the country, being distributed beyond its limits, while eighteen are true endemics, as follows:

<i>Eremiaphila persica</i> .	<i>Derocorys roseipennis lazurescens</i> .
<i>Brunnerella mirabilis</i> .	<i>Drymadusa grisea</i> .
<i>Scintharista brunneri</i> .	<i>Paradrymadusa pastuchovi</i> .
<i>Thalpomena persa</i> .	„ <i>satunini</i> .
<i>Helioscirtus moseri tichomirovi</i> .	„ <i>persa</i> .
<i>Tmethis persa</i> .	„ <i>longipes</i> .
„ <i>carinatus</i> .	„ <i>bocquilloni</i> .
<i>Nocarodes woronowi</i> .	<i>Platycleis persica</i> .
„ <i>schelkovnikovi</i> .	<i>Olynthoscelis satunini</i> .

Amongst these endemics a great percentage of the “ancient Mediterranean” forms is evident, as, for example, all *Paradrymadusa* species, *Drymadusa grisea*, two species of *Nocarodes*, etc.



Very characteristic of the Aderbaidzhan fauna are also numerous Eremian genera and species, for example: *Eremiaphila*, *Oxythespis*, *Helioscirtus*, *Sphingonotus*, *Derocorys*, *Sphodromerus*, etc.

Summarising the results of our analysis, we may characterise the fauna of the Aderbaidzhan district as a true Eremian one, with a well-marked admixture of "ancient Mediterranean" forms and with very slight indications of the steppe fauna, which penetrates here through the Somkheto-Kakhetian and Armenian districts.

I include in the Aderbaidzhan district the Persian province bearing this name (but not the recently formed republic of Azerbaidzhan in Transcaucasia), as well as the valley of middle Arax from Kaghyzman as far as Migry. Thus, the northern boundary is to be drawn along the southern slopes of the Minor Caucasus at a somewhat considerable height, about 6000-7000 feet above the sea-level. To this district also belongs (I am not yet sure whether partly or wholly) the Karabagh, where the Aderbaidzhan fauna comes in direct contact with the here already impoverished Somkheto-Kakhetian one. Farther eastwards the northern boundary of Aderbaidzhan goes along the eastern boundary of the Zangezur chain and near Migry goes over the Arax, turning eastwards nearly parallel with the latter river along the chain of Karadagh as far as the Talysh chain; farther on the boundary of Aderbaidzhan coincides with the latter chain. The western boundary is the same as the eastern limit of Armenia, which we have already considered above. As for the southern limit it is as yet unknown, but there are some indications that it lies rather far southwards in Central Persia.

## 12. *The district of Caspian Transcaucasia (T.C.).*

The Orthopteran fauna of the deserts of the eastern or Caspian Transcaucasia as compared with other districts has been more fully investigated. The amount of its known species is 98 (6 M + 1 P + 50 A + 24 L + 17 G), which number is, I suppose, very near to the real one.

If we take into consideration the uniformity of this district, its fauna may be regarded as a rather rich one, though poorer than that of Aderbaidzhan. The difference between the fauna of the latter district and that of Caspian Transcaucasia appears to be a very marked one, since as many as 45 Aderbaidzhanian forms do not reach Caspian Transcaucasia. Out of them 23, that is nearly half, are species of "ancient Mediterranean" origin, as follows:

<i>Pallasiella bolivari.</i>	4 species of <i>Nocarodes</i> .
<i>Pyrgodera armata.</i>	<i>Drymadusa grisea.</i>
<i>Brunnerella mirabilis.</i>	„ <i>konowi.</i>
<i>Heliopteryx humeralis.</i>	4 species of <i>Paradrymadusa.</i>
<i>Charora crassivenosa.</i>	<i>Platycleis persica.</i>
<i>Trinchus schrenki.</i>	„ <i>squamiptera.</i>
4 species of <i>Tmethis.</i>	<i>Olynthoscelis satunini.</i>



The typical Eremian forms which do not penetrate into Caspian Transcaucasia from Aderbaidzhan are 19 in number :

<i>Eremiaphila persica</i> .	<i>Helioscirtus moseri moseri</i> .
<i>Oxythespis wagneri</i> .	„ „ <i>tichomirovi</i> .
<i>Fischeria baltica</i> .	6 species of <i>Sphingonotus</i> .
<i>Blepharis mendica</i> .	<i>Leptoternis gracilis</i> .
<i>Duronia fracta fracta</i> .	<i>Derocorys roseipennis lazurens</i> .
<i>Platypterna tibialis</i> .	<i>Schistocerca peregrina</i> .
<i>Scintharista brunneri</i> .	<i>Sphodromerus serapis</i> .

