DATA ON THE DISTRIBUTION OF MAYFLY LARVAE (EPHEMEROPTERA)

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Abstract

The horizontal and vertical distributions of mayfly larvae in a special biotope are reported, and reference is made to the effects of the abiotic and biotic factors on the density.

Introduction

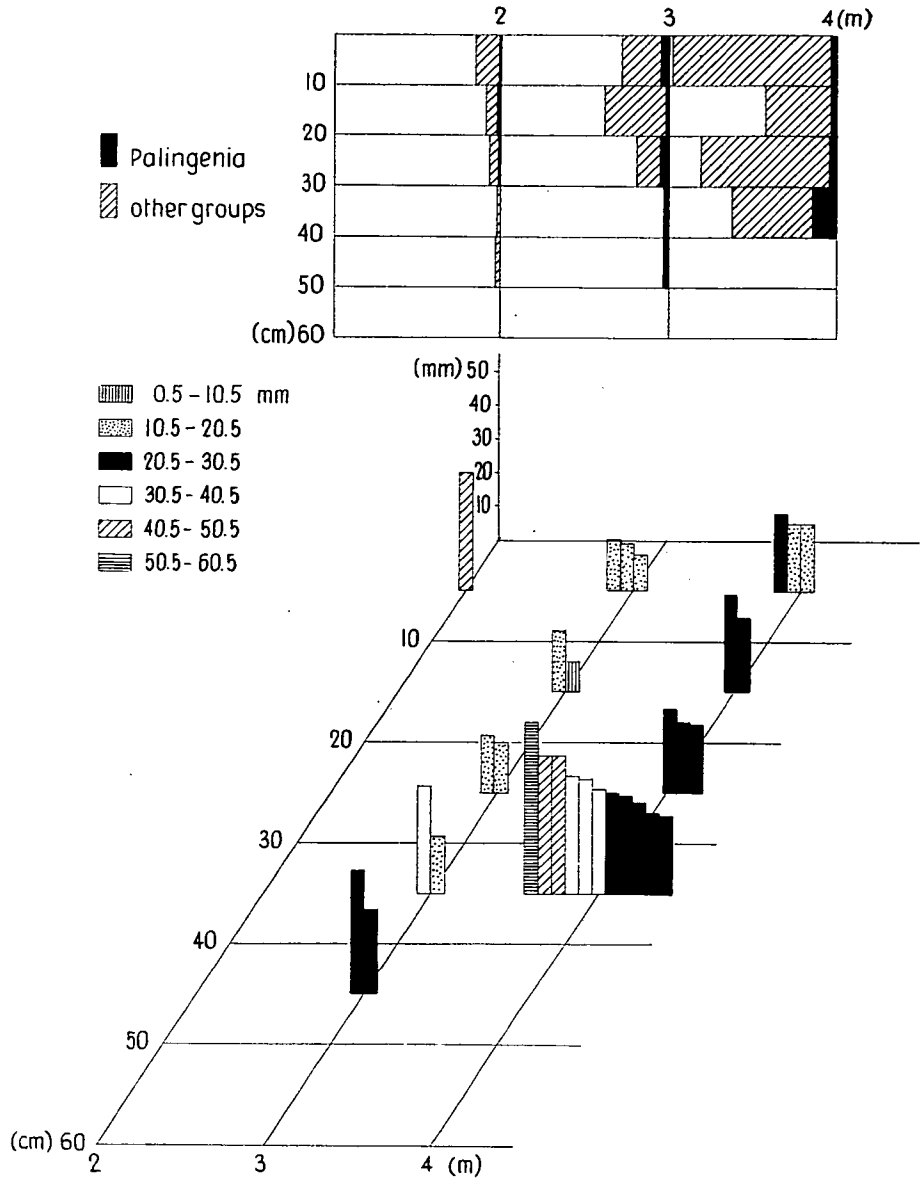
In recent years many new data have been provided by the zoobenthic study of the Hungarian section of the river Tisza (Beretzk et al. 1958, Csoknya et al. 1972, Ferenz 1968, 1969); these data are the results partly of faunistic, and partly of zoocoenological observations.

In the course of our researches on parts of this river with a definite bottom type (areas termed by us Palingenic biotope), the more important taxonomic groups were reported (CSOKNYA et al. 1972), and data were presented on the distribution ratios of mayfly larvae and other groups. Subsequently, the study of the relative density of the larvae and the variations in the movements of larvae of different ages was designated the primary task of our researches.

