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**Rozmieszczenie fauny dennej w kilku potokach
Balkanu Środkowego w okresie letnim**

**The distribution of the bottom fauna in several streams
of the Middle Balkan in the summer period**

Mémoire présenté le 4 décembre 1972 dans la séance de la Commission Biologique de l'Académie Polonaise des Sciences, Cracovie

Abstract — In the streams of the Middle Balkan the main component of the bottom fauna were the larvae of insects represented mainly by *Ephemeroptera*, *Plecoptera*, *Trichoptera*, and *Chironomidae*. In the springs *Oligochaeta* occurred in masses. In these streams six communities of fauna were found, which differed in their qualitative composition and in the structure of domination. On this basis two types of streams were determined. The stream Ribarica is a typical stream of „middle mountains” which may be classified according to Illies, Botosaneanu (1963), while the short upper parts of streams on the slopes of the Botev are of montane type.

In the period from 14th to 20th August 1969 by courtesy of the directors of the Zoological Institute of the Bulgarian Academy of Sciences in Sofia, a group of workers from the Laboratory of Water Biology of the Polish Academy of Sciences in Kraków took part in an entomological expedition directed by Docent G. P. P e s e v in the mountains of the Middle Balkan, hydrobiological investigations of streams being carried out there.

The purpose of the present paper is to give a faunistic description of these streams, particular attention being paid to the dominant groups (*Ephemeroptera*, *Plecoptera*, *Trichoptera*, and *Chironomidae*), and to determine the zonal distribution of the communities of the bottom fauna.

The territory and method of study

The Balkans (Stara Planina) are the „middle mountains” covered up to an altitude of 2000 m with mixed forests (beech, fir and spruce) or with deciduous forests (oak, Robinia), with single domed peaks covered with grass.

The investigations were carried out in the Middle Balkan in the stream Ribarica — the spring tributary of the River Bialy Wit, the catchment basin of the Danube, and in the small unnamed streams on the slopes of the Mountain Botev — the tributaries of the River Tundza or Stakaks, the catchment basin of the Aegean Sea.

The little streams flowing down the southern slopes of Botev (2376 m altitude) rise from small rheokren or limnokren springs situated at 2150 m (the alpine zone) and then flow steeply down in a narrow bed composed of stones and gravel, or — in some sections — of solid rock. In the section near the springs the width of these streams does not usually exceed 0.5 m. On small terraces flooded areas are formed with the bottom covered with slime and sand. Numerous lateral springs increase the amount of water in the streams, hence on the border line of forests and pastures the width of the streams ranges from 1 to 2 m, the bottom being covered with large stones, and areas of quieter water being found only behind the rocks. The streams then flow into a thin oak forest. Because of the radial system of these streams round the peak, they do not all unite, in flowing down some of them gradually lose water in consequence of strong transpiration, and often dry up in the summer period. Those streams which flow continually always have less water in the forest zone than in the alpine zone. In the submontane region the water of all the streams is collected by the Rivers Tundza and Stakaksu.

The stream Ribarica, flowing down steeply from the slopes of the Wezen Mountains (2198 m altitude), rises in the forest zone from some springs of holokren type whose water, seeping on the surface, forms swamps. After some metres small spring streams are formed, after which they unite into the stream Ribarica proper, a number of smaller streams flowing into it. The stream Ribarica flows in a dense beech and spruce forest and is strongly shaded. In some places only it flows into a better lighted area. The bottom is covered with large stones and in some places waterfalls and cascades are formed. In its middle section the stream flows in a deep rock canyon. Near the village Stara Ribarica at the watershed it unites with several other streams and flows into a wide valley. In this section the bottom of the stream is composed of pebbles, small stony areas covered with bushes and single trees, often fruit trees, being formed at the bank. Near the village Ribarica the stream flows together with another one giving rise to the River Bialy Wit.

Tabela I. Charakterystyka stanic w potokach Bałkanu Środkowego
 Table I. Characteristics of the stations of the Middle Balkan streams

| Potok - Stream | Potoki stoków Botevu Streams of Botev slopes | | | | | | Potok Eibarica Ribarica stream | | | | | |
|---|---|-----------------|------------------|------------------------------------|-----------------|-----------------|-----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Staniczko - Station | | | | | | | | | | | | |
| Typ zbiornika Water body type | źródło spring | potok stream | źródło spring | rozle- wisko flood waters | potok stream | potok stream | źródło spring | potok stream | potok stream | potok stream | potok stream | potok stream |
| Wysokość w m n.p.m. Altitude m. | 2150 | 2150 | 2150 | 2100 | 2000 | 1500 | 1900 | 1800 | 1400 | 1100 | 900 | 850 |
| Temperatura wody °C Water temperature °C | 8.3 | 10.5 | - | - | 13.5 | 17 | 7.8 | 11 | 13 | 14.3 | 16.3 | 15 |
| pH | 5.5 | 6 | - | - | 6 | 5.6 | 6.8 | 6.8 | 6.6 | 6.8 | 7 | 7.2 |

