

MOLLUSCA COMMUNITIES IN THE TISZA BED IN THE REGION OF SZEGED

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Abstract

Benthos samples from six collection sites were processed. 42% of the samples were living Mollusca. The number of Mollusca species found was 10. The bulk of the species were shells. The number of individuals of the Mollusca comprised about 30% of the invertebrates belonging to the different taxonomic categories. The number of Mollusca individuals was greatest in those parts of the water near the bank, at a depth of 1—5 m, where there was a neutral or moderately eroding bed-side (along the current-line). The character-species everywhere was *Lithoglyphus naticoides*. In comparison with the collection site above the town, which is free from contamination, in the town section of the river the proportion of Mollusca increases and that of species belonging to other taxonomic categories decreases. In the town section of the Tisza the number of empty shells was several times larger than the number of living specimens.

It can be stated that via the quantitative changes in the Mollusca it is possible to measure the cultural effects on the river, and also to characterize the changes taking place in the river water.

Introduction

The material for this study consisted of benthos samples collected by DR. MAGDOLNA FERENCZ from the 173—178 river km section of the Tisza in the region of Szeged, between 1963 and 1971.

As so many benthos samples were involved, it was possible to investigate the dispositions of the Mollusca in the river bed and their quantitative and qualitative relations, with regard to the contamination entering the river from the town. Site and means of collecting; method of processing.

The benthos samples were obtained from a water-depth of 1—7 m, from both banks and from the middle of the bed of the river Tisza. In all cases the mud-excavator extracted bottom samples 20×40 cm in area from the individual sites.

Collections were generally repeated three times annually, from six sites (Fig. 1): the Ship-repair yard (1), the vicinity of the Kőrössy Fischermen's Inn (2), the winter harbour (3), 300 m below the waste-water outlet of the Salami Factory (4), below the site of the old railway bridge (5), and in the Maros, 300 m above its mouth into the Tisza (6).

In this section waste-water from the town or factories enters the river at six points: above the Kőrössy Inn (1), below the Salami Factory (2), above the railway bridge (3) (at the river km values indicated in Fig. 1); of these inlets the three above the railway bridge lead the waste-water into the middle of the river, while in the other cases it enters from the bank.

51 of the 119 samples available (42%) contained living Mollusca. Besides the benthos sampling, separate collections were also made, as controls, on the stones on the banks of the Tisza and the Maros. Data prepared by the Szeged Water Board and relating to the cross-sections of the bed were utilized. In the evaluation of the material, attention was also paid to the positions of the town waste-water inlets in the vicinity of the collection sites, and to the water-quality examinations performed by the Water Board.

The list of Mollusca species found was compared with the data already published on the Tisza Mollusca (HORVÁTH 1943, 1955). The quantitative distribution of the Mollusca species was compared with the quantitative relations of the other taxonomic categories observed in the samples (Annelida: Oligochaeta, Hirudinoidea, Arthropoda: Ephemeroptera, Diptera (Chironomidae).

The similarities and differences between the Mollusca from the individual collection sites were established by species-identity and dominance-identity calculations, using the Ramsay—Pócs formula (Pócs 1966). The calculations were checked with a χ^2 significance test. The total numbers of individuals found in each individual collection site were employed in the analysis.

