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The zoogenic food composition of Utricularia vulgaris in the Lake Fertő

By

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Abstract. The zoophagous activity of the plant *Utricularia vulgaris* is presented in the Lake Fertő. In 1000 traps examined 19 animal species of 9 major taxonomic groups were found. The frequency of the groups was as follows: Copepoda > Ostracoda > Cladocera > Chironomidae. Beside faunistic results, it has been evidenced that *a)* the most important prey animals belonged to the mesofauna (mainly to Copepoda and Ostracoda), and *b)* the traps never contained specimens of Protozoa and Rotatoria. The zoophagous activity of the plant can be considered as important since two-third of their traps contained animals or fragments of those.

The areas covered by aquatic plants in the shallow lakes are frequently compared to forests, i.e. the aquatic plants correspond to the trees and the crowd of the animals represent the terrestrial fauna elements at various levels.

The place and function of the carnivorous plants – among them *Utricularia vulgaris* – have not been clarified so far. Considering these, we have designed to reveale the zoogenic foods of *Utricularia vulgaris* so as to assigne this plant into the trophic system of the litoral region. This topic is also actualized by the fact that 90% of the Hungarian section of the Lake Fertő, the important shallow lake of our country, is composed of Scirpo-Phragmitetum utricularietosum (Csapody, 1975) with mass occurrence of various *Utricularia* stands. Despite of these, no detailed taxonomic studies have been carried out on the *Utricularia* species. It seems probably, therefore, the occurrences of other *Utricularia* species than *Utricularia vulgaris.*

The place and function of the carnivorous plants to play in the matter and energy flow of the litoral region hasn't been clarified. Their prey animals are probably composed of those mesofauna elements which are best-fitting to the size of the trap.

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The objectives of this study were to reveale the major zoogenic foods of *Utricularia vulgaris*, to identify the most frequent organisms occurring in the traps so as to assigne this plant species into the trophic system, using samples taken from the *Utricularia vulgaris* vegetation of the lake.

Sites, dates of sampling and methods

The *Utricularia vulgaris* samples examined were taken from the Hungarian section of the Lake Fertő in three areas: two isolated ponds, Herlakni and Hidegség, and one smaller isolated pond (Kis-Herlakni). In all three areas the reed belts contained considerable *Utricularia vulgaris* stands at the margins. This plant contituted even a continuous zone in the Kis-Herlakni pond, but the open water in the Nagy Herlakni pond was free of hair-weed.

The sampling periods for the three areas corresponded to the peak vegetation season of the year 1980.

Table 1. Sites and dates of sampling and the numbers of the traps opened

Sampling site	Datum	No. of traps examined
Herlakni pond	13. 08.	300
Hidegség pond	24. 09.	400
Kis-Herlakni pond	24. 09.	300

The samples (indicated in Table 1), were fixed immediately in 4% formalin and opened with a thin insect needle soldered to a glass tube under a stereo-microscope using a magnification of 100×. The animals found in the traps were placed into vials labelled individually according to the taxonomic group. Special attention was also paid to the fact that the traps opened would represent small, intermediate and large sized ones in ca. identical numbers.

Results and discussion

Of the three areas a total of 1000 traps were opened for food analysis (Tables 2 and 3).

Table 2. Representation of the traps contents

Item	Occurrence (No.)
Animal	of 115 traps: 173
Animal fragments (unid.)	13
Detritus	560
Empty	312

In the entire sample, the most frequent were the Copepoda (94 specimens.) On 7 accasions two or three specimens did occur in a single trap.