This list includes a rather large percentage of forms of more southern origin (*i. e.* Indo-Ethopian), such as *Oxythespis*, *Fischeria*, *Blepharis*, *Schistocerca*, *Sphodromerus*, which are to be regarded as recent invaders into the Eremian subregion and do not reach its northern parts, which accounts for their absence from the Caspian Transcaucasia. Besides, two species are common to the latter district but represented by distinct subspecies (*Duronia fracta* and *Derocorys roseipennis*), and nearly all the remaining species are remarkable for their sporadic distribution, being bound to certain habitations which are not to be met with in Caspian Transcaucasia; their absence from the latter district is thus easy to understand.

The remainder is formed of three species: *Stenobothrus zubowskyi*, *Callimenus dilatatus*, and *Orphania scutata zacharovi*. The first of them is too little known as regards its geographical distribution, and the two others are Balkano-Anatolian species confined to the alpine pastures which are absent from Caspian Transcaucasia.

The negative features which distinguish the fauna of Caspian Transcaucasia from that of Aderbaidzhan are thus very numerous. Nevertheless, they are but of little zoogeographical value, being due to the comparative youth of the fauna of Caspian Transcaucasia, it being the cause that "ancient Mediterranean" species (mostly flightless or bad flyers) and the Eremian ones of more southern origin have not had time enough to extend their range of distribution into this district but recently left by the waters of the Caspian Sea.

Let us see now what is the positive distinction of the fauna of Caspian Transcaucasia from that of Aderbaidzhan. The forms of Caspian Transcaucasia which are not found in Aderbaidzhan are 19 in number, as follows :

<i>Gelastorrhinus sagitta</i> .	** <i>Isophya adelungi</i> .
<i>Duronia fracta kalmyka</i> .	** „ <i>schmidtii</i> .
<i>Stenobothrus petraeus</i> .	** <i>Leptophyes albivittata</i> .
* „ <i>parallelus</i> .	** <i>Paradrymadusa sordida</i> .
* <i>Gomphocerus maculatus</i> .	<i>Platycleis burri</i> .
* <i>Arcyptera flavicosta transcaucasica</i> .	„ <i>decticeiformis</i> .
* <i>Celes variabilis carbonaria</i> .	* „ <i>vittata</i> .
<i>Derocorys roseipennis roseipennis</i> .	* „ <i>grisea</i> .
** <i>Pæcilimon distinctus</i> .	** <i>Olynthoscelis indistincta</i> .
** „ <i>bosphoricus</i> .	



Two of them belong to the species represented in Aderbaidzhan by other races (*Duronia* and *Derocorys*), and four are of no value, their zoogeographical character being unknown (*Gelastorrhinus*, *Stenobothrus petraeus*, *Platypleis burri*, and *Pl. decticiformis*). Thus, the difference is based on 13 species only, out of which six (marked in list with an asterisk) belong to the steppe fauna and seven (marked with two asterisks) are Balkano-Anatolian; they all inhabit the Somkheto-Kakhetian district as well, which explains their appearance in Caspian Transcaucasia through recent immigration from the latter district.

This connection with the Somkheto-Kakhetian fauna is, nevertheless, but of little importance, the differences between it and that of Caspian Transcaucasia being too numerous.

Summarizing these facts, we may conclude that the Orthopteran fauna of the Caspian Transcaucasia is undoubtedly in close affinity with the Aderbaidzhan fauna, being nothing more than the northern vanguard of the latter, distinguished by some impoverishment and by slight marks of an influence from the Somkheto-Kakhetian fauna. The past history of the fauna of Caspian Transcaucasia should be rather short and simple: the vast plains of eastern Transcaucasia dried up after the retreat of the Caspian Sea were populated by the most mobile and progressive elements of the Aderbaidzhan fauna, while Balkano-Anatolian and steppe forms proved mostly to be unadaptable to the rough conditions of life in the newly formed deserts.

