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Ecological and coenological investigations of
Orthoptera in the environs of Poroszló

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Abstract

As a continuation of an investigation series before /G a u s z 1966, G a l l é - G a u s z 1968, G a u s z 1969/, we carried out the collection series published below, from July 26th until August 5th 1969. These investigations contain the results of collections in the Middle-Tisza region at 12 stations of 5 biotopes. The causes of different distribution of *Orthoptera* are given as a function of various ecological conditions.

Methods

From the relative methods used at quantitative collectings I have applied the collecting technique used by G a l l é - G a u s z /1968/. In case of the *Acrididae* family, I have applied 4 x 100 grass-net strokes in every biotop, resp. collecting; and in the case of the *Tettigoniidae* family I have used the method of singling. At the *Angelico-Cirsietum oleracei* Tx. 37 population I applied "time-collection" for an hour. The methods mentioned above were repeated three times in every area during the 11-day period available for me. In the single biotops, there was given also the discovered amount of nymphs and, if possible, they were also determined on species or genus level. The ecological type and the distribution of the fauna according to spectrum are given on the basis of H a r z's work /1957/.

Characterization of biotops and coenoses

As the ecological collectings of *Orthoptera* are generally determined in respect of plant association, I am applying that method in this paper, as well. Concerning the plant associations I accented S o ó's /1964/ nomenclature. The structural conditions of the vegetation and the variation of the single abiotic factors, first of all the microclimate are, however, often more important than the exact nomination of the association /C l a r k 1948/. I indicate, therefore, these data, as well. On the basis of a classification like that, the following associations can be distinguished:

1. *Angelico-Cirsietum oleracei* Tx. 37. association with high stalks in the inundation area, containing *Rubus caesius* L. in large amount. Height of vegetation is 50-60 cm, cover 100 p.c., three-level association /moss, grass, shrub/.

2. Meadow in the inundation area:

a. Grass-land of large extent, with *Alopecuretum pratensis cynodontetosum* B o d r o g k ð z y 62. association, immediately after mowing. Height of vegetation is 5-10 cm, cover 100 p.c. There are shrubs *Prunus spinosa* L. in smaller spots.

b. Grass-land of lower site, *Caricetum vulpinae* S o ð 27. association. Height of vegetation is 5-10-20 cm, here and there becoming weedy; cover is 90-95 p.c., in the immediate vicinity of the weed associations along the way.

c. Grass-land of lower site, rather wet subsoil. Height of vegetation is 20-30-40 /-50/ cm, cover 90-95 p.c., in the vicinity of *Scirpo-Phragmitetum austro-orientale* S o ð 57. association.

d. Grass-land with high sedge, *Caricaetum acutiformis-ripariae* S o ð /27/ 30 association, height being 30-40-60 /-80/ cm, cover 95-100 p.c. Strongly shaded, not mown for long.

e. Reedy part in the inundation area, *Scirpo-Phragmitetum* association, with wet sub-soil. Immediately after mowing, the height of vegetation is 5-10 cm, cover 80 p.c.

3. The under growth of the inundation wood is *Salicaetum albae-fragilis* I s s l e r 26. First of all *Rubus caesius* L. stand, strongly shaded. Height of vegetation is 40-50 cm, cover 80 p.c.

4. Inundation pasture, *Glycyrrhizetum echinatae* /K e r n. 1868/ S o ð 40 association, height of vegetation is 3-5-10 cm, cover 80-90 p.c., the biotop is disturbed by the standing pasturing.

5. Dam-side.

a. The lower half part of the inundation-side of dam is the ecotone of the *Rubus caesius* L. stand, strongly enough shaded. It is a variety, becoming strongly weedy, of the *Alopecuretum pratensis festucetosum pseudovinae* S o ð 57 association. In the phase before mowing the height of vegetation is 15-25-40 cm, cover 100 p.c.

b. On the upper part of the inundation-side of dam the association and Eastern exposition agree with the previous collecting station, but they are less shaded.

c. The upper part of the protected inundation-side of dam, the association conditions are agreeing with the former one. Western exposition.

d. In the lower part of the protected inundation-side of dam also the *Consolido-Stachyetum annuae* /S o ð 47/ T i m å r 57 weed-association takes part in developing the vegetation. The height conditions are similar, as well; cover is 90-95 p.c. It is in immediate vicinity of the plough-lands, the shrub stand is smaller.

