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QUALITATIVE AND QUANTITATIVE STUDIES ON THE AMPHIPODA IN LAKE BALATON AT TIHANY

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Qualitative and quantitative analyses of Amphipods of Lake Balaton were done by several authors between 1934 and 1974 (SEBESTYEN 1934, MOON 1934, MESCHKAT 1934, ENTZ 1943,1947, PONYI 1956,1957,1962, PONYI et al. 1971, BIRO and GULYAS 1974). Quantitative data were obtained by MESCHKAT (1934) on the periphyton of reed and by ENTZ (1947) as well as by BIRO and GULYAS (1974) on higher aquatic vegetation. Ponyi and coworkers studied the benthic fauna including the amphipods in 1971. Eight species have been recorded, some of them in the earlier years (for instance Gammarus roeseli), other after their propagation in the 60's, for instance Dikerogammarus species.

The aim of our studies was to have a general picture on the quantitative distribution of the amphipod fauna near the Tihany peninsula in the submerged aquatic vegetation along the shores and in the story littoral areas. A further goal was to see whether there are differences in the species composition, the size distribution and productivity of the different amphipods on different substrata. Furtheron I tried to answer the question, whether there were differences in the development of the amphipod fauna between the years 1983 and 1985 in the same seasons and localities within the aquatic vegetation.

I tried, based on my own results, to show the differences between the data of previous years given in the literature and the present situation.

Materials and methods

The stations of collections can be seen on Fig.1. The dates of collection were as follows: August 1983 in submerged macrovegetation and in the stony littoral zone, August 1985 in the submerged vegetation.

The sampling was carried out according to the method of DORGELO (1977). The submerged stones were deplaced carefully, holding a hand net under the stones in order to avoid the loss of amphipods. The stones were then placed on tray and washed thoroughly until no more animal were found in the washing water. Since the stones had an algal coating and the amphipods lived among the algae dinging tightly to the filaments so that it was difficult to wash them out even by careful washing. I think that by this way we obtained fairly good quantitative data. The surface of the stones measured approximately. To determine the biomass the dry weight of eggs and animals was determined. Further details are to be published elswhere (MUSKO, in preparation).

Results and conclusions

There were alltogether three species of amphipods in the material collected: Corophium curvispinum Sars, Dikerogammarus haemobaphes Eichw. and Dikerogammarus villosus Sow.

In the weed stands as well as in the story shore zones the bulk of amphipods was formed by Corophium (80-90 %) (Fig.2). Dikerogammarus haemobaphes was present in much lower numbers, and Dikerogammarus villosus was generally present everywhere but in very low numbers.

There were remarkable differnces between the aquatic weeds and the stony littoral zones, insofar as Corophium was present in about 92 percent in the submerged vegetation and only in 78 % in the story littoral zones (Fig.2).

In 1985 according to parallel collections carried out from the same localities the proportion of Corophium was higher on Myriophyllum spicatum than on Potamogeton perfoliatus stands.

The distribution of the animals was studied according to their sizes. For this reason by Corophium the following size groups were established: from 0 to 1 mm, from 1 to 3 mm, from 3 to 5 mm and from 5 to 7 mm. The distribution in sizes of Corophium depends on the locality and the macrophyta species in question. In general the proportion of juveniles (0-1 mm) were the lowest on both weed species at both collecting times near the waterworks (sewage inlet). By Dikerogammarus haemobaphes and D.villosus the following size groups were considered: 0-2 mm, 2-4 mm, 4-7 mm, and 7-10 mm. There were generally egg carrying females among the size groups 4-7 and 7-10 by D.haemobaphes and D.villosus. Station 3 is an exception in that there were no egg carrying females among the size groups 4-7 and 7-10 mm of D.haemobaphes. The same occurred by D.villosus in 1983.

The mean numbers of eggs per female ranged from 3.3 to 8.8 by Corophium. Generally it can be stated that the productivity is higher within the macrovegetation than in the stony littoral zones (Table 1). The productivity in the weed stands was much lower in 1985 than in 1983. It is remarkable that in front of the waterworks (station 3) the mean egg numbers per female were consequently low (ranging from 5.3 to 5.85), both in 1983 and 1985, independently from the species compostion of the weed stands. This station is an exception also referring to the productivity of D. haemobaphes, inasmuch as no egg carrying females could be detected here. As for D.villosus, there were no egg carrying females on station 3 in 1983, but they appeared there in 1985.

The biomass data are seen on Table 2. The greatest biomass of Corophium was in 1985 at station 3 where it was higher in a Myriophyllum stand than that of Potamogeton. Accordingly there is the same proportion of total numbers of individuals per g aquatic plant, in contrast to ENTZ (1947) who stated, based on quantitative analysis in the macrovegetation (Potamogeton and Myriophyllum) in front of the Institute, that there were relatively more Corophium specimens on Potamogeton than on Myriophyllum Regarding the size distribution of Corophium it can be said that at the waterworks (station 3) there were very low numbers of juveniles as compared to the relative high total biomass in 1983 as well as in 1985.

Regarding D.haemobaphes the greatest biomass was found at station 3 in 1983 and at station 1 in 1985.

The biomass of D.villosus was the highest in 1983 at station 1 and in 1985 at station 3 on Potamogeton.

The mean values of the biomass of all Amphipods in the weed stands in 1983 were 0.6 mg animal dry weight/g plant wet weight in 1985 growing to 1.2 mg animal dry weight/g plant wet weight in 1985. The mean biomass on stony shores was 15 mg animal dry weight/m^2 stone surface in 1983.

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Table 1.
The number of eggs per female of the different amphipod species.
Symbols as in Figs. 1 and 2.

Stations and dates of collections	C.c.	D.h.	D.v.
1983			
1-M	7.1	17.0	14.7
2-P	8.8	16.4	15.0
3-M	5.5	-	-
4-S	6.4	-	-
5-S	3.3	-	-
6-S	4.7	-	-
1985			
1-M	5.2	22.8	-
2-P	7.1	18.4	17.5
2-M	5.0	-	-
3-M	5.9	-	8
3-P	5.3	-	16.7

Table 2.
The biomass data of different amphipod species in mg animal dry weight/g water plant wet weight (stations 1-3) and mg animal dry weight/dm^2 stone surface (stations 4-6).
Symbols as in Figs. 1 and 2.

Stations and dates of collections	C.c.	D.h.	D.v.
1983			
1-M	0.75	0.3	0.2
2-P	1.8	0.2	0.05
3-M	1.3	0.9	0.01
4-S	7.8	0.5	0.1
5-S	1.4	1.7	0.4
6-S	1.7	0.3	0.1
1985			
1-M	2.2	1.2	0.01
2-P	1.0	0.2	0.5
2-M	0.04	0.01	-
3-M	7.3	0.3	0.2
3-P	3.1	0.2	1.3

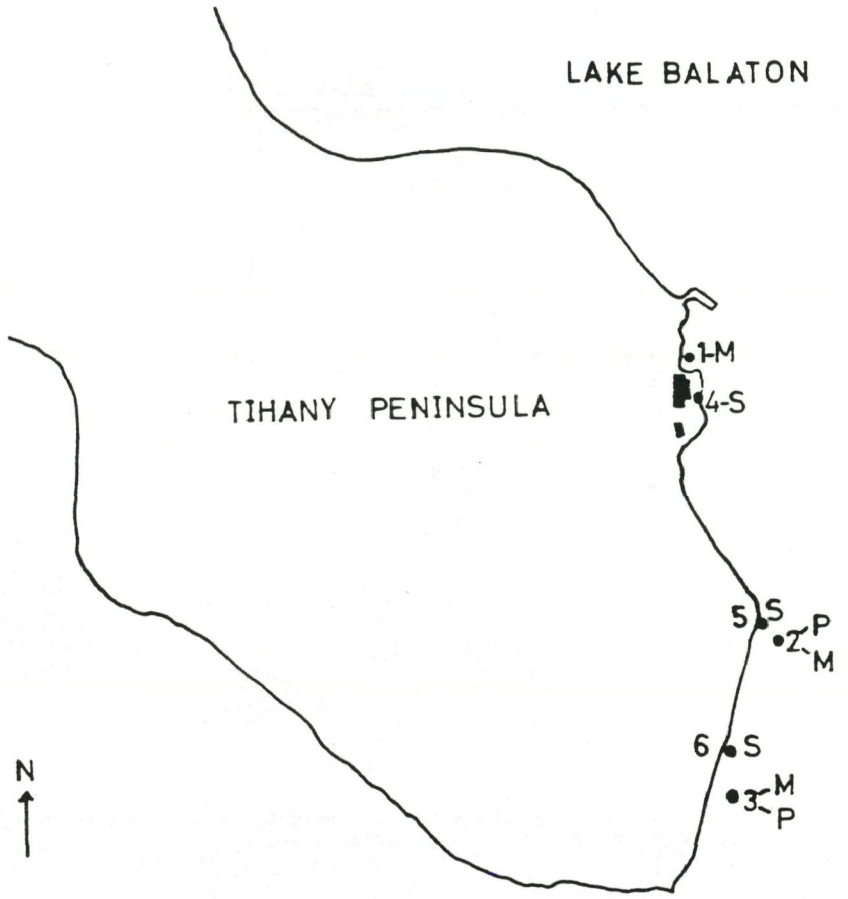

Fig. 1

The stations of collection around Tihany Peninsula.

