7 Ecogeographical Distribution of Orthoptera

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Introduction

The biology of species in vertebrates is understood only through studies of all stages of their population throughout their total range, usually comprising a set of habitats (Gleaves, 1977; Siger, 1981). I discuss herein problems associated with spatio-temporal distribution of Orthoptera, spatial problems involving distribution of any individual object (specimen, population, species, genus, etc.) over different geographic regions of the earth. This distribution is the type generally shown on maps. In the broad sense, it overlaps so-called "niche" or "niche" distribution. The latter is distribution of individuals through a system of connected landscapes (e.g. an individual or a parameter limit of other landscape parts). (Staats and Serper, Chapter 4, this volume.)

Species Range Distribution

The traditional approach to species distribution has been the study of biology, i.e. historical pattern is unavailable for most species, especially those distributed widely. The Territory and Quaternary history of terrestrial insects, including Orthoptera, is the "evident trouble" of historical biogeography. What can we say about the history of widely distributed species? Key questions seek an answer to their distribution within their geographic ranges.

Generally speaking, different biogeographic phenomena result from historical and spatial interactions between species and their physical environment. Such regional population may be characterized as both geographic and biocological (Matysiewicz, 1969). The former describes patterns common to animals, plants, and their communities (Brown, 1974). The latter emphasizes ecological and historical differences between species that may reflect regionalization schemes (Gleaves, 1977).

A regional pattern may be described as the regular distribution of species and other taxa (i.e. the tops of phylogenetic and faunistic clusters) (Gleaves, 1977; Craig, 1982). These patterns may be characterized as the relation of dialectal contradiction between vicariance for which boundaries are isolating lines and dispersal (on which boundaries may be imagined as partly permeable membranes). Observed boundaries often reflect modern differentiation of the geographic envelope of the earth.

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Ecology or History?

In my earlier work, I suggested that the species inhabiting an area's range, compared the distribution of their boundaries in relation to geographic barriers, exhibited different boundaries, and recognized different regions (Sergio, 1986, 1984, 1991). I distinguished between boundaries, which are lines marking divisions of ranges, dialectic, etc., and barriers, which are agents that control dispersal.

Consistent use of a regional approach should help in understanding age-long oppositions between historical and ecological interpretations of biogeographical and ethno-geographical phenomena (Gillen, 1982; Smith, 1989) and affirm the validity of both folkloric ideas of "process-induced pattern" (Harris, 1980) and that of the housing loss of pattern (Sergio, 1926).

The Ecological, Geomorphological, and Tectonic Factors Behind Range Boundaries

Analysis of these factors begins with investigating the distribution of species and other taxa. Their relationships with biogeographic differentiation can be established. Finally, extraction may provide a basis for spatial prediction. The distributional boundaries of taxa, floras, and communities tend to coincide with geographic barriers or climatic isolines (Gillen, 1982; Emlen, 1974; Sergio, 1988, 1991). This regular differentiation of barriers mainly into geographic barriers is congruent on the basis of their data. For example, the range boundary of Ochotona sparkJKLMNOPAD with the borders of life zones or vegetation types (Huxley, 1981; Sergio, 1984, 1985).

Amphibians and Reptiles (1983) discussed the possible role of rivers as barriers to Amazanian grasshopper dispersal.

Mammals, Amphibians, and some other highly mobile species have morphologically distinct, allopatric or parapatric populations, often with restricted ranges separated by comparably trivial barriers (Jablonski, 1985). Barrier distribution is a major factor in the geographic isolation of species forms such as Gigaiphetes spp. (Notophilus), whose individual populations occupy areas ranging from 300 m to 1 km in diameter (Kemp, 1973). Geomorphological barriers such as the different faces of slopes, glacial outwash streams, marshes, etc., all shu: 10-50 m in breadth, may also pose effective barriers to dispersal.

