

TISCIA (SZEGED) 4. 1968.

DATA FOR KNOWLEDGE THE ENTOMOLOGY OF THE UPPER-TISZA DISTRICT (Orthopteroidea and Formicoidea)

L. GALLÉ, jr. and J. GAUSZ

Institute No. 600 „MüM” of the Ministry of Public Education Szeged,
and Institute of Experimental Physics Attila József University Szeged

(Received January 12, 1968)

The entomological elaboration of the river Tisza began with the monograph of Zilahi-Sebess (Bába et al. 1962). The orthopterological and myrmecological investigations of the Tisza are contained, so far, in the articles of Gausz (1966, 1967) and in those of Gallé, jr. (1966a, 1966b, 1967). This work is containing the results of our investigations carried out in the summer of 1967 concerning this topic.

Geographic and climatological conditions

The area investigated is lying along the Upper-Tisza, on the right of the river, in the district of villages Tizzaszalka and Gergelyugornya. at the degree of latitude 48,25.

Macroclimatologically it belongs to the climatic area of the Great Hungarian Plain, the mean annual temperature being 9° C degree (Pécsi-Sárfalvi, 1960), with -3,5° C january and 20,3° C July mean temperature. The amount of the annual precipitation is 650 mm (Bacsó, 1959). The number of rainy days exceeds ninety, the dominant direction of wind is N—E. Height above sea-level of the Adriatic is 109,2 m. The soil is mud, rather middle-bound, poorly permeable to water.

Methods

Nagy's quadratic method (in Balogh, 1953) could not be applied because of the difficulty of orthopterological surveyings, thus the quantitative conditions of the respective biotopes could be established by a definite number of grass-net strokes. During applying this method of grass nets, we had, of course to gather grasshoppers one by one, too, owing to their strongly different faculty of movement.

That surveying method can, however, be applied with results only in case of an adequately homogeneous grass level. Therefore, in the underwood of the woods „Bagiszeg” and „Bockerek” and in the association *Cypero-Juncetum*, we have rather performed a time collection lasting for one hour. The comparison of the

two areas investigated with two different methods is thus, of course, unreal but the orthopterological importance of the latter ones is negligible.

The tables published about the biotopes are putting down the summarized results of ten surveys. In every biotope, the number of larvae, determined and averaged to one survey, is a characteristic particular, as well. A similarly significant datum is also the ratio *Acridoidea/Tettigonoidea*, necessary first of all on the basis of considerations concerning the production. The establishment of biotopes has taken places according to plant associations.

The ecological evaluation of the *Orthopteroidea* fauna is given on the basis of works of Nagy (1949) and Harz (1957), the dispersion of the fauna according to spectrum on the basis of those of Harz (1957). In connection with feeding types of *Orthoptera*, Gangwere's classification (1961) has been used (forbivorous, graminivorous, carnivorous ones, etc.).

At the cenological surveys of the *Formicoidea* populations, the methods contained in works published previously concerning this topic (Gallé, 1966b, 1967) have been followed. On the grass of the dam sides and on the protected grassland of the inundation area, squares 1×1 m have generally been applied owing to the relatively high frequency of the ants nests; on the soil of *Querceta* in the inundation area, however, there were to be applied only squares of 5×5 m for the survey. For the ecological evaluation of the *Formicoidea* fauna Pittioni's ecological classification has been used (according to Móczár, 1953).

Characterization of biotopes and cenoses

The cenoses investigated in the area are members of the macrozonation complex along the river Tisza. Their characteristic type is determined by the distance from the river and, in the function of that, by the microclimatic picture, by soil conditions and, in connection with those by plant associations. Surveys were carried out in the following biotopes:

1. Wood in the inundation area. Inside it three association types can be separated from one another.

a) *Salicetum triandrae* Malcuit, 1929. — in the bush-willow plantation along the river the increased inundation effect is impeding the formation of constant *Orthopteroidea* and *Formicoidea* faunae.

b) *Salicetum albae-fragilis* Issler, 1926 — this typical inundation association is forming but lesser substances, as a rule with a mixed *Salix-Populus* consociate, the most frequently with *Rubus caesius* facies and here and there with *Cornus sanguinea* subass. (*Salicetum albae-fragilis cornetosum sanguineae*). Wendelbg.-Zelinka, 1952. In smaller spots with substance *Populus* it appears also in the *Convallario-Quercetum*.

c) *Convallario-Quercetum roboris* Soó, [1934] 1957 wood „Bagiszeg”. — It is the most considerable from the inundation woods. As a consequence of a shading effect of the comparatively dense and tall tree-substance, the vegetation of grass level is poor. The litter production, as compared with the former cenoses, is higher and the soil humidity is more moderate.

2. The ruderal ecotonic cenosis of the inundation area. Its bulk belongs to the substance *Amarantho-Chenopodietum albi* Soó, 1947, here and there *Echinochloeto-Polygonetum lapathifolii* Soó et Csűrös, 1944 can be observed, as well. The areas under cultivation (*Trifolium pratense*, *Triticum aestivum*) being close, and also disarranged by

the near-by road, it is a substance rather poor in quality. The height of vegetation is changing between broad limits, the value of coverage being 85—90 per cent.

3. Dam. The course of dam is of direction N-S, its sides having accordingly an exposition of direction E-W. The dam of river is relatively low, its sides are steep, with a 55—60 degree slope of gradient.

The vegetation of the dam-side is homogeneous: with facies *Alopecuretum pratensis ranunculetosum acris Rumex acetosa* fac. On both sides of the dam crown a weed-bordering of *Sclerochloo-Polygonetum avicularis* (Gams, 1927) Soó, 1940 is spreading. Height of vegetation is 15—25—30(—40) cm, covering 100 per cent. On the side of dam of Eastern exposition the vegetation is somewhat lower, the insolation is rather strong.

4. Protected grassland in the inundation area. The grasslands, lying at both banks of the canal that connects the wood „Bockerek” with the Tisza, are closely connected with the flood area, first of all with the dam-sides. Also the plant association is nearly the same: it has been produced by the progressive decay of *Alopecuretum pratensis festucetosum pseudovinae* Soó, 1957 and the previous association. Height of vegetation is 10—20—25(—35) cm, the cover 100 per cent.

5. Protected meadow in the inundation area. In areas of humid subsoil smaller stagnant waters are not rare, either, and the plant association is *Cypero-Juncetum*. Height of vegetation is between 50 and 70 cm, the cover being 80—85 per cent.