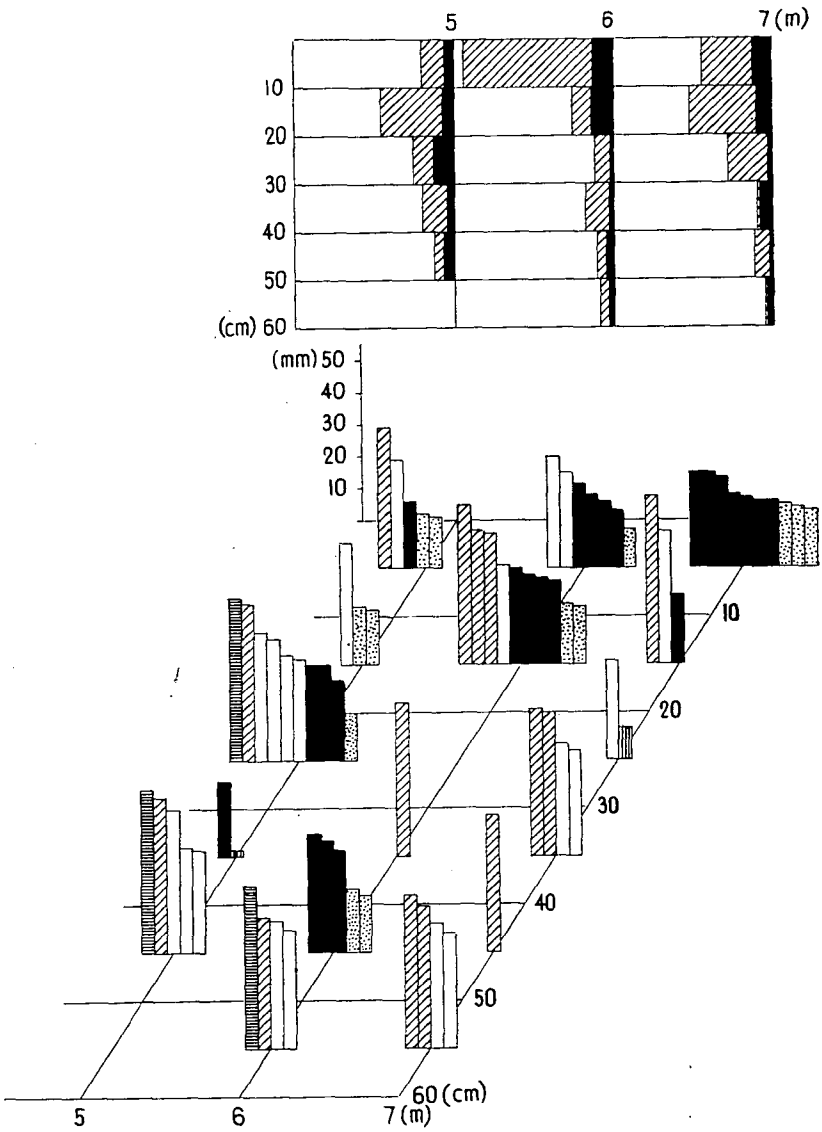
The aim of our preliminary study was to provide data on the horizontal and vertical distributions of these larvae by examining first a region where there had been no significant fluctuation of level of the water (rise or fall) for a long time, and the collection was performed well after the swarming of the last year's larvae.

Material and method

Our investigations were made on 6 October 1973 at 166.5 river km in the Tisza. The sampling apparatus was an iron cylinder 16 cm in diameter, which removed 12,000 cm^3 of mud on each occasion. The samples taken from the cylinder were divided up at 10 cm intervals, and then washed through a sieve with apertures 0.51 mm in diameter. The animals were separated according to taxonomic groups and fixed in 10% formalin. To obtain information on the horizontal distribution of the larvae too, samples were taken at one-metre intervals towards the river bed and were processed as above.



Histogram 1, a: Horizontal and vertical distributions of mayfly larvae and overall taxonomic groups.
(0.5 mm = 1 individual per 4000 cm²;
m = distance in metres from the bank;
cm = mud depth in centimeters; mm = length of animals in millimetres)



Graph 1, b: Horizontal and vertical distributions of mayfly larvae of different sizes.

Results and discussion

As regards their more important taxonomic groups (Ephemeroptera, Oligochaeta, Polychaeta, Mollusca, Diptera, Trichoptera, Amphipoda), samples taken from the Palingenic biotope with characteristic bottom exhibit considerable agreement with the data observed in collections from similar biotopes at other sites in the Tisza and the Maros (CSOKNYA et al. 1972, FERENCZ et al. 1973). In the present case the Ephemeropterae were represented by the larvae of a single species, *Palingenia longicauda*.

The horizontal and vertical distributions of the sum of the larvae and other taxonomic groups are shown in the histogram 1, a, from which it emerges that the most uniform distribution of the zoobenthos is found 5 m from the bank towards the river bed, in the entire depth of the mud samples (60 cm). Up to 5 m from the bank the fauna is the richest in the 0—40 cm layers, while beyond 6 m it is richest in the uppermost 0—20 cm layers. This distribution (abundance values) holds not only for the overall fauna, but for the mayfly larvae too.

The dominance values are frequently given in the literature as percentage values referred to the biomass (SUKOP 1973). We did not carry out measurements of such a nature, but with regard to the tremendous extent of the larvae compared to other species it can be maintained that they do display such a dominance.

Besides the data referring to the numbers of the mayfly larvae in the samples, one may also examine their distribution according to development (the standard of development is taken as the length of the larvae). This distribution is shown in graph 1, b. It can be seen from the graph that in the region lying closer to the bank (3 m) the young larvae (0.5—20.5 mm) are distributed fairly uniformly in the mud samples. Between 3 and 7 m from the bank, however, they occur in the uppermost 20 cm layers. The largest larvae (40.5—60.5 mm) are more frequent 4—7 m from the bank, and predominantly in the lower mud layers (30—50 cm). Intermediate larvae (20.5—40.5 mm) exhibit uniform distribution in the examined region.

It is known that the movement of the benthic fauna in the mud, and hence their density too, are decisively affected by the abiotic factors (FERENCZ et al. 1973, LEHMKUHL et al. 1972, RADFORD et al. 1971, WAYNE—MINSHAL et al. 1969, ZELINKA 1969), the most important of them being the variation of the water level. With the change of this, the effects of the other abiotic factors (pollution, oxygen-supply, etc.) become more enhanced. This is particularly the case for mayfly larvae (CSOKNYA et al. 1972, FERENCZ et al. 1973). From the data of the present investigation it appears to be evident that the larvae in various stages of development found the most favourable abiotic factors at various depths of the benthos 5 m from the bank (water column height 2.2 m).

In addition to the abiotic factors, the biotic factors too naturally have a significant effect on the distribution of the larvae. The life-cycle must be mentioned above all here; this decreases the number of individuals considerably at the time of swarming (LANDA 1968). In the case of the mayfly larvae, the effect of predatory fish can not be neglected either (SUKOP 1973). The establishment of the efficiency of these latter factors will form a later task.

We consider the data of this paper as the basis for a comparative investigation in which a joint examination will be made of the effects of abiotic and biotic factors on the distribution of mayfly larvae.

References

BERETZK, P. et al. (1958): Das Leben der Tisza VII. — Acta Biol. Szeged *4*, 81—108.

CSOKNYA, M. and M. FERENCZ (1972): A study of *Palingenia longicauda* OLIV. in the zoobenthos of the Tisza and Maros (Ephemeroptera). — Tiscia (Szeged) *7*, 47—57.

ELLIOTT, J. M. (1971): Upstream movements of benthic Invertebrates in a Lake District stream. — J. Anim. Ecol. *40*, 235—252.

FERENCZ, M. (1968): Vorstudium über die vertikale Verteilung des Zoobenthos der Theiss. — Tiscia (Szeged) *4*, 53—58.

FERENCZ, M. (1969): Occurrence of *Hypania Invalida* (GRUBE) in the Tisza (Annelida, Polychaeta). — Tiscia (Szeged) *5*, 69—71.

FERENCZ, M. and M. CSOKNYA (1973): Comparative zoobenthos investigation in the Tisza and Maros. — Tiscia (Szeged) *8*, 98.

LANDA, V. (1968): Developmental cycles of Central European Ephemeroptera and their interrelations. — Acta Ent. bohemoslov. *65*, 276—284.

LEHMKUHL, D. M. and N. H. ANDERSON (1972): Microdistribution and density as factors affecting the downstream drift of mayflies. — Ecology *53*, 661—667.

RADFORD, D. S. and R. HARTLAND-ROWE (1971): A preliminary investigation of bottom fauna and Invertebrate drift in an unregulated and a regulated stream in Alberta. — J. appl. Ecol. *8*, 883—903.

SUKOP, I. (1973): Annual cycle of mayflies (Ephemeroptera) in a karstic stream. — Acta Ent. bohemoslov. *70*, 81—85.

WAYNE-MINSHAL, G. and R. A. KUEHNE (1969): An ecological study of Invertebrates of the Duddon, an English mountain stream. — Arch. Hydrobiol. *66*, 169—191.

ZELINKA, M. (1969): Die Einstagsfliegen (Ephemeroptera) in Forellenbächen der Beskiden. I. — Abundanz und Biomasse. — Folia Fac. sci. nat. Univ. Purk. brunensis *10*, 157—168.