

DATA TO THE HORIZONTAL AND VERTICAL DISTRIBUTION OF THE ZOOBENTHIC FAUNA OF THE TISZA REGION AT SZEGED

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Abstract

Authors have studied the horizontal and vertical distribution of zoobenthos, with particular regard to Oligochaetes and Ephemeroptera, in definite reaches of the Tisza (at km-mark 165), referred to by them as "Palingenial" biotope.

Introduction

We know by reason of the so-called mosaic principle of the freshwater zoobenthic associations that water motion and substratum-type play a decisive part in the formation of the freshwater zoocoenoses (DORRIS *et al.* 1962, STEFFAN 1965, WACHS 1968). The differentiating effect of these two main abiotic factors involves, of course, a change in other abiotic factors, as well. (LEHMKUHL 1972, LEHMKUHL *et al.* 1972). The mosaics formed in the rivers are comparatively homogeneous parts of the biotopes, they may be called dynamic units. As to their size, in the upper region of the river they are generally smaller than in the lower one.

The biotope-type investigated by us averages, in respect of its maximum dimension, up to 700 to 1000 sq.m, being a characteristic, steep riverside sector, of clayey soil. We named that area after its typical species. — *Palingenia longicauda* — "Palingenial" biotope (CSOKNYA *et al.* 1972).

Considering from among the primary determinative factors (substratum-type and water motion) the first one, the substratum-type as identical in forming the associations of the area, our aim was to investigate the modifying effect of the other factor. To be sure, due to the water motion, the washing away of the upper sediment layer of the river bed is permanent, as well; the changes resulting from that are, however, not so radical that they would induce a change in the substratum-type.

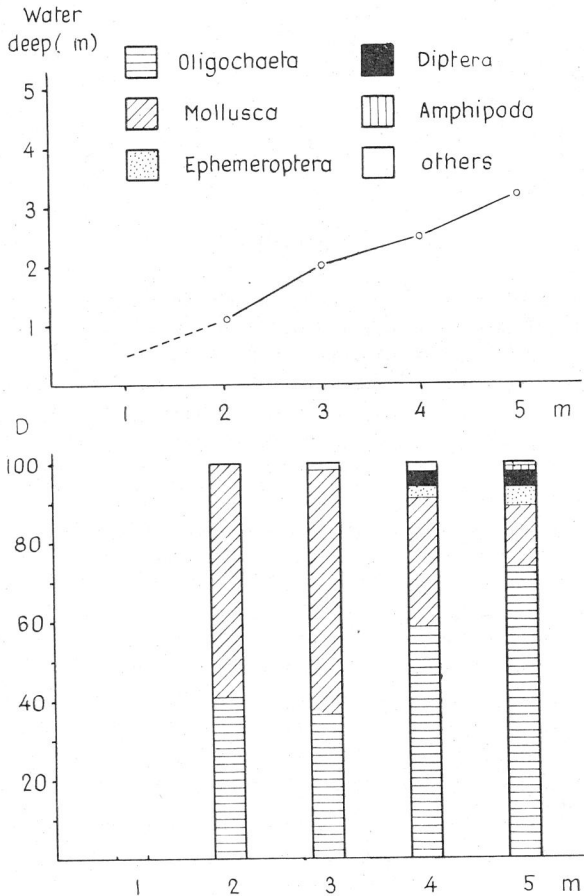
Material and method

The material for our investigations was collected in Autumn 1971, 1972, and 1973 at different water-levels, at km-mark 165. The samples were taken in every metre, from the bank towards the river-bed, with a cylindrical gripper of 16 cm diameter (CSOKNYA *et al.* 1972). We cut them in 10 cm pieces and washed them through 0.5 mm mesh sieves. The animals found in the samples were arranged according to taxonomical groups and fixed in 10 per cent formalin.

Results and their discussion

Our observations were mainly directed towards recognizing the ecology of may-fly nymphs, therefore we considered necessary to know the species, resp. taxonomical groups, as well, living together with them. It is to be established from the data of our collections that in the "Palingenial" biotope the taxonomical groups occurring the most frequently are: Oligochaetes, Mollusca, Ephemeroptera, Diptera, Amphipoda. Apart from these, Polychaetes, Odonata, Trichoptera, Nematoda, too, could be observed in low percentage. We found these taxonomical groups also in the course of other collections carried out in places of similar substratum-type (CSOKNYA *et al.* 1973, FERENCZ *et al.*, 1973).