6. Protected wood in the inundation area („Bockerek”). *Convallario-Quercetum roboris* of a rather dry soil, with a secondarily grown tree vegetation in a considerable part of its territory. The *Salicetum albaefragilis* is entirely missing.

Orthopteroidea

The result of surveys carried out in surveyings in seven biotopes is: 29 species, 614 specimens. (The distribution of species, explanation of the notation of ecological types and fauna are contained in Table I.) In a part of biotopes, however, we have not succeeded in demonstrating constant *Saltatoria* associations.

1. Wood in the inundation area. It is an unfavourable biotope for the *Orthopteroidea* fauna. Only in the underwood of the *Convallario-Quercetum* of a higher situation we have found some hygrophilic species preferring shade. The biotope is not stable, the eggs of immigrated species are anyway destroyed by the spring inundations. That is probably the cause of not finding larvae, either.

Ecological type	Type of area	Species	Number	Dom.p.c.
Hyg.	Middle-Eu.	<i>Leptophyes albovittata</i>	4	28.59
Hyg.	Eu.-Sib.	<i>Roeseliana roeselii</i>	2	14.30
Hyg.	Eu.	<i>Pholidoptera griseoptera</i>	7	49.98
Mes.	Eu.-Sib.	<i>Chortippus longicornis</i>	1	7.14

The great predominance of hygrophilic species is obvious at first sight. The total dominance of *Pholidoptera griseoptera* is remarkable and can be considered, in some degree, as a montanic effect.

The species *Leptophyes albovittata* and *Roeseliana roeselii* are less bound to the underwood and are frequent in open associations, as well. For the graminivorous *Chortippus longicornis* the wood is not a satisfying biotope.

2. Ruderal ecotonic cenosis in the inundation area. Lying on a higher point of the inundation area, it is less exposed to inundation influences. Nevertheless, a stable *Saltatoria* cenosis has not been taken place here, either. The picture of fauna is disturbed, to a certain extent, by the joint occurrence of some species of different ecological types (*Chortippus dorsatus* — *Omocestus ventralis*). The dominance of *Roeseliana roeselii* is a particular case as in *Saltatoria* associations the carnivorous species is usually not in dominance. Also the *Chortippus longicornis* of relatively mesophilious nature is characteristic. The *Decticus verrucivorus* is a local character species, the cause of its lower dominance being the larger alimentary field of its single specimens. It is particularly frequent in the *Trifolium pratense* culture; we have not, however, carried out any investigations there. On the other hand, we have observed the joint occurrence of the two colour types of *Decticus verrucivorus*.

Ecological type	Type of area	Species	Number	Dom.p.c.
Hyg.	Eu.-Sib.	<i>Roeseliana roeselii</i>	15	34.15
Mes.	Eu.-Sib.	<i>Decticus verrucivorus</i>	2	4.54
Hyg.	Palaearc.	<i>Tetrix tenuicornis</i>	2	4.54
Mes.	East-Eu.	<i>Stenobothrus crassipes</i>	2	4.54
Mes.	Eu.-Sib.	<i>Omocestus haemorrhoidalis</i>	2	4.54
Xer.	Palaearc.	<i>Omocestus ventralis</i>	1	2.27
Xer.	Palaearc.	<i>Glyptobothrus brunneus</i>	2	4.54
Xer.	Palaearc.	<i>Glyptobothrus biguttulus</i>	1	2.27
Hyg.	Eu.-Sib.	<i>Chortippus dorsatus</i>	3	6.71
Mes.	Eu.-Sib.	<i>Chortippus longicornis</i>	14	31.90

Ratio of imago/larva for one survey: 4.4 to 12

Ratio of *Acridoidea*/*Tettigonoidea*: 27 to 17

The species of association are characteristic of the mesophilious meadows. The hygrophilious species, too, are rather distributed in the plain. Thus the *Roeseliana roeselii* is the common grasshopper species of the southern river sectors and can be observed even in the rather arid biotopes.

The total dominance of the xerophilous species is insignificant; they are more accessory in nature. That is easy to understand, the *Omocestus ventralis* being a character species of macchia associations at the seashores comparable to the half-desert conditions (P r a v d i n, 1964).

3. Dam-side. In spite of the identical plant association, it is advisable to elaborate separately the faunas found on both sides of the dam. According to N a g y's experience (1949), the *Saltatoria* faunas of the two areas can be differentiated in case of the same plant association with different vegetation heights. The *Schlerochloo-Polygonetum avicularis* weed-association of small extent on the dam top has no peculiar orthopterous fauna, it is therefore not practical to be investigated separately.

a) Side from the inundation area. Shading being rather strong, the dominance of hygrophilous species is increasing. From the mountain species we have observed the *Pholidoptera aptera aptera* that has probably moved forward to the Plain by the way of the valley of river Bodrog. One of the mountain species is the *Bicolorana bicolor*, too, living on dry mountain slopes and mentioned by N a g y (1953) from the area of Bátorliget. We also don't know about the plain occurrence of *Pseudopodisma fieberi* that frequently occur, according to K n e c h t e l and B i z n o s e a n u (1959), in the wood clearings of the Beech-zone. Owing to the very incomplete orthopterologic knowledge of the Tisza valley, the exact distribution of these species in Hungary isn't, of course, cleared, as yet.

It is worthy of our attention if even a single specimen of *Pezotettix giornae* in state of larva could be observed, because it is a proof of the spreading of species. It isn't contained in G a u s z's material (1966) from Taktaköz, and even in the Southern parts of the Plain it has occurred dominantly only in the latter years (G a u s z, 1967). In the secondary spreading of the species the Tisza valley has probably had an important role. The direction of its primary invasion is not cleared.

Ecological type	Type of area	Species	Number	Dom.p.c.
Hyg.	Central-Eu.	<i>Leptophyes albovittata</i>	1	1.1
Hyg.	Palaearc.	<i>Conocephalus fuscus</i>	1	1.1
Mes.	Eu.-Sib.	<i>Phaneroptera falcata</i>	2	2.2
Mes.	Palaearc.	<i>Tettigonia viridissima</i>	1	1.1
Hyg.	Central-Eu.	<i>Pholidoptera aptera aptera</i>	1	1.1
Hyg.	Eu.	<i>Pholidoptera griseoptera</i>	1	1.1
Xer.	Eu.-Sib.	<i>Bicolorana bicolor</i>	4	4.4
Hyg.	Eu.-Sib.	<i>Roeseliana roeselii</i>	29	31.9
Mes.	Eu.-Sib.	<i>Decticus verrucivorus</i>	1	1.1
Xer.	Med.	<i>Pezotettix giornae</i>	1	1.1
Hyg.	Central-Eu.	<i>Pseudopodisma fieberi</i>	2	2.2
Mes.	Eastern-Eu.	<i>Stenobothrus crassipes</i>	6	6.6
Mes.	Eu.-Sib.	<i>Omocestus haemorrhoidalis</i>	4	4.4
Xer.	Palaearc.	<i>Glyptobothrus biguttulus</i>	1	1.1
Hyg.	Palaearc.	<i>Chortippus albomarginatus</i>	1	1.1

