11 THE LOWER CRUSTACEA FROM THE TEMPORARY POOLS OF THE BANAT (SOUTH-WESTERN ROMANIA)

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INTRODUCTION

The temporary pools are small and shallow water bodies, some of them not exceending a few tens or hundreds of square meters, with a short duration of life (some less than five months) which is followed by a longer lasting drought, when the pools become dry. The majority are present in arid areas. They have no connection with the riverine net and are never flooded by the high waters of the rivers.

Their fauna consists of species with a short life cycle or a short aquatic stage followed by a a terrestrial or aerial one (larvae or numerous families of Diptera and Ephemeroptera), besides insects living permanently in water, but whose adults can fly and leave the pools in the dry seazon (various Coleoptera and Heteroptera). Those with a short life cycle possess resistant eggs, able to survive many months or years in the dried mud or outside the water and to be dispersed through the wind or other passive means.

The latter groups include Turbellaria, Rotatoria and other socalled worms and especially crustaceans.

The most typical inhabitants of the temporary pools are the members of three groups of lower crustaceans: Anostraca (fairy shrimps), Conchostraca (clam shrimps) and Notostraca (tadpole shrimps). These were lumped in a subclass or superorder, Euphyllopoda. Actually they are not interelated; Anostraca are considered as representing a distinct lineage of lower crustaceans while both other groups are included,

alongside the Cladocera or waterfleas, in another lineage, that retained the name Phyllopoda (WALOSSEK, 1993, 1995, 1995; NEGREA, BOTNARIUC and DUMONT, in press; see also FRYER, 1987 a, 1997 b).

Most Anostraca are strictly confined to freshwater temporary pools, one genus, *Artemia* lives in continental hypersaline waters and a few species in alpine lakes. Strictly confined to temporary pools are the Notostraca (which comprise only two genera and few species) and most Conchostraca (some of their species living in temporary and in permanent pools as well). Confined to temporary pools are also some Ostracoda. Well represented are many species of Cladocera and of Copepoda (Cyclopoida and Calanoida); neither the cladocerans nor the cycloipoids include however exclusive inhibitants of temporary pools and most of their species are cosmopolitan, hence of little interess. The calanoids (family Diaptomidae) comprise however some species confined to temporary pools and others well represented in this habitat. Since all their species and genera, like all those of anostracans and all species of conchostracans have restricted ranges, they deserve special attention.

The Banat is a central European area, well delimited by the Danube on the south, the river Tisza on the west, ist tributary, Mures on the north, the Southern Carpathians on the east. The eastern third of the Banat is montanic and hilly, the western two thirds are lowland. Most of the Banat belongs, since 1918 to Romania, the south-western quarter to Yugoslavia (Serbia), being included in the province Voivodina. The lowlands ot te Banat have initially been in a large measure a marshy area, drained by rivers, comprising numerous shallow lakes, ponds, permanent and temporary pools. The area has been drained aince the second half of the XVIII-th century, most standing waters desapeared, but many remained. The temporary pools of the province, whose number is gradually decreasing, are inhabited by a rich fauna of lower crustaceans.

MATERIAL

The present study is based on specimens sampled by the authors, Between 1948 and 1955, P. BĂNĂRESCU has collected especially anostracans and diaptomids; these specimens have been used in the description of *Palpicephalus brevipalpis*, in the ellaboration of the issue on Phyllopoda in the "Fauna Romaniaes" (BOTNARIUC and ORGHIDAN, 1952) and the both comprehensive studies on the Diaptomidae from Romania (BĂNĂRESCU and SERBAN, 1954; DAMIAN-GEORGESCU, 1966).

Between 1960 and 1996 BĂNĂRESCU collected further Anostraca and Cladocera from various localities in the lowlands of the Banat; the anostracans were determined by A. STOICESCU, the cladocerans by St. Negrea, who collected further specimens from the latter group, mainly in southern Banat. These specimens are mentioned in the present paper.

A great number of anostracans from the Banat and from whole Romania is present in two collections, one located in the laboratory of Animal Taxonomy of the Institute of Biology in Bucureşti, another in the private collection of A. STOICESCU in Oltenița. Specimens will be sent to the great museums of zoology in the world and both collections will be finally given to the museum "GROGORE ANTIPA" in Bucureşti. The collection of Cladocera, presently located in the Institute of Speology "EMIL RACOVIȚĂ" in Bucureşti will be given to the same museum. Specimens of Anostraca, Cladocera, in the future also Conchostraca and Diaptomidae from the Banat will be given also to the Muzeul Banatului in Timisoara.