Orthoptera fauna of biotons

1. Association with high stalks in the inundation area. The population is of low specimen number, as a result of the high vegetation shaded strongly. It contains mostly phytocolous species /Table 1/.

Species	Ec. type	Area	No.	D p.c.
<i>Leptophyes albovittata</i> Koll.	Hyg.	Cent. Eu.	3	13,2
<i>Conocephalus fuscus</i> Fabr.	Hyg.	Palearc.	1	4,34
<i>Conocephalus dorsalis</i> Latr.	Hyg.	Eu.-Sib.	3	13,02
<i>Homorocoryphus nitidulus</i> Scop.	Hyg.	South Eu.	2	8,68
<i>Roeseliana roeselii</i> Hgb.	Hyg.	Eu.-Sib.	3	13,02
<i>Chorthippus albomarginatus</i> Deg.	Hyg.	Palearc.	+	-
<i>Chorthippus dorsatus</i> Zett.	Hyg.	Palearc.	6	26,32
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	2	8,68
Ch. nymph.	Hyg.	-	2	8,68
<i>Euchorthippus declivus</i> Bris.	Mes.	Cent.-Eu.	1	4,34

2. Meadow in the inundation area

a. Grass-land. Strongly hygrophilous fauna. Besides the *Ch. albomarginatus* D e g., however, I have discovered only one specimen of *Parapleurus alliaceus* G e r m., while *Mecostethus grossus* L. is almost entirely missing, opposite to G a u s z's /1969/ collectings carried out in a similar biotop. *Aiolopus thalassinus* F a h r. is no characteristic species of the biotop /Table 2/.

Species	Ec. type	Area	No.	D p.c.
<i>Homorocoryphus nitidulus</i> Scop.	Hyg.	South Eu.	1	1,22
<i>Tetrix subulata</i> L.	Hyg.	Palearc.	8	9,76
<i>Tetrix tenuicornis</i> Sahlb.	Hyg.	Palearc.	3	3,66
<i>Aiolopus thalassinus</i> Germ.	Xer.	Med.	2	2,44
<i>Mecostethus grossus</i> L.	Hyg.	Eu.-Sib.	+	-
<i>Parapleurus alliaceus</i> Germ.	Hyg.	Eu.-Sib.	1	1,22
<i>Chorthippus albomarginatus</i> Deg.	Hyg.	Palearc.	56	68,28
<i>Chorthippus dorsatus</i> Zett.	Hyg.	Palearc.	3	3,66
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	2	2,44
<i>Chorthippus</i> nymph	Hyg.	-	6	7,32

b. Lower sedge stand in the inundation area. Orthoptera population of lower specimen number but rich in species, influenced probably also by the weed population along the adjacent way. The occurrence of the alone male specimen of *Dociostaurus maroccanus* T h u n b g. is remarkable.



Species	Ec. type	Area	No.	D p.c.
<i>Conocephalus fuscus</i> Koll.	Hyg.	Palearc.	3	13,02
<i>Homorocoryphus nitidulus</i> Scop.	Hyg.	South-Eu.	3	13,02
<i>Roeseliana roeselii</i> Hgb.	Hyg.	Eu.-Sib.	2	8,68
<i>Glyptobothrus brunneus</i> Thunbg.	Xer.	Palearc.	4	17,36
<i>Chorthippus albomarginatus</i> Deg.	Hyg.	Palearc.	7	30,56
<i>Chorthippus dorsatus</i> Zett.	Hyg.	Palearc.	1	4,34
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	2	8,68
<i>Chorthippus nymph</i>	Hyg.	-	1	4,34
<i>Doclostaurus maroccanus</i> Thunbg.	Xer.	South Eu.	+	

c. Meadow with high sedge in the inundation area. Mostly with strongly hygrophilous species, except a few specimens of the *Omocestus ventralis* Zett. with broad ecological tolerance-limit: *Chrysochraon dispar* Germ. that is rather rare in the Hungarian Plain, is faunistically remarkable.