Ecological type	Type of area	Species	Number	Dom.p.c.
Hyg.	Eu.-Sib.	<i>Chortippus dorsatus</i>	2	2.2
Mes.	Eu.-Sib.	<i>Chortippus longicornis</i>	33	36.2

Ratio of imago/larva for one survey: 8.9 to 68

Ratio of *Acridoidea/tettigonoidea*: 50 to 41

Some of the hygrophilious grasshopper species of the wood fringe cenoses are of accessory character (*Conocephalus fuscus*, *Leptophyes albovittata*). The number of definitely local character species is low. It is a transitory *Saltatoria* association type rather characteristic of the hygrophilious-mesophilious grasslands. The influence of the July aspect on the *Orthopteroidea* fauna has been noticeable in the later surveyings, as well. From the species that can less be determined in larval state in the autumn aspect probably the percentage of xerophilious ones is increasing. Therefore, all the surveying data can be used only after taking those into consideration.

b) Protected side from the inundation area. As a consequence of a lower vegetation and a stronger insolation, in spite of the same plant association, there can be observed definite differences. A great part of the colouring mountain species disappear and the *Glyptobothrus brunneus* and *Glyptobothrus biguttulus*, so frequent under extreme conditions, do indicate the change of the fauna picture.

Ecological type	Type of area	Species	Number	Dom.p.c.
Hyg.	Central-Eu.	<i>Leptophyes albovittata</i>	22	17.68
Hyg.	Palearc.	<i>Conocephalus fuscus</i>	4	3.18
Mes.	Palearc.	<i>Tettigonia viridissima</i>	2	1.58
Hyg.	Eu.-Sib.	<i>Roeseliana roeselii</i>	10	7.98
Hyg.	Central-Eu.	<i>Pseudopodisma fieberi</i>	2	1.58
Mes.	Eastern-Eu.	<i>Stenobothrus crassipes</i>	31	23.99
Mes.	Eu.-Sib.	<i>Omocestus haemorrhoidalis</i>	8	6.32
Xer.	Palearc.	<i>Glyptobothrus brunneus</i>	2	1.58
Xer.	Palearc.	<i>Glyptobothrus biguttulus</i>	10	7.98
Hyg.	Eu.-Sib.	<i>Chortippus dorsatus</i>	10	7.98
Mes.	Eu.-Sib.	<i>Chortippus longicornis</i>	25	20.25

Ratio of *Acridoidea/Tettigonoidea*: 86 to 40

Ratio of *Acridoidea/tettigonoidea*: 86 to 40

Compared with the other side of dam, the species number of the *Saltatoria* fauna is decreasing, the number of specimens, however, increasing. A general increase of the dominance of transitory species may be observed (*Stenobothrus crassipes*, *Omocestus haemorrhoidalis*), anyway, an adequate quantity of sunshine is absolutely necessary even to certain parts of the development of individuals of the hygrophilous species. Therefore, the number of imagos is higher, generally too.

The high dominance of the *Leptophyes albovittata* is one of the recent results of the *Saltatoria* cenology in the Plain. In the associations published in literature the *Glyptobothrus biguttulus*, as well, can be observed in a lower number of specimens, while here it is a local character species.

4. Protected grassland in the inundation area. Among all the associations the population is conspicuous with its qualitative and quantitative many-sidedness. A representative of the Mediterranean species is the *Phaneroptera quadripunctata* the penetration of which is similar to that of *Pezotettix giornae*, its expansion, however, is not by a long way so large in numbers. The elements of the Ponto--Mediterranean fauna in the Southern Plain are the common *Platycleis affinis* and the *Stenobothrus nigromaculatus*. The *Euchortippus declivus*, as well, is common but in the environs of the Lower Tisza, there it can be classified only among the accessory elements of the association. The specimen number of the *Tetrix subulata* can only be explained by the mistakes of collection.

Ecological type	Type of area	Species	Number	Dom.p.c.
Mes.	Eu.-Sib.	<i>Phaneroptera falcata</i>	2	0.63
Mes.	Med.	<i>Phaneroptera quadripunctata</i>	1	0.32
Hyg.	Central-Eu.	<i>Leptophyes albovittata</i>	13	4.12
Hyg.	Palaearc.	<i>Conocephalus fuscus</i>	15	4.75
Mes.	Palaearc.	<i>Tettigonia viridissima</i>	5	1.58
Xer.	Pont.-Med.	<i>Platycleis affinis</i>	2	0.63
Xer.	Eu.-Sib.	<i>Bicolorana bicolor</i>	5	2.63
Hyg.	Eu.-Sib.	<i>Roeseliana roeselii</i>	36	11.37
Mes.	Eu.-Sib.	<i>Decticus verrucivorus</i>	2	0.63
Hyg.	Palaearc.	<i>Tetrix subulata</i>	2	0.63
Xer.	Med.	<i>Pezotettix giornae</i>	2	0.63
Hyg.	Central-Eu.	<i>Pseudopodisma fieberi</i>	7	2.20
Mes.	Eastern-Eu.	<i>Stenobothrus crassipes</i>	68	21.56
Xer.	Pont.-Med.	<i>Stenobothrus nigromaculatus</i>	2	0.63
Xer.	Palaearc.	<i>Omocestus ventralis</i>	1	0.32
Mes.	Eu.-Sib.	<i>Omocestus haemorrhoidalis</i>	18	5.71
Xer.	Palaearc.	<i>Glyptobothrus biguttulus</i>	6	1.90
Hyg.	Palaearc.	<i>Chortippus albomarginatus</i>	4	1.27
Hyg.	Eu.-Sib.	<i>Chortippus dorsatus</i>	7	2.22
Mes.	Eu.-Sib.	<i>Chortippus longicornis</i>	111	35.18
Mes.	Central-Eu.	<i>Euchortippus declivus</i>	6	1.90

Ratio of imago/larva for one survey: 30.5 to 227

Ratio of *Acridoidea*/*Tettigonoidea*: 234 to 81

The *Saltatoria* association can be characterized first of all by the species of the mesophilious meadows of the Plain. It differs from the former population of the dam side rather in quantitative respect. The ecological conditions are not homogeneous inside the biotope, either. The higher percentage of the Mediterranean and Ponto- Mediterranean elements may be a function of the better thermostatic capacity of soil: unfortunately, however, that cannot be demonstrated for lack of a soil analysis. The biotope is open in the direction of the adjacent culture areas, shrubberies, and meadows of humid subsoil. Therefore, a part of its species is deriving from those. On the basis of the high number of imagos and larvae the area investigated is optimal from the point of view of the *Saltatoria* fauna.