HISTORICAL OVERVIEW

The first contributions to the Anostraca, Conchostraca and Diaptomidae from the western areas on Romania are those of DADAY (1888, 1900, 1910); these refer however only to Transylvania and Crișana (the western Romanian province west of historical Transylvania and north of Banat). It is worth mentioning however that DADAY (1891) records the occurence at Șiria (formerly Világos), in Crișana (county Arad), in the vecinity of the Banat) of a Siberian and north-east European species, *"Diaptomus" thelli* (right name: *Mixodiaptomus theeli*). He obviously misidenrified under this name another species, *M. kupelwieseri*, which was found in 1954 in the same locality by P. Bănărescu (BĂNĂRESCU and ȘERBAN, 1954; DAMIAN-GEORGESCU, 1960).

RESULTS

All contributions to the fauna of Anostraca and Diaptomidae from Romanian part of the Banat have been published after 1946 and are based exclusively on specimens collected by P. BĂNĂRESCU between 1943 and 1996, most of the temporary pools from the for "Überland" (contiguous with the much larger "Pădurea Verde", N-NE of the town Timișoara, between the railways Timișoara-Radna and Timișoara-Bucureşti). Nothing has been published until now on the Conchostraca

from Romanian part of the Banat, but a few new species have been described from the Serbian one.

The contributions to the four groups of lower crustaceans from temporary pools found until now in the Banat, the list of the species identified and their distribution are mentioned separated for Anostraca, Notostraca, Diaptomidae and Cladocera.

Anostraca

The first contribution on the Anostraca from the Banat is that of Orghidan (in BOTNARIUC and ORGHIDAN, 1953) who mentions the occurrense at Überland of two remarkable species:

- *"Chirocephalopsis" grubii* (presently: *Siphonophanes g.*), a western European species, Timișoara representing the easternmost limit of its range.

- a new species, *Palpicephalus brevipalpis*, of a genus described earlier by ORGHIDAN (1948) under the name *Ceratocephalus* (being preocupied it was changed in *Palpicephalus*) for a species from south-eastern Romania (province Muntenia): *Ceratocephalus* (now *Palpicephalus*) *recticornis* Orghidan. The two species, *recticornis* and *brevipalpis*, represent a pair of sisters with vicariant (allopatric) ranges.

Dealing with the widely distribuited *Chirocephalus diaphanus*, Orghidan (same place) mentions that this is distribuited in the "vecinity of the towns București ... Timișoara ..."; since the only fairy shrimps at his disposal from the Banat were those collected by BĂNĂRESCU at Überland proves that he identified from this locality also *C. diaphanus*.

A rich material of fairy shrimps has been collected by BĂNĂRESCU between 1956 and 1996 from several localities in the lowland of the Banat; this has been determined by A. STOICESCU who identied six species in two families (besides some branchipodids which could not be identified).

Family Chirocephalidae

Genus *Siphonophanes* Simon, 1886

1. *Siphonophanes grubii* (Dybowski, 1860)

Synonyms: *Branchipus grubii* Dybowski, 1860; *Branchipus hungaricus* Chyzer, 1861; *Chirocephalopsis grubii* - Duday, 1910; Orghidan, 1952.

The species has been collected in almost each year at Überland (the last time in 1996), during the months March and April. It has also

been found at Lugoj, (again in the Banat, more than 50 km east of Überland and even about 140 km farther east), at Gura Motrului in the south-eastern province Oltenia; the eastern limit of its known range has been hence shifted with some 190 km farther.

Genus *Palpicephalus* Orghidan, 1953

Synonym: *Ceratocephalus* Orghidan, 1948, nomen preoccupatum.

The nomenclatorial status of *Palpicephalus* raises problems. ORGHIDAN has never published the replacement ot the name *Ceratocephalus* throught *Palpicephalus*. He has mentioned this nomenclatorial change at a scientific meeting, without however publishing it. In his monograph of the Romanian Anostraca (in BOTNARIUC and ORGHIDAN, 1953), ORGHIDAN gives the diagnosis of the genus *Palpicephalus* Orghidan, 1952, listing *Ceratocephalus* Orghidan, 1948 as synonym. Sience no paper mentioning the name change has been published in 1952, the year of discription of *Palpicephalus* is 1953; the usual expression "nomen novus" has never been published, BRTEK (1966) does not accept *Palpicephalus* as valid, synonymizing it with *Chirocephalus*.

