

RECENT DATA ON FAUNISTICAL AND ECOLOGICAL CONDITIONS OF ORTHOPTERA AT THE DALMATIAN COAST

J. GAUSZ

Department of Zoology, Attila József University, Szeged

(Received November 29th 1969)

In the faunistical research of the Dalmatian coast a significant place is occupied by the *Orthoptera* fauna. From taxonomic point of view *Orthoptera* had been investigated by many researchers as early as the last century, first of all by BRUNNER (1882), KRAUSS (1888), EBNER (1908), and WERNER (1920). These authors have described a number of new species from this territory, completing their investigations with certain ecological data. Lately, besides the faunistical investigations, some importance has been attached to estimating the ecological conditions of coastal biotopes, as well (KÜHNELT, 1943), for the well-definable halophilous, macquis and karst-steppe associations of Dalmatia mean a special biotope for the insect population living there. PRAVDIN's fundamental paper (1964) estimates the *Saltatoria* fauna of littoral biotopes as dependent upon vertical distribution, completing them with climatological and phytosociological data. Similar intentions are reflected by ADAMOVICH's (1964) investigations carried out in the environs of Dubrovnik. Us (1964) investigates the conditions of presence and quantity of the *Orthoptera* species in connection with the plant associations in the islands Cres and Losinj, paid attention to macquis associations. Author discusses in this paper the results of his collecting activity in three successive years (August 1964—1966), attaching primary importance to the role of environmental factors and the characterization of biotopes, on the basis of their *Saltatoria* fauna.

Methods

The peculiar phytocoenologic structure of littoral biotopes does not enable collecting by a sweeping net (GALLÉ and GAUSZ, 1968); the species of families *Acrididae* and *Tettigoniidae* are consequently collected one by one. For measuring quantitatively the single biotops under the given experimental conditions, I performed a time collecting of one hour. The single sites of collectings at Bar a and b stations took place in 1965, those of Zaostrog a, b, c, Baska Voda, and Gradac in 1966, while the others in 1964, always at the beginning of August. The time of collecting in August is unfavourable, for at this time the insects of the Adriatic coast are in a state of the so-called „summer pause”.

At characterizing the biotops, vegetation has a primary importance, thus I endeavoured to determine, when possible, the plant association. In that task I was supported by the works of ADAMOVICH (1911) and HORVATIC (1927). The observations concerning

the composition of vegetation and the data about the abiotic factors play a part at treating the single biotops together with the data of dominance calculated for the species demonstrated. The nomenclature of species is given on the basis of HARZ's work (1957).

Orthoptera fauna of the single biotops

1. Rijeka

There is a slope of southern exposition 250 m a. s. l. Its vegetation is strongly overrun by weeds, therefore, the plant association is not definite, its height varies between 3–10–20 cm. The *Orthoptera* fauna with low species and specimen numbers is formed first of all by euriplastic species. (Table 1)

Table 1

Species	Number	D p. c.
<i>Phaneroptera quadripunctata</i> BR. v. W.	3	10.7
<i>Pezotettix giornae</i> ROSSI	18	64.0
<i>Calliptamus italicus</i> L.	4	14.6
<i>Oedipoda coerulescens</i> L.	3	10.7

2. Medveja

Even in the sparse, shaded, weedy underwood of *Pinus halepensis* only species with wide tolerance limit subsist, while the complete lack of herbivorous and graminivorous species is the result of the complete absence of *Gramineae* vegetation. (Table 2)

Table 2

Species	No.	D p. c.
<i>Pezotettix giornae</i> ROSSI	21	56.8
<i>Calliptamus italicus</i> L.	7	17.2
<i>Oedipoda coerulescens</i> L.	10	26.0

3. Lovranska Draga

The vegetation of the grass-land 400–500 m a. s. l. is composed of *Melica*, *Briza*, *Setaria*, and *Arrhenaterum* stand. The height of vegetation is 20–25–30(–40) cm, the coverage is 90–95 per cent. The soil became only somewhat karstic and compared with the littoral zone it is of lower air temperature with a 6–7 °C. The *Saltatoria* population consists of karst-steppe species (*Tylopsis liliifolia* FABR., *Phaneroptera quadripunctata* BR. v. W.). The number of locusts is rather high but also the *Oedipoda germanica* LATR. living in higher lying biotops of the littoral zone can be found. Faunistically the *Glyptobothrus eisentrauti* RME. is interesting for it has not been demonstrated in Dalmatia yet, and its nearest locality is in Croatia (RAMME, 1951). (Table 3)