5. Protected humid meadow in the inundation area. In spite of the low specimen number of the *Mecostethus grossus* and *Parapleurus alliaceus*, they are considered as local character species of the biotope in respect of their significance. Nagy (1943) on the basis of his surveyings in the Nyírség, mentioned both of them as important species of hygrophilious meadows. Their dominance, however, does not achieve the level mentioned there. The appearance of *Tettigonia caudata* is remarkable, as well.

Ecological type	Type of area	Species	Number	Dom.p.c.
Mes.	Palearc.	<i>Tettigonia viridissima</i>	4	14.70
Mes.	Central-Eu.	<i>Tettigonia caudata</i>	2	8.70
Hyg.	Eu.-Sib.	<i>Mecostethus grossus</i>	3	13.05
Hyg.	Eu.-Sib.	<i>Parapleurus alliaceus</i>	3	13.05
Mes.	Eu.-Sib.	<i>Chortippus longicornis</i>	11	47.80

Value of imago/larva for one hour: 23 to 54

Ratio of *Acridoidea*/*Tettigonoidea*: 17 to 6

The predominance of mesophilious species, on the other hand, denotes probably that the association is no longer covered by water at the end of August and that then it is changed in character. And its stability is doubtful by reason of the low number of larvae and the small density of specimens.

6. „Böckerek” wood. It is to be mentioned only for the sake of completeness. For the *Orthopteroidea* fauna, the very strong shade of underwood and a complete lack of clearings don't assure adequate essential conditions. The whole fauna is represented by a single species.

Ecological type	Type of area	Species	Number	Dom.p.c.
Hyg.	Eastern-Eu.	<i>Poecilimon schmidti</i>	1	100.00

There must live in the wood, of course, also other species that do prefer shadow, first of all arboricolous ones, however they have not appeared during the collecting time. The *Poecilimon schmidti* can rather

be classified among the species of mountain character. The *Poecilimon fussi*, a species similar to that in many respects, is mentioned by G a u s z (1966) in his material of Taktaköz.

General evaluation of the orthoptero logical results

For evaluating the collected material of the entire area, it is worth while making a comparison with the surveying of the *Orthopteroidea* fauna in the district of the Southern Tisza on the basis of similar principles (G a u s z, 1967). With help of the analysis, performed according to the fauna spectrum and with ecological demand, clear and vivid differences may be noticed. A detailed explanation of the differences would not be reasonable in this monograph and anyway, it needs some complementary examinations, too.

Ecological demand of species

Tiszaszalka		Szeged (Vesszős)	
Xerophilous	6.12 p.c.	Xerophilous	38.04 p.c.
Mesophilous	58.91 p.c.	Mesophilous	38.04 p.c.
Hygrophilous	34.57 p.c.	Hygrophilous	43.14 p.c.

Biogeographic spectrum of species

Tiszaszalka		Szeged (Vesszős)	
Eu.-Sib.	59.40 p.c.	Eu.-Sib.	29.24 p.c.
Palaearct.	10.61 p.c.	Palaearct.	31.30 p.c.
Central Eu.	9.78 p.c.	Central Eu.	9.52 p.c.
Eastern Eu.	17.60 p.c.	Southern Eu.	0,34 p.c.
European	1.30 p.c.	Mediterranean	28.55 p.c.
Ponto-Med.	0,65 p.c.	Ponto-Med.	1.02 p.c.
Mediterranean	0.65 p.c.		

Ratio of *Acridoidea*/*Tettigonoidea*

Tiszaszalka: 407 to 197

Szeged (Vesszős): 824 to 54

A comparison is possible, of course, but in the relation of inundation areas. The sodic lowland plains („puszta”) and sand-grasses are in orthoptero logical respect thoroughly different. The *Saltatoria* associations of the environs of Tiszaszalka at the Upper Tisza are characteristic of the hygrophilous-mesophilous meadows. The number of xerophilous species and mainly their dominance are unimportant. The mountain species are deriving probably from the Zemplén mountains, a connection with the Carpathians being less probable. The general combination of *Saltatoria* associations, like that of the homogeneous plant associations, is the same, taken all round. This does not concern the associations of woods and those strongly influenced by inundations. A considerable

part of the associations in inundation areas are seasonal and the populations grown again and again every year.

The density of specimens is influenced harmfully by the higher percentage of carnivorous species. As influenced by a favourable microclimate, in certain biotopes the production may be much higher than the average one (Protected meadow in the inundation area).

The Euro-po-Siberian species are predominant, the Mediterranean, Ponto-Mediterranean elements being very few. The *Pezotettix giornae* and *Phaneroptera quadripunctata* do nevertheless penetrate by the way of the dams along the rivers and the river valleys. The complete lack of *Calliptamus italicus*, highly euryoekous in nature, is very obvious. The geophilous species can be found, at any rate, but in minimal quantity. Taking into consideration G a n g w e r e's (1961) classification of alimentary types, the proportion of graminivorous/forbivorous species is growing, as well. Even making allowance for all the conditions, it is not right to call the association on the basis of the *Saltatoria* fauna because we could not take account of the change of the autumn aspect.

Formicoidea fauna

In the biotopes in the environs of Tiszaszalka we have established nesting of twenty-five ant species. In the period of investigation (July 3—13 1967), at the cenological surveyings, we counted 266 nests. From the species that could not be determined on the site, we collected 712 specimens altogether, for being determined.

1. Wood associations in the inundation area. As a consequence of the mixed phytocenotical character of the „Bagiszeg” wood lying in the inundation area, the ant population isn't homogeneous, either.