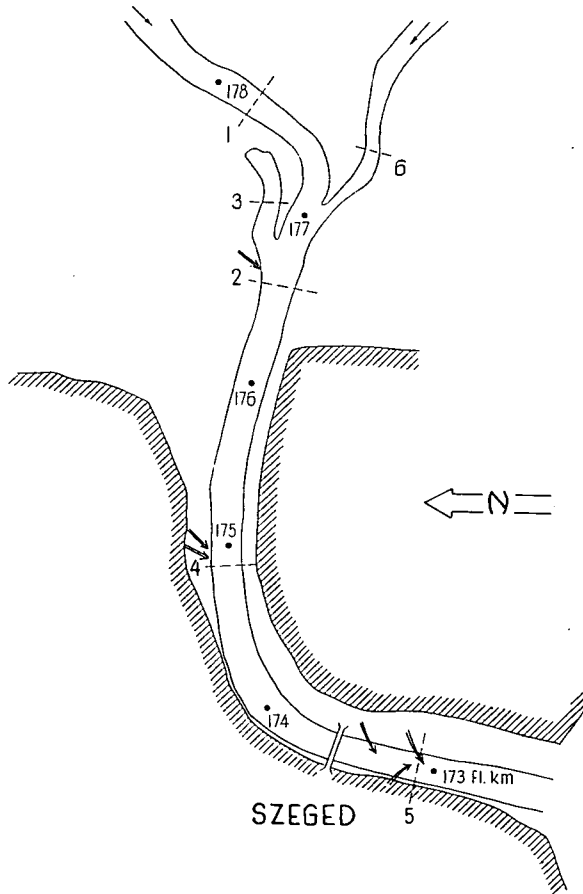


Fig. 1

Table 1. Occurrence of Mollusca species at the collection sites

Species	Collection sites					
	1	2	3	4	5	6
<i>Theodoxus transversalis</i> (C. PFEIFFER)	-	+	-	-	+	+
<i>Lithoglyphus naticoides</i> (C. PFEIFFER)	+	+	+	+	+	+
<i>Sphaerium rivicola</i> (LAMARCK)	+	-	-	-	-	-
<i>Unio pictorum balatonicum</i> KÜSTER	+	-	-	-	-	-
<i>Unio crassus bosnensis</i> MÖLLENDORF	+	-	-	-	-	-
<i>Unio tumidus zellebori</i> ZELLEBOR	+	-	-	-	-	-
<i>Pisidium amnicum</i> (O. F. MÜLLER)	+	+	-	+	-	-
<i>Pisidium subtruncatum</i> MALM	+	-	-	-	-	-
<i>Pisidium nitidum</i> JENYNS	+	+	-	-	-	-
<i>Dreissena polymorpha</i> (PALLAS)	+	+	-	+	+	-

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Species found and their ecology

In addition to 6908 Annelida, Ephemeroptera and Diptera, the 51 bottom-samples yielded 1969 Mollusca, which can be classified in ten species (see Tables). The total number of Mollusca individuals comprises 29% of the invertebrates belonging to the different taxonomic categories. This proportion agrees with that found by ZAGUBIZENKO and LUBYANOV (1971) in reservoirs and rivers on the plains in the Ukraine.

The species found are very widespread in the rivers of Europe. An exception is *Theodoxus transversalis*, which lives only in the catchment area of the Danube (BROHMER—EHRMANN—ÜLMER 1960).

Compared to the publications of HORVÁTH (1943, 1955), two new *Pisidium* species were found: *Pisidium subtruncatum* and *Pisidium nitidum*. Whereas only their empty shells had previously been found, the present work revealed living specimens of *Sphaerium rivicola* and *Pisidium amnicum*. However, *Pseudanodonta complanata* (ROSSM.), which figures in the publications of HORVÁTH, was not found, and nor were the standing-water species which he collected from the bank-side waters. Further, it can be stated that the Mollusca fauna of the Tisza is poorer than that of the Danube (DUDICH 1948).

Table 2. Quantitative distribution of the different taxonomic categories

Category	Collection sites					
	1	2	3	4	5	6
Annelida	2126	879	207	267	699	199
Mollusca	775	112	168	156	666	92
Ephemeroptera	127	132	1	4	53	139
Diptera	278	504	5	96	484	705
Proportion of Mollusca to the other categories	23	6	43	29	35	8

As a result of the control collections, the bank-side stones yielded 20 individuals of *Theodoxus fluviatilis* from the Maros, complementing the earlier finds in the Tisza (HORVÁTH 1955). The possibility of the occurrence of this species in the water-system of the Danube has been strongly denied by Soós (1965). Very many *Lithoglyphus naticoides*, some *Theodoxus transversalis* and some *Radix peregra ovata* (DRAP.) were found in the company of the *Theodoxus fluviatilis* among the bank-side stones.

Because of the steepness of the banks, the *Unio* species are found only in small numbers.

The Mollusca observed are without exception eaters of alga and detritus. For this reason their settlement is favoured by a bottom rich in organic detritus, in contrast with sand poor in organic matter. The settlement of the Mollusca is not favoured by varying bed-conditions, or by building-up or strongly eroding bed-sections, as at the collection site in the Maros. From this respect, the Szeged section of the Tisza is favourable, for it is a stagnating bed-section. A mosaic-like settlement results here from the soil-conditions and the entering waste-waters.

On the basis of the benthos samples it can be established that the numbers on Mollusca individuals in samples from near the bank, at water-depths of 1—5 m, are higher than those in samples from the middle of the bed. As regards the two sides of the Szeged section of the Tisza, the bulk of the Mollusca were found on the right bank, where the current-line of the river runs. The settlement on the left bank may be inhibited by the accumulation of phenol originating from the Maros. However, the laboratories of the Water Board have no reliable methods for the determination of phenol accumulated in the mud.

Mollusca communities, and conclusions drawn from their changes

The structure of the Mollusca communities is typified in that there is only one character-species: *Lithoglyphus naticoides*. At all six collection sites Mollusca species are dominant, such as *Dreissena polymorpha* and *Pisidium amnicum*. At the Ship-repair yard these are accompanied by *Unio crassus*. The communities are different variants of the *Lithoglyphus naticoides* synusium type.

Characteristic decreases can be observed in the number of species and the total number of individuals at the collection sites between the two end-points of the benthos examinations. Characteristic changes also occur in the proportions of Mollusca and other invertebrates living in the bed. Since there were no significant differences in the position of the current line and in the quality of the bottom between the two end-points of the examinations, the reason for the decreases in the numbers of total individuals and species may primarily be the town waste-water flowing into the river.

As regards the collection sites, the Tisza section at the Ship-repair yard is the richest in Mollusca. Here 666 individuals from 10 species were found. There is no waste-water inlet into the Tisza in the vicinity of this collection site. The fewest Mollusca were obtained from the water of the winter harbour, where 168 individuals of only one species, *Lithoglyphus naticoides*, were found. Below the Kőrössy Inn 112 individuals of 5 species were found, below the Salami Factory 156 individuals of three species, and from the Tisza section below the railway bridge site 666 indi-

viduals of three species. The high number of individuals at the last-named collection site can be attributed to the fact that the right bank is free from contamination.

Characteristic values similar to the number of species and the total number of individuals are also exhibited by the proportions of the Mollusca in comparison to the other taxonomic categories. The proportion of Mollusca compared to the Annelida, Ephemeroptera and Diptera categories is relatively low, 23%, above the Ship-repair yard, which is free from town waste-water. It is very low below the Kőrössy Inn (6%) and at the collection site in the Maros (8%), where a strong effect is exerted by the Maros water rich in industrial contamination. At the other collection sites this proportion increases with the number of waste-water inlets. Thus, below the two inlets of the Salami Factory it is 29%, and after the additional three inlets at the railway bridge 35%. The proportion of the Mollusca is highest (43%) in the standing water of the winter harbour, which is rich in oil contamination.

The fact that the contamination gives rise to changes in the numbers and proportions of the Mollusca species and individuals is also shown in that there is a parallel extensive decrease in the numbers of individuals in the other invertebrate taxonomic categories taken as the basis for comparison. At the Ship-repair yard the total number of individuals of the invertebrates mentioned above is 3306, at the Kőrössy Inn 1627, at the winter harbour 381, at the Salami Factory 523, at the railway bridge 1902, and at the collection site in the Maros 1135.

Discussion

The numbers show that the increase in the proportion of the Mollusca after the waste-water inlets must be interpreted in that the number of individuals of a majority of the species found in the Tisza decreases to zero, while at the same time the number of individuals in some species increases. Of the invertebrates, the detritus-eating Mollusca with the greatest limits of endurance remain. These are *Lithoglyphus naticoides*, *Dreissena polymorpha* and *Pisidium amnicum*. What has been said draws attention to the role of the Mollusca in the self-cleaning of the river. The species remaining in spite of the pollution are small, and do not include the large *Unio* species.

It is well known from the investigations by BERINKEY (1966), KNEDITS (1903), UNGER (1918) and ZIEMIANKOVSKY—CRISTEA (1961) that the Mollusca are important food for fish of value in Hungary, mainly the predatory and omnivorous fish.

On the basis of the investigations, the poorness in fish of the Szeged section of the Tisza can be correlated with the decrease in the numbers of individuals of the Mollusca and other invertebrates.

Evidence of this is provided by the number of individuals per square metre, calculated from the samples richest in individuals. The number of individuals per square metre is 937 at the Ship-repair yard, 412 at the Kőrössy Inn, 275 at the Salami Factory, and 662 at the railway bridge. As comparative data, it may be mentioned that densities of 1300 and 6600 Mollusca per sq. metre were found in the Siret in the Ukraine (flow-rate 1.5—2 m/sec) and in the lower reaches of the Danube, respectively (ZAGUBIZENKO—LUBYANOV 1971, ZIEMIANKOVSKY—CRISTEA 1961).

In the course of the author's investigations to date, the change in the quantitative relations of the Mollusca has been used to characterize the land-biotopes. From the evaluation of the benthos samples it may be stated in conclusion that the changes

taking place in the river water may be characterized with the aid of the quantitative changes in the Mollusca living in the river bed. Via the quantitative changes in the Mollusca, it is possible to measure the cultural effects on the river.

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