Table 3

Species	No.	D p. c.
<i>Tylopsis liliifolia</i> FABR.	8	10.1
<i>Phaneroptera quadripunctata</i> BR. v. W.	16	20.2
<i>Acrometopa macropoda</i> BURM.	1	1.3
<i>Pachytrachis striolatus</i> FIEB.	2	2.7
<i>Rhacocleis germanica</i> H.—S.	5	6.8
<i>Pezotettix giornae</i> ROSSI	12	15.1
<i>Odontopodisma schmidti</i> FIEB.	1	1.3
<i>Oedipoda coerulea</i> L.	4	5.2
<i>Oedipoda germanica</i> LATR.	6	8.1
<i>Omocestus ventralis</i> ZETT.	10	12.9
<i>Omocestus haemorrhoidalis</i> CHARP.	3	4.1
<i>Glyptobothrus eisentrauti</i> RME.	4	5.2
<i>Chorthippus longicornis</i> LATR.	3	4.1
<i>Gomphocerippus rufus</i> L.	2	2.7

4. Split

Mixed macquis vegetation on the side of the mountain Marjan (*Juniperus oxycedrus*, *Cistus villosus*, *Agave americana*), the cover being 75–80 per cent. We have found the typical macquis-dwelling *Orthoptera* population, mentioned by PRAVDIN (1964). (*Anacridium aegyptium* L., *Acrotylus patruelis* H.—S., *Aiolopus strepens* LATR.). (Table 4).

Table 4

Species	No.	D p. c.
<i>Pezotettix giornae</i> ROSSI	36	43.4
<i>Anacridium aegyptium</i> L.	4	8.7
<i>Calliptamus italicus</i> L.	5	6.1
<i>Oedipoda coerulea</i> L.	3	3.8
<i>Acrotylus patruelis</i> H.—S.	11	13.1
<i>Aiolopus strepens</i> LATR.	14	16.7
<i>Aiolopus thalassinus</i> FABR.	6	7.2

5. Solin

There is a deep lying, dry biotop profusely covered by weeds (*Festuca*, *Xanthium*), the height of vegetation being 3–5–7–10 cm, coverage is 85–90 p. c. The plant association is a transition between the karst-steppe and the macquis. Particularly characteristic are the specimens of *Bacillus rossii* F. and *Acrida mediterranea* DIRSH in nymphal state, as well as that of *Omocestus petraeus* BRIS. (Table 5)

6. Klis

There is a pasture of poor quality on a higher level (400 m); *Onopordetum illyricum* association, the height of vegetation being 7–10–15(–30–40) cm, coverage is 90–95 per cent. The population is formed first of all by

Table 5

Species	No.	D p. c.
<i>Bacillus rossii</i> F.	8	13.2
<i>Mantis religiosa</i> L.	4	6.9
<i>Pezotettix giornae</i> ROSSI	29	49.1
<i>Calliptamus italicus</i> L.	1	1.7
<i>Oedipoda coeruleescens</i> L.	5	9.4
<i>Acrida mediterranea</i> DIRSH	6	10.3
<i>Omocestus petraeus</i> BRIS.	5	9.4

macquis-dwelling elements. *Tessalana tessalata* CHARP. and the *Calliptamus barbarus barbarus* COSTA are worth to mention. (Table 6)

Table 6

Species	No.	D p. c.
<i>Mantis religiosa</i> L.	7	14.0
<i>Tessalana tessalata</i> CHARP.	1	2.0
<i>Pezotettix giornae</i> ROSSI	16	32.0
<i>Calliptamus italicus</i> L.	6	12.0
<i>Calliptamus b. barbarus</i> COSTA	5	10.0
<i>Oedipoda coeruleescens</i> L.	3	6.0
<i>Oedipoda germanica</i> LATR.	3	6.0
<i>Omocestus petraeus</i> BRIS.	4	8.0
<i>Glyptobothrus brunneus</i> THUNBG.	5	10.0