In the soil level of the dominant *Convallario-Quercetum roboris*, the presence of five nesting species could be established, two of them being absolutely constant:

Ecological type	Species	N/1 sq.m	C/1 sq.m	N/25 sq.m	N/25 sq.m	D.p.c.
EH	<i>Myrmica laevinodis</i> Nyl.	0,28	0,40	7,00	10	35,76
EH	<i>Myrmica ruginodis</i> Nyl.	0,05	0,20	1,33	5	10,24
EE	<i>Leptothorax tuborum</i> <i>unifasciata</i> L A T R	0,13	0,40	3,33	10	25,76
HI	<i>Lasius niger</i> . L.	0,04	0,16	1,00	4	7,68
EE	<i>Lasius emarginatus</i> O l.	0,01	0,04	0,33	1	2,56

It is obvious that owing to the small density of nests the constant minimiareal of the population for the species *Myrmica laevinodis*-*Leptothorax tuborum unifasciata* is 25 sq.m. From the concomitant species the *Myrmica ruginodis* nested first of all in the less shaded parts

of biotope, having a rather dry soil while the *Lasius emarginatus* nested on hills of dryer soil with less top soil (humus). The dispersion of all the three concomitant species is bad. The small density of the ant nests can be explained partly with the influence of inundations, partly with the poor grass level. This *Formicoidea* population is showing a good qualitative conformity with the associations *Lasius emarginatus* — *Leptothorax tuberum unifasciata* — *Myrmica ruginodis* described by Balogh and Loksa (1948) from the oak forests of the Hungarian Central Mountains.

In the fragments of the *Salicetum albae-fragilis*, appearing at Bagiszeg as a *Populus*, there could not be carried out any exact quantitative analysis because of the small extent and strong dispersion of these census parts. The qualitative composition of the ant population is corresponding to the myrmecological character of the woods of *Populus* substance in the inundation areas of other habitats along the Tisza (cf. Gallé, 1966 b):

litter level:

Myrmica ruginodis Nyl.
Myrmica rugulosoides För.
Lasius emarginatus Ol.

log level:

Lasius niger L.
Myrmi caruginodis Nyl.

level of tree-trunks and leafy crowns:

Dolichoderus quadripunctatus L.
Lasius fuliginosus Latr.
Lasius brunneus Latr.
Lasius emarginatus Ol.

The ant population discovered in the protected *Quercetum* in the inundation area of the „Bockerek” wood:

Ecological type	Species	N/1 sq.m	C/1 sq.m	N/25 sq.m.	C/25 sq.m	D.p.c.
HI	<i>Myrmica scabrinodis</i> Nyl.	0,24	0,40	6,00	10	17,80
EE	<i>Leptothorax nylanderii</i> För.	0,99	0,40	24,86	10	76,50
HI	<i>Lasius niger</i> L.	0,02	0,28	0,60	7	1,80
I	<i>Lasius flavus</i> F.	0,04	0,08	1,17	2	3,60
EH	<i>Formica rufa</i> L.	0,003	0,04	0,09	1	0,30

The character of the protected inundation area and, connected with that, the lower amount of soil air moisture is shown by the fact that in the ensemble of a combination similar to that of the oak forest at Bagiszeg, inside the *Myrmica* and *Leptothorax* population, the species of Bagiszeg have been changed with more thermophilous xerophytic species; therefore, the ecological character of the species of high dominance is containing the hypereuryoecial intermediary — euryoecial eremophilous provinces, the euryoecial hylophilous total dominance being small, 0,3 percent, contradiction to the 64 p.c. euryoecial hylo-

philous total dominance of the „Bagiszeg” wood. Similarly, the character of the protected inundation area and, in connection with that, the lack of an inundation is shown by the greater average number of nests in the unit of territory (N/1 sq.m) and in one square of surveying (N/25 sq.m).

2. Grasslands on the dam-sides. The ant faunas of the dam-sides of eastern and western expositions correspond well to each other in respect of the elementary ways of life. In the plant association *Alopecuretum prantensis ranunculetosum acris Rumex Acetosa* facies on the dam-side, exposed to the West and the inundation area, there occurred the more hygrophytic type of the *Lasius* — *Plagiolepis* — *Formica* association that is generally characteristic of the dam-sides of the river Tisza:

Ecological type	Species	N/1 sq.m	C/1 sq.m	D.p.c.
HI	<i>Myrmica rugulosoides</i> F o r.	0,2	2	5,88
HI	<i>Solenopsis fugax</i> L a t r.	1,6	6	47,04
HI	<i>Tetramorium caespitum</i> L.	0,4	4	11,76
EE	<i>Tapinoma erraticum</i> L a t r.	0,2	2	5,88
SE	<i>Camponotus caryae fallax</i> L a t r.	0,1	1	1,47
EE	<i>Camponotus aethiops</i> L a t r.	0,1	1	1,47
HI	<i>Lasius niger</i> L.	0,4	4	11,76
EE	<i>Lasius mixtus</i> N y l.	0,2	2	5,88
EH	<i>Formica fusca</i> L.	0,2	2	5,88
EE	<i>Polyergus rufescens</i> L a t r.	0,1	1	2,94

The constant minimiareal of this group of *Formicidae* population, taking into consideration the species *Solenopsis fugax* — *Tetramorium caespitum* — *Lasius niger*, is 2,5, square metre. The generally constant-dominant, thermopyilous *Plagiolepis* species of southern distribution, taking a dominant part is the ant fauna of dams in the central and lower sectors of the Tisza, are completely lacking on the dam-sides at Tiszaszalka. Their functioning is taken over by the *Tapinoma erraticum* of a similar way of life. The strong climatological dependence of these reaches of the Upper Tisza on the Northern Central Mountains is shown by the lack of *Plagiolepis* species, as well.

In the *Lasius* — *Formica* — *Solenopsis* combination of the dam-side of eastern exposition the *Myrmica rugulosoides* and the *Lasius* (*Chthonolasius*) *flavus* are dominant. The dominant character of both species can be explained by the milieu being humid as a consequence of the exuberant vegetation; both species being thermophilous and, in the same time, claiming some humidity, too. It may be explained by the warmer microclimatae as well, that the *Formica* population is represented here by the eremophilous *Formica rufibarbis*.

Ecological type	Species	N/1 sq.m	C/1 sq.m	D.p.c.
HI	<i>Myrmica rugulosoides</i> F o r.	3,0	6	27,75
HI	<i>Solenopsis fugax</i> L a t r.	1,2	4	11,10
HI	<i>Tetramorium caespitum</i> L.	0,4	2	3,70
EE	<i>Tapinoma erraticum</i> L a t r.	0,4	2	3,70
HI	<i>Lasius niger</i> L.	0,6	2	5,55
EI	<i>Lasius flavus</i> F.	5,0	8	46,25
EE	<i>Formica rufibarbis</i> F.	0,2	1	1,85

The minimiareal of this association is: 2.5 square metre.