Polychaetes are represented by a single species, *Hypania invalida* (FERENCZ 1969), Oligochaetes by the species *Limnodrilus hoffmeisteri*, *L. udekemianus*, *L. claparedeanus*, *Psammoryctes moravicus*, *Tubifex tubifex*, *Branchiura sowerbyi*; while



Graph 1: Horizontal distribution of the ground-fauna after a quick recession (1971).

Ephemeroptera by the species *Palingenia longicauda*. At the other taxonomical groups we have not performed any species determination.

In the course of our comparative investigations, we first studied the horizontal distribution and later on the vertical distribution of the zoobenthos at various water-levels; namely immediately after a strong recession (1971), then similarly a few days after a considerable recession (1972), and at a rather long-stagnating water-level (1973).

The data of the first two collections (1971, 1972) are showing a considerable parallelism, enabling us to establish as follows.

To quick changes in water-level the Ephemeroptera (FORBER *et al.* 1970) and Amphipoda respond the most sensitively. These taxonomical groups are namely missing from the samples taken at the metres next to the bank (one or two, and even three metres) (Graphs 1, 2). The groups less responding to changes are the Oligochaetes and Molluscs, as they are to be found in a high enough individual number, resp. percentage even in the most unfavourable places, respectively in those becoming unfavourable. Rather far from the bank (beyond three metres) all the taxonomical groups occurring in this biotope-type are already represented in a growing percentage.

A collection in 1973 — carried out at a water-level stagnating long enough — is differing from the above mentioned ones (Graph 3). It appears from the Graph that close to the bank (two metres) every taxonomical group can already be found in a considerable individual number, even the groups responding in the most sensitive way (Ephemeroptera, Amphipoda).

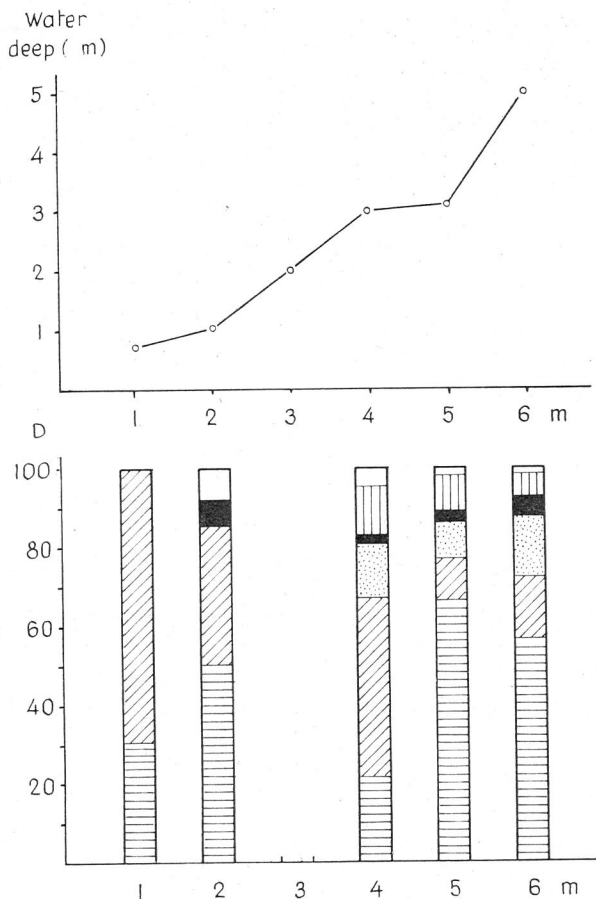
If we compare the three Graphs, taking into consideration also the heights of water-columns measured above the sampling points, then we may establish that e. g., the nymphs of mayflies occur at lower water-columns, too, in case of stagnating water-levels while in case of falling water-levels they cannot be found in deeper water, either. The motion of these nymphs may, perhaps, be influenced not so much by the height of water-column above them but rather by the change in (speed of?) water motion induced by the recession or flood. These are, of course, for the time being, not more than partly empirical observations, partly suppositions. We want to give an exact reply to these questions in the course of our later observations.