Species	Ec. type.	Area	No.	D p.c.
<i>Chrysochraon dispar</i> Germ.	Hyg.	Eu.-Sib.	+	
<i>Omocestus ventralis</i> Zett.	Xer.	Palearc.	3	7,50
<i>Chorthippus albomarginatus</i> Deg.	Hyg.	Palearc.	24	60,00
<i>Chorthippus dorsatus</i> Zett.	Hyg.	Palearc.	3	7,50
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	4	10,00
<i>Chorthippus nymph</i>	Hyg.	-	2	5,00
<i>Euchorthippus declivus</i> Bris.	Mes.	Cent. Eu.	4	10,00

d. Grass-land with high sedge. Compared with the former ones, it is a less troubled population. The dominance of the *Conocephalus* species is much higher while the other species compared with the former biotons are identical ones.

Species	Ec. type	Area	No.	D p.c.
<i>Conocephalus fuscus</i> Fabr.	Hyg.	Palearc.	18	30,61
<i>Conocephalus dorsalis</i> Latr.	Hyg.	Eu.-Sib.	9	15,31
<i>Roeseliana roeselii</i> Hgb.	Hyg.	Eu.-Sib.	1	1,69
<i>Tetrix subulata</i> L.	Hyg.	Palearc.	4	6,76
<i>Tetrix tenuicornis</i> Sahlb.	Hyg.	Palearc.	5	8,45
<i>Mecostethus grossus</i> L.	Hyg.	Eu.-Sib.	1	1,69
<i>Parapleurus alliaceus</i> Germ.	Hyg.	Eu.-Sib.	+	
<i>Chorthippus albomarginatus</i> Deg.	Hyg.	Palearc.	8	13,52
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	11	18,59
<i>Euchorthippus declivus</i> Bris.	Mes.	Cent. Eu.	2	3,38

e. Cut reeds in the inundation area. *Orthoptera* population with extremely low specimen number. of exclusively hygrophilous species, without nymphs.

Species	Ec. type	Area	No.	D n.c.
<i>Phanoptera falcata</i> Poda.	Mes.	Eu.-Sib.	1	6,24
<i>Conocephalus fuscus</i> Fabr.	Hyp.	Palearc.	+	
<i>Tetrix tenuicornis</i> Sahlb.	Hyp.	Palearc.	2	12,48
<i>Chorthippus dorsatus</i> Zett.	Hyp.	Palearc.	2	12,48
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	11	68,80

3. Undergrowth of the wood in the inundation area. From the species of the population only the *Pholidoptera griseoptera* D e g. is characteristic of the population. *Meconema thalassinum* D e g. derives supposedly from the foliage level. It is proved also by the absence of nymphs that here may be formed only a temporary *Orthoptera* population.

Species	Ec. type	Area	No.	D n.c.
<i>Phanoptera falcata</i> Poda	Mes.	Eu.-Sib.	6	39,96
<i>Meconema thalassinum</i> Deg.	Hyp.	Eu.-Sib.	+	
<i>Pholidoptera griseoptera</i> Deg.	Hyp.	Eu.	1	6,66
<i>Tetrix tenuicornis</i> Sahlb.	Hyp.	Palearc.	+	
<i>Chorthippus albomarginatus</i> Deg.	Hyp.	Palearc.	2	13,32
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	5	33,40

4. Pasture in the inundation area. In spite of the comparatively considerable differences in vegetation, it is a *Saltatoria* population that is very similar to the former ones, having exclusively hygrophilous species despite the increased solar radiation.