In the described streams 12 stations (Table I) were determined, several quantitative (2 to 5 at one station) and qualitative samples being collected. The qualitative samples were taken with a hand net of 0.3 mm mesh. The stones collected in the net were placed in a calibrated vessel, their volume was measured, and they were carefully washed. The material thus obtained was preserved in 4 per cent formalin, later in the laboratory all animals of the body length above 2 cm being determined and counted under a stereomicroscope (enlargement 16 ×). The obtained material was calculated for the volume of 2 cubic decimetres of stones. The temperature and pH of the water was checked at each station. The method of preservation of the samples made impossible any detailed determination of *Oligochaeta*, *Turbelaria*, *Nematoda*, and *Hydracarina*. It was attempted to determine more precisely the larvae of insects, therefore the adults flying over the water were caught. The adult mayflies and caddis flies were elaborated by Dr R. Sowa, while the stoneflies were studied by Dr B. Szcześny.

General survey of the bottom fauna

The main component of the bottom fauna of the investigated streams were the larvae of insects represented mainly by *Ephemeroptera*, *Plecoptera*, *Trichoptera*, and *Chironomidae* (Table II). Other insects and invertebrates did not play any important part in the composition of the fauna, only *Oligochaeta* occurring in masses in the springs (station 1, 7).

Turbelaria — were noted often and in great numbers in springs and in the small spring streams. They occurred more rarely in the lower section of the stream. They were not precisely determined.

Nematoda — were found in springs, not determined.

Oligochaeta — single specimens occurred in the whole course of the investigated streams, being dominant only in the springs. They were not precisely determined.

Hydracarina — in the stream system of the Botev single specimens were found in the spring 1, but they were found in very great numbers in the submontane part of the stream Ribarica. They were not exactly determined.

Gastropoda — single specimens of the snail *Ancylus fluviatilis* were found on stones in the water course of the lower section of the stream Ribarica.

Collembola — single specimens were found on the surface of the water in the springs (stations 1, 7).

Ephemeroptera (Table III) — occurred in great numbers especially in the forest part of the investigated streams, where they are a dominating

Tabela II. Ilościowy i procentowy udział grup fauny denniej w potokach Bałkanu Środkowego

(Q - średnia liczba organizmów w 2 dm³ kamienistego dna na stanowisku; + - obecny w próbie jakościowej)

Table II. The quantitative and percentage share of the groups of bottom fauna in the Middle Balkan streams

(Q - average number of organisms in 2 cubic decimetres of the stony bottom in the station; + - present in the qualitative sample)