2. *Palpicephalus brevipalpis* Orghidan, 1953

Synonym: *Chirocephalus brevipalpis* - Brtek, 1966.

ORGHIDAN (same place) lists the species as *Palpicephalus brevipalpis* Orghidan, 1953. He did not however publish its description in that year; hence the species dates from 1953, although it was never described as "species nova".

The original description in 1953 records this species only from Überland, on the base of specimens collected by BĂNĂRESCU in 1948 and 1949 and by ORGHIDAN and BĂNĂRESCU in 1952. No holotype has been mentioned and the location of the syntypes is unknown; they probably do no more exist. A neotype must be selected.

The species was collected, in great number from Überland almost each year, during the months March, April and the first half of May. It has also been found between Șag and Pădureni (S-SE of Timișoara) in 1980 and in three localities in southern Banat: Grădinari (formely Cacova) in 1980 and 1988, Comorâște in 1988 and 1996 and Forotic in 1996. It has never been fond outside the Romanian Banat, being, in the present state of knowledge, endemic to this province.

Genus *Pristicephalus* Daday, 1910

3. *Pristicephalus carnuntanus* (Brauer, 1877):

Synonyms: *Branchipus* (*Chirocephalus*) *carnuntanus* Brauer 1877;

Pristicephalus carnuntanus - Daday, 1910; *Chirocephalus carnuntanus* - Brtek 1966, 1976; *Pristicephalus carnuntanus* - Stoicescu, 1991

The species has been recorded for the first time in Romania by STOICESCU (1991) after specimens colected at Sânnicolau Mare, the extreme north-western Banat, in April 1987; he identified later the same species after specimens collected in April 1985 and April 1987 at Überland.

The range of this species encompasses eastern Austria, most of Hungary, the lowlands of southern Slovakia and of northern Croația and Serbia (BRTEK, 1976); it is endemic to the Pannonian plains.

Genus *Chirocephalus* Prevost, 1803.

4. *Chirocephalus spinicaudatus chyzeri* (Daday, 1910)

Synonyms: *Branchipus diaphabus* var. *chyzeri* Daday, 1888; *Chirocephalus spinicaudatus* var. *chyzeri* - Daday, 1910; ORGHIDAN, in BOTNARIUC and ORGHIDAN, 1953; *Chirocephalus chyzeri* - Brtek. 1966, 1976.

This species has been found, until now in a single site in the Banat: near the railway station Sacul (midway between Lugoj and Caransebeș) in April, 1996.

The species is more frequent in the south-east of Romania (numerous sites near București). *Ch. spinicaudatus* has a wide range in Europe; in the west of the continent lives the nominal subspecies, in the east *C. s. chyzeri.*

5. *Chirocephalus diaphanus romanicus* Stoicescu, 1992

Based on the difference between the specimens form all Romanian populations and those from western Europe, STOICESCU (1992) has included the populations from Romania in a new subspecies: *C. diaphanus romanicus*. This is the most widely distribuited chirocephalid in the country and, contrary to the other members of the family, it is not confined to temporary pools in lowlands, but also ocurs in alpine lakes and pools at higer altitudes (in the mountains Retezat and Bucegi). Specimens of *C. diaphanus romanicus* have been idetified in lowland temporary pools form following localities and sites in the Banat: Überland, Sânnicolau Mare, Jena (eastwards of Lugoj), Sustra and Jebel. The subspecies is widely distribuited also in the lawlands of south-central and south-eastern Romania (provinces Oltenia and Muntenia). Fairy shrimps have been seen, in July 1940 in a higmountain lake on Mount Bloju (near Poiana Mărului, Țarcu mountain massif) by P. BĂNĂRESCU. These obviously belong to *C. d. romanicus,* too.

While this subspecies is met with in lowland temporary pools in the spring (March to the first half of May), it lives in mountains during the summer, June to August.

Family Streptocephalidae

Genus *Streptocephalus* Baird, 1852

6. *Streptocephalus torvicornis* (Waga, 1842)

Contrary to all species of Chirocephalidae, which live during the spring, *S. torvicornis* has a longer period of life, adults being met with during the summer, occasionally also, in September. The species has a wide distribution in central and southern Europe, north-western Africa and western Asia. It was found in many localities in the southern half of Romania, two of them in the Banat: Überland, and Sacul.

Family Branchipodidae

Branchipodidae gen. sp.