Species	Ec. type	Area	No.	D n.c.
<i>Roeseliana roeselii</i> Hgb.	Hyp.	Eu.-Sib.	2	4,08
<i>Tetrix subulata</i> L.	Hyp.	Palearc.	1	2,04
<i>Chorthippus albomarginatus</i> Deg.	Hyp.	Palearc.	5	10,20
<i>Chorthippus dorsatus</i> Zett.	Hyp.	Palearc.	10	20,40
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	25	51,04
<i>Chorthippus</i> nymph	Hyp.	-	6	12,24

5. Dam-side.

a. Lower half part of the inundation-side of dam.

It is a *Rubus caesius* L. ecotone and a *Saltatoria* population with lower specimen number if compared with the coenoses on the dam-side because of being more strongly shaded. The mesophilous species have an increased dominance.

Species	Ec. type	Area	No.	D n.c.
<i>Homorocoryphus nitidulus</i> Scop.	Hyp.	South Eu.	4	7,68
<i>Roeseliana roeselii</i> Hgb.	Hyp.	Eu.-Sib.	1	1,92
<i>Tetrix tenuicornis</i> Sahlb.	Hyp.	Palearc.	2	3,84
<i>Omocestus haemorrhoidalis</i> Charn.	Mes.	Eu.-Sib.	2	3,84
<i>Omocestus</i> nymph	Mes.	-	2	3,84
<i>Chorthippus albomarginatus</i> Deg.	Hyp.	Palearc.	3	5,76
<i>Chorthippus dorsatus</i> Zett.	Hyp.	Palearc.	1	1,92
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	25	48,16
<i>Chorthippus</i> nymph	Hyp.	-	4	7,68
<i>Euchorthippus declivus</i> Bris.	Mes-	Cent. Eu.	8	15,36

b. Upper part of the inundation-side of dam. Owing to the more expressed effect of the favourable Eastern exposition, the specimen density of *Saltatoria* has increased. The hygrophilous *Chorthippus* species are rare enough, and it is proved by the presence of *Glyptobothrus brunneus* Thunbg. that the conditions are more favourable for the more xerophilous species. *Euchorthippus declivus* Bris. is super-dominant.

Species	Ec. type	Area	No.	D p.c.
<i>Leptophyes albovittata</i> Koll.	Hyg.	Cent. Eu.	2	1,48
<i>Homorocoryphus nitidulus</i> Scon.	Hyg.	South.Eu.	3	2,22
<i>Platycleis affinis</i> Fieb.	Mes.	Ponto-Med.	+	
<i>Tessalana vittata</i> Charp.	Xer.	South Eu.	2	1,48
<i>Tetrix tenuicornis</i> Sahlb.	Hyg.	Palearc.	+	
<i>Parapleurus alliaceus</i> Germ.	Hyg.	Eu.-Sib.	2	1,48
<i>Glyptobothrus brunneus</i> Thunbg.	Xer.	Palearc.	10	7,44
<i>Omocestus nymph</i>	Mes.	-	8	5,92
<i>Chorthippus albomarginatus</i> Deg.	Hyg.	Palearc.	2	1,48
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	4	2,96
<i>Euchorthippus declivus</i> Bris.	Mes.	Cent.Eu.	101	75,54

c. Upper part of the protected inundation-side of dam. The population conditions are more and less similar. The Western exposition is favourable to the hygrophilous-mesophilous species. There are comparatively many nymphs.

Species	Ec. type	Area	No.	D p.c.
<i>Conocephalus dorsalis</i> Latr.	Hyg.	Eu.-Sib.	3	1,88
<i>Tessalana vittata</i> Charp.	Xer.	South Eu.	7	4,37
<i>Stenobothrus nymph</i> .	-	-	+	
<i>Omocestus nymph</i>	Mes.	-	20	12,50
<i>Glyptobothrus brunneus</i> Thunbg.	Xer.	Palearc.	11	6,88
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	23	14,37
<i>Chorthippus nymph</i>	Hyg.	-	14	10,00
<i>Euchorthippus declivus</i> Bris.	Mes.	Cent. Eu.	80	50,00

d. Lower part of the protected inundation-side of dam. The high specimen-density of *Saltatoria* is caused by the favourable exposition conditions and probably by other advantageous microclimatic factors. We have found a great number of specimens of the grasshopper species *Tessalana vittata* Charp. that is frequent in the district of the Middle Tisza, taking here the place of *Roeseliana roeselii* Hgb. The fauna is shifted in a greater degree in mesophilous-xerophilous direction.

