

ECOLOGICAL AND ZOOCOENOLOGICAL CONDITIONS OF THE FORMICIDAE FAUNA AT TISZAKÜRT

L. GALLÉ jr.

Ferenc Móra Technical Secondary School Szeged
(Received December 4, 1966)

In the Hungarian zoological literature there are known but a very few papers that contain the myrmecological elaboration of an area of another. The first data concerning the myrmecology of the Tisza region come from Zilahy-Sebess (Bába and others, 1962). The first paper of similar topics (Gallé, 1966) was rendering account of 33 species demonstrated in 11 collecting centres, as a result of the examinations performed in the inundation area of the Tisza in 1963–1965. This paper summarises the results of myrmecological informations at Tiszakürt in 1966.

Geographical and climatic conditions

The examined inundation area lies beside Tiszakürt, at the left bank of the river, in the so-called „Tiszazug”, to about 30 km south of the town Szolnok.

Climatically it belongs to the most arid and warmest regions of the Tisza valley. The amount of annual precipitation does not exceed 500 mm, the annual mean temperature is about 10 °C, with 2 °C January and 22 °C July averages (Bacsó, 1959).

The bioclimatic index of the area is the lowest in the whole Tisza region, not more than 35,55 mm.C°/degree-m, while, e.g., in the environs of Szeged, situated considerable more southwards, it is 46,8 mm.C°/degree-m.

Methods

At the collection of coenological data, on the soil, I have applied the quadratic method. Ants show a very poor coenological dispersion, therefore it is difficult to establish exact values of constance, minimiareal, etc., for the single individuals. Therefore, in the course of the examinations, I have considered the single ant nests as units, giving for these the different coenological constants (constance, dominance, minimiareal, etc.). This behaviour is motivated by the fact, as well, that in the material and energy transfer of colonies the different individuals of a species may often have, owing to the high degree of division of labour, differing roles; the colonies are, however, homogeneous in this respect, as well.

In the course of these examinations, accomodating myself to the frequency of nests as established at informative collections, I have used 1×1 or 2×2 m quadrats. The surfaces of quadrats have been digged in every case, and all the nests, found in the quadrats, have been taken into account, in ten quadrats a biotop.

For ascertaining the ecological data and character of *Formicidae* populations, I have performed synchronous temperature, soil-temperature, evaporating (with Piché's instrument for measuring the evaporation) and soil measurnigs, in four biotops.

For characterizing generally the ecology of the single species, I have used Pittioni's ecological classification, as described by Móczár (1953), concerning stenoecic eremophilous (SE) — euryoecic eremophilous (EE) — hypereuryoecic intermediary (HI) — intermediary (I) — euryoecic hylophilous (EH) — stenoecic hylophilous (SH) surroundings.

Biotops and cenoses

Biotops of the ant fauna in the area are: the riverside shallows, the willow-poplar grow-woods, the Tisza dams, the *arboretum* at Tizsakürt connected with the inundation area, the major meadows and weedverge-associations in the inundation area (Table I). Between August 10th and 19th 1966 I took into account 150 nests of 16 species in those biotops.

From the *Salicion* plant cenoses the association *Salicetum albaefragilis* has some myrmecological significance. Though the grove-like gallery wood of *Populus* and *Salix* tree-substance with dense underwood is a biotop of the most compensated and wettest milieu-influence, its daily temperature fluctuation is, according to measurings on August 18th 1966, 10,5 °C (Fig. 1,a), the water quantity evaporated in 12 hours is 6