The boundaries between plains and mountains are typically barriers preventing the spread of species. I have described range such patterns (Sergio, 1988), supported by evidence from others (Peter and Audibert, 1988; Coradja et al., 1989). In some cases,
significant coincidence has been described for
such borders and for interpopulation bound-
aries (Schramm and Willey, 1979; Bergner, 1991; Kastner and Sergiev, 1992a,b).
Nagy (1932) noted that human settlements, in-
cluding Red Sea, may be a wider barrier to
the spread of species. There are other bound-
aries which cannot be attributed to
spontaneous spread; they are historical.
Some barriers cannot prevent the spread of
species. The oceans and seas are examples
of limited areas of geographic barriers, but even
when they are crossed by Orthoptera. The exis-
tence of ecological niches is significant with
regard to the speed of species into new regions.
Such dispersion is mainly associated with
human activity. Examples have been provided
by Kogan (1990a), for Micronecta, and by Yule
(1969) and Nicaite and Castane (1984), for
North America. In Europe, the northern dis-
persal of some thermophiles Orthoptera is
ability by human activity including general
landscape change, hunting, energization, urban-
ization, and transportation (Nagy, 1980). The popu-
lation of rare species may be 
eliminated or divided in this way (Gleaves and Serapace, 1989).

Species Ranges and Centres of Biological Diversity

Analysis of the distribution of species of diver-
sity and of geographic variation of species allow
for an understanding of species patterns. Histore-
ically, such centers reflect locations suitable
for species differentiation and for their
endemism. In northern and central Asia, for
example, the central area of biodiverse and
generic endemism are associated with seven
regions (Sergiev, 1992, 1993). (a) the desert
of Turan; (b) and parts of Mongolia and China; (c) the temperate regions near the boundary
of the areas of northern and eastern Asia; (d) the mountains of the Tian Shan, Pamir, and
Himalaya; and (e) the mountainous areas between the
mountains of Himalaya and
south-western Tibet and the adjacent Hima-
layan slopes. Centres of geographic diversity
and species endemism are distributed similarly.

Ameis and Driouech (1982) described
the centre of biological diversity of
Ammerla scorpions, which are mainly
distributed with peculiar climatic patterns
and
Metapopulation Distribution

Many questions of biogeography and ecology may be solved by studying population distributions throughout the range of species. As a rule, local populations (islands) are distributed over a range in accordance with natural conditions, especially the earth's landscape pattern. These populations may be connected with each other into a single landscape unit or may be divided by different barriers. Such distributions are described as metapopulational (Correns, 1970) or as actual population structures (Shiley, 1972). Hence, a metapopulation is a system of local species populations throughout their range.

Complete isolation of populations is exceptional (Bateman, 1927). As a rule, they are observed only in the zone of non-plowing montane or similar forms or under other specific natural conditions. Some examples of isolated local populations have been described amongst British Orthoptera (e.g. Oeophila seminivora L., Oecanthus punctatus L.) (Bousfield, 1981). Continuous populations of uniform structure are also rare (see Eady, 1981). Willey (1937) described the North American Arthropod populations (Thomisid) as irregularly distributed in patches, each with optimal habitat. We describe significant differences between valley and watershed settlements of Chersloggus platypus (Bate) over its range (Kasukova and Berger, 1992a).

Distributions of species populations over a large geographic landscape, and their units allow for identification of groups with similar geographic relations, including endemism and xenomorphy. The isolation of metapopulations distributional patterns also allows for understanding the historical and genetic organization of species, Certain well-grown genera include species which occupy the same type of habitat but replace each other geographically, but other genera include sympatric species with almost identical occupied habitats (Polasky, 1968).

It is important to re-estimate the different geographic barriers limiting the spread of species. For example, Schekter and Wiley (1978) emphasized that metapopulations show a higher degree of differentiation and disjunction of their components. Isolated Michigan is estimated to be a moraine barrier to pennants (Wiley, 1987). Other barriers include those created by large boundary analysis and causes by closeness of species distribution and environmental variety. The relationship among these different forms of dispersion metapopulations may be observed at a regional level. It is possible to see patterns of disjunct and potential contacts of parts of spatial population structures.