| Taxon Stawisko Station | Potoki stoków Betevu - Streams of Betev slopes | | | | | | | | | | | | Potok Ribarica - Ribarica stream | | | | | | | | | | | | | | |
|------------------------------|--|------|-----|------|-----|------|----|------|-----|------|-----|------|----------------------------------|------|------|------|-----|------|------|-----|------|------|------|------|------|-----|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | |
| Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | Q | % | | |
| Turbellaria | 1 | 0.1 | 16 | 9.0 | 35 | 5.9 | | | 32 | 5.8 | | 8 | 4.5 | 55 | 23.0 | | 6 | 1.6 | | | | | 2 | 0.1 | | | |
| Nematoda | 4 | 0.4 | | | + | | | | + | | | 18 | 10.2 | | | | | | | | | | | | | | |
| Oligochaeta | 330 | 38.2 | | | | | | 2 | 4.2 | 1 | 0.2 | 108 | 61.4 | 5 | 4.3 | 2 | 0.8 | 2 | 0.5 | | | 3 | 0.2 | 5 | 0.6 | | |
| Hydracarina | 4 | 0.4 | | | | | | | | | | | | | | | 1 | 0.4 | | | | | 30 | 2.1 | 9 | 1.2 | |
| Anonylus fluvialis | | | | | | | | | | | | | | | | | | | | | | | 1 | 0.1 | 1 | 0.1 | |
| Colembola | 1 | 0.1 | | | | | | | | | | 3 | 1.7 | 145 | 26.5 | 10 | 8.7 | 61 | 25.5 | 242 | 63.8 | 192 | 74.4 | 447 | 30.5 | | |
| Ephemeroptera | | | | | | | | | | | | | | | | | | | | | | | | | | 133 | 17.6 |
| Plecoptera | 48 | 5.6 | 25 | 14.1 | 33 | 5.6 | 5 | 10.4 | 14 | 2.6 | 39 | 33.9 | 20 | 11.4 | 22 | 9.2 | 24 | 6.3 | 247 | 9.3 | 110 | 7.5 | 58 | 7.7 | | | |
| Trichoptera | | | 38 | 21.5 | 3 | 0.5 | 9 | 18.7 | | | 1 | 0.9 | 3 | 1.7 | 27 | 11.3 | 31 | 8.2 | 7 | 2.7 | 150 | 10.3 | 21 | 2.8 | | | |
| Coleoptera | 2 | 0.2 | | | | | | | | | | 2 | 0.4 | | | | | 4 | 1.1 | 3 | 1.1 | 44 | 3.0 | 5 | 0.7 | | |
| Hemiptera | | | | | | | | | | | | | | | | | | | | | | | 2 | 0.1 | 1 | 0.1 | |
| Chironomidae | 474 | 54.9 | 94 | 53.1 | 514 | 86.7 | 30 | 62.5 | 351 | 64.0 | 56 | 48.7 | 12 | 6.8 | 47 | 19.7 | 58 | 15.3 | 7 | 6.7 | 644 | 44.0 | 518 | 68.5 | | | |
| Simuliidae | | | | | | | | | | | | | | | | | | | | | | | 3 | 0.2 | 96 | 0.1 | |
| Pterostafe Diptera | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Others | 1 | 0.1 | | | | | | | | | | | | | | | | | | | | | 26 | 1.8 | 5 | 0.6 | |
| Ogółem - Total | 865 | 100 | 177 | 100 | 593 | 100 | 48 | 100 | 548 | 100 | 115 | 100 | 176 | 100 | 239 | 100 | 379 | 100 | 258 | 100 | 1462 | 100 | 756 | 100 | | | |

group. In the lower section of the streams they are slightly less numerous and they are absent in springs and spring streams. One adult specimen *Ecdyonurus* sp. of the *helveticus* group was indeed found near the spring (station 3), but no larvae were noted on the slopes of the Botev. The most numerous species is *Baetis alpinus*, whose larvae dominate in the zone of forest springs. In the submontane sections of streams this species is replaced by *Baetis melenonyx*. Besides the above-mentioned, the larvae of *Epeorus assimilis*, *Habrophlebia lauta*, *Paraleptophlebia* sp., *Rhithrogena* sp., *Ecdyonurus* sp., *Caenis* sp., occurred less numerously in the montane part of the stream, and *Beatis rhodani*, *B. muticus*, *B. fuscatus*, *Ephemerella ignita*, and *Centroptilum pennulatum* in the submontane streams. Here also adults of *Rhithrogena aurantiaca* were recorded. On the other hand, no larvae of *Rhithrogena loyolaea* were found in the investigated streams, while at that time they were very numerous in the Tatra streams (K o w n a c k a 1971) and were also reported from Bulgaria (R u s s e v 1960, 1967).

Plecoptera (Table III) were fairly numerous in the whole course of the investigated streams, but they were most often larvae in the early stages of development which could not be identified even as to genus. Within the genera *Leuctra* and *Protonemura* several forms of larvae were distinguished and denoted by Roman numerals because it was impossible to determine precisely their systematic position. However, on the basis of adults and larvae two species new to science, *Isoperla rusevi* and *Nemoura kownackorum*, were indentified (S o w a 1970).

Trichoptera (Table III) — were represented by 18 taxons and amounted to a considerable percentage of the bottom fauna, especially in the upper and lower section of the Ribarica and of the stream on the slopes of Botev. 7 species of *Rhyacophila*, one of them being new to science, *R. kownackiana* (S z c z e s n y 1970), were found. The most numerous were *R. gr. fasciata*. In the small spring streams of the Ribarica the larvae of *Philopotamus ludificatus*, and in the middle and lower section those of *Hydropsyche instabilis* were fairly numerous. *Hydropsyche pellucidula* was noted in the spring streams on the slopes of Botev. Among *Limnephilidae*, *Drusinae* and *Brachycentrinae*, occurring in considerable numbers in the stagnant areas of the lower section of the stream Ribarica, and *Potamophylax latipennis* found on the slopes of Botev are worthy of note.