A badly preserved specimen of branchipodid fairy shrimps, which cloud not be determined even at the generical level (either *Brachipus* or *Tanymastix*) was found at Überland, the 15-th March 1988.

Notostraca

Family Triopidae

Genus *Triops* Schrank, 1803

1. *Triops canoriformis* Schafer, 1756

The species is widely distribuited in Europe and in Romania. Specimens have beeen found at Überland and Sacul.

Genus *Lepidurus* Leach, 1816

2. *Lepidurus productus* (Bosc, 1802)

Another widely distribuites species, found at Überland and previously seen (prior to 1938) between Timișoara and the village Urseni.

Copepoda Calanoida

Family Diaptomidae

Two major contributions have been published on the Diaptomidae of Romania: those of BĂNĂRESCU and ȘERBAN (1954) and of DAMIAN-GEORGESCU (1966). Both include numerous data on the species present in the Banat, the diaptomid fauna of this province is better known than those of the other Romanian provinces.

Genus *Hemidiaptomus* Sars, 1903

1. *Hemidiaptomus hungaricus* Kiefer, 1933

Synonym: *Diaptomus superbus* (non Schmeil - Radu, 1947)

This species has been described by KIEFER (1933) from Tekovskych Luzian (formerly Nagysalo) in southern Slovakia; its second recording is that by BĂNĂRESCU and SERBAN (1954) from Überland and two other localities in the Banat and two in south-eastern Romania. It is an esclusive inhabitant of temporary pools in forests or formerly forested sites and only in lowlands, being absent at somewhat hingher altitudes, in hilly areas, where it is replaced by its congener *H. amblyodon*. This fact, remarked by BĂNĂRESCU and ȘERBAN (1954) in Romania is confirmed by tha data of BRTEK (1977) who maped the distribuition of both species in Slovakia: *H. hungaricum* is concentrated in the south and south-west of the country, i. e. in lowlands and *H. amblyodon* in the east, near the Ukraine, at hingher altitudes.

H. hungaricus is a spring species, adults being met with from March (sometimes even from end February) to end May, in cold years even in the first half of June. Its range encompasses the Pannonian and Vallachian plains and the western part of the Ukraine.

The species was abundant in the temporary pools in the forest of Überland (but not in those outside the forest) and present also in three other localities in the Banat: some 2 km west of Timișoara (in the direction of Săcălaz), in the forest Bistra (village Ghiroda) and in that of Pișchia. It became extinct from Überland during the 80-s and has nc more be found in other places in the Banat.

Genus *Diaptomus* Westwood, 1836

2. *Diaptomus serbicus* Gjorgjewic, 1907

Like the preceding species, *D. serbicus* is an exclusive inhabitant of temporary pools, being however not confined to those from forests: it also lives in open fields etc. It has been found in great quantities at Überland and also in other localities in the lowlands of the Banat: at Pișchia and west of Timișoara, as well as in south-eastern Romania (Oltenia and Muntenia). Like *H. hungaricus* it lives only the spring. Its general range is more southern than that of *H. hungaricus*: it lives also in Serbia, in the western Balkan and Italy but not in Slovakia, where it is replaced by *D. castor* (Brtek, 1977). A distinct subspecies, *D. aerbicus charini*, ranges in the Ukraine and in south-western Russia.

Genus *Mixodiaptomus* Kiefer, 1932

3. *Mixodiaptomus kupelwieseri* (Brehm, 1907)

This species was abundant in the temporary pools of Überland and in two other sites in the lowlands of the Banat (forest Pișchia and west from Timișoara). It is not confined to temporary pools, being present also in permanent ones (including some shalow lakes of the floodplain of the Danube); it was found also in other areas of Romania: Transylvania, Muntenia, county Bihor, even including hilly ones (BĂNĂRESCU and SERBAN, 1954) and has a wide range in central and southern Europe. Like the preceding ones, it lives only during the spring. Since more than ten years it became extinct from Überland and has no more been found in other localities in the Banat.

Genus *Arctodiaptomus* Kiefer, 1932

4. *Arctodiaptomus wierzeskyi* (Richard, 1888)

This species was found in smaller quantities at Überland, being more numerous in temporary pools far from forests; it has been present also in other localities in the Banat (at Uliuc and at Bacova near Buzias) as well as in various localities in south-eastern Romania, including permanent pools and shallow lakes of the floodplain of the Danube. It has a longer life cycle than the preceding species, being found from the beginn of March until June; in the early spring the specimens have an intensive red coloration and become later linght greenisch or blue. This species has a wide European range.