In the weed association *Schlerochloo-Polygonetum avicularis* extending on the dam-top, and in the *Messor-Tetramorium* combination that is characteristic of this cenosis, the *Messor structor* of southern distribution is lacking because of the northern situation of the habitat, and only the *Tetramorium caespitum* is nesting there.

From the protected grasslands in the inundation area, an ant combination characterized by constant species has been demonstrated only in the grassland *Alopecuretum pratensis festucetosum pseudovinae*:

Ecological type	Species	N/1 sq.m	C/1 sq.m	D.p.c.
HI	<i>Myrmica rugulosoides</i> F o r.	0,9	6	18,36
EE	<i>Myrmica lobicornis</i> F o r.	0,2	2	4,08
HI	<i>Solenopsis fugax</i> L a t r.	0,2	2	4,08
HI	<i>Tetramorium caespitum</i> L.	0,2	2	4,08
EE	<i>Tapinoma erraticum</i> L a t r.	0,1	1	2,04
HI	<i>Lasius niger</i> L.	0,3	2	6,12
EI	<i>Lasius flavus</i> F.	2,0	10	40,10
EE	<i>Formica rufibarbis</i> F.	0,3	2	6,12
EE	<i>Formica fusca glebaria</i> Nyl.	0,5	4	10,20
EE	<i>Formica pratensis</i> Retz.	—	—	2,04
EE	<i>Polyergus rufescens</i> L a t r.	0,1	1	2,04

The average nest density of the association is mediocre, its constant minimiareal for the species *Myrmica rugulosoides* — *Tetramorium caespitum* — *Formica fusca glebaria* is: 2,5 square metre.

4. In the weed fringe *Amarantho-Chenopodietum albi* of the inundation area there occurred no constant ant population. The species nesting there are: *Tetramorium caespitum* L., *Formica rufibarbis* F., *Lasius niger* L. From them the *Tetramorium caespitum* and *Formica rufibarbis* are frequent weed-fringe species, the *Lasius niger* of broad ecological amplitude, however, occurs but rarely in other weed fringes.

Evaluation of the myrmecological results

The *Formicoidea* species combinations investigated in the three cenoses of different physiognomy have been separated well in qualitative and quantitative respects.

The *Formicidae* play a significant role in some cenoses, like the carnivorous, necrophagous, and coprophagous groups. The species having a similar food combination create a population different concerning their way of life, the place of their alimentation and the nesting oecus, and separated even inside the same cenosis. Inside these elementary groups of the way of life there is generally one dominant species in each. It can be explained by that the ant population of a cenosis appears usually with condominant species.

In the woods of the inundation area there can be observed two ant populations of different ways of life: (1) Terricolous, arboricolous species or those nesting in punks that hunt on the surface of soil or of fallen leaves, visiting and sometimes breeding plant-lice. There belong to here also the *Myrmica*, *Lasius* and *Formica* species although the way of life of the last ones partly differs from that of the *Myrmica* and *Lasius* species because they don't breed any plant-lice but they do attack even bigger insects and preserve larger alimentary and hunting grounds in the environment of their nest. The dominant species of this group in the „Bagiszeg” wood is the *Myrmica laevinodis*, in the „Bockerek” the *Myrmica scabrinodis*. (2) Tiny, photophobe, rather necrophagous *Myrmicinae* that nest in the soil on fallen leaves or under the rind, leaving their nest rarely or but in a small district. This group is represented in the „Bagiszeg” by the *Leptothorax tuborum unifasciata*, in the „Bockerek” wood by the *Leptothorax nylanderi*.

The ant populations of the grasslands and hayfields on the dam-sides have more combined species with a way of life rather varied. (1) Inside the species group *Lasius* — *Myrmica* described above, on the dam-side of western exposition, the *Lasius niger* and elsewhere the *Myrmica rugulosoides* are the dominant species. (2) The cenotical role of the *Solenopsis fugax* is similar to that of the *Leptothorax* species thus it is a representative of the syntrophium of the tiny *Myrmicinae* described at the woods. (3) The yellow *Lasius* (*Chthonolasius* subgenus), on the basis of their obligatory endogenous way of life, are separated from the *Lasius* — *Myrmica* group hunting on the surface of soil. The condominance of the *Lasius niger* — *Lasius* (*Chthonolasius*) *flavus*, so frequent in grasslike cenoses, can be explained with the different alimentary levels. On the dams and grasslands at Tiszaszalka the *Chthonolasius* species are represented by the *Lasius flavus* and *Lasius mixtus*. (4) Finally, the *Tapinoma erraticum* is to be mentioned as a species with a way of alimentation differing from that of the former ones. This may probably be classified into the dam-side syntrophium of the *Plagiolepis* species that are, as a rule, dominant at the central and lower sectors of the Tisza.

In the weed cenoses only the *Tetramorium caespitum* is constant, therefore we may not speak in that case about an ant fauna differentiated in respect of its way of life.

As to the ecological evaluation of the ant fauna, it can be established that the species comprise the stenoecical eremophilous — euryoecical eremophilous — hypereuryoecical intermediary — euryoecical hylophilous ecological scale. Evaluating the types according to species number and dominance percentage, it is practical to compare the data from the Upper Tisza with the results of the Central Tisza and Lower Tisza environs:

1. On the basis of the distribution of species numbers

	Upper	Central Tisza (p.c.)	Lower
stenoecical eremophilous (SE)	3.84	0.00	4.00
euryoecical eremophilous (EE)	53.76	50.00	52.00
hypereuryoecical intermediary (HI)	26.88	35.00	24.00
euryoecical hylophilous (EH)	15.46	15.00	20.00

2. On the basis of dominance percentage

	Upper	Central Tisza (p.c.)	Lower
stenoecical eremophilous (SE)	0.29	0.00	0.001
euryoecical eremophilous (EE)	30.61	48.57	55.64
hypereuryoecical intermediary (HI)	53.75	50.66	39.12
euryoecical hylophilous (EH)	15.35	0.67	5.23

As it is obvious, there is not too great difference as to the distribution of the species number of the three habitats. In case of the values reckoned on the basis of the dominance percentage, however, the percentile value of the mountain-hylophilous species at Tiszaszalka (Upper-Tisza) surpasses many times both the values from the Central Tisza and those from the Lower Tisza. On the other hand, the dominance percentage of the eremophilous species decreases at the Upper Tisza; that is so say, the mountain-climatological influence of the habitat at the Upper Tisza is reflected by the ant fauna not with the appearance of the populous mountain-sivicolous species but with higher dominance values of the hylophilous species living in other areas of the Tisza valley, as well.