Diptera — were represented by the families: *Chironomidae*, *Simuliidae*, *Blepharoceridae*, *Ceratopogonidae*, *Rhagonidae*, *Limoniidae*, and *Empididae*.

Chironomidae (Table IV) were the main quantitative and qualitative component of the bottom fauna of the investigated streams (60 forms were identified). It was attempted to classify the collected forms as to species or group of species, but the youngest larval stages were difficult

to differentiate and could only be determined as to genus or subfamily. Several morphologically different larval forms were recognized and denoted with Roman numerals.

Orthocladius sp. I — the larvae included here have the labium, labrum, and mandible developed like the majority of *Cricotopus* larvae, but they differ in their body shape: dark brown head with a light spot round the eye, body dark violet. These larvae were found in masses in a spring (station 7) on the slopes of Botev. They occurred equally often in the Tatra streams in the region of springs (K o w n a c k i 1971).

Corynoneura gr. *minuta* I — larva with a yellow head, second and third antennal segments black, first and fourth yellow. They were found at all stations of the investigated streams except the spring of the stream Ribarica (station 7) and a drying stream on the slopes of Botev (station 6). Probably the larvae of *Corynoneura* gr. *minuta* I or a considerable part of them are of the species *C. celtica*, whose imagines were caught over the stream.

Corynoneura gr. *minuta* II — larva with a yellow-gray head, antennae of the same colour, uniformly coloured. They were only found in the spring streams on the slopes of Botev (stations 3, 5).

Thienemaniella gr. *nana* I — larva with a dark brown head and antennae uniformly coloured in the same colour. Numerous in the middle and lower sections of the streams.

Thienemaniella gr. *nana* II — larva with a yellow head and antennae, only the second antennal segment being black. Single specimens were found at stations 5, 6, 9, and 12.

Diamesa gr. *latitarsis* I — larvae have proceri with 4 short, thick, pointed bristles. They were only found in the spring section of the streams of Botev (stations 1, 2, 3).

In the lower section of the stream Ribarica (station 12) numerous larvae and pupae as well as single adults of the genus *Rheosmittia* were observed. The larvae and pupae are similar to those of the genus *R. longuida*, while the adult specimens have the hypopygium similar to *R. spinicornis*. In the collected material some species not reported before for Bulgaria (Dimitrov 1972, Russev 1967) such as *Zavreliomyia signatipennis*, *Nilotanypus dubius*, *Diamesa bartrami*, *D. aberata*, *Eukiefferiella devonica*, *Parametriocnemus stylatus*, and *Corynoneura celtica* were found.

Ceratopogonidae — single specimens were found in the spring and submontane section of the stream Ribarica.

Simuliidae — were observed along the whole course of the investigated streams with the exception of the first station. Two species: *Prosimulium rufipes* and *Eusimulium carpaticum* were identified.

Blepharoceridae — were found in inconsiderable numbers in the middle and lower section of the stream Ribarica.

Tabela III. Rozmieszczenie Ephemeroptera, Plecoptera, Trichoptera na poszczególnych stanowiskach w potokach Bałkanu Środkowego

(xxx - więcej niż 100 osobników/2 dm³ kamieni; xx - 100-10 osobników/2 dm³ kamieni; x - mniej niż 10 osobników /2 dm³ kamieni; m - osobniki młode)

Table III. Distribution of Ephemeroptera, Plecoptera and Trichoptera in the individual stations in the Middle Balkan streams

(xxx - more than 100 specimens in 2 cubic decimetres of stones; xx - 100-10 specimens/2 cubic decimetres of stones; x - less than 10 specimens/2 cubic decimeters of stones; m - young specimens)