Inner Structure of Species Range

The traditional method of biogeographic analysis of spatial distribution and relationships of local populations within a species range (Tylor, 1938; Hoenigfeld and Heed, 1952) is inadequate with respect to many animal groups, including Orthoptera. Applications of the vertical axis are necessary (Tylor, 1938; Germain, 1939; Germain, 1955). Such a three-dimensional approach is associated with the idea biogeographic changes of Orthoptera (Bate, 1978; Berthe and Siger, 1982), and it allows for showing vertical distributions of populations over a range. This aspect of biogeographic analysis was discussed by Stabler (1974), Siger (1979), and Willey (1989). The general pattern of metapopulation distribution was described in other papers (e.g. Kasukova and Siger, 1992a, 1992b). Liskova (1976) tried the three-dimensional approach with respect to the widely distributed Orthoptera Hymenoptera. These emphasized the species' regional and map-scale specificities of population dynamics and genetical. Some earlier two-dimensional maps (Eschscholz and Ordoniz, 1956) are adequate in that they present timelines of species range data for historic population dynamics. We use these to show four species populations in the landscape, each linked with a dashed.
landscape units: (i) watershed (plains) populations, which are invariably diffuse settlements (Fig. 7.2, F); (ii) valley population groups associated with flood-plains and low, moile terraces (X), which, as a rule, are isolated at linear or steppe places (terrace) population groups distributed over the upper and middle terraces of rivers and lakes (X); and (iii) isolated high-soilite population groups also may be described within the high altitudes of mountainous regions.

These population groups form a limited number of combinations in every region or locality, as with the following described for plains (Steinberg and Sergeyev, 1965; Sergeyev, 1966). Kanasco and Sergeyev, 1993:ab (i) hill plains or optimal part in which species are distributed over all available biotopes at high levels of abundance (Fig. 7.2, F); (ii) the terracrostic part (K) associated with the beginning of settlement bifurcation into watershed and valley population subsystems; (iii) the basic part (C) in which species populations are found over watersheds and flood-plains and/or low terraces or only over watersheds, sometimes reaching high levels of local abundance; (iv) the marginal part (K) characterized by isolated or linear settlements connected to flood-plains and low terraces; and (v) a high montane-valley system may be added in mountain zones.

All of the above may be represented.

Analysis at the regional and basin levels usually shows that the range is a mosaic of transcontinental, marginal, and sometimes main types of settlement parts interspersed throughout the dominant background.

Analysis of metapopulation distribution within northern and central Asia (Sergeyev and Sergeyev, 1985; Sergeyev, 1966, 1991) shows that the juncture between the steppe and semi-desert zones is significant in distinguishing parts of the metapopulation and range as a whole. Fragmentation between the semi-desert and northern deserts and between the latter and the southern deserts is important. Steppes present optimal conditions for the Orthoptera of northern and central Asia. Taiga (coniferous forest) and tundra are characterized by association between orthopteran settlements and dry or, rarely, bog meadows. Population displacement into river valleys may be observed in arid regions. Likewise, huge domes of steppe and forest-steppe species are found in desert and semi-desert zones.

The described patterns allow for estimation of general situations with respect to every life zone and major region, but the optimal conditions and the corresponding specificity of population distribution may change not only from north to south but also from west to east and vice versa.
Regional and Local Parts of Species Metapopulations

Metapopulations are defined by the local geographic boundaries. It is important to differentiate between regional and local distribution patterns and in the analysis of the existence of different origins and life forms.

Local metapopulations are found within the study limits of small units within the landscape. This can be either a population or a continuously distributed population of a species. The local population is defined by the landscape and habitat suitability. This is based on the species' knowledge of the habitat suitability within the small region allowing for an understanding of the presence of populations, community organization, and dynamics.

Genes of species are exchanged between populations, resulting in a more widespread distribution of species. Local populations are often found in distinct habitats and may be connected by corridors or other means of connectivity. The problem of species distribution is often studied in the context of landscape ecology and conservation biology. The diversity of species and their distribution within the landscape is crucial for understanding the functioning of ecosystems.

In the Saharan-Gobain Subregion, the evolution of native species is impeded by barriers and their abundance is reduced in some areas, such as in the high sand dunes. This is due to the natural barriers and the lack of suitable habitats for the species. The problem of species distribution and conservation of species is crucial for the preservation of biodiversity in the region.

Problems of Species Coexistence

Species distributions within a region may be differentiated by several factors. Differences in habitat selection, competition, and predation can all influence the distribution of species. The problem of species coexistence is crucial for understanding the functioning of ecosystems and the conservation of biodiversity.

Comparison of the local metapopulation distributions of Orithers in small areas based on the role of biogeographic regions, the following species: (1) the species' distribution patterns within different landscapes; (2) the role of species interactions and competition; (3) the role of species interactions and competition; (4) the role of species interactions and competition.
Community Distribution

A community (including a landscape community) is the aggregate of individual species inhabiting an ecosystem (e.g., a forest) of different ranks. The terms "community", "assembly", and "multispecies population" are synonymous. A guild is a group of species that use the same resources or a similiar habitat (Krebs and Lawler, 1963). This is not necessarily a functional group of coexisting species since it includes species that are parasitic or take advantage of others. Also, certain species may be grouped together because of their size or their mutualistic or antagonistic interactions.