The southern boundary of this district, delimitating it from Aderbaidzhan, is not clearly enough defined, the still continuing northward migration of Eremian elements being the cause of its indistinctness; the approximate direction of this boundary is to be seen above in the section dealing with the Aderbaidzhan district (p. 466).

The boundaries between the Caspian Transcaucasia and the Somkheto-Kakhetian district are also mentioned above. The district of Caspian Transcaucasia gives a very long and narrow branch northwards, along the western shore of the Caspian Sea, but it is still uncertain where the northern boundary is to be drawn, for the deserts along this shore are as yet unexplored.

### 13. *The district of Caspian Ciscaucasia (C.C.).*

This district is inhabited by 70 species of Orthoptera (4 M + 39 A + 13 L + 14 G) and, as its fauna may be regarded as having been thoroughly investigated, this number cannot be expected to increase in a marked degree after further explorations.

A glance at the composition of this fauna enables us to conclude that it belongs to the Eremian subregion. This is evident from the fact of the relative abundance of Acridiodea and Gryllodea in comparison with the poverty of Locustodea; it is even still more supported by the study of families: *Ædipodidæ* being well represented, the *Decticidæ* also, while of the *Phaneropteridæ* there



is here one species only—the very well-flying *Phaneroptera falcata*, penetrating into this district from the neighbouring district of Kuban-Terek along the valley of Kuma.

The fauna of Caspian Ciscaucasia shows the greatest resemblance to that of the district of Caspian Transcaucasia, the difference between them being based upon the negative features of the first, while a rather large number (46, *i. e.* 2 M + 1 P + 21 A + 17 L + 5 G) of Transcaucasian Orthoptera do not range into Ciscaucasia; a careful examination of this group shows that it is composed of species of distinct southern origin, except *Arcyptera flavicosta* and *Celes variabilis*, which are members of the steppe fauna represented in Transcaucasia and Ciscaucasia as well though by different geographical races. As for the positive differences of the Ciscaucasian fauna from that of Caspian Transcaucasia they are 16 in number, as follows:

<i>Acrida turrita turrita</i> .	<i>Ædipoda schochi caucasica</i> .
* <i>Chrysocraon dispar</i> .	** <i>Hyalorrhapis clausi</i> .
* <i>Stenobothrus hæmorrhoidalis</i> .	<i>Tmethis muricatus</i> .
* <i>Staurotus brevicollis</i> .	* <i>Saga pedo</i> .
* „ <i>kraussi</i> .	* <i>Platycleis montana</i> .
<i>Arcyptera flavicosta flavicosta</i> .	<i>Decticus verrucivorus schugurovi</i> .
* <i>Epacromia tergestina</i> .	** <i>Gryllus odicus</i> .
<i>Celes variabilis variabilis</i> .	** <i>Tridactylus tartarus</i> .

Five of them are but geographical races (subspecies) of the species represented in Transcaucasia as well; one, *Tmethis muricatus*, is very closely related to the southern *T. bilobus*, and is, perhaps, also but a race of the latter. The remaining group of ten species is composed of seven steppe forms (marked in above list with an asterisk) and three are desert species originating from the Turanian province of the Eremian subregion (two asterisks). The presence of these latter is very interesting, as it gives an evidence of the affinity of the Ciscaucasian fauna to that of the Kirghizian district of the Turanian province adjacent to it on the north-east. It is a very curious fact that the affinity of the Ciscaucasian fauna to the Turanian province is far closer than it is to the Iranian one; a comparison of the fauna of Caspian the Ciscaucasia with that of the Kirghizian deserts shows us that the first contains one species only which is not represented in the second: this is *Ædipoda schochi caucasica*, an evidently new intruder into the Ciscaucasian plains from the dry stony hills of Transcaucasia. This leads us to the conclusion that the desert plains of Caspian Ciscaucasia, quite recently left by the retreated Caspian Sea, got their Orthopteran fauna mostly from the north, being populated by the most progressive elements of the steppe and Turanian fauna (the greater part of which are also proper to the Iranian province of the same Eremian subregion), while the migration from Transcaucasian deserts was prevented by some unknown factors. As the eastern Ciscaucasian plains were at first separated from the Kirghizian deserts by the Strait of



