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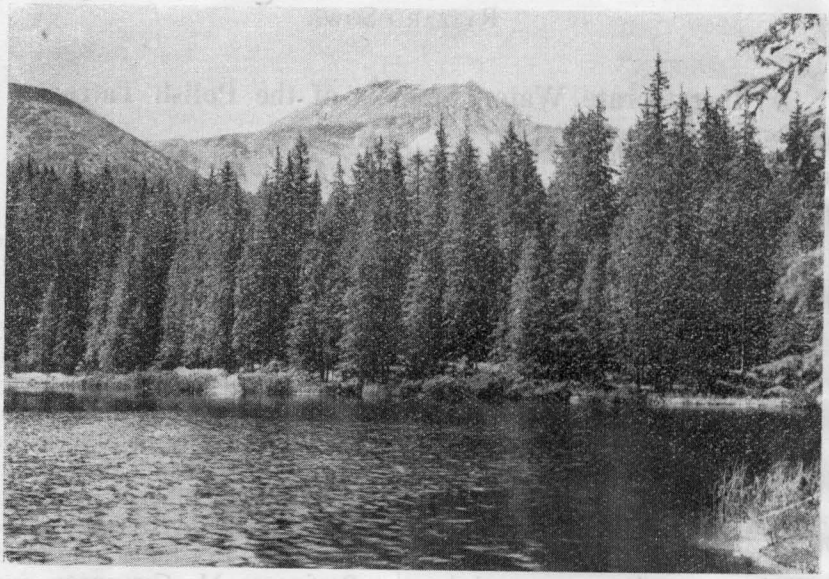
# Invertebrate Water Animals of the Polish Tatra

Research on the invertebrate water fauna in the Polish part of the Tatra has nearly a hundred years tradition. The first investigators of the fauna in the Tatra were NOWICKI and then WIERZEJSKI and DADAY. Their researches, of a physiographic character, concerned principally the fauna of the Tatra lakes and included a series of animal groups. Research in the Tatra was particularly intensified in the first twenty years of the present century when MINKIEWICZ and LITYŃSKI, two of the most distinguished investigators of the crustaceans of the Tatra lakes, published their works. In following years research on various groups of lake animals was carried out among others, by GAJL, KOŹMIŃSKI, WISZNIEWSKI, GIEYSZTOR, PAWŁOWSKI, and STEFAŃSKI. The last war stopped scientific investigations in the Tatra for a long time. Their resumption, promoted by the Professors M. GIEYSZTOR and K. STARMACH in the scientific centers of Warsaw nad Cracow, took place only in the last ten years. This time principally the animals of the Tatra streams were investigated, together with the animals of the lakes and pools. KAMLER, MADALIŃSKI, PRÓSZYŃSKA, WOJTAS, and RIEDEL should be mentioned among the authors who have already published their papers.

Notwithstanding much research work, the knowledge of the Polish Tatra water fauna is greatly lacking in uniformity. The *Cladocera* (28 species) and *Copepoda* (29 species) are among the best known. From other better investigated groups we know 22 species of *Turbellaria*, over 100 of *Rotatoria*, 46 species of lake *Nematodes*, 39 of *Odonata*, 13 of *Ephemeroptera*, and 88 species of *Trichoptera*. From some other groups were found: 2 species of *Porifera*, 1 species of *Hydroida*, 7 of *Mollusca*, about 30 species of *Oligochaeta*, 7 of *Hirudinea*, and more than 60 species of *Plecoptera*. The *Protozoa*, *Hydrachnellae*, and the majority of the *Diptera* families, as well as *Oligochaeta*, *Ostracoda*, *Coleoptera* and many other groups, still require further well-grounded research.

The larger and deeper oligotrophic lakes in the dwarf pine and alpine zone (e.g. Morskie Oko, four of the Five Polish Lakes and the Green Gąsienicowy Lake) have a narrow littoral some metres in width, usually indistinctly formed, with a bottom covered with rock rubble and granite boulders of different sizes, only on a very small part covered with thick sand or mud. The beach zone of these lakes is, however,



Lake Smreczyński in the Kościeliska Valley. Photo ST. ZWOLIŃSKI

inhabited by a fauna of varied composition and sometimes quite numerous. *Turbellaria* like *Crenobia alpina* (DANA) and *Gieysztoria foreli* (HOFST.) live here. In the hygropsammon there appear the rotifers *Elosa worrallii* LORD and *Cephalodella tenuior* (GOSSE). From the *Nematodes* there occur, among others, the common *Tripyla glomerans* BAST. and *Tobrilus zakopanensis* (STEF.), whilst the *Oligochaeta* are represented most often by *Nais variabilis* PIG., *Chaetogaster crystallinus* VEJD., and *Ch. diastrophus* GRUITH. Among the animals of this lake zone there are also aquatic insects: from the *Ephemeