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Littoral microfauna (Cladocera and Copepoda) in the reedbelt of Neusiedler See (Austria)

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Abstract: During 1989 the author studied the littoral microfauna in the reedbelt of Neusiedler See at Illmitz. Samples were taken with funnel traps at three stations. 22 species of Cladocera and Copepoda were found. *Daphnia pulex, Ceriodaphnia laticaudata, Simocephalus exspinosus, Alona rectangula, Chydorus sphaericus, Eucyclops serrulatus* and *Megacyclops viridis* occurred most frequently. The abundance showed considerable variation, it changed between 1095 and 50089 ind/m^2.

Kurzfassung: 1989 wurde im Schilfgürtel des Neusiedler Sees bei Illmitz die litorale Mikrofauna untersucht; die Probeentnahmen erfolgten mit Trichterfallen an drei Stellen. 22 Cladocera und Copepoda Arten wurden gefunden. Die häufigsten Arten waren: *Daphnia pulex, Ceriodaphnia laticaudata, Simocephalus exspinosus, Alona rectangula, Chydorus sphaericus, Eucyclops serrulatus* und *Megacyclops viridis*. Die Individuendichte zeigte große Schwankungen und lag zwischen 1095 und 50089 Ind/m^2.

Introduction

Neusiedler See is a large shallow, alkaline lake at the Austrian - Hungarian border; one of its most characteristic features is the reedbelt. The reed covers about 150 km^2, about 55 % of the total lake area. This vast zone around the open water plays an important role in functioning of this ecosystem, however, its function is still little understood.

Microcrustaceans (Cladocera, Copepoda and Ostracoda) form a major component of the microfauna which inhabits vegetated habitats. While the limnetic communities have been the focus of detailed investigations, the littoral microfauna has been given much less attention, probably because of sampling difficulties imposed by structural complexity in the littoral habitats.

This is also true for Neusiedler See, since in contrast with the considerable body of information about the zooplankton of the lake there is no comparable data base for microcrustacean communities inhabiting the littoral zone. Beside faunistical surveys (Löffler 1979), Forró & Metz (1987) dealt with quantitative aspects of microcrustacean communities of the reedbelt. This study was initiated to provide information about the species composition and abundance of the crustacean microfauna living in the reedbelt.

Materials and methods

Three sampling stations were selected in the reedbelt in the vicinity of the Biologische Station Neusiedler See, Illmitz (Fig. 1). The first station is situated in a small bay, immediately in front of the reed fringe, while the other two are situated in the reedbelt. In the bay the water depth is about 100-120 cm, with

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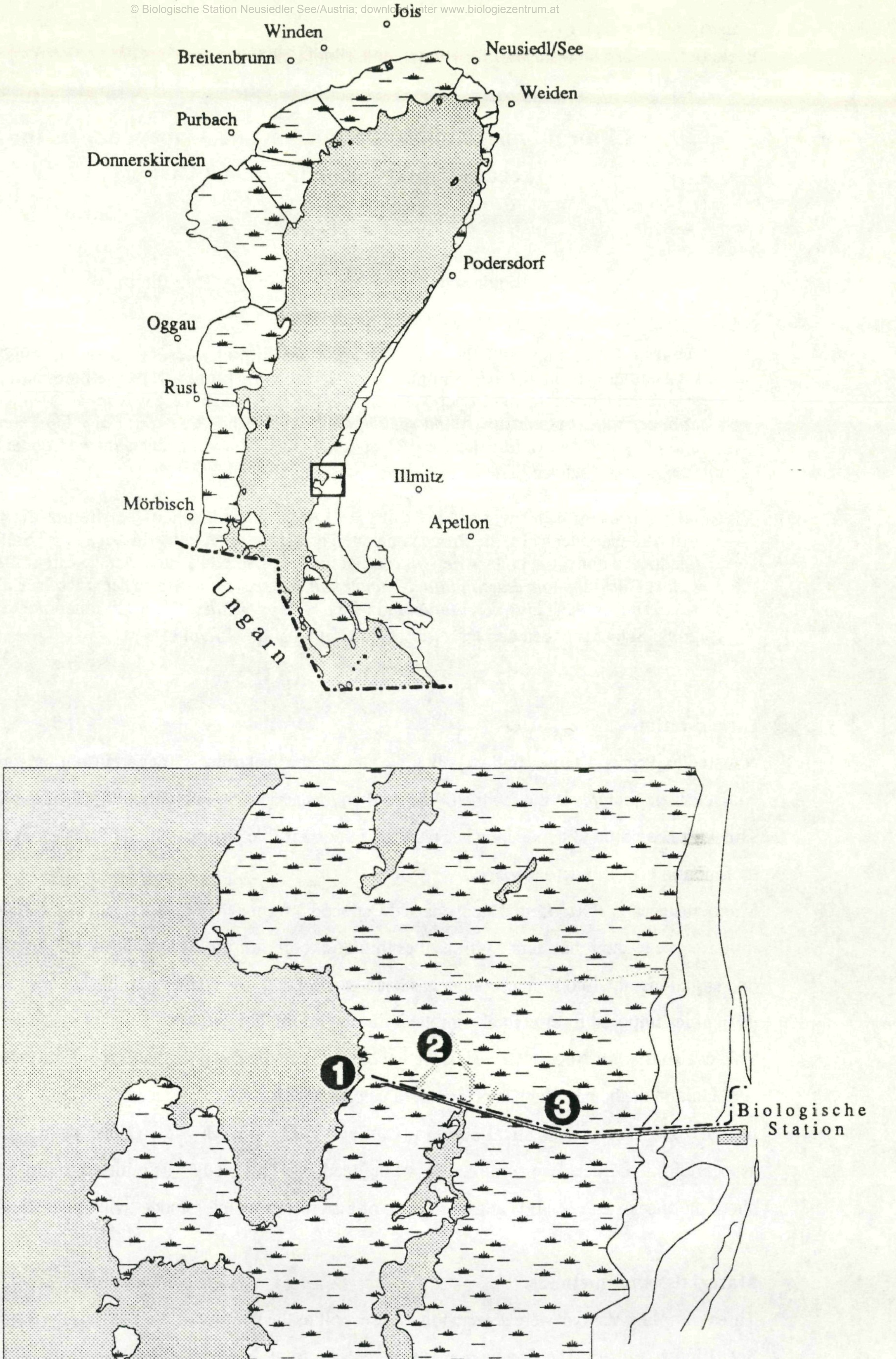