Species	Ec. type	Area	No.	D p.c.
<i>Tessalana vittata</i> Charp.	Xer.	South Eu.	10	6,17
<i>Roeseliana roeselii</i> Hgb.	Hyg.	Eu.-Sib.	2	1,22
<i>Omocestus haemorrhoidalis</i> Charp.	Mes.	Eu.-Sib.	7	4,27
<i>Omocestus nymph</i>	Mes.	-	12	7,32
<i>Chorthippus albomarginatus</i> Deg.	Hyg.	Palearc.	14	8,54
<i>Chorthippus longicornis</i> Latr.	Mes.	Eu.-Sib.	25	15,25
<i>Chorthippus dorsatus</i> Zett.	Hyg.	Palearc.	19	11,59
<i>Chorthippus nymph</i>	Hyg.	-	6	3,66
<i>Euchorthippus declivus</i> Bris.	Mes.	Cent.Eu.	67	41,98

Ecological evaluation of the *Saltatoria* populations
in the areas investigated

From the areas investigated, in the course of the operations, I have collected 2435 specimens of 24 species. These are generally common from faunistical point of view in the inundation biotops of the Great Hungarian Plain. Perhaps only the *Chrysochraon dispar* Germ. that is characteristic of the marshy meadows, and the semiarid species *Doclostaurus maroccanus* Thunb. with a broad ecological tolerance can be classified into the rarer species.

It is important to emphasize that we have found by and large similar *Saltatoria* populations even in the comparatively different biotops, and the discovered differences were expressed rather in the number of specimens. This is remarkable as compared with Gausz's /1969/ material at Kisköre where in the marshy meadows of the inundation area first of all the *Mecotethus-Parapleurus Saltatoria* population group mentioned by Nagy /1949/, could be demonstrated, while here are these species insignificant. It would be necessary, of course, to take into consideration the identical aspects of the same year as the hatching percentage of eggs, and thus the size and structure of populations, depend upon the meteorological changes /Richardson - Wolf 1954/.

Under the conditions of the inundation areas, if in the period of the spring inundation the eggs laid in autumn are still in the state of diapause, there takes place no particular damage /Bodenhaimer - Shulov 1951/. As in case of the single species the time of oviposition and, therefore, also the state of diapause can strongly change, the composition of the grasshopper populations may be changed by the inundations from year to year.

On the basis of the collectings carried out concerning all the biotops of the collecting station, we had better to represent the distribution of the single species according to the ecological, resp. biogeographic spectra. In connection with these, the effects of the microclimatic influences can be compared in the collectings from the dam-sides, and those of the height-differences of vegetation in those from the meadows in the inundation area, on the basis of the two formerly characteristics.

Ecological demand		Biogeographic spectrum	
/p.c./		/p.c./	
Hygrophilous	38,84	Central-European	31,17
Mesophilous	55,05	Palaearctic	36,10
Xerophilous	6,11	Euro-Siberian	28,36
		South-European	4,00
		Mediterranean	0,25
		European	0,12

Changes in specimen number, ecological demand, and biogeographic spectrum along the biotops on the dam-side.