7. Baska Voda

It is a mixed stand of karst-steppe and macquis (*Helichrysetum italicum* and *Pistacietum lentiscum* associations), the height of vegetation being 10–20–30 cm, coverage is 75–80 per cent. I have found there the grasshopper species *Platycleis stricta* ZELL., characteristic of South Dalmatia (BEIER, 1954) and *Empusa fasciata* BRULLÉ, living in macquis. The other elements of the populations can be found primarily in the macquis. (Table 7)

Table 7

Species	No.	D p. c.
<i>Mantis religiosa</i> L.	3	3.1
<i>Empusa fasciata</i> BRULLÉ	2	2.0
<i>Tylopsis liliifolia</i> FABR.	3	3.1
<i>Platycleis stricta</i> ZELL.	1	1.0
<i>Pezotettix giornae</i> ROSSI	20	20.4
<i>Calliptamus italicus</i> L.	4	4.1
<i>Calliptamus b. barbarus</i> COSTA	2	2.0
<i>Oedipoda coeruleescens</i> L.	7	7.1
<i>Oedipoda germanica</i> LATR.	6	6.1
<i>Acrotylus insubricus</i> SCOP.	4	4.1
<i>Acrotylus patruelis</i> H.—S.	11	11.2
<i>Aiolopus strepens</i> LATR.	26	26.5
<i>Acrida mediterranea</i> DIRSH	4	4.1
<i>Glyptobothrus vagans</i> EVERSM.	4	4.1

8. Zaoztrog

a) It is in the littoral zone the undergrowth of *Ficus carica* and *Olea europaea* stand. Apart from the shrubs occurring sparsely, it is a karst-steppe vegetation, being 3–5–7–10 cm high, coverage is 85 per cent. The population is formed mainly by macquis-dwelling elements but, owing to deep shade, it has a low specimen number compared to other biotops. *Rhacocleis bucchichi* HERM. has a place in Us's (1967) Yugoslav Orthoptera catalogue among insular endemics, thus it is its first continental occurrence. (Table 8)

Table 8

Species	No.	D p. c.
<i>Pachytrachis frater</i> BR. v. W.	1	2.9
<i>Rhacocleis bucchichi</i> HERM.	1	2.9
<i>Pteronemobius heydeni</i> FISCH.	4	11.5
<i>Pezotettix giornae</i> ROSSI	9	26.1
<i>Calliptamus italicus</i> L.	3	8.6
<i>Oedipoda coerulescens</i> L.	2	5.7
<i>Acrotylus patruelis</i> H.—S.	4	11.5
<i>Aiolopus strepens</i> LATR.	11	31.8

b) *Helichrysetum italicum* is a karst-steppe association somewhere with a stand of *Quercus coccifera* and *Nerium oleander*; vegetation height being 10–20–30(–40) cm, coverage is 85–90 per cent. As compared with those of the former biotope, the conditions of soil structure and shade are more favourable. Both the macquis and karst-steppe species are dominant, and even the *Oedipoda miniata* PALL., characteristic of the halophilous vegetation also occurs here (Table 9)

Table 9

Species	No.	D p. c.
<i>Phaneroptera quadripunctata</i> BR. v. W.	4	6.0
<i>Pezotettix giornae</i> ROSSI	15	22.5
<i>Calliptamus italicus</i> L.	6	8.9
<i>Oedipoda miniata</i> PALL.	2	3.0
<i>Oedipoda coerulescens</i> L.	5	7.4
<i>Oedipoda germanica</i> LATR.	2	3.0
<i>Acrotylus patruelis</i> H.—S.	7	10.4
<i>Aiolopus strepens</i> LATR.	14	21.0
<i>Aiolopus thalassinus</i> FABR.	3	4.5
<i>Omocestus ventralis</i> ZETT.	7	10.4
<i>Glyptobothrus vagans</i> EVERS.M.	4	6.0
<i>Glyptobothrus brunneus</i> THUNB.	3	4.5

c) The typical *Pistacietum lentisci* macquis is in a height of 100 m a. s. l., with a vegetation height of 60–70 cm, little dense clumps of grass. The most important species of the population are *Pezotettix giornae* ROSSI and *Aiolopus strepens* LATR. but the solitaria phase nymph of *Locusta migratoria* L. can be found (Table 10).