Some problems of species' coexistence within communities were discussed by Mace (1977, 1982), who emphasized that mathematical models may vary with different communities in which the different species interact and how the different species interact. These models are based on computer simulations and do not necessarily reflect the true nature of the interactions within the community. The model used in this study is based on computer simulations and does not necessarily reflect the true nature of the interactions within the community.
Zonal Distribution

Patterns of orthopteran biomass distribution within the Palaearctic region suggest that the insects’ main regions of dominance are in east Kazakhstan, southern Turkmenia, and some local mountains in the southern deserts of the Turanian Plain (Sergeev, 1989, 1990, 1991). The biomass level is reduced, being less than 1 kg per ha, dried moist, in the western parts of semi-deserts (Sergeev, 1990); in the southern deserts of the Turanian Plain (Sergeev, 1989), and especially in the Gobi (Kaplin, 1989). Maximum orthopteran biomass and abundance is associated with flood-plains, low terraces (up to 6 kg per ha), and the middle parts of mountain slopes. The highest levels are observed in the piedmont plains of central Asia (up to 19 kg per ha). Orthopteran biomass is reduced 0.3–0.5 kg per ha in forest life zones (Suslik, 1984). In European Russia and north-west Kazakhstan, total grasshopper abundance increases from the

numeral (deciduous) forest zone (1500–2700 per ha) in the steppe zone (4800–8600 per ha) (Guseva et al., 1979).

Orthoptera are not typical of tundra (Chur- nov, 1978; Sergeev, 1992), although a few species are described from the southern taiga and forest-tundra. Melanoplus frigidus (Boheman) is common in Eurasia.

Orthopteran settlements in boreal and subboreal/boreal forests are closely associated with openings, chipes, and river valleys. The northern steppes of Yakutia are mainly inhabited by typical, widely distributed steps grasshoppers (Berman and Mozzakhvishvili, 1978). The stepp is true of the dry parts of central Yakutia, in which the common species include Chorthippus albo-marginatus (De Geer), Agrypus alticus (L.), and Omocestus haemorrhoidalis (Charpentier).

Some communities of the European boreal zone were described by Ingrisch (1928), Kritskij (1938), and Köhler (1938). Kritskij noted that Chorthippus fortunatus (L.), Chorthippus sabulosus (Eftested) and O. haemorrhoidalis (Charpentier) are common near Moscow, and essentially the same pattern was found in Germany (Ingrisch, 1984), Poland (Moczylna-79; Liuss, 1981), and Slovakia (Suslik, 1981). Typical boreal forms such as Chorthippus diaspor (Germar) and Romalea norvegica (Hagenbach) settle bog landscapes (Schmidt and Schillm. 1984). European urban landscapes are settled by other Orthoptera including the widely distributed Pol- arcric grasshopper G. bipustulatus, Chorthippus parthenius (Geissler), and O. haemorrhoidalis (De Geer). The European katydids Leptophyes punctatissima (Bosc) and the cricket Nemobius sabulosus (Bosc) (Glehn. 1980; Klaussner and Klaussner, 1982). A similar situation is evident in Far Eastern Eurasia (Sergeev, 1990, 1991; Stonebridge, 1987). The Orthoptera of Kunashir Island (southern Kurils) were examined by Sergeev and Lee (1982) and Stonebridge (1985). In Komandor, there are specific species assemblages associated with the local xeric and arctic calderas including the southern thermophilic orthopterans Dictemnus japon- ica Blakers and Loxoblemmus arcticus Szostak and the southern part of the island vary in temperature according to the prevailing oceanic current.

There are many publications concerning
forest-steppe and steppe slopes. Nagez (1983) analyzed the oriothecan communities of Taimsky-National Park, Hungary, within the steppe region of central Europe, where certain widely distributed grasshoppers are common. Included are the \textit{Orthetrum chrysonota} Schrank (Orthetridae) and \textit{Orthetrum australis} Schrank (Crambidae) and the subfamily \textit{Crambinae} (F).