5. *Arctodiaptomus pectinicornis (*Wierzejski. 1887)

A species similar to the preceding one, present in small quantities at Überland in May, 1952 and in no other localities in the Banat, being much more numerous in south-eastern Romania, in temporary and permanent pools as well. It is a summer species, found also in August and September. It range encompasses the countries on the western watershed of the Black Sea: Crimeea, the Ukraine, Romania, Bulgaria and western Turkey. Überland (respectively Timișoara) represents the western limit of its range.

Genus *Eudiaptomus* Kiefer, 1932

6. *Eudiaptomus vulgaris* (Schmeil, 1897)

Found in great quantities at Überland, from late April-May, when it replaces *Mixodiaptomus kupelwieseri*, until July. In the recent years it has no more been found in this site, where it probably became totally extinct, like all other members of the family; it was however found in May

1995 and 1996 further east, between the villages Jena and Sacul. It is the only species of diaptomids known to have survived in the lowlands of the Banat. The species has a wide range in Europe; it has been recorded also in Transylvania and in soth-eastern Romania, both in temporary and permanent water bodies.

Cladocera

A comprehensive monograph of the Cladocera or waterfleas from Romania has been published by Negrea (1983) who mentions species from the temporary pools of the Banat.

The classification of the water-fleas used here is that proposed by FRYER (1887 a, 1987 b) who divides *Branchiopoda* in ten orders.

The specimens this study is based on have been collected partally by P. BĂNĂRESCU (during the spring, March to May, at Überland, Sag, Pădureni, Forotic and in July at Comorâste), partly by GH. BREZEANU at IEȘELNIȚA.

Order Ctenopoda
Family Sididae

Genus *Diaphanosoma* Fischer, 1850

1. *Diaphanosoma brachyurum* (Lievin, 1849)

A palearctic species, widely distributed in Europe (except the Feno-scandian tundra), inhabiting large eutrophic lakes, rich in organic matter. Recorded with certitude until now, only in three sites from Romania: lake Sf. Ana (Tușnad), lake Snagov and the fisheries farms from Maliuc in the Danube Delta, from May to September. Identified in single locality in the Banat: at Ieșelnița, the 25 May 1966.

Order Anomopoda
Family Daphiidae

Genus *Daphnia* O. F. Müller, 1785

2. *Daphnia magna* Straus, 1820

A holarctic, oriental and african, β-meso-saprobic to polysaprobic species, widely distributed in Europe, from lowlands to 2.500 m altitude. It inhabits, in the lowlands, small, permanent or temporary water bodies rich in organic matter of animal origin. Collected at Comorâste the 27 July 1979, being representant by very many specimens.

3. *Daphnia obtusa* Kurz, 1874

A palearctic, oriental and african species, frequent in Romania; it inhabits temporary pools, permanent ponds, shallow lakes, *Sphagnum* bogs and glacial lakes, up to 2100 m alt. It has been found only once, in the Banat at Überland, the 23 March 1953, being represented by very many specimens.

4. *Daphnia pulex* Leydig, 1860

A holarctic, oriental and african species, distributed throughout Europe, except at high altitudes. It inhatits temporary pools, ponds, limnocren springs. It is meso- to polysaprobic prefering water bodies with many algae, bacteria and detritus. It is found from May to December, sometimes also during the winter. The species ist rare in Romania; during 45 years of investigations, it has been found only in the lake "Tăul fără fund" at Băgău-Aiud and in the temporary pools from four localities in the Banat (Überland, between Sag and Pădureni, Pădureni and Forotic) in March to May, 1960-1997. In these localities the species was represented by large populations, including parthenogenetic and gamogenetic females.

5. *Daphnia curvirostris* Eylmann, 1887

A palearctic and african species, rather frequent in Romania, in temporary and permanent pools, ponds, with slightly alkaline water with much organic matter, also in bogs, with or without *Sphagnum*, from March to November. Found in the Banat only at Ieselnita, in March and May 1966.

6. *Daphnia longispina* O. F. Müller, 1785

A palearctic species, found until now in Romania only in permanent lakes and ponds, up to 1200 m alt.; usually few specimens. Identified in the Banat only at Überland (collected the 2 May 1986; rather few specimens, among which parthenogenetic and gamogenetic females).

Genus *Simocephalus* Schoedler, 1858

7. *Simocephalus vetulus* (O. F. Müller, 1776) and

8. *Simocephalus expinosus* (Koch, 1841)

Both species are widely distributed in the world and in Romania, inclusively in temporary pools.