Evaluating the ant fauna faunistically, both on the basis of species number and on that of the dominance percentage, the dominance of the Euro-Siberian species is characteristic, and, apart from that, also the percentile value of the Palearctic and European species is considerable:

Investigating the distribution of the single ecological and area types according to cenoses, it is obvious that in the woods of inundation areas there occur rather mountain-silvicolous species while of damsides the dominance of eremophilous species of more southern distribution is characteristic. The Tisza valley has, accordingly, a double mediatory effect on the fauna: in the woods first of all the mountain-hylophilous

	on the basis of species number	dominance
	percent	
Palaearctic	28.00	25.42
Euro-Siberian	36.00	38.71
Euro-Turanian	12.00	8.18
European	12.00	26.70
Euro-Mediterranean	4.00	0.48
Ponto-Mediterranean	8.00	0.48

species (e.g., *Myrmica laevinodis*, *Myrmica ruginodis*) are spreading on the Plain while along the dams the eremophilous species of more southern distribution (e.g., *Camponotus caryae fallax*, *Camponotus aethiops*) are advancing westwards.

Summary

In the course of our collection along the Upper Tisza we have demonstrated 29 *Orthopteroidea* and 24 *Formicoidea* species from the environs of Tiszaszalka—Gergelyugornya. In the several cenoses four relatively independent *Saltatoria* combinations have been established on the basis of the dominant species (woods in the inundation area: *Pholidoptera griseoptera* — *Leptophyes albovittata*, in the weed association of the inundation area: *Roeseliana roeselii* — *Chortippus longicornis*, on the dams: *Chortippus longicornis* — *Stenobothrus crassipes* — *Roeseliana roeselii*, in the protected humid meadow of the inundation area: *Chortippus longicornis* — *Mecostethus grossus* — *Parapleurus alliaceus*. In the ant fauna five combinations have been separated that can be classified into three more general types: the *Myrmica* — *Leptothorax* — *Lasius* association type of the oak woods in the inundation area, the *Myrmica rugulosoides* — *Solenopsis* — *Lasius* associations of the dam-sides and grasslands, and the weed cenoses with the constant species *Tetramorium caespitum*.

The ecological spectrum both of the *Orthopteroidea* and the *Formicoidea* faunas is displaced in the direction of the hygrophilous species as compared with the southern habitats. The climatological influence of the Northern Central Mountains on the *Orthopteroidea* fauna is demonstrated by the presence of the mountain species that are unknown in the more southern habitats of the Tisza (*Poecilimon schmidti*, *Pholidoptera aptera aptera*, *Bicolorana bicolor*, *Pseudopodisma fieberi*) while the *Formicoidea* fauna is reflecting the mountain influence with the larger total dominance of the hygrophilous species.

Faunistically the predominance of the Euro-Siberian, East-European and Palaearctic species is characteristic. The river valley has a double fauna-mediatory influence: promoting partly the spread of mountain species to the Plain, partly that of the Mediterranean and Ponto-Mediterranean species (*Phaneroptera quadripunctata*, *Platycleis affinis*,

Pezotettix giornae, *Stenobothrus nigromaculatus*, resp. *Camponotus caryae fallax*, *Camponotus aethiops*, etc.) in northern direction.

References

- Bába, K., Kolosváry, G., Sterbetz, I., Vászárhelyi, I., Zilahi-Sebes, G. (1962): Las Leben der Tisza XVII. — *Acta Biol. Szeged* 8, 203—215.
- Bacsó, N (1959): Magyarország éghajlata (Climate of Hungary) — Budapest.
- Balogh, J., Loksa, I. (1948): Artropod cenosis of the litter stratum of an oak forest. — *Arch. Biol. Hung.* 2, 18, 264—279.
- Balogh, J. (1953): Grundzüge der Zoözoologie. — Budapest.
- Gallé, L. jr. (1966a): Über die myrmecologischen Verhältnisse bei Taktaköz. In: Beretzky, P. et al.: Kollektive Arbeit. — *Tiscia II*, 67—83.
- Gallé, L. jr. (1966b): Ecological and zoocenological investigation of the *Formicoidea* fauna of the flood area of the Tisza River. — *Tiscia II*, 113—118.
- Gallé, L. jr. (1967): Ecological and zoocenological conditions of the *Formicoidea* fauna at Tiszakürt. — *Tiscia III*, 67—73.
- Gangwere, S. K. (1961): Monograph on food selection in *Orthoptera*. — *Trans. Amer. Ent. Soc.* 87, 67—230.
- Gausz, J. (1966): Untersuchungen über die Orthopteren-Fauna von Taktaköz. In: Beretzky, P. et al.: Kollektive Arbeit. — *Tiscia II*, 67—83.
- Gausz, J. (1967): Az Alföld *Orthoptera* faunájának összehasonlító vizsgálata (Comparative investigation of the *Orthoptera* fauna of the Plain). — (Unpublished).
- Harz, K. (1957): Die Geradflügler Mittel-Europas. — Jena.
- Knechtel, W., Biznoseanu, A. P. (1959): *Orthoptera*. — *Fauna RPR.* 4, 2. Bukarest.
- Móczár, L. (1953): Bátorliget hártýásszárnyú faunája (*Hymenoptera* fauna of of Bátorliget), in Székessy, V.: Bátorliget élővilága (Natural history of Bátorliget). — Budapest, 187—193.
- Nagy, B. (1943): Adatok a Tiszántúl *Orthoptera* faunájának ismeretéhez. (Data to knowledge of the *Orthoptera* fauna of the region lying beyond the Tisza). — *Fol. Ent. Hung.* 8, 33—44.
- Nagy, B. (1949): Quantitative and qualitative investigation of the *Saltatoria* on the Tihany Peninsula. — *Ann. Inst. Biol. Pervest. Hung.* 1, 96—121.
- Nagy, B. (1953): Bátorliget egyenesszárnyú faunája (*Orthoptera-Saltatoria* fauna of Bátorliget), in: Székessy, V.: Bátorliget élővilága (Natural history of Bátorliget). — Budapest, 187—193.
- Pécsi, I., Sársfalvi, J. (1960): Magyarország földrajza (Geography of Hungary); — Budapest.
- Pravdin, F. N. (1964): Regularities of the vertical distribution of the orthopteroid insects in the Adriatic part of the Balkan Peninsula. — *Ent. Oboz.* 43, 258—266 (Russian).
- Somfai, Edit (1959): *Formicoidea*. — *Fauna Hungariae* 13, 4, 1—79.
- Soó, R. (1964): A magyar flóra és vegetáció rendszertani-növényföldrajzi kézikönyve I. (Taxonomic and phytogeographic handbook of the Hungarian flora and vegetation. Vol I. Budapest.
- Stitz, H. (1939): Hautflüger oder *Hymenoptera* I. Ameisen oder *Formicidae*. In: Dahl, F.: Die Tierwelt Deutschlands, 37, 1—428.