Fig. 1: Map of Neusiedler See and a detailed sketch of the study area; numbers indicate the sampling locations.

mostly turbid water (due to wind action). The reed stations are shallower, with 40-60 cm water depth and transparent, brownish-brown water.

The samples were collected with funnel traps, which were set in place in the evening and retrieved the next morning. A funnel trap consisted of three funnels set into a rectangular sheet of plexiglass. Each funnel had a diameter of 10 cm, or about 78.5 cm^2 trapping surface; a 150-ml collecting bottle was attached to each funnel. More details of this method are given by Whiteside & Williams (1975) and Whiteside & Lindegaard (1982). Collections were made in April, August and October.

Results

The microcrustacean species collected are listed in Table 1; 14 Cladocera and 8 Copepoda species were found. The three stations were markedly different concerning species composition. The first one (station 1) yielded 13, nine cladoceran and four copepod species. Three species *(Macrothrix hirsuticornis, Oxyurella tenuicaudis, Paracyclops fimbriatus)* occurred at each sampling date, but their occurrence was restricted to this station.

The second station (station 2) had 16 species, eleven cladocerans and five copepods; it was the richest one in cladocerans. *Megafenestra aurita* was the only species which occurred only at this site. However, characteristic for this and the other reed station were several species, such as *Ceriodaphnia reticulata* and *C. laticaudata, Scapholeberis rammneri* and *Pleuroxus aduncus.* Of the copepods, *Megacyclops viridis, Diacyclops bicuspidatus* and *Microcyclops varicans* characterized the two reed stations.

The third station (station 3) also yielded 16 species, but was the richest one in copepods, seven species of the group occurred here. Two species, *Cyclops strenuus* and *Mesocyclops leuckarti* were found only at this site.

The two dominant species of the open water, *Arctodiaptomus spinosus* and *Diaphanosoma mongolianum* (according to N. Korovchinsky, pers. commun., only this species of *Diaphanosoma* occurs in the lake), were found in the funnels at each station, but not at all dates. Interestingly, *A. bacillifer* , a species known only from the reedbelt of the lake, did not occur in these samples.

Species number and its seasonal variation were also different at the three sampling sites. At station 1 this number varied between 6 and 12, with maximum in summer. This pattern is also true for the species numbers found in the individual funnels, as its mean was five in April, 7.8 in August and 4.3 in October. The reed stations had greater species numbers, but the maximum numbers occurred here in April and decreased in summer, remained or further decreased in autumn. Interestingly, the total number of species was usually greater in the third station than in the second one, but the species number in the individual funnels at these stations looked somewhat different. The seasonal change was the same as described above for these stations, but in all seasons was the species number greater in the third station (reed 2: 5.6, 3.8, 3.6; reed 3: 8.2, 5.5, 5.3), the maximum was also found here.

Table 2 shows the abundance data for each crustacean group, arithmetical means were calculated for each site and date, values are expressed in ind/m^2. The ostracods were found only in the reed stations; their contribution to the total numbers varied between 1% and 4%.