Meso- and macrofauna taxa found in the traps:

Nematoidea
Nematoda (fragments)
Gastropoda
Physa fontinalis (fragments)
Crustacea
Cladocera
Bosmina longirostris (O. F. MÜLLER, 1785)
Alona rectangula (SARS, 1862)
Pleuroxus aduncus (JURINE, 1820)
Chydorus sphaericus (O. F. MÜLLER, 1785)
Simocephalus exspinosus (KOCH, 1841)
Copepoda
Arctodiaptomus spinosus (DADAY, 1890)
Eucyclops serrulatus (FISCHER, 1851)
Acanthocyclops robustus (SARS, 1863)
Megacyclops viridis (JURINE, 1820)
Diacyclops bicuspidatus (CLAUS, 1857)
Mesocyclops leuckarti (CLAUS, 1857)
Ostracoda
Cyclocypris ovum (JURINE, 1820)
Cypria ophthalmica (FISCHER, 1853)
Ephemeroptera
Cloeon dipterum (LINNÉ, 1761)
Diptera
Chironomidae (from subfamily Orthocladiinae)
Acaridea
Hydracarina
Arrenurus sp. juv.
Oribatidae
Hydrazetes lacustris (MICH., 1882)

The digested chitin fragments, the various granules and plant fragments are indicated by the term „detritus". Of 1000 traps opened 312 contained neither digestion fragments nor identifible animals, thus, they were empty.

Unfortunately, we have no information on the digestive speed of the traps and on the exact ratio of the Protozoa of softer body and smaller size, and that of the Rotifera in the food contents of the traps.

According to the analysis by GARDINI (in: HEGI, 1929), of 2084 *Utricularia neglecta* traps the following animal groups were identified: 1196 small crabs, 469 Rotatoria, 327 Protozoa, 66 Nematoda, 13 Isopoda, 10 insect larvae, and 3 Hydracarina specimens. Comparing the list of the 19 species described here with that of GARDINI it can be seen that our sample contianed also the same major groups expect two, Protozon and Rotatoria. It can probably due to the fact that the numbers of the free-living Protozoa and Rotatoria were well below the general level in the water surrounding the *Ultricularia vulgaris* traps.

No animals neither animal fragments were found in 31,2% of the 1000 *Utricularia vulgaris* samples taken in the three areas. The item in 56% of the traps was detritus. Among these, some contained few detritus – occasionally animals as well – but full traps were also frequent. These traps were probably unoperating and they were changed by the more recent ones.

These intermediate and large-sized traps were localized at the deeper, floating part of the plant, much lower from the water surface, close to the bottom.

At this level the aquatic animals floating in the water or living at the bottom can easily be trapped by the plant. We found 115 traps which contained animals, too.

It is worthy to compare the animals found in the 9 major taxonomic groups to the species lists reported earlier for the Lake Fertő. The comparison is rendered more difficult, among the plant stands is small and they are relatively old.

During examinations, one Nematoda species was found in the traps of the plant. *Alona rectangula* was previosuly identified from *Chara*, *Cyclocypris ovum* and *Cypria opthalmica* from *Drepanocladus*, whereas *Arctodiaptomus spinosus* and *Mesocyclops leuckarti* were found in reeds without submerge vegetation (PONYI and DÉVAI, 1977).

The major part of Cladocera occurred in the traps was the typical species-group characteristic of the weedy waters. Thus, their occurrence can be considered natural.

Table 3. Comparison of the crustacean prey to food resource

Food recource (species occurring on *Utricularia vulgaris)*	Prey crustaceans
Chydorus sphaericus	*Chydorus sphaericus*
Acanthocyclops viridis	*Acanthocyclops robustus*
Pleuroxus aduncus	*Pleuroxus aduncus*
Ceriodaphnia reticulata	*Alona rectangula*
Daphnia curvirostris	*Arctodiaptomus spinosus*
Simocephalus exspinosus	*Simocephalus exspinosus*
Scapholeberis kingi	*Megacyclops viridis*
Ceriodaphnia laticaudata	*Diayclops bicuspidatus*
Eucyclops serrulatus	*Eucyclops serrulatus*
Scapholeberis aurita	*Mesocyclops leuckarti*
Diaphanosoma brachyurum	*Cyclocypris ovum*
Bosmina longirostris	*Bosmina longirostris*
Cypris pubera	*Cypria ophthalmica*
Notodromas monacha	

It is also interesting that the Ostracoda occurring in relatively high numbers (44 specimens) are composed of only two species. Among the individuals of the six various species occurred 94 Copepoda specimens. Occurrence of *Arctodiaptomus spinosus*, the predominant crustacean species of the open water of the Lake Fertő, is also noteworthy.