Manytch (which joined the Black Sea to the Aralo-Caspian basin), it is necessary to conclude that the process of populating these plains began after the drying up of the above-named strait, and the whole fauna of the Caspian Ciscaucasia should be regarded as being of quite recent origin, which explains the absence of some characteristic Kirghizian forms, as, for example, *Armene alata*, *Oxythespis turcomanica*, *Pyrgodera armata*, etc. All above considerations support the idea that the deserts of the Caspian Ciscaucasia form a distinct zoogeographical district of the Turanian province.

As for the boundaries of this district, they are all well marked except the southern one. This district occupies the clay and sandy deserts adjacent to the lower currents of the rivers Kuma and Terek, as well as the whole valley of the Manytch. I consider the latter valley as the northern limit of this district, while the western and south-western are determined by the corresponding boundaries of the South-Russian and the Kuban-Terek districts. The southern boundary, delimitating this district from the Caspian Transcaucasia, is yet unknown, and I suppose it is not very sharply defined.

#### 14. *The district of Western Caucasus (C.Oc.).*

The Orthopteran fauna of the subalpine and alpine zones of the western part of the main Caucasian chain includes 40 species (24 A + 13 L + 3 G). Amongst them a very striking group is formed by 20 species of evident boreal origin, as follows:

<i>Tettix bipunctata</i> .	<i>Stenobothrus apricarius</i> .
„ <i>subulata</i> .	* <i>Gomphocercus sibiricus caucasicus</i> .
<i>Parapleurus alliaceus</i> .	<i>Arcyptera fusca</i> .
<i>Chrysochaon dispar</i> .	* <i>Mecostethus grossus</i> .
„ <i>brachypterus</i> .	* <i>Psophus stridulus</i> .
<i>Stenobothrus nigromaculatus</i> .	* <i>Podisma pedestris</i> .
* „ <i>viridulus</i> .	* <i>Locusta caudata caudata</i> .
„ <i>hæmorrhoidalis</i> .	* <i>Platycleis rœseli</i> .
* „ <i>ventralis</i> .	* <i>Decticus verrucivorus verrucivorus</i> .
* „ <i>scalaris</i> .	* <i>Olynthoscelis griseoptera</i> .

The presence of these boreal species as well as the total absence of representatives of Mantodea, the small number of Gryllodea, the poverty of *Œdipodidæ* and *Decticidæ*—this all gives to this fauna a rather northern character. This character is further strengthened by the remarkable fact that eleven, *i. e.* more than half of the above-named boreal species (marked by an asterisk), show a discontinuous range of distribution, their main (northern) area being separated from the Caucasian one by a large space of South-Russian steppes from which these species are totally absent. As regards the way by which these boreal elements came to the Caucasus there may be two different suggestions: either they migrated via Balkania and Asia Minor, or reached the Caucasus direct from the north at some remote time when the



climate of South Russia was colder and damper, which might occur during the Glacial period. As a good many of the boreal species, as for example, *Mecostethus*, *Psophus*, *Podisma pedestris*, are doubtless absent from Asia Minor, the latter supposition should be by far the more correct.

The remaining 22 Orthoptera of this district show rather mixed affinities. The most marked affinity is that to the Balkano-Anatolian fauna as expressed by the presence of *Nocarodes cyanipes*, four species of *Pæcilimon*, four *Isophya* and two *Psorodonotus*, while the direct influence of the steppe fauna is evidenced by the presence of such forms as *Stenobothrus macrocerus*, *St. parallelus*, and *Celes variabilis variabilis*.

The endemic forms of the Western Caucasus are only four in number: *Podisma satunini*, *P. rufipes*, *Isophya caucasica*, and *I. kalischevskyi*, their small number being a rather characteristic feature of this fauna.

The northern and southern boundaries of this district coincide with the upper limits of the forests on the corresponding slopes of the Caucasian chain; while the eastern boundary, delimitating Western Caucasus from the district of Eastern Caucasus, is as yet insufficiently known; I suppose it is somewhere near the sources of the Terek and the Aragva.