Table 10

Species	No.	D p. c.
<i>Phaneroptera quadripunctata</i> BR. v. W.	3	3.6
<i>Rhacocleis buccichi</i> HERM.	1	1.2
<i>Pezotettix giornae</i> ROSSI	20	23.8
<i>Anacridium aegyptium</i> L.	6	7.1
<i>Calliptamus italicus</i> L.	8	9.5
<i>Locusta migratoria</i> L.	1	1.2
<i>Oedipoda coerulescens</i> L.	4	4.8
<i>Oedipoda germanica</i> LATR.	4	4.8
<i>Acrotylus patruelis</i> H.—S.	8	9.5
<i>Aiolopus strepens</i> LATR.	23	27.4
<i>Omocestus ventralis</i> ZETT.	6	7.1

9. Gradac

It is the weed association of the cultivated stands of *Olea europaea*, *Ficus carica*, and *Vitis vinifera*, mainly with macquis plants. Vegetation height is strongly heterogeneous, coverage is 60–70 per cent. Conditions are more and less similar to those of the former biotop, the role of karst-steppe species being negligible. *Tetrix ceperoi balcanicus* KARAM. is new for the Yugoslav fauna; although mentioned by PRAVDIN (1964), it is not included in Us's (1967) catalogue (Table 11).

Table 11

Species	No.	D p. c.
<i>Phaneroptera quadripunctata</i> BR. v. W.	4	6.1
<i>Pholidoptera dalmatica</i> KR.	1	1.6
<i>Tetrix ceperoi balcanicus</i> KARAM.	1	1.6
<i>Pezotettix giornae</i> ROSSI	18	27.4
<i>Calliptamus italicus</i> L.	5	7.5
<i>Oedipoda coerulescens</i> L.	4	6.1
<i>Oedipoda germanica</i> LATR.	4	6.1
<i>Sphingonotus caeruleus</i> L.	2	3.1
<i>Acrotylus patruelis</i> H.—S.	6	9.0
<i>Aiolopus strepens</i> LATR.	21	31.9

10. Mljet

The underwood of *Pinus halepensis*, *Pinus pinea* and *Ceratonia siliqua* stand is the southern macquis, *Myrtetum italici*, the grass level is negligible; along the paths somewhat weedy. The population is very poor in species and, besides the macquis elements, we may find *Glyptobothrus lesinensis* KR. as a dominant species, also mentioned by KRAUSS (1888) and RAMME (1951) from the island Hvar and reported in the Yugoslav fauna catalogue only from that habitat (Table 12).

Table 12

Species	No.	D p. c.
<i>Pezotettix giornae</i> ROSSI	15	28.5
<i>Calliptamus italicus</i> L.	6	11.4
<i>Oedipoda coerulescens</i> L.	2	3.8
<i>Acrotylus patruelis</i> H.—S.	7	13.3
<i>Omocestus ventralis</i> ZETT.	3	5.7
<i>Glyptobothrus lesinensis</i> KR.	19	37.3

11. Hercegnovi

There is first of all a mixed stand of deciduous and evergreen bushes, here and there with *Gramineae* vegetation (*Stipa*, *Briza*, *Sesleria*), 10–20–30(–40) cm high, coverage is 95–100 per cent. The cricket species, *Trigonidium cicindeloides* RAMB. is characteristic for South Dalmatia in areas shaded by shrubs. A number of the carnivorous locust species (*Rhacocleis germanica* H.—S., *Saepiana saepium* YERS., *Tettigonia viridissima* L., *Roeseliana roeselii* HGB.) can also be found together with the species of the xerophilous grass-land meadows of the Carpathian Basin. (*Glyptobothrus brunneus* THUNB., *Omocestus ventralis* ZETT.) *Poecilimon fussi* BR. v. W. in Dalmatia has been first demonstrated in that biotop (Table 13).