The occurrence of crustacean species in the traps of *Utricularia vulgaris* (Table 3.) can probably be related to the fact that its area has extended with the parallel reduction of the aquatic vegetation. *Acanthocyclops robustus* is getting more frequent in the Austrian open waters, as well. Its increased occurrence can be explained with the reduction of the weed at the end of the seventies.

The traps contained generally detritus-eating crustaceans. The very mobile predatory crustaceans occurred in small numbers in the traps of the plant. Altogether two species, *Acanthocyclops robustus* and *Mesocyclops leuckarti* are predators. Thus, the predominant foods for the plant are composed of the detritus chain.

The sharp between-area differences in the food spectra are also interesting. Whilst specimens of two species were found in the Herlakni and Hidegség ponds each, specimens of 12 species did occur in the Kis-Herlakni pond. These data refer only to the crustaceans, but the results are similar when analysing the proportions of the species belonging into the other major taxonomic groups. Thus, it can be stated that the most organisms occurred in the Kis-Herlakni pond, consequently the fauna of this isolated small pond was the richest in species. The Amphipoda species, known also in the Hungarian section of the lake, did also occur in this pond (ANDRIKOVICS, FORRÓ and METZ, 1982).

The only Ephemeroptera species *(Cloeon dipterum)* found is frequent in the weed-stands of the Lake Fertő. The relatively low contribution of Ephemeroptera to the food spectra of the traps can probably be explained by size-problems.

According to previous reports (ANDRIKOVICS, 1973, 1979), 53,6% of the *Utricularis vulgaris* stand contained Chironomida larvae. Supposed, this high occurrence might have resulted from the high proportion (7.5%) of the relatively large-sized animals in the trap contents. The 13 Chironomidae larvae belong into the subfamily Orthocladiinae and into the herbivorous and detritus eating groups. We have failed to identify the larvae according to species due to their progressive digestion stage.

In the plant stand, among Hydracarina occurring in 6,4% altogether, one specimen was found in the *Utricularia* traps. This animal was identified to be a young *Arrenurus* sp. The Oribatidae belonging into the genus *Hydrazetes* represented itself with altogether one specimen. The animal was identified by DR. PÉTER BALOGH.

Considering the animals found in the traps and the literary data, the following statements can be concluded. The most frequent organisms belong to the crustaceans (89,5%). Of these the Copepoda are predominant (54,3%). The animals are collected by the catching-traps according to size. In case of the intermediate traps the Crustacea, Gastropoda and Nematoda occur. The various Arthropoda species (Chironomida, Ephemeroptera, Hydracarina, Oribatida) occur in the intermediate and mainly in the large-sized traps. The majority of the species found are sediment-eating, the number of predators is relatively small. Altogether one-third part of the traps examined (31,2%) contained neither animals, nor fragments. It can therefore be stated that the zoophag activity of the plant is considerable, but at least non-negligible.

The plant compensates mainly its nitrogen deficiency by digestion of meso- and macrofauna elements. Contrary to our expections, Protozoa and Rotatoria are negligible items in the foods of *Utricularia vulgaris*.

Comparing our results on the fauna-phagous activity of *Utricularia vulgaris* with the feeding studies of the Lake Fertő (ANDRIKOVICS and KERTÉSZ, 1978 – 79) we can state that the food items of this plant has been enlarged by new elements, particularly by small crustaceans, via the detritus food-chain. On the other hand, the plant is also a component of the trophic chain originating from the detritus-Chironomidae level.

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