The Tisza Mayfly (An English Summary)
(Ecology of an endangered species)

Introduction

Aquatic animals between 1-5 cm belong to macrofaunal invertebrates. These aquatic animals living in or on the bottom of water are collectively called benthos. These invertebrates taxonomically are members of Mollusca, Annelida, Crustacea and Insecta. The role of benthos in the life of running waters is very important. The animals use the materials of the bottom by bioturbation. They are important members of the food web. The aquatic insects carry out a lot of materials from the water during their mass-emergence. As they are bioindicators they show the water quality.

The Hungarian Upper-Tisza is divided into three characteristic sections: the Upper Tisza between Tiszabecs and Dombrád, the Middle Tisza between Dombrád and Kisköre, and lastly the Lower Tisza extending from Kisköre to the Hungarian border. If we consider the hydrogeographical data, the catchment area of the Tisza along its 964 km length, constituting 157,180 sq. km, is also divided into three sections: the mountainous Upper-Tisza, the Middle-Tisza between the two main tributaries, the River Szamos and the River Maros and finally the Lower-Tisza extending from its confluence with the Maros to its confluence with the River Danube.

This part of our project gives a detailed account of zoobenthos, mainly the protected, endangered mayfly *Palingenia longicauda* of the whole river system. Together with the members of the project we collected the meso- and macrobenthos elements of the reservoir "Tisza-Lake". After the terrible cyanide and heavy metal pollution from Rumania we try to establish the effects on the benthos of the reservoir and the benthic invertebrates of the upper and the lower sections of the Tisza river system.

Material and methods

Hydroecological parameters (e.g. pH, conductivity, dissolved $O_{2,}$ redox potential) were measured by WTW equipment. We constructed colour-Secchi discs to measure the light penetration into the water. The bottom type, river km and another meteorological parameters were also registered. The macroinvertebrate animals were collected in the reservoir by Ecman-Birge collecting equipment. Palingenia mass-emergence was examined visually. The colonies of Palingenia larvae were studied by a bagger collecting device. The benthic animals from the surface of the sediment were collected by an aquatic net. In the lab we made cyanide solution with 30 mg/l cyanide content and we diluted it to 18 mg/l, 4.2 mg/l and finally 1.5 mg/l cyanide content. The exposition time was 24 hrs.

Results and discussion

First we collected the data about the benthos of the reservoir and the Hungarian stretch of the Tisza before the cyanide pollution. The reservoir, constructed in 1976, changed the water current, colour of the water and other ecological characters. According to the old and the new zoological data, the benthos of the Upper Tisza and the other part of the river showed very rich and mainly insect dominated characteristics. In the historical time the fish fauna of the river was also extraordinarily rich. This very rich and unique animal life was expressed by the Palingenia mayfly named with the Hungarian word "tiszavirág" as the symbolic entity of the lowland section of the Tisza. This insect was very common throughout Europe to Russia until the 19^{th} century. At the end of the 19^{th} century, because of the heavy pollution and canalisation that took place along the large rivers in Europe, the Palingenia disappeared from the European rivers. It only remained in large, survivable populations in the Hungarian stretch of the Tisza. Until the end of the 90s the populations were very low in Hungary, too.

Fortunately, during the last ten years, parallel to the collapse of the socialist industry which caused the high anthropogenic effect to the ecosystem of the Tisza, the Palingenia began to colonize again in the lower sections of the river. But, at the beginning of 2000 there was a large cyanide and heavy metal pollution inflow to the Hungarian Tisza from Rumania. It caused the death of fish on a large scale. The long term effects of this pollution were examined under this project with the financial guidance of the Hungarian Environmental Ministry.

Light penetration in the Tisza-Lake and its bottom conditions

The light conditions, pH, dissolved oxygen, redox and conductivity were measured in the main areas of the reservoir. The results of our measurements were shown in fig. 25 and table 2. The map of the Tisza-Lake with the collecting sites was shown in fig. 26. The benthos of the reservoir was listed in table 3. The fauna living in the bottom of the relatively new shallow lake differed from the benthos of the Tisza. The rheophilous, real potamon species disappeared during the last decades. The benthic fauna of the reservoir was not affected by the cyanide pollution. We registered good water quality and a large population of invasive species in the lake.

Mayflies of the Hungarian section of the River Tisza and the types of Palingenia larvae colonies

During our longitudinal section investigations the mayflies were one of the most characteristic animal groups. While in the reservoir the Chironomid-larvae, snails, shells and Oligochaets were dominant in the Upper-, Middle- and Lower-Tisza, the “tiszavirág” sixth types of colonies were found (figures 22 and 23). Around the colonies the type of bacteria, algae and sediment fragments were different from the other habitats of the river (table 10). The zoobenthos of the upper and lower section of the Tisza was demonstrated and listed (tables 8 and 9).

During 2000, the large mass-emergence of Palingenia was examined. The new data showed the successful recolonisation of Palingenia in the Midddle- and the Lower-Tisza.

Pilot toxicological examinations were conducted to determine the toxic effects of cyanide. Palingenia larvae were not affected by the cyanide contamination and the Palingenia larvae proved to be sensitive of the cyanide-polluted water to a medium extent (figures 24 b).