Genus *Ceriodaphnia* Dana, 1853

9. *Ceriodaphnia reticulata* (Jurine, 1820)

A holarctic, african and neotropical species, sparsly ditributed in Romania, but locally abundant in fishponds and temporary pools.

10. *Ceriodaphnia megops* Sars, 1862

A holarctic species, relatively rare in Romania, present in shallow, permanent and temporary pools.

11. *Ceriodaphnia quadragula* (O. F. Müller, 1785)

A member of the glacial mixt fauna with a paleoarctic range, until now found in Romania only in the *Sphagnum* bogs Mohos and Bâlbâitoarea.

12. *Ceriodaphnia dubia* Richard, 1894

A holarctic, african and neotropical species, rare in Romania; it inhabits lakes and ponds with abundant vegetation, inclusively temporary pools.

Genus *Megafenestra* Dumont & Pensaert, 1983

13. *Megafenestra aurita* (Fischer, 1849)

A paleoarctic and african, hypneustonic species, rather rare in Romania, in lowland warm ponds with much vegetation and in temporary pools.

Genus *Scapholeberis* Schoedler, 1858

14. *Scapholeberis mucronata* (O. F. Müller, 1776)

A holarctic hyponeustonic species, relatively frequent in Romania in water bodies with a rich vegetation and many algae, inclusively temporary pools.

These eight species (no 7-14) were found in the Banat only at Ieșelnița, the 24 March and 25 May 1966.

Family Macrothricidae

Genus *Macrothrix* Braid, 1843

15. *Macrothrix hirsuticornis hirsuticornis* Norman & Brady, 1867

A west-central palearctic subspecies, very rare in Romania (recorded only from three localities), found at Überland, the 23 March 1953.

Genus *Lathonura* Lilljeborg, 1853

16. *Lathonura rectirostris* (O. F. Müller, 1785)

A holarctic species, rare in Romania, in lakes with vegetation and in oligotrophic bogs, up to 910 m altitude. In the Banat it was found only at Ieșelnița, the 25 May 1966 (parthenogenetic and gamogenetic females).

Genus *Chydorus* Leach, 1816

17. *Chydorus sphaericus* (O. F. Müller, 1776) s. str.

The species *C. sphericus* as delimited by Frey from the "*sphericus* complex" has been recorded until now only from Danmark and Romania (NEGREA, 1983). It is the most frequent and abundant species of waterfleas in Romania, present in all types of standing waters, inclusively in subterranean ones and alpine lakes. It was found at Überland, the 25 March 1953, being represented by many specimens.

Genus *Pluroxus* Baird, 1843

18. *Pleuroxus laevis laevis* Sars, 1862

A holarctic and african subspecies, present only in few localities in Romania in ponds with vegetation. Found at Ieșelnița, in March and May 1966.

Genus *Alonella* Sars 1862

19. *Alonella excisa excisa* (Fischer, 1854)

A holarctic subspecies, widely distributed in Romania in ponds with muddy bottom and vegetation. Found at Ieșelnița in May 1966.

Genus *Pseudochydorus* Fryer, 1968

20. *Pseudochydorus globosus globosus* (Baird, 1843)

An almost cosmopolitan subspecies, inhabiting stagnant waters with a rich vegetation, widely distributed in Romania. Found at Ieșelnița in May 1966.

Genus *Alona* Baird, 1843

21. *Alona quadragularis* (O. F. Müller, 1785)

An almost cosmopolitan species belonging to the glacial mixt fauna, rather frequent in Romania, up to 950 m alt. and to a depth of 40 m, in ponds with muddy bottom and vegetation. Found at Überland, the 23 March 1953.

22. *Alona rectangula coronata* Kutz, 1875

This subspecies occurs in the Caucasus, the Danube Delta and many localities in Romania, especially in eutrophic ponds with muddy bottom and much vegetation. Found at Ieșelnița, in March and May 1966.

Genus *Camptocercus* Baird, 1843

23. *Camptocercus rectirostris rectirostris* Schoedler, 1862

An eurasian and african subspecies, rare in Romania in ponds with mud and vegetation. Found at Ieșelnița in May 1966.

Genus *Acroperus* Baird, 1843

24. *Acroperus angustatus* Sars, 1864

A palearctic species, present in stagnant, permanent and temporary waters with a rich vegetation, much detritus and muddy bottom. Found at Ieșelnița in March and May 1966.