Grasshoppers spread into fields. However, \textit{Orthetrum} and \textit{Crambus} (Orthetridae) and \textit{Crambus} (Crambidae) are clearly more abundant in the steppe region of central Europe, where certain widely distributed grasshoppers are common. Included are the \textit{Orthetrum chrysonota} Schrank (Orthetridae) and \textit{Orthetrum australis} Schrank (Crambidae) and the subfamily \textit{Crambinae} (F.).

Nagez (1983) found that slightly grazed pastures are favored by oriothecan communities in the steppes of Szeklerland and western Siberia. Some prairie communities have been described. Differences in the taxonomic composition of disturbed and undisturbed pastures were described for the semi-arid prairie (Nagez, 1982a) despite the long-term stability of prairie community structure (Jensen and Pruski, 1985). The typical prairie in the ecoregion of Aridlands (Platt, 1982) involves increasing species diversity due to decreasing vegetative diversity. Platt hypothesized that such a distribution of species cannot support overall density, diversity, and richness of \textit{Orthetrum}, which data relative studies on oriothecan species. Mulholland (1986) described the oriothecan composition and distribution of the grasshopper community of a "vertical grassland" in which \textit{Orthetrum australis} (Chloris), \textit{Apogonotrius arenarius} (Gossler), \textit{Chloris arenarius} (Harris), \textit{Melanoplus sanguinipes} (Scudder), \textit{M. amplusulceus} (F.), and \textit{Boletus varius} (Scheidler) are common. Nagez (1979) classified oriothecan communities of the prairie and desert grasslands of Texas, which prove to be phylogenetically evolved.

The distribution and composition of the oriothecan communities of the semi-arid and desert regions of arid lands were described by Prince (1978). Prince and Pelham (1985a) and Stearns (1961) who emphasized that these disturbed ecosystems are associated with the local natural communities, both desert and flood-plain.

In Kazakhstan, we observed oriothecan communities with a high level of diversity and abundance, both in natural and anthropogenic landscapes (Fig. 7A). Here, the natural landscapes are settled by a single steppe, semidesert, and desert species such as \textit{Orthetrum stanovoi} (Stkhilianov), \textit{Crambus alticola} (F.), \textit{Orthetrum obscuratinctum} (Fischer-Waldheim), \textit{Orthetrum senecionis}, and \textit{Crambus alticola}. Almost all the local species are widely distributed throughout the grassland and desert ecosystems and also spread through anthropogenic landscapes. Their abundance sometimes reaches high levels. I observed monotypic oriothecan forms such as \textit{Orthetrum alticola} distributed in semi-arid fields and steppe areas.

In Mongolia, local endemics and subendemics (mainly terrestrials of the tribe Brodnemini) are characteristic of community composition, both in natural and anthropogenic landscapes such as semi-arid crop fields, flood fields, roadbeds, and roadways. Their populations seldom reach high levels of abundance and their species diversity is usually low.

In Kazakhstan, the general diversity of oriothecan communities is high overall (Steichert, 1979) but may be reduced locally. Different types of desert areas are occupied by different species and life forms. For example, \textit{Orthetrum rufescens} (F.) and \textit{E. marshallorum} (F.) are typical of the stone deserts of southern Tahiristan and \textit{Orthetrum arenaria} (Crambidae) is common to local sandy deserts (Bergen, 1983). Local anthropogenic landscapes are usually inhabited by specific groups of oriothecan species that are characteristic of flood-plains, low-term terraces along roadsides, or canalsides, flood fields, and other post-agricultural features.

In the Red Desert of central Asia, the oriothecan communities include relatively few species (Kalous, 1959). Some are commonly widely distributed grasshoppers such as the \textit{Orthetrum arenaria} (F.), \textit{Crambus alticola} (F.), \textit{Orthetrum arenaria} (Crambidae), and \textit{Orthetrum obscuratinctum} (F.). Gilmanem are endemic orien Asian forms such as the
terrestrial Eremobates spp. and Mammillaria pygmaea (Zahnrey). Community diversity is higher in the central Asian mountains than in the plains of this region. This situation is mainly associated with altitudinal and ecological differentiation (Duggav, 1994). Many anthropogenic landscapes are settled by widely distributed species and reassemble in their compositions basic desert and steppe communities.

In general, the Orthoptera of semi-deserts and deserts are varied, and common species of the subregion being determined by local watershed and steppe conditions. The incidence of species with reduced ranges and isolated populations increases from north to south and...
reflects a decline in general abundance and an increase in community diversity. The valley assemblages of species are relatively uniform (Tumerow et al., 1985). The communities of local montane-peats landscapes are distinguished by species mainly associated with non-peats ecosystems. Irrigated fields are noted mostly by flood-peats Orthoptera. Rodent's and subterranean do not penetrate into the agric- and temperate areas. Thus, the orthopteran communities of artificial geographic landscapes are more closely related to one another than to those of natural landscapes. Increased abundance is not characterized of medically disturbed biomes (fig. 7).4.

In Maryland's region, specific suite communities are distributed along the gradient for Spits, for example. Verriciccia littoralis (Humb. Bolomia antarctica (Cuvier), and Calicius discoides (Latreille) see common (Kubisiak et al., 1987).

In North America, Reesor (1986) studied the seasonal composition of montane grasshopper communities. He identified the groups of useful species. They grasshoppers Prionolophidae, Plecoptera, and Collembola inhabit (Grindov) frequented the upper part of the local seta and Pluric rufs (Hbssaur). Proctolophus margin Erleuth, Aularches marshalli (Droeshed) and a few other species the lower part.

Some papers have dealt with grasshopper community compositions in the grasslands of the Indian Pools. Haga et al. (1985) described two communities, one characterized by Azelochthonia crassa (Waller), Scutamene- mium articulatum (Walk), and on Colcius discoides (Macquart) and the other by Colcius- capis (Smith), Prionolophus margrina (Waller), and Acrasites humilis (Eversole). The latter is the most common representative of Indian grassland communities (Prehoda, 1985). Human activity is responsible for significant changes in the structure of these mavin communities (Julia et al., 1982).

Clifford-Masie and Collins (1985) described the bioclimatic communities of Lusso Kurotshu, Ivory Coast, where the abundance of insect fauna is high (about 50-100 m²). Interestong, they found that after the year, the number of species decreases from 20 to 35, although the number of individuals increases. Duranta et al. (1985) discussed the imperceptible grasshopper community contours of Cape Verde, of which Colcius articulatum (Kroml. Prionolophus capis (Crans), and Sphenomorphus ruber (F.) (Vegl.) are common species. Total numbers of individu- als is high, being more than 5000 per ha.

Connor (1982) estimated mean grasshopper biomass as 0.3-0.4 kg per ha in the mixed grass-free South African savanna at Nyaswe Nature Reserve. Where grasshoppers denspoin 7-18 per cent to total grass production. Barker (1973) described the grasshopper communities of Kalbarri State, noting that one inh- cludes relatively low species. Arctiina sp. and Sphingidae are subordinately are common representatives.

The study of the orthopteran communities of tropical and equatorial forest zones is com- plexified because of the highly developed spatial structure of such ecosystems. Ambrosion and Decamps (1980) analyzed the rich, relatively abundant assemblies of arboreal grasshopper communities in the Upper Association Basin and Cuvins. As a rule, each includes more than 10 species belonging to various sub- families. The different species groups of the local forests react to environmental disturbance mainly by variances in population number. Immigrants are either representatives of initial succession or species typical of degraded plant formations. In cultivated plots, there are at least three species groups (Ambrosion et al., 1980) (i) primary pioneers associated with open, non-forest stations whose populations achieve maximum numbers during the 1st year of cultivation and then disappear; (ii) secondary pioneers whose populat- ions increase during the 2nd, 3rd, and 4th years; and (iii) tertiary plunders which appear after the 2nd year of cropping. Their most significant decrease is evident during the 4th year of cultivation. Following which species abundance and diversity slowly increase in association with other species and species groups. The true tree communities re-establish themselves about 71 years after clearance.
Three-Dimensional Patterns of Community Distribution

I have analyzed the altitudinal communities of Orthoptera in the area south of the Carpathians, the Carpathians, and the Alat Mountains (Berg, 1939a). Croprheinian communities generally include only a few Orthoptera of reduced abundance. The alpine and subalpine meadows are inhabited only by Microtettix alpinus (Kollar). The forest meadow communities are characterized by a number of widely distributed species. The larvalidae Paratettix alpinus (Pruin) and Pulicetettix striatellus (Champeroutier) are common representatives (Cecon, 1928). being typical of open forest and subalpine forests.

The communities of the Carpathians are distinguished from those of the Carpathians by species composition and level of abundance. The alpine, subalpine, and forest meadows are inhabited by the transalpineavertebrate nematode grasshopper Chorthippus pygmaeus (L.) as well as by a few montane subalpine and an abundant invertebrate species. Anota alborus (L.). in some regions, local montane becomes important (Marov, 1927). The characteristic forest meadow communities are similar to those in the Carpathians. Orthoptera diversity increases in the deciduous forest subalpine belt where European species such as Elytropus alpinus Kuhl and Pseudoscelus crucifrons Ore Delapar appear, along withCorsica endemics such as Pseudochorthippus weissi (Barnett). A similar pattern was described in Gauss's classic paper (1910).

The altitudinal communities of Orthoptera are distinguished by their great species diversity, which is perhaps merely an artifact of intensive study. They include mainly arthropod species whose levels of abundance are similar to those of the species of the Carpathians. The alpine and subalpine communities are interesting (Barnes and St-Briant, 1926), in that the typical species form successions in mountainous areas. The southern Carpathian montane endemic Pedetes albifrons (Alboflora) and the southern Carpathian montane endemic Pedetes albifrons (Alboflora). In the steppe subalpine belt, other Chorthippus populations (L.) is important, along with the eastern Palaeartic

unsoapinaceae grasshoppers C. howitt

stromus (Mireaux) and Cela alboflora (Schloeg). Investigations into the Mediterranean and East European Orthoptera (Broux, 1962; Prehn, 1917; Chalde and Sanguin, 1978) show a similar pattern of growing intensity invertebrate species diversity. High levels of diversity are described for relatively rare arid grassland pastures and vice versa (Hammond and Proctor). 1917a; Cladice and Shihon (1970) tried to distinguish amongst community types. They hypothesized two possible species associations, namely a Mediterranean and a montane, but their results reflect species' continuous altitudinal distribution. This suggests that, for understanding Mediterranean distribution, in analysis of the interactions between grasshopper's complex community structure and beetle and reptile patterns is essential. Patterns of diversity increase and of diversity decrease as a result of energygrazing are described for the submediterranean mountains (Wilson, 1917).

Pyrenean Orthoptera are associated with vegetation type (Broux, 1978b, 1980), but the relatively typical forest communities characterized by Pyrrophorus grantii (L.) and Isoscelis costella (Hegnuchius) habitat places. Elytropus pygmaeus (Wheeler) in Mediterranean uppers, and Chorthippus pygmaeus (L.) in ser
desertic places. Barnes and Lecaron (1930) used vegetation types for dividing the orthopteran communities of Corsica. In a willow, one undifferentiated and disturbed (b), grassland in (a) marshy and saline and (c) forest. Baco-Goichon (1992) described relatively uniform assemblages in the grassland slopes the Pyrenean timberline, of which Strado
torina alboflora (Barnes) and Stethauchis (Herrich-Schaeffer). and Onymacris intermari

a (Champeroutier) are common species. Paquot (1978b) analyzed the altitudinal distribution of Orthoptera in the Sierra Nevada, Spain, in which typical Mediterranean communities are observed. He observed high altitude community above 2,500 m. An attempt at classification of the altitudinal communities of the Sierra de Guadarrama, Spain, was undertaken by Tena et al. (1981).

Altitudinal communities of Orthoptera on the flora of the Jura mountains were characterized by Mynotus (1988) and montane and subalpine landscape communi-
Conclusions

The spatial (including regional) approach allows for the visualization of whole faunas, biotas geographically and ecologically. From the geographical point of view, a fauna occupies a given territory having internal and external boundaries, whose distribution is associated with differentiation of the earth's surface. From the ecological point of view, a fauna is an aggregate of species' territories united at least in territory. Thus, a fauna may be described as not only an historical combination of endemic and widely distributed faunas, but also a specifically unique aggregate of populations, regularly distributed over local landscapes. This population of corresponding communities on every landscape or biotope, including one in succession.

The spatial approach leads one to appreciate that it is not possible to study a local part of a population or a community and, subsequently, to use the data for predicting composition of the entire area. These biogeographical units may be identified by non-identical obstacles (biotic or not) and can be different in origin: anthropogenic, secondary, biotopic, climatic, dynamic, behavioral, etc.

A most valuable biogeographical problem consists in the penetrability of different barriers of various scales so as to determine optimal ways for the dispersal of species, settling new territories and regions, and creating new populations.

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Notes

The migration system of grizzly populations is essentially unique to a region (Drake and Parsons, 1983).

The methodology stems from migratory faunas.

References