| Takson Taxon | Potok - Stream | | Potoki stołów Botewu Streams of Botew slopes | | | | | | | Potok Ribarica Ribarica stream | | | | |
|---|----------------------|---|---|---|---|---|---|---|----|-----------------------------------|----|-----|----|--|
| | Stanowisko - Station | ☐ | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| <i>Ecdyonurus</i> sp. gr. <i>helveticus</i> (♂) | | | | | x | | | | xx | xxx | | | | |
| <i>Baetis alpinus</i> Etn. | | | | | | | x | | x | | | xxx | | |
| <i>Habroleptoides</i> sp. | | | | | | | | | x | | x | | | |
| <i>Paraleptophlebia</i> sp. | | | | | | | | | x | | x | | | |
| <i>Rhithrogena</i> sp. (m) | | | | | | | | | x | x | x | | x | |
| <i>Epeorus assimilis</i> Etn. | | | | | | | | | x | x | x | | xx | |
| <i>Ecdyonurus</i> sp. (m) | | | | | | | | | x | x | x | | x | |
| <i>Ecdyonurus</i> sp. I | | | | | | | | | x | x | x | | x | |
| <i>Habrophlebia lauta</i> Etn. | | | | | | | | | x | x | x | | x | |
| Heptageniidae (m) | | | | | | | | | x | x | x | | x | |
| <i>Caenis</i> sp. (m) | | | | | | | | | x | x | x | | x | |
| <i>Baetis</i> sp. (m) | | | | | | | | | x | x | x | | x | |
| <i>Baetis rhodani</i> Pict. | | | | | | | | | x | x | x | | xx | |
| <i>Baetis muticus</i> I. | | | | | | | | | x | x | x | | x | |
| <i>Ephemerella ignita</i> Pop. | | | | | | | | | x | x | x | | xx | |
| <i>Rhithrogena aurantiaca</i> Burm. (♂) | | | | | | | | | x | x | x | | xx | |
| <i>Baetis melanonyx</i> Pict. | | | | | | | | | x | x | x | | x | |
| <i>Baeti. fuscatus</i> I. | | | | | | | | | x | x | x | | x | |
| <i>Centroptilium pennulatum</i> Etn. | | | | | | | | | x | x | x | | x | |
| Plecoptera (m) | xx | | x | | | | | | x | x | x | | xx | |
| Leuctridae (m) | xx | | | | | | | | x | x | x | | xx | |
| <i>Leuctra</i> sp. III | | | xx | | | | | | | | | | x | |
| <i>Nemoura kowalakorum</i> Sowa | | | x | | | | | | | | | | x | |
| <i>Leuctra</i> sp. IV | | | | | | | | | x | x | x | | x | |

Tabela IV. Rozmieszczenie Chironomidae na poszczególnych stanowiskach w potokach Bałkanu Środkowego

(xxx - więcej niż 100 osobników/2 dm³ kamieni; xx - 100-10 osobników/2 dm³ kamieni; x - mniej niż 10 osobników/2 dm³ kamieni; m - osobniki młode)

Table IV. Distribution of Chironomidae in the individual stations in the Middle Balkan streams

(xxx - more than 100 specimens in 2 cubic decimetres of stones; xx - 100-10 specimens/2 cubic decimetres of stones; x - less than 10 specimens/2 cubic decimetres of stones; m - young specimens)

| Takson - Taxon | Potok - Stream | | | | | | | | | | | |
|---|----------------------|--|-----|---|----|----|---|----|---|----|-----|----|
| | Stawowisko - Station | Półki stoków Botewu Streams of Botev slopes | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| <i>Orthocladus</i> sp. I | xxx | | | | | | | | | | | |
| <i>Diamesa</i> sp. (m) | xxx | x | xx | x | x | | | | | | | |
| <i>Diamesa</i> gr. <i>latitarsis</i> | xx | xx | xxx | x | x | | | | | | | |
| <i>Diamesa</i> gr. <i>insignipes</i> | xx | xx | xx | x | x | | | | | | | |
| <i>Limnophyes</i> sp. (gr. <i>pussilla</i>) | xx | | | | | | | | | | | |
| <i>Metricnemus</i> gr. <i>hydropetricus</i> | x | x | x | | | | | | | | | |
| <i>Diamesa</i> gr. <i>latitarsis</i> I | | x | xx | | | | | | | | | |
| <i>Diamesa</i> <i>bertrami</i> Edw. | | | xx | x | | | | | | | | |
| <i>Pseudodiamesa</i> <i>braniccki</i> Now. | | | xx | | | x | | | | | | |
| <i>Diamesa</i> <i>aberrata</i> (Lundb.) | | | x | | | | | | | | | |
| <i>Corynoneura</i> gr. <i>minuta</i> II | | | xx | | x | | | | | | | |
| <i>Eukiefferiella</i> <i>minor</i> (Verr.) | | | x | | xx | | | | | | | |
| <i>Chaetocladus</i> gr. <i>vitellinus</i> | | | x | | | | | | | | | |
| <i>Eukiefferiella</i> gr. <i>alpestris</i> | | | x | | xx | x | | | | | | |
| <i>Diamesa</i> gr. <i>cinerella</i> | | | | | x | | | | | | | |
| <i>Rheocricotopus</i> <i>effusus</i> (Walk) | | x | x | | | x | | | | | x | xx |
| <i>Eukiefferiella</i> <i>bavarica</i> G. | | xx | x | | xx | x | x | xx | | | x | xx |
| <i>Orthocladus</i> sp. (m) | | x | xx | x | | | | | | | x | xx |
| <i>Eukiefferiella</i> sp. (m) | | xx | xx | x | xx | x | | | | | x | xx |
| <i>Rheocricotopus</i> <i>dispar</i> (G.) | | x | xx | x | x | x | | | | | x | xx |
| <i>Corynoneura</i> gr. <i>minuta</i> I | | x | | | xx | xx | | | | | x | xx |
| <i>Thienemannella</i> gr. <i>nana</i> I | | x | | | xx | xx | | | | | xxx | x |
| <i>Cricotopus</i> gr. <i>algarum</i> | | x | | | xx | xx | | | | | xxx | xx |
| <i>Eukiefferiella</i> <i>brevicalear</i> (K.) | | | x | | | | | | | | x | x |
| <i>Macropelopia</i> sp. | | | xx | x | xx | x | | x | | | x | x |
| <i>Tanytarsini</i> (m) | | | x | x | x | x | | x | | | x | xx |