1.) Kis-öböl bay near the Balaton Limnological Research Institute of the Hungarian Academy of Sciences about five metres from the shore on Myriophyllum spicatum (M).

2.) In front of the fishery base about 50 metres from the shore on Potamogeton perfoliatus (P) in 1983 and both on Potamogeton and Myriophyllum in 1985.

3.) Near waterworks beside the sewage inlet on Myriophyllum in 1983 and Myriophyllum and Potamogeton in 1985.

4.) Stony littoral zone (S) in front of our Institute.

5.) A stony littoral section near station 2.6. Similar stony shore near station 3.

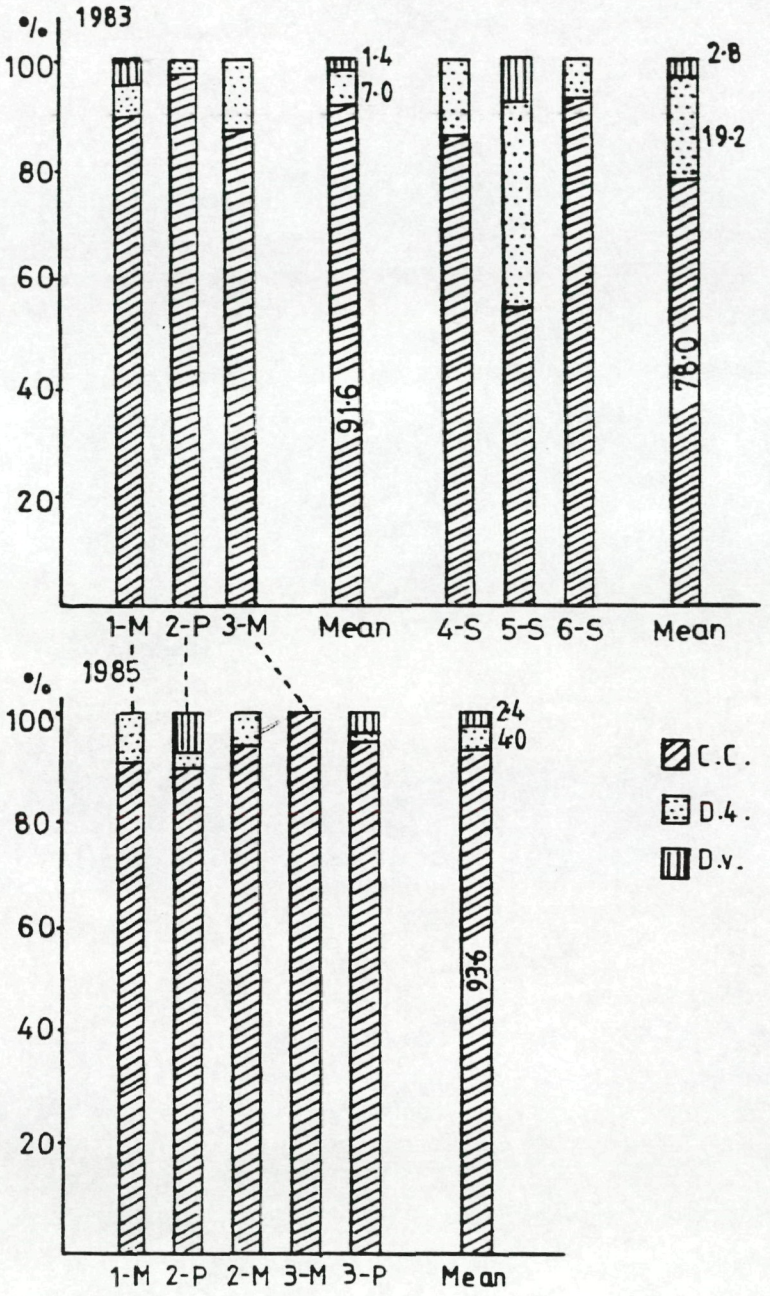

Fig. 2
Percentage distribution of the three Amphipoda species at the different stations of collections in 1983 and 1985. C.c. = Corophium curvispinum, D.h=Dikerogammarus haemobaphes, D.v. = Dikerogammarus villosus