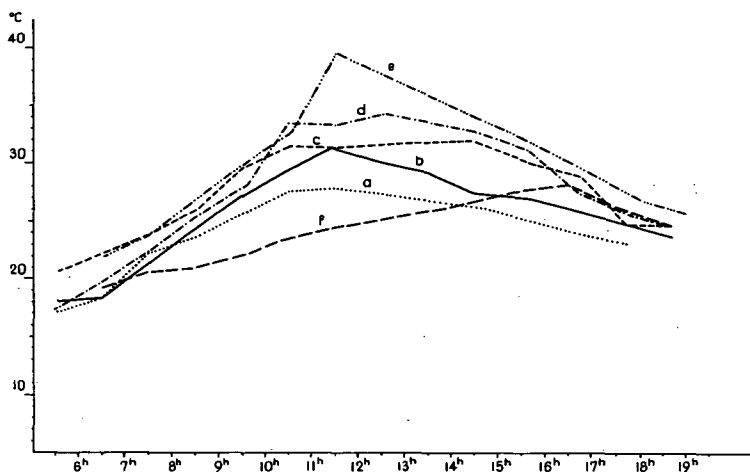


Fig. 1

dam

ecological type	distribution	species	dam					
			<i>Salicetum albae-fragilis</i>	<i>Arboretum</i>	<i>Cynodoniti-Poetum</i>	<i>Alopecuretum pratensis</i>	Weedassociations	<i>Schl.-Polygonetum av.</i>
		Exp.:	-	-	S-W	N-W	S-E	-
EH	Eu.	<i>Myrmica ruginodis</i> Nyl.			+			
HI	Eu.	<i>Myrmica scabrinodis</i> Nyl.		+				
HI	Eu.	<i>Myrmica rugulosoides</i> Forel				+		
EE	Eu.	<i>Myrmica lobicornis</i> Nyl.		+				
EE	Eu-Med.	<i>Messor structor</i> Latr.					+	+
HI	Pal.	<i>Solenopsis fugax</i> Latr.			+	+		
HI	Pal.	<i>Tetramorium caespitum</i> L.		+			+	+
EE	Eu-Med.	<i>Plagiolepis vindobonensis</i> Lomn			+	+	+	
EE	Eu-Med.	<i>Camponotus lateralis</i> Ol.			+	+		
HI	Pal.	<i>Lasius niger</i> L.	+	+	+	+		
EE	Pal.	<i>Lasius alienus</i> Först.			+			
EE	Pal.	<i>Lasius brunneus</i> Latr.		+				
I	Eu.	<i>Lasius flavus</i> F.			+			
EE	Eu.	<i>Formica rufibarbis</i> F.			+	+	+	+
EH	Eu.	<i>Formica rufa</i> L.				+		
EE	Eu.	<i>Polyergus rufescens</i> Latr.					+	

Ecological spectra:

	According to the Number of Species	On the basis of D per cent
Euryoecic eremophilus (EE)	50,00 %	48,57 %
Hypereuryoecic intermediary (HI)	27,00 %	50,00 %
Intermediary (I)	8,00 %	0,66 %
Euryoecic Hylophilous (EH)	15,00 %	0,67 %

Distribution of fauna elements:

Palaearctic (Pal.)	35,72 %	60,67 %
European (Eu.)	42,84 %	6,13 %
European-Mediterranean (Eu.-Med.)	21,44 %	33,20 %

ml, the hylophilous elements of *Lasius niger* — *Myrmica* ant cenosis, which is characteristic of the grove woods in the Tisza region (Gallé, 1966), are missing and alone the *Lasius niger* (HI) is present, because of the inundation danger of soil exclusively as a member of the arboricolous cenosis.

The grass-lands on the dam sides are, from the point of view of the *Formicoidea* fauna, the most important biotops at Tiszakürt. Along the tortuous dam, in the Tiszakürt region, several biotops have been formed with differing exposition, vegetation and soil conditions. On the dam side of northwestern exposition, facing the woods in the inundation area, the plant association *Alopecuretum pratensis*, *Arrhenatherum* facies is typical (Timár, 1953; Timár and Bodrogeközy, 1959). The amount of soil moisture has here the highest value, 17,33 per cent, among the biotops on the dam side; the daily temperature maxima are lower both in the soil (Fig. 1, f), and in the grass level (Fig. 1, b) than the corresponding values measured in other biotops of the dam side. The *Formicidae* population of the biotope shows the typical picture of the cenosis *Lasius niger* — *Plagiolepis vindobonensis* — *Solenopsis fugax* on the dams:

	D per cent (dominance)	C/1 squ. m (constancy, 1—10)
<i>Lasius niger</i> (HI)	37,00	7,5
<i>Solenopsis fugax</i> (HI)	31,84	5,0
<i>Plagiolepis vindobonensis</i> (EE)	17,25	2,5
<i>Myrmica rugulosoides</i> (HI)	7,46	2,5
<i>Formica rufibarbis</i> (EE)	3,23	0,5
<i>Camponotus lateralis</i> (EE)	3,22	0,5

The constant minimiareal of the association *Formicidae* is 2 sq. m, taking notice of the species *Lasius niger* and *Solenopsis fugax*. At the enumeration of species, I am considering the species *Myrmica rugulosoides* For. as a separate species and not but as a simple variation of the *Myrmica scabrinodis* Nyl., on the basis of Petal's (1963) anatomical and taxonomical revision.

On the SW side of the dam, being less steep and, therefore, exposed all day to a strong insolation, a phytocoenosis *Cynodonti-Poetum angustifoliae* has appeared with 80—90 per cent total coverage, generally with *Festuca psedovina* facies, and sporadically with *Stipa capillata* and *Digitaria sanguinalis* facies. The daily temperature maximum of the soil is higher than in the former biotope, its water content is, on the other hand, considerably lower, 11,07 per cent. The more aride and warmer situation may have been the cause of that, in the cenosis which is similar to the former partial association *Lasius niger* — *Solenopsis fugax* — *Plagiolepis vindobonensis*, mostly the more thermophilous and xerophytic *Lasius alienus* is substituted for the *Lasius niger*, the *Myrmica rugulosoides* doesn't occur, the Euro-Mediterranean *Camponotus lateralis* is, however, represented in a rather high percentage:

	D per cent	C/1 sq. m
<i>Lasius alienus</i> (EE)	39,97	7
<i>Plagiolepis vindobonensis</i> (EE)	19,81	4
<i>Solenopsis fugax</i> (HI)	10,52	6
<i>Lasius niger</i> (HI)	16,98	4
<i>Camponotus lateralis</i> (EE)	8,49	2
<i>Lasius flavus</i> (I)	2,83	1
<i>Formica rufibarbis</i> (EE)	1,40	0,5

The constant minimiareal for the dominant species *Lasius alienus* — *Plagiolepis vindobonensis* is 2,50 sq. m (Fig. 2, 1).

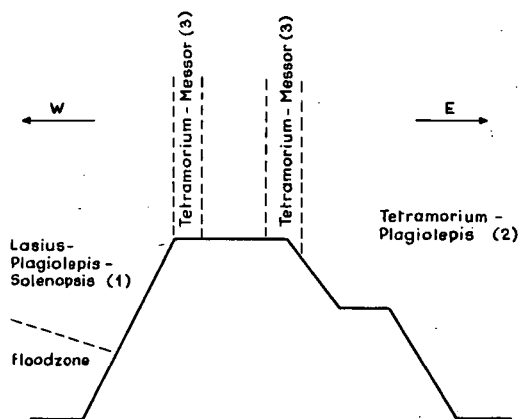


Fig. 2

On the SE or E side of the dam, not facing the inundation area, aride conditions are dominant which may be considered extreme under the conditions of the inundation area. The original plant associations of the dam side became, as a rule, xerophilous weed associations under the strong ruderal influence. The total soil coverage by vegetation is fifty per cent or so, therefore the soil insolation is strong. The soil is dry, its water content was on August 18th only 0,68 per cent, the maximal soil temperature 40 °C, the temperature of the grass level rose till 32 °C (Fig. 1, c, e). The present ant collection consists of thermophilous, xerophilic species:

	D per cent	C/2 sq. m
<i>Tetramorium caespitum</i> (HI)	43,00	10
<i>Plagiolepis vindobonensis</i> (EE)	37,00	10
<i>Messor structor</i> (EE)	12,00	5
<i>Polyergus rufescens</i> (EE)	7,50	0,2

The constant minimiareal of the *Tetramorium caespitum* — *Plagiolepis vindobonensis* is 2 sq(m (Fig. 2, 2).