Limoniidae — one larva of *Pedicia nivosa* (station 9) in the upper section and single larvae of the genus *Ormosia* sp. in the lower section, as well as of *Antocha* sp. in the middle and lower sections of the stream Ribarica were recorded.

Empididae — single specimens occurred along the whole water course of the stream Ribarica.

Rhagonidae — single larvae of the genus *Atherix* occurred in the lower section of the stream Ribarica.

Culicidae — single larvae were found in the middle section of the stream Ribarica.

Coleoptera — were represented by specimens of two families, *Elminthidae* and *Dydiscidae*. They occurred in insignificant numbers in the stream Ribarica and in the small streams on the slopes of Botev.

Hemiptera — single specimens were found in the submontane section of the stream Ribarica.

Zonal distribution of the bottom fauna

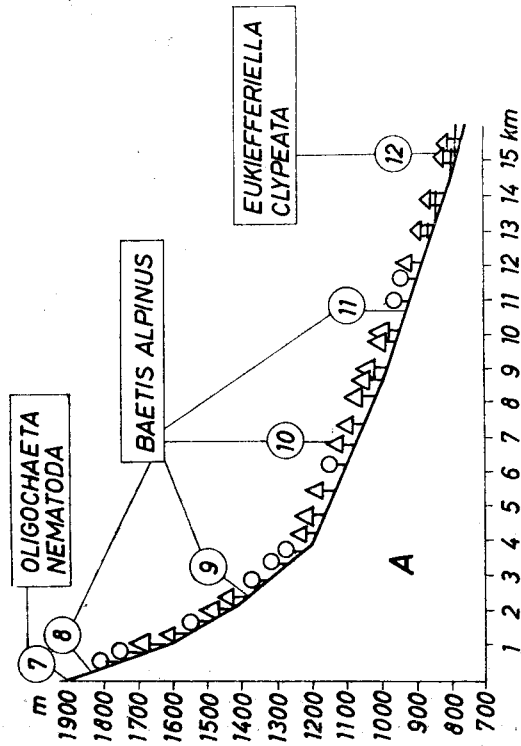
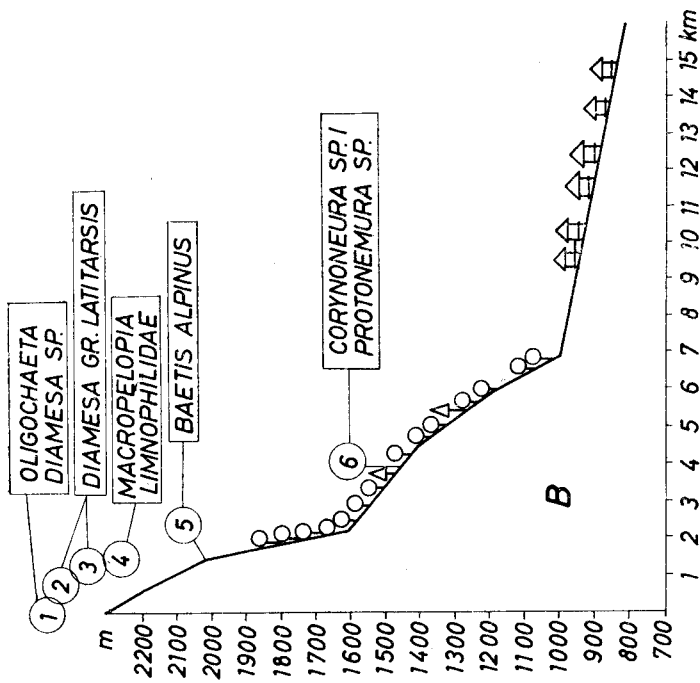
On the basis of observations on the distribution of the fauna along the water course of the investigated streams, several communities were determined differing in their qualitative composition and the structure of domination (fig. 1).