Table 13

Species	No.	D p. c.
<i>Tylopsis liliifolia</i> F.	7	7.1
<i>Phaneroptera quadripunctata</i> BR. v. W.	8	8.2
<i>Acrometopa macropoda</i> BURM.	2	2.0
<i>Poecilimon fussi</i> BR. v. W.	1	1.0
<i>Tettigonia viridissima</i> L.	1	1.0
<i>Saepiana saepium</i> YERS.	2	2.0
<i>Roeseliana roeselii</i> HGB.	2	2.0
<i>Rhacocleis germanica</i> H.—S.	7	7.1
<i>Pteronemobius heydeni</i> FISCH.	3	3.1
<i>Trigonidium cicindeloides</i> RAMB.	4	4.1
<i>Pezotettix giornae</i> ROSSI	18	18.5
<i>Anacridium aegyptium</i> L.	2	2.0
<i>Calliptamus italicus</i> L.	4	4.1
<i>Calliptamus b. barbarus</i> COSTA	3	3.1
<i>Oedipoda coerulescens</i> L.	6	6.1
<i>Aiolopus strepens</i> LATR.	2	2.0
<i>Omocestus ventralis</i> ZETT.	7	7.1
<i>Glyptobothrus vagans</i> EVERS.M.	19	19.5

12. Melnije

300 m a. s. l., there is a *Helichrysetum italici* association, sparsely mixed with macquis. Vegetation height is 15–20–30(–45) cm, coverage is 100 per cent. Apart from the Central-European mountaineous species (*Pachytrachis gracilis* BR. v. W., *Pholidoptera aptera* FABR.), the population is formed by euriplastic species distributed widely (Table 14).

Table 14

Species	No.	D p. c.
<i>Platycleis grisea</i> FABR.	2	6.7
<i>Pholidoptera aptera</i> FABR.	2	6.7
<i>Pachytrachis gracilis</i> BR. V. W.	1	3.3
<i>Pezotettix giornae</i> ROSSI	12	39.9
<i>Calliptamus italicus</i> L.	2	6.7
<i>Oedipoda coerulescens</i> L.	4	13.3
<i>Oedipoda germanica</i> LATR.	5	16.7
<i>Chorthippus longicornis</i> LATR.	4	13.3

13. Z a n j e v d o

At a height of 1000—1200 m a. s. l., on an almost bare southern slope, there is *Saltatoria* fauna of a low species and specimen number. In higher regions, apart from the common *Oedipoda germanica* LATR., *Lucusta migratoria* L. can also be found (Table 15).

Table 15

Species	No.	D p. c.
<i>Locusta migratoria</i> L.	1	3.8
<i>Oedipoda coerulescens</i> L.	7	26.6
<i>Oedipoda germanica</i> LATR.	18	69.6

14. B a r

a) There is a *Quercetum ilicis* association mixed with macquis and karst-steppe associations (*Scolymetum hispanici*, *Eryngietum echinosporium*). As compared with macquis associations, the significance of *Anacridium aegyptium* L. is lower. From the carnivorous species *Eupholidoptera chabrieri* CHARP. was found here common (Table 16).

Table 16

Species	No.	D p. c.
<i>Empusa fasciata</i> BRULLÉ	2	2.0
<i>Tylopsis liliifolia</i> FABR.	4	4.1
<i>Phaneroptera quadripunctata</i> BR. V. W.	2	2.0
<i>Eupholidoptera chabrieri</i> CHARP.	4	4.1
<i>Rhacocleis germanica</i> H.—S.	4	4.1
<i>Pezotettix giornae</i> ROSSI	19	19.4
<i>Anacridium aegyptium</i> L.	2	2.0
<i>Calliptamus italicus</i> L.	7	7.1
<i>Oedipoda miniata</i> PALL.	3	3.1
<i>Oedipoda coerulescens</i> L.	6	6.1
<i>Acrotylus patruelis</i> H.—S.	10	10.2
<i>Aiolopus strepens</i> LATR.	21	21.5
<i>Acrida mediterranea</i> DIRSH	4	4.1
<i>Glyptobothrus vagans</i> EVERSM.	6	6.1
<i>Glyptobothrus brunneus</i> THUNB.	4	4.1

b) There is a littoral halophilous vegetation, overrun by weeds (*Phragmites*, *Juncus*, *Salicornia*, *Plantago*). The population is formed, apart from Central-European xerophilous and even hygrophilous elements by South Dalmatian ones (*Tessalana orina* BURR, *Euchorthippus declivus stichai* MAR.) especially by macquis-dwelling species (Table 17).