Genus *Graptoleberis* Sars, 1862

25. *Graptoleberis testudinaria alexandrinae* Negrea, 1982

A subspecies described after Romanian populations, whose validity has been proved throught the study of populations from Hungary and Spain; it is rather frequent in permanent and temporary standing waters with vegetation. Found at Ieșelnița in March and May 1966.

Order Onychopoda
Family Polyphemidae

Genus *Polyphemus* O. F. Müller,1785

26. *Polyphemus pediculus* (Linnaeus, 1761)

A species of the glacial mixt fauna having a Holarctic range, present in Europe up to an altitude of 2300 m. It is relatively frequent in Romania in the shallow lakes with much vegetation from the floodplain and the delta of the Danube, also in some oligotrophic *Sphagnum* bogs, in distrophic bogs, sometimes in temporary pools, too. It feeds on copepods, ostracods, rotifers, infusors, even on other waterfleas (Bosmina). It has been found in the Banat only in the temporary pools with vegetation of Ieșelnița, the 25 May 1966.

ZOOGEOGRAPHICAL CONSIDERATION

All lower crustaceans living in temporary pools have resistent eggs, being able to be dispersed through the wind or other passive means. Nevertheless, all species of Anostraca, Diaptomidae and Conchostraca (excepting the circum-tropical *Cyclstheria hislopi*) and even most genera jave limited, some even quite limited ranges. This means either that their eggs can be carried only short distances, or, more probably, that the

ecological requirements of each species permits the hatching of the eggs obly in certain categories of water bodies. It is known that certain species live only in forrests (some *Hemidiaptomus*), others in steppes (*Branchinecta ferox*). The ranges of these crustaceans differ from those of fishes, decapod crustaceans and branchiate mollusca, which depend, in a large meassure, on river basins. The ranges of the temporary pools crustaceans correspond rather to climatic and vegetation zones, BĂNĂRESCU (1992) suggested that two "areas of endemism" can be distinguished for the lower crustaceans (mainly for temorary-pools inhabitans) in central-southeastern Europe: the "pannonian plains" (extreme western Austria, most of Hungary, the lowlands of Slovakia, of western Romania, northern Croatia and Serbia) and the "Vallachian or Romanian plains" (the lowlands of Romania east of the Iron Gates and of Moldova, east to the river Nistru), unsharply delimited from the Ukrainian plains. The lowlands of the Banat belong to the "Pannonian plains".

Following species are endemic to, the Pannonian plains:

Anostraca: *Chirocephalus slovacicus, Palpicephalus brevipalpis, Pristicephalus carnuntanus, Drepanosurus hankoi*;

Conchostraca: *Imnadia panonica, I. banatica, I. cristata, Eoleptestheria spinosa*;

Diaptomidae: *Hemidiaptomus sostarici.*

The most remarkable non-endemic is *Branchinecta ferox*, disjunctly distributed in the arid steppes, from Central Asia to south-eastern Europe (inclusively in the easternmost part of the Vallachian plains) and in Hungary/suthern Slovakia. Shared exclusively with the Vallachian plains is *Imnadia voitesti* (not yet recorded in the Romanian part of the Banat). Sharded with the Vallachian plains but more widely distributed are *Hemidiaptomus hungaricus* (eastwards to the Ukraine) and *Diaptomus serbicus* (south-eastwords to Italy).

Actualy a single one of the endemics is widely distributed throughout the Pannonian plains, from Slovakia to the Banat and eastern Austria: *Pristicephalus carnuntanus.* The three endemic conchostracans have been recorded only from the Yugoslavian province Voivodina (incliding the Serbian area of the Banat); they range probably also in the Romanian Banat and in southern Hungary but not in Slovakia. *Chirocephalus slovacicus* has been recorded only from Slovakia, *Hemidiaptomus sostarici* only from Croatia, *Drepanosurus hankoi* only from Hungary; the occurence of the two former species in the Banat is improbalbe. Finally, *Palpicephalus brevirostris*, recorded until now only

from the Romanian Banat, probably lives also in Voivodina and southern Hungary, eventually in the western Romanian areas north of the river Mureș, too, but surely not in Slovakia, whose anostracan fauna has been very thoroughly investigated. Of the two diaptomid species shared by the Pannonian an Vallachian plains, *Diaptomus serbicus* widely distributed in the south of both areas, but is absent from Slovakia (BRTEK, 1977) and surely from northern Hungary, too.

These data demonstrate that the entomostracan fauna of the "areas of endemisms" is far from being uniformous.