At an altitude of 2150 m, in the highest parts of streams descending from the slopes of Botev, the occurrence of a community dominated by the larvae of *Diamesa* gr. *latitarsis* was recorded. The larvae of *D.* gr. *insignipes*, young larval stages of *Diamesa* sp., single caddis flies (very small), stoneflies, and *Simuliidae* also occurred, while no mayflies were yet found.

The complex of flooded areas formed on small terraces were quite different. Here the pelophilous forms — *Macropelopia* sp., *Syndiamesa branicki*, and stoneflies of the family *Limnephilidae* prevailed. The forms which had been found previously occurred more rarely here, mainly on stones near the outflow of the water from a flooded area.

Slightly above the timber-line (2000 m), in a stream which was already fairly wide at this point, the mayflies *Baetis alpinus* and the larvae of *Eukiefferiella bavarica* and *E. alpestris* dominated. A similar community was observed in the upper and middle section of the stream Ribarica. Here the dominating species was also *Baetis alpinus*, the first dominant in the taxocenosis of *Chironomidae* being *Eukiefferiella bavarica*.

In the drying streams on the slopes of Botev (1500 m) the larvae of *Corynoneura* gr. *minuta* I and caddis (*Protonemura* sp. III and very



Ryc. 1. Rozmieszczenie fauny dennej w potokach Bałkanu środkowego określone na podstawie gatunków i grup dominujących.

1—12 — numery stanowisk

Fig. 1. Distribution of the bottom fauna in the streams of the Middle Balkan determined on the basis of species and dominating groups. 1—12 — numbers of stations

small indeterminable stages of caddis) dominated, *Baetis alpinus* being only the first subdominant.

In the submontane section of the Ribarica most numerous were the larvae of *Eukiefferiella clypeata*, *Baetis alpinus* being replaced by other species of this genus. It was also here that a number of species (Tables II and III) were found which did not occur in the upper sections of the streams.

A different composition was found in the springs, where the main component of the fauna were *Oligochaeta*. The larvae of *Orthocladius* sp. I, which were the only forms connected exclusively with the spring, were found only here.

On the basis of the changes discussed above in the composition of the bottom fauna, two types of streams may be differentiated in the Middle Balkan. The stream Ribarica is a typical stream of „middle mountains” according to the classification of Illies, Botosaneanu (1963), in which the communities of the fauna characteristic for the zone of springs (krenon), of montane streams (epirhithron), and of submontane streams (metarhithron) may be determined.

However, the upper parts of small streams flowing from the slopes of Botev differ from the scheme mentioned above. Though they also originate from the springs where communities similar to those in the springs of Ribarica (domination of *Oligochaeta*) were found, the larvae of *Diamesa* of the group *latitarsis* dominate already in the spring stream. The species of this group are characteristic for the Alpine (Thienemann 1954, Serra-Tosio 1968), Tatra (Kownacki 1971), or Lapland streams (Saether 1968, Steffan 1971).

The community of the bottom fauna observed on the flooded area on the slopes of Botev is formed under the influence of the different ecological conditions prevailing here: the stagnation or diminished flow of water, the sedimentation of slime, sand and plant parts on the bottom.

In the drying stream the current was also very weak, hence the rheophilous community with the dominating species *Baetis alpinus*, which should develop here, was replaced by a community more adapted to life in stagnant water. It seems probable that this phenomenon is very characteristic for the streams of the southern slopes of the Balkan, but it still requires confirmation.

STRESZCZENIE

W sierpniu 1969 r. w czasie trwania ekspedycji naukowej Instytutu Zoologicznego Bułgarskiej Akademii Nauk grupa pracowników Zakładu Biologii Wód PAN z Krakowa przeprowadziła badania hydrobiologiczne w kilku potokach górskich

środkowego Bałkanu. Próby fauny dennej zbierano z 6 stanowisk usytuowanych na potoku Ribarica (północne zbocze Bałkanu, zlewnia Dunaju) i 6 stanowisk wytypowanych na bezimiennych potoczkach odwadniających południowe zbocze góry Botev (zlewnia Morza Egejskiego) (tabela I).