#### 15. *The district of Eastern Caucasus (C.Or.).*

Only 17 species of Orthoptera (11 A + 5 L + 1 G) are known in the eastern part of the Caucasian chain; its fauna being thus far poorer in comparison with that of the preceding district. The most interesting features of this fauna are: the small number of boreal and, in general, northern species and, furthermore, the presence of two exceedingly well characterized and, therefore, very ancient endemics—*Podisma lezgina* and *Phlocerus menetriesi*, the latter being the single representative of its genus.

The boundaries of this district are easy to understand.

#### 16. *The district of the Caucasus Minor (C.M.).*

The Orthopteran fauna of this district, being rather well investigated, includes but 52 species (30 A + 18 L + 4 G), which indicates its poverty.

The analysis of this fauna indicates its close affinity to that of Armenia, only twelve species being strange to the latter district, as follows:—

*Chrysochraon dispar.	Pæcilimon similis.
Stenobothrus werneri sviridenkoi.	*Meconema thalassinum.
Gomphocerus variegatus.	*Platycleis bicolor.
*Arcyptera flavicosta transeucasica.	* „ weseli.
*Psophus stridulus.	„ iljinskii.
*Celes variabilis carbonaria.	*Decticus verrucivorus verrucivorus.

The bulk of this group evidently belongs to species of boreal origin (marked in the list with an asterisk), some of them being



the leading forms of the Boreal fauna (*Chrysochraon*, *Psophus*, *Meconema*); their presence here, together with their absence from the mountains of Armenia, allows us to conclude that they came here somehow from the Great Caucasus, perhaps by the transverse chain of Suram which joins the mountains of the Minor Caucasus to the main chain. In this characteristic admixture of boreal forms, as well as in the presence of two endemics (*Stenobothrus wernerii sviridenkoi* and *Platypleis iljinskii*), I see the sufficient cause for separating this district from Armenia.

The district of Caucasus Minor occupies the high table-lands of Akhalkalaki, Kars, and Alexandropol, sending a narrow and long branch along the shores of the Goktcha Sea and, farther south-eastwards, along the chain of Zangezur. The northern boundary coincides with the upper limit of Somkheto-Kakhetian forests; the western goes along the Arsian chain; and the southern is exceedingly circuitous, being not yet satisfactorily explored.

The difficult task of drawing the accompanying map of zoogeographical districts has been undertaken in a most friendly way by P. I. Nagorny, and I avail myself of the opportunity of once more expressing my sincere gratitude to him.

#### EXPLANATION OF THE MAP.

*Zoogeographical division of the Caucasus and Western Asia.*  
(Text-fig. 1, p. 454.)

#### PALÆARCTIC REGION.

##### I. Steppe subregion.

*South-Russian Steppe province.*

**R.M.** (*Rossia meridionalis*).—South-Russian district.

**K.-T.**—Kuban-Terek district.

**D.**—Daghestan district.

##### II. Mediterranean subregion.

*Balkano-Anatolian province.*

**N.**—Novorossiisk district.

**P.**—Pontian district.

**S.-K.**—Somkheto-Kakhetian district.

**C.M.**—District of the Caucasus Minor.

**T.**—Talysh district.

**Ar.**—Armenian district.

**A.M.** (*Anatolia mediterranea*).—Western Anatolian district.

**A.S.**—District of the Syrian Anatolia.

##### III. Eremian subregion.

###### 1. *Iranian province.*

**Ad.**—Aderbaidzhan district.

**T.C.**—District of the Eastern (Caspian) Transcaucasia.

###### 2. *Turanian province.*

**C.C.**—District of the Eastern (Caspian) Ciscaucasia.

##### IV. Caucasian subregion (?).

**C.Oc.**—(*Caucasus occidentalis*).—District of the Western Caucasus.

**C.Or.**—(*Caucasus orientalis*).—District of the Eastern Caucasus.





Uvarov, B. P. 1921. "The Geographical Distribution of Orthopterous Insects in the Caucasus and in Western Asia." *Proceedings of the Zoological Society of London* 1921, 447–472. <https://doi.org/10.1111/j.1096-3642.1921.tb03273.x>.

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