DISTIBUTION OF THE SPECIES WITHIN THE BANAT, ECOLOGICAL REMARKS

Überland is the site that has the richest fauna of lower crustaceans in the Banat. Five of the six species of Anostraca recorded until now from this province (six if one add the undertemined branchipodid), all six diaptomids and both notostracans have been found in this locality. On the contrary, only *Palpicephalus brevipalpis* has been found in the three southern localities (Grădinari, Comorâste, Forotic), only *Pristicephalus carnuntanus* and *Chirocephalus diaphanus romanicus* (and no diaptomids) at Sânnicolau Mare, only *Siphonophanes grubii* at Lugoj, only *C. spinicaudatus chyzeri, Streptocephalus torvicornis* and *Eudiaptomus vulgaris* at Sacul etc. while conchostracans have been found only between Jebel and Pădureni.

It is difficult to explain the differences in the structure of the crustaceans associations in the various localities. It can be assumed that each species has its own ecological requirements. But less us consider two localities: Überland and Comorâste. *Palpicephalus brevipalpis* is abundent in both, but in the former it is accompanied by three other species of anostracans, while in the latter locality these species are absent. Could one suggest that some ecological factor, say the water chemismus of the temporary pools of Comorâste is favorable only to *P. brevirostris*? Why, in this case, does the species live also at Überland, together with the three others? And how to explain the disjunct distribution of *Siphonophanes grubii* at Überland and Lugoj its absence in the intermediary localities, Recaș and Șustra?

Hazard may have played a role. The eggs of the various species may have limited dispersal possibilities, they may have only rarely the occasions to reach a group of temporary pools and, when a species is

firmly established in a pool and has developped a rich population, its density may prevent the establishment of another species.

Many of the temporary pools having a similar ecology which existed in the 40's to the 60's do no more exist; they have been dryed for agricultural purposes. The ecological conditions of others have been modified; e. g. as a consequans of certain hidrotechnical "ameliorations" some temporary pools became semi-permanent or even permanent and several species, especialy among the diaptomids, whose eggs can hatch only after having undergone a period of dryness, do not survive.

Pollution of the water through nutrints, pesticids, etc., has determined the local extinction of several species. The fauna of Anostraca from the temporary pools in the Banat is still rich: all species are locally abundant; on the contrary, that of Diaptomidae has undergone a drastic reduction: a single one of the six species found during the 50' s and 60' s - *Eudiaptomus vulgaris*, has been found during the recent years and only at Jena and ar Sacul, not at Überland, where all six species were formely present, four of them in great number.

All cladocerans identified in the temporary pools in the Banat have wide ranges and have previously been found in other localities in Romania; none raise biogeographical problems. Their local occurrence in the Banat is however remarkable ecologically. Five of them were found only at Überland (*Daphnia obtusa, D. longispina, Macrothrix hirsuticornis, Chydorus sphaericus* and *Alona quadrangularis*) another one, *Daphnia magna*, only at Comorâște, *D. pulex* at Überland, between Șag and Pădureni, at Pădureni and at Forotic. The pools in these four sites are inhabited by a fauna of lower crustaceans "typical" for temporary pools, also including anostracans and diaptomids. Nineteen other species have been found only in the temporary pool from Ieșelnița, close to the Danube. Two of these are planctonic, *Daphnia curvirostris* and *Diaphanosoma brachyurum*, the seventeen other are phytophilic or benthic: both species of *Simocephalus*, the four ones of *Ceriodaphnia*, the single species of *Megafenestra, Scapholeberis, Lathonura, Pleuroxus, Alonella, Pseudochydorus, Camptocercus, Acroperus, Graptoleberis, Polyphemus* and *Alona rectangula*. Neither Anostraca, nor Notostraca and Diaptomidae are present in this large temporary pool (300-400 m length) with rains water and vegetation at border, contrary to the typical smaller temporary pools, inhabited by Anostraca, Notostraca etc. whose water originates only from rains and melting of the snow and without vegetation. The pool of Ieșelnița belongs hence to a special category, characterized by a rich vegetation and other animal species. It is worth mentioning that

one planctonic species of waterfleas present at Ieșelnita, *Daphnia curvirostris*, is present also in bogs, where anostracns, diaptomids etc. are never found.

Many inhabitants of temporary pools deserve protection and must be included in red books: all anostracans with restricted ranges (e. g. *Palpicephalus brevipalpis*), several rare cladocerans a. oth. Their protection is possible only be preventing the deterioration of the habitat.

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