This *Tetramorum* — *Plagiolepis* — *Messor* sociation is, in its character, near the myrmecological picture of the *Schlerochloeto* — *Polygonetum avicularis ruderalis ecotone*, beside the way along the dam top, whose characteristic species are the *Messor structor* (EE, D= 26 p.c.) and the *Tetramorium caespitum* (HI, D= 74 p.c.; Fig. 2, 3). The temperature conditions of the *Schlerochloeto* — *Polygonetum avicularis* are demonstrated in Fig. 1, d.

The large inundation meadow, with its associations *Alopecuretum pratensis* and *Echinochloeto* — *Polygonetum*, is in a close contact, in myrmecological respect, with the biotop of the adjacent *Lasius alienus* — *Plagiolepis vindobonensis*, etc. ant association; its ant population is given first of all by the *Camponotus lateralis* having its hill in the *Cynodonti* — *Poetum*, using for food first of all the aphides of the poplar row along the verge of the meadow.

In the artificially grown *arboretum* with a mixed tree substance of the type of *Fraxinus*, *Populus*, *Quercus* woods, owing to the not-uniform surroundings, there could not be formed any well-derived *Formicidae* *coenosis*. On the soil *Lasius niger* (HI), *Tetramorium caespitum* (HI), *Myrmica scabrinodis* (HI), and *Myrmica lobicornis* (EE) have been observed, and on the tree stems *Lasius brunneus* (EE) occurred like a nesting species.

Summary

In the inundation area at Tizsakürt, on the dam sides and in the *arboretum*, we could demonstrate 16 species in the course of the myrmecological investigations in 1966. The species are faunistically Euroturannian, Euromediterranean and Palearctic elements, with a predominance of the individuals of the Euromediterranean and the rare scattered Palearctic elements. The ant fauna contains ecologically the euryoecic eremophilous — euryoecic hylophilous provinces, according to nest and individual numbers with a very small hylophilous percentage. The ant species form four populations which are well-separated from the point of view both the abiotic and of the biotic environmental factors.

References

- Andó, M. (1959): Mikroklimatikus sajátosságok a Tisza-ártér déli szakaszán. — Földr. Ért. VIII. 3, 309—336.
- Bába, K., Kolosváry, G., Sterbetz, I., Vásárhelyi, I., Zilahi-Sebess, G. (1962): Das Leben der Tisza XVII. — Acta Biol. VIII. 203—215.
- Bacsó, N. (1959): Magyarország éghajlata. — Budapest.
- Balogh, J. (1953): Grundzüge der Zooönologie. — Budapest.
- Gallé, L. jr. (1966): Ecological and zoocoonological investigation of the *Formicoidea* fauna of the flood area of the Tisza River. — Tiscia II, 113—118.
- Móczár, L. (1953): Bátorliget hártýásszárnyú faunája, *Hymenoptera*, in: Székessy, V.: Bátorliget élővilága. — Budapest, 1953, 286—316.
- Petal, Joanna (1963): Données pour la morphologie de *Myrmica rugulosoides* For. et *Leptothorax nigrescens* Ruzsky (*Hymenoptera*, *Formicidae*). — Bull. de l'Acad. Pol. des Sci. XI. 8, 379—382.
- Somfai, Edit (1959): *Formicoidea*. — Fauna Hungariae 13, 4, 1—79.

- Stitz, H. (1939): Hautflüger oder *Hymenoptera* I. Ameisen oder *Formicidae*. In: Dahl, F.: Die Tierwelt Deutschlands 37, 1—428.
- Timár, L. (1953): A Tiszamente Szeged—Szolnok közötti szakaszának növényföldrajza. — Földr. Ért. 2, 87—113.
- Timár, L. und Bodrogközy, Gy. (1959): Die pflanzengeographische Karte von Tiszazug. — Acta Biol. V/1—2, 203—232.