Table 1: Species list and occurrence

	Station 1			Station 2			Station 3		
Month	IV	VIII	X	IV	VIII	X	IV	VIII	X
Diaphanosoma mongolianum		+		+					
Daphnia pulex	+		+	+	+	+	+		
Ceriodaphnia reticulata				+	+		+	+	
Ceriodaphnia laticaudata				+	+	+	+	+	+
Scapholeberis rammneri				+	+		+		+
Megafenestra aurita					+				
Simocephalus exspinosus		+		+	+		+	+	+
Bosmina longirostris		+		+	+				
Macrothrix hirsuticornis	+	+	+						
Oxyurella tenuicaudis	+	+	+						
Leydigia acanthocercoides		+						+	
Alona rectangula	+	+	+	+	+	+		+	+
Pleuroxus aduncus				+	+		+	+	
Chydorus sphaericus	+	+		+		+	+	+	+
Arctodiaptomus spinosus	+	+		+			+		
Eucyclops serrulatus	+	+	+	+	+	+	+	+	+
Paracyclops fimbriatus	+	+	+						
Cyclops strenuus							+		+
Megacyclops viridis		+		+	+	+	+	+	+
Diacyclops bicuspidatus				+		+	+		+
Microcyclops varicans				+			+		
Mesocyclops leuckarti								+	+
Number of species	8	12	6	15	11	7	13	10	10

At station 1 a copepod dominance was found troughtout, and maximum abundance occurred in summer, however, this value also is much smaller than those found at the reed stations (2 + 3). It should be noted, that in most of the funnels at each station at least half of the copepod specimens were nauplius larvae. The seasonal change in abundance was similar in the second station, where the maximum value occurred in summer and the minimum in autumn. However, at this site the copepod dominance appeared only in spring, later the cladocerans reached higher values. In summer *Ceriodaphnia laticaudata* occurred here in large numbers, while in October *Daphnia pulex* was very numerous. In some funnels *C. laticaudata* was dominant over *D. pulex* in autuum too.

Copepods were dominant also at the third station, but the seasonal change of abundance was different, since the greatest value was found in April, and the smallest in August. In spring *Eucyclops serrulatus* and *Megacyclops viridis* dominated, of the Cladocera *Daphnia pulex* was rather numerous. In summer *E. serrulatus, M. leuckarti* and *Chydorus sphaericus* occurred in great numbers. In October cladocerans occurred in very small numbers, and in most funnels two or three copepod species co-occurred.

Table 2: Abundance (ind/m2)

21. 04. 1989	Station 1	Station 2	Station 3
Cladocera	509	1414	7912
Copepoda	2840	8657	25754
Ostracoda	-	305	812
Total	3349	10376	34478

04. 08. 1989	Station 1	Station 2	Station 3
Cladocera	6305	22697	3004
Copepoda	8190	1958	11080
Ostracoda	-	297	555
Total	14495	24952	14639

17. 10. 1989	Station 1	Station 2	Station 3
Cladocera	993	13994	802
Copepoda	3713	2101	16259
Ostracoda	-	170	710
Total	4706	16265	17771

Discussion

Summing up the faunistical data on the Crustacea fauna of the reedbelt of Neusiedler See, Löffler (1979) reported 19 Cladocera and 26 Copepoda species from this zone. This study extended this list with *Paracyclops fimbriatus*, the occurrence of this species was noted also previously by Forró & Metz (1987) from the bay. Schiemer (1979) in his summary of the benthic community of the open lake also did not mention this copepod species.

Schiemer (1979) listed six Cladocera species as members of the benthic community of the open lake, three of them (*Leydigia acanthocercoides, Alona rectangula, Chydorus sphaericus*) were found also in the funnel traps. The difference might be due to the biology (migrating activity) of the species, but also indicates that mud habitat in the reed zone has other species composition.

The abundance data of the present study revealed, that microcrustaceans occur in the reedbelt in such densities that they certainly form a significant food resource for fish. Whiteside, Doolittle & Swindoll (1985) have shown that the littoral microfauna in Lake Itasca is more abundant than limnetic zooplankton, thus the most plentiful food supply is in the littoral zone. From Forró & Metz (1987) and the present study it becomes obvious that the reedbelt has a more numerous fauna in Neusiedler See too.

Seasonal changes in littoral microfauna, particularly Cladocera, were described by Whiteside (1974), Whiteside, Williams & White (1978) and Kelso & Ney (1985). All these studies reported a summer decline in abundance, and it might be due to predation. In this study a similar seasonal change occurred at the third station. This change could perhaps also be explained changes by the oxygen content of the reed water. Neuhuber & Hammer (1979) noticed, that reed water has always less oxygen than lake water, and here also a higher oxygen content can be observed in spring than in summer and autumn.

This study has shown some of the features of the crustacean microfauna of the reedbelt. To get a better knowledge of this important zone the study should be extended to other parts of the reedbelt, and, on the other hand, more frequent sampling would be necessary in order to follow the seasonal dynamics.

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