Table I

Ecol. type	Type of area	Species	1	2	3	4	5	6	7
Mes.	Eu.-Sib.	<i>Phaneroptera falcata</i> Poda.			+		+		
Mes.	Med.	<i>Phaneroptera quadripunctata</i> Br.							+
Hyg.	Central-Eu.	<i>Leptophyes albovittata</i> Koll.	+		+	+	+		
Hyg.	Eastern-Eu.	<i>Poecilimon schmidti</i> Fieb.		+					
Hyg.	Palaearc.	<i>Conocephalus fuscus</i> Fabr.				+	+	+	
Mes.	Palaearc.	<i>Tettigonia viridissima</i> L.				+	+	+	+
Hyg.	Central-Eu.	<i>Tettigonia caudata</i> Charp.							+
Hyg.	Central-Eu.	<i>Pholidoptera a. aptera</i> Fabr.				+			
Hyg.	Eu.	<i>Pholidoptera griseoptera</i> Deg.	+		+				
Xer.	Ponto-Med.	<i>Platycleis affinis</i> Fieb.							+
Xer.	Eu.-Sib.	<i>Bicolorana bicolor</i> Phil.				+		+	
Hyg.	Eu.-Sib.	<i>Roeseliana roeselii</i> Hgb.	+		+	+	+	+	+
Mes.	Eu.-Sib.	<i>Decticus verrucivorus</i> L.				+		+	+
Hyg.	Palaearc.	<i>Tetrix subulata</i> L.						+	
Hyg.	Palaearc.	<i>Tetrix tenuicornis</i> Sahlb.							+
Xer.	Med.	<i>Pezotettix giornae</i> Rossi				+		+	
Hyg.	Central-Eu.	<i>Pseudopodisma fieberi</i> Scudd.				+	+	+	
Hyg.	Eu.-Sib.	<i>Mecosthetus grossus</i> L.							+
Hyg.	Eu.-Sib.	<i>Pcrapleurus alliaceus</i> Germ.							+
Mes.	Eastern-Eu.	<i>Stenobothrus crassipes</i> Charp.				+	+	+	+
Xer.	Ponto-Med.	<i>Stenobothrus nigromaculatus</i> H. S.						+	
Xer.	Palaearc.	<i>Omocestus ventralis</i> Zett.						+	+
Mes.	Eu.-Sib.	<i>Omocestus haemorrhoidalis</i> Charp.				+	+	+	+
Xer.	Palaearc.	<i>Glyptobothrus brunneus</i> Thunbg.						+	
Xer.	Palaearc.	<i>Glyptobothrus biguttulus</i> L.				+	+	+	+
Hyg.	Palaearc.	<i>Chortippus albomarginatus</i> Beg.				+	+	+	
Hyg.	Palaearc.	<i>Chortippus dorsatus</i> Zett.				+	+	+	+
Mes.	Eu.-Sib.	<i>Chortippus longicornis</i> Latr.	+		+	+	+	+	+
Mes.	Central-Eu.	<i>Euchortippus declivus</i> Bris.							+

Ecological types: Hyg: Hygrophilous, Mes: Mesophilous, Xer: Xerophilous.

Types of area: Eu.-Sib.: Europo-Siberian, Med.: Mediterranean, Central-Eu.: Central European, Eastern-Eu.: Eastern European, Palaearc.: Palaearctic, Eu.: European, Ponto-Med.: Ponto-Mediterranean.

Collecting stations: 1: „Bagiszeg”, 2: „Bockerek”, 3: dam-side in the inundation area, 4: Protected dam-side from the inundation area, 5: Protected canal bank in the inundation area, 6: Ruderal ecotone in the inundation area, 7: Protected humid meadow in the inundation area.

Table II

Ecolog. type	Type of area	Species	1	2	3	4	5	6
EH	Eu.-Sib.	<i>Myrmica laevinodis</i> Nyl.	+					
EH	Eu.-Sib.	<i>Myrmica ruginodis</i> Nyl.	+					
HI	Eu.-Sib.	<i>Myrmica scabrinodis</i> Nyl.		+				
HI	Eu.	<i>Myrmica rugulosoides</i> For.			+	+	+	
EE	Eu.	<i>Myrmica lobicornis</i> Nyl.					+	
HI	Palearc.	<i>Solenopsis fugax</i> Latr.			+	+	+	
EE	Eu.-Tur.	<i>Leptothorax tuberum unifasciata</i> L a.	+					
EE	Eu.-Tur.	<i>Leptothorax-nylanderi</i> Latr.						
HI	Pal.	<i>Tetramorium caespitum</i> L.			+	+	+	+
EE	Ponto-Med.	<i>Dolichoderus quadripunctatus</i> L.	+					
EE	Eu.-Tur.	<i>Tapinoma erraticum</i> Latr.			+	+	+	
SE	Eu.-Med.	<i>Camponotus caryae fallax</i> Latr.					+	
EE	Ponto-Med.	<i>Camponotus aethiops</i> Latr.					+	
EI	Palearc.	<i>Lasius fuliginosus</i> Latr.	+					
HI	Palearc.	<i>Lasius niger</i> L.	+	+	+	+	+	+
EE	Palearc.	<i>Lasius alienus</i> Foerst.	+					
EE	Eu.-Sib.	<i>Lasius brunneus</i> Latr.	+					
EE	Eu.-Tur.	<i>Lasius emarginatus</i> Ol.	+					
EI	Eu.-Sib.	<i>Lasius flavus</i> F.		+		+	+	
EE	Eu.-Sib.	<i>Lasius mixtus</i> Nyl.			+			
EH	Palearc.	<i>Formica fusca</i> L.			+			
EE	Palearc.	<i>Formica funca glebaria</i> Nyl.					+	
EE	Eu.-Sib.	<i>Formica rufibarbis</i> F.				+		+
EH	Palearc.	<i>Formica rufa</i> L.	+					
EE	Eu.-Sib.	<i>Formica pratensis</i> Retz.					+	
EE	Eu.-Sib.	<i>Polyergus rufescens</i> Latr.			+		+	

Collecting stations: 1: „Bagiszeg”, 2: „Bockerek”, 3: dam-side of W-exposition, 4: dam-side of E-exposition, 5: protected growland in the inundation area, 6: weed associations.