Głównym składnikiem fauny dennej były larwy owadów reprezentowane przede wszystkim przez *Ephemeroptera*, *Plecoptera*, *Trichoptera*, *Chironomidae* (tabele II, III, IV). Pozostałe owady i inne bezkręgowce nie odgrywają większej roli w całości fauny dennej, jedynie w źródłach *Oligochaeta* wystąpiły masowo. Analizując rozmieszczenie fauny dennej w badanych potokach wyróżniono sześć stref zasiedlenia (ryc. 1). W potokach wypływających z małych źródeł na stokach Botevu rozwija się zespół, w którym dominują larwy *Diamesa* gr. *latitarsis*. W tworzących się poniżej rozlewiskach pojawiają się typowe formy pelofilne *Macropelopia* sp., *Pseudodiamesa branickii*. Na granicy lasu pojawia się zespół, w którym pierwszym dominantem są jętki *Baetis alpinus* wraz z larwami *Chironomidae* — *Eukiefferiella alpestris*, *E. bavarica*. Podobny zespół zaobserwowano w leśnym potoku Ribarica na wysokości 900—1900 m n.p.m. W wysychających potokach spływających ze stoków południowych Botevu na tej samej wysokości *Baetis alpinus* jest tylko pierwszym subdominantem, natomiast dominują larwy *Chironomidae* (*Corynoneura* gr. *minuta*) i widelnice. W dolnym odcinku potoku Ribarica najliczniej występują larwy *Eukiefferiella clypeata*. Inna jest struktura dominacji zespołów rozwijających się w źródłach (przewaga *Oligochaeta*).

Na podstawie omówionych powyżej zoocenoz możemy wyróżnić w Bałkanie śródkowym dwa typy potoków. Potok Ribarica to typowy potok „gór średnich” mieszczący się w klasyfikacji Illies a, Botosaneanu (1963), natomiast krótkie najwyższe odcinki potoków na stokach Bałkanu mają wysokogórski charakter.

REFERENCES

- Dimitrov M., 1972. Vrchu Chironomidnata fauna (larvae) na reka Tundža. Izv. Zool. Inst. Muzej, 35, 155—158.
- Illies J., Botosaneanu, 1963. Problèmes et méthodes de la classification et de la zonation écologique des eaux courantes, considérées surtout du point de vue faunistique. Inter. Verein. Teoret. Ang. Limnol., 12, 1—57.
- Kownacka M., 1971. Fauna denna potoku Sucha Woda (Tatry Wysokie) w cyklu rocznym — The bottom fauna of the stream Sucha Woda (High Tatra Mts) in the annual cycle. Acta Hydrobiol. 13, 415—438.
- Kownacki A., 1971. Taksoceny *Chironomidae* potoków polskich Tatr Wysokich — Taxoceny of *Chironomidae* in streams of the Polish High Tatra Mts. Acta Hydrobiol., 13, 439—464.
- Russev B., 1960. Neue Eintagsfliegen für die Fauna Bulgariens (*Ephemeroptera*). Beitr. Ent., 10, 697—705.
- Russev B., 1967. Chidrobiologični izsledovanija na reka Marica. II. Saprobiologična preценка za 1965 i 1966 g. Izv. Zool. Inst. Muzej, 25, 87—99.
- Saether O. A., 1968. Chironomids of the Finse Area, Norway, with special reference of their distribution in a glacier brook. Arch. Hydrobiol., 64, 426—483.
- Serra-Tosio B., 1971. Contribution à l'étude taxonomique, phylogénétique, biogéographique et écologique des *Diamesini* (*Diptera*, *Chironomidae*) d'Europe. Thèse Univ. Scie. Méd. Grenoble, 2.
- Sowa R., 1970. Deux Plécoptères nouveaux de Bulgarie. Bull. Acad. Scie. Sér. Sci. Biol., 18, 773—775.

- Steffan A. W., 1971. Chironomid (*Diptera*) biocenoses in Scandinavian glacier brooks. *Can. Ent.*, 103, 477—481.
- Szczęsny B., 1970. Contribution à la connaissance des Trichoptères de Bulgarie. *Bull. Acad. Scie. Sér. Sci. Biol.*, 18, 773—775.
- Thienemann A., 1954. *Chironomus*, Leben, Verbreitung und wirtschaftliche Bedeutung der Chironomiden. *Die Binnengewässer*, 20.

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