	Specimen number Total sp. n.c.	Ecological demand		
		Hygrophilous	Mesonphilous	Xerophilous
1. Lower part in the inundation area	10,19	28,80	71,20	-
2. Upper part in the inundation area	26,70	6,66	84,42	8,92
3. Upper part in the protected area	31,36	11,88	76,87	11,25
4. Lower part in the protected area	31,75	25,01	68,82	6,17

biogeographic spectrum:

	Euro-Sib.	Palaearc.	Central Eu.	South-Eu.
1. Lower part in the inundation area	61,44	15,92	15,36	7,68
2. Upper part in the inundation area	10,36	8,92	77,02	3,70
3. Upper part in the protected area	33,75	11,98	50,00	4,37
4. Lower part in the protected area	29,72	22,13	41,98	6,17

Changes in specimen number, Ecological demand, and biogeographic spectrum in the meadows of the inundation area

Height of vegetation	Specimen number	Ecological demand		
		Hygrophilous	Mesonphilous	Xerophilous
1. 5-10 cm	40,22	95,12	2,44	2,44
2. 5-10-20 cm	11,27	73,96	8,68	17,36
3. 20-30-40 cm	19,60	72,50	20,00	7,50
4. 30-40-60 cm	28,91	78,03	21,97	-

biogeographic spectrum

	Eu.-Sib.	Palaearc.	Central Eu.	South-Eu.	Mediterranean
1. 5-10 cm	6,98	89,36	-	1,22	2,44
2. 5-10-20 cm	19,36	67,62	-	13,02	-
3. 20-30-40 cm	12,40	77,60	10,00	-	-
4. 30-40-60 cm	37,18	59,34	3,38	-	-

The comparison of these data may cause difficulties because the accentuation of a single factor /at the biotons on dam-sides the exposition or the vertical position, at the meadows in the inundation area the height of vegetation/ cannot give an exact explanation. At the biotons on the dam-sides it can be well demonstrated that the xerophilous species avoid the ecotone of the *Rubus caesius* L. stand, and here is the specimen density of *Saltatoria* generally low. It can also be demonstrated that the Western exposition is more favourable to the hygrophilous species. In the biogeographic spectrum, the percentage of the occurrence of Euro-Siberian species correspondingly

higher, if we leave out of consideration the ecotone of *Rubus caesius* L. which is shaded.

We have difficulty at the meadows in the inundation area, as well, if we wanted to prove the generally known unfavourable role of the growing height of vegetation /Rubtzov 1932, Uvarov 1928/ as here also mowing and pasturing take place as disturbing factors. In this respect there is the least disturbed collecting station marked "4", where there took place neither mowing nor pasturing in the given period. In the collecting station "2", however, the moist soil and the vegetation that was strongly disturbed and became weedy are very unfavourable to the development of *Saltatoria* populations. Taking all these into consideration, we may establish that a high vegetation has an unfavourable effect on the *Orthoptera* population.

Summary

In the course of the ecological and faunistic of collections carried out in the environment of Poroszló, there could be demonstrated 24 species on the basis of 12 biotops, resp. collectings. There were remarkable from them: *Chrysochraon dispar* G e r m. and *Doclostaurus maroccanus* T h u n b g.

In the different biotops, the following *Saltatoria* populations could be established: 1. Undergrowth of the wood in the inundation area, *Phaneroptera falcata*-*Chorthippus longicornis* /1/; 2. Weed-association with high stalks: *Leptophyes albobittata*-*Conocephalus* /2/; Grass-land in the inundation area: *Chorthippus albomarginatus*-*Chorthippus longicornis* /3a,b,c,d, 4/; 4. Dam-side: *Euchorthippus declivus*-*Chorthippus longicornis* /5a,b,c,d/. We can, of course, find larger or smaller transitions, first of all a lesser fluctuation in the composition of species.

In the development of the *Saltatoria* populations in the whole area, apart from the conditions of vegetation, a major role may be played also by certain ecological factors /exposition, height of vegetation, the vegetation being shaded, disturbed/ and the effect of them can be proved well. On the basis of the collectings we may establish that the *Orthoptera* fauna of the Middle-Tisza district is particular and can be separated from other biotops along the Tisza. It is, anyway, to be mentioned that a collecting carried out for a definite time, like this, cannot give at all the true picture of the fauna.

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