We have connected the investigations of horizontal distribution with studying the vertical distribution of the taxonomical groups, as well. It can be established that the zoobenthos is the richest in a 4 to 5 m distance from the bank (subripal one). There, namely, the species are contained in a very high individual number in the whole depth of silt-samples while till 4 to 5 m from the bank only the lower layer (40—60 cm) and beyond 5 m the upper layer (30 cm) are the richest ones (CSOKNYA *et all.* in print, FERENCZ *et all.* in print).

Our investigations in detail about the vertical distribution have already not comprised but Oligochaetes and Ephemeroptera. The distribution of mayfly nymphs was studied in connection with their stage of development. We have observed that the more developed nymphs (in their last year) occur farther from the riverside, in the lower depth of silt-layers, while the young nymphs closer to the riverside, in the whole depth of samples, and in the samples taken from farther places from the riverside, they occur in the upper layers. If we investigate the distribution according to the stage of development resp. its change connected with the decrease in water-level, then we may establish that the young nymphs change their place the earliest not only in the substratum-regions closer to the bank but in those farther from that, as well. In the latter places, anyway, that is in the deeper layers of samples, the older nymphs continue to be found in the samples.

We investigated (1973) the horizontal and vertical distribution of the Oligochaetes

tes, too, as that of the species occurring together with the mayflies the most frequently. The greatest percentage (about 50 per cent) of *Oligochaetes* preferred the 1 m deep bed sectors 3 m far from the riverside. The species occurring there are almost exclu-

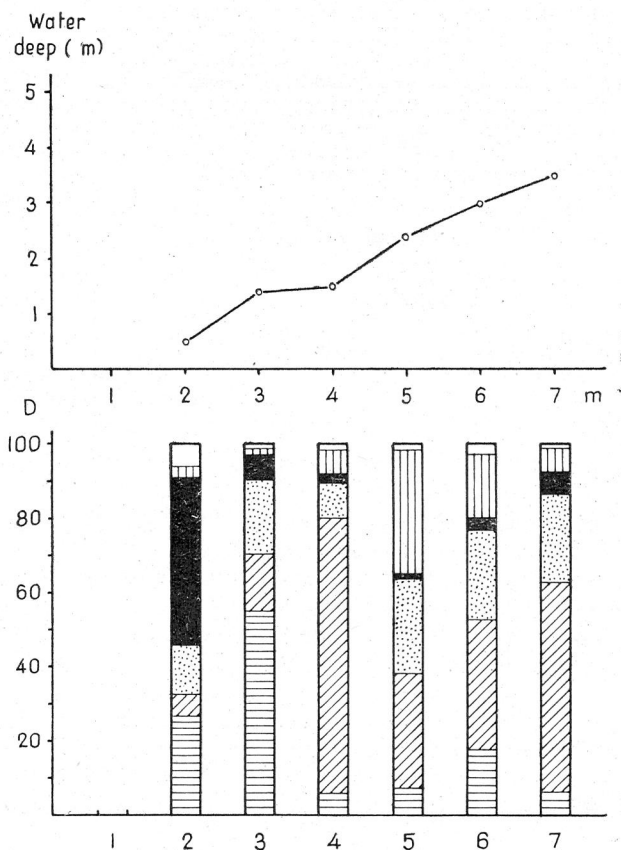


Graph 2: Distribution values after a considerable recession (1972) (Cf. legends in Graph 1).

sively belonging to the genus *Limnodrilus*. *Limnodrilus hoffmeisteri* and *L. claparedeanus* are nearly identical. *L. udekemianus* could only be found in a smaller quantity. These three frequent species, occurring together, are living in a higher individual number in the Tisza, too, as well as in the other European rivers, as established on the basis of our other collections, as well. Ecologically they are euryoek species, with an extensive tolerance. There was just the *Limnodrilus hoffmeisteri* that was found in the comparatively highest individual number even in the deepest bed-sector farthest from the riverside.

Oligochaetes are dominant in the upper 20 cm layers of the sediment but they occurred 40 to 50 cm deep, as well. Here we could only find *Psammoryctes moravicus*, anyway in the comparatively highest individual number. *Branchiura sowerbyi* came to light from the deepest places (3 m), although according to our investigations

so far, the dominant species in the clayey-silty substratum was the species *Oligochaetes*. This difference can be explained with the population dynamics of the species, as well. At the end of Summer, namely, after laying cocoons, the individuals perish.



Graph 3: Zoobenthic distribution appearing at a stagnating water-level (1973) (Cf. lencgeds in Graph 1):

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