Table 17

Species	No.	D p. c.
<i>Tessalana orina</i> BURR	2	3.6
<i>Eupholidoptera chabrieri</i> CHARP.	2	3.6
<i>Pezotettix giornae</i> ROSSI	23	42.3
<i>Acrotylus patruelis</i> H.—S.	4	7.2
<i>Aiolopus strepens</i> LATR.	14	25.3
<i>Stenobothrus fischeri</i> EVERSM.	2	3.6
<i>Chorthippus albomarginatus</i> DEG.	3	5.4
<i>Chorthippus dorsatus</i> ZETT.	3	5.4
<i>Chorthippus loratus</i> FISCH.	1	1.8
<i>Euchorthippus declivus stichai</i> MAR.	1	1.8

Evaluation of results

Because of the great differences in the distances of the biotops investigated and in the time lapse of collectings, I can give but a general characterization of the population groups of *Orthoptera* in Dalmatia. The evaluation is the more difficult for I have no climatic data and the number of collectings is low, too. Having collected in the most important littoral plant associations certain classifications may be carried out. It is to be emphasized that at establishing the groups of populations no importance has been attached to the euriplastic species that are common everywhere (*Pezotettix giornae* ROSSI, *Calliptamus italicus* L., *Oedipoda coerulescens* L.) but only to the elements of local character of a given biotop. Similarly, the role of the *Tettigoniidae* species occurring only in a few biotops is less important for characterization. In the following the separable *Saltatoria* population groups will be discussed.

A. *Macquis* populations. It should be mentioned that the *Saltatoria* fauna of a real macquis plant association is generally very poor; the fauna of the macquis mixed (with karst-steppe and weed associations) can, however, be well characterized. In biotops like these, *Acrotylus patruelis* H.—S., *Aiolopus strepens* LATR., *Anacridium aegyptium* L., *Omocestus ventralis* ZETT. are the most important species and a secondary role is played by *Empusa fasciata* BRULLÉ, *Locusta migratoria* L., *Glyptobothrus vagans* EVERSM. In a macquis vegetation, the forbivorous species are dominant and the graminivorous and herbivorous elements are rarer also in mixed stands (Split, Mljet, Bar a, Zaostrog a, c, Baska Voda stations).

B. Karst-steppe populations of littoral zone. The macquis-dwelling elements may be observed here, too, with lower dominance; the population group is, however, characterized by other, so-called „phytocolous elements” as *Tylopsis liliifolia* FABR., *Phaneroptera quadripunctata*

BR. v. W. and *Acrometopa macropoda* BURM. In such biotops the carnivorous grasshopper species have a greater role. (Hercegnovi, Gradac, Zaostrog b stations).

C. Karst-steppe populations of higher sites. They are the species of the former two population groups, in a more moderate amount. The species of the Central European xerophilous meadows are characteristic, with a moderate dominance (*Glyptobothrus brunneus* THUNB., *Omocestus ventralis* ZETT.), and *Oedipoda germanica* LATR. (Lovranska Draga, Melnije, Klis stations).

D. Littoral grassland populations. Characteristic dominant species are *Acrida mediterranea* DIRSH, *Bacillus rossii* F., and *Mantis religiosa* L. that are in nymphal state even in August. There is a decrease in specimen density, as compared with the former biotops. (Solin station).

E. Subalpine populations. On rocky mountain sides of very scarce vegetation, the *Saltatoria* fauna is formed by *Oedipoda germanica* LATR. and *Oedipoda coerulea* L. (Zanjevdo station).

F. Halophilous littoral populations. From the macquis-dwelling species *Aiolopus strepens* LATR. and *Acrotylus patruelis* H.—S. occur as well as the Central European xerophilous species. (Bar b station).

G. Ruderal populations. Only euriplastic species occur as components of these populations (Rijeka, Medveja stations).

It is important to be mentioned that these populations mostly cannot be separated definitely from one another because transitory types are also frequent. One of the drawbacks of these investigations is that no data about the populations in the oak and beech zones of higher territories were obtained.

Summary

In the months August of 1964—1966 I collected 1046 specimens of 54 species in the territory of Dalmatia in 17 biotops. From the species demonstrated, *Glyptobothrus eisentrauti* RME. and *Tetrix ceperoi balcanicus* KARAM, as well as *Euchorthippus declivus stichai* MAR. are new to the fauna of Dalmatia, although the last two have been mentioned by PRAVDIN (1964). The presence of *Glyptobothrus lesinensis* KR., known so far from Hvar, in the island Mljet, and the specimens of *Rhacocleis bucchichi* HERM., known so far from islands, and now found in the mainland, are similarly worth mentioning.

The *Orthoptera* populations in Dalmatia can be separated from one another on the basis of the single vegetation types and, in that relation, they can be classified on the basis of my collectings in seven groups. From there are of outstanding importance the macquis and karst-steppe associations, and their intermediates from which the *Saltatoria* fauna can be well determined. The other biotope types are rarer and the characterization of their fauna is more complex. There are a few species (*Pezotettix giornae* ROSSI, *Calliptamus italicus* L., *Oedipoda coerulea* L.) common in the most of the biotops.

References

- ADAMOVICH, L. (1911): Die Pflanzenwelt Dalmatiens. — Leipzig.
- ADAMOVICH, Z. R. (1964): *Orthopteroides* collected in Dubrovnik district, Jugoslavija. — Glas. Prirod. Mus. Beogr. 19, 155—188.
- BEIER, M. (1954): Die jugoslawischen Arten der *Pholidopterini*. — SAZU. Ljubljana Razp. 2, 199—213.
- BRUNNER, W. (1882): Prodrömus der europäischen *Orthopteren*. — Leipzig.
- EBNER, R. (1908): Beiträge zur *Orthopteren*fauna Bosniens und der Herzegowina. — Verh. Zool. Bot. Ges. Wien. 57, 329—339.
- GALLÉ, L. jr.; GAUSZ, J. (1968): Data for knowledge of the entomology of the Upper Tisza district (*Orthopteroidea* and *Formicoidea*). — Tiscia. (Szeged) 4, 83—101.
- HARZ, K. (1957): Die Geradflügler Mitteleuropas. — Jena.
- HORVATIC, S. (1927): Flora i vegetacija otoka Plavnika. — Act. Bot. Univ. Zagr. 2, 27—34.
- KRAUSS, H. (1888): *Orthoptera* duo nova ex insula Lesina Dalmatiae. — Wiener Ent. Zeit. 5, 117—118.
- KÜHNELT, W. (1943): Die Leitformenmethode in der Ökologie der Landtiere. — Biol. Gen. 17, 106—146.
- PRAVDIN, F. N. (1964): Regularities of the vertical distribution of orthopteroid insects in the Adriatic part of the Balkan Peninsula (In Russian). — Ent. Oboz. 43, 258—266.
- RAMME, W. (1951): Zur Systematik, Faunistik und Biologie der *Orthopteren* von Südost-Europa und Vorderasien. — Berlin.
- US, P. (1964): Ortopterska fauna otoka Cresa i Losinja. — Biol. Glas. 17, 17—29.
- US, P. (1967): Catalogus faunae Jugoslaviae, III/6 *Orthopteroidea*. — Ljubljana.
- WERNER, F. (1920): Beiträge zur Kenntnis der Fauna Dalmatiens besonders der Insel Brazza. — Zool. Jahrb. Abt. Syst. Bd. 42, 213—225.

Address of the author:

Dr. J. GAUSZ
Department of Zoology, A. J. University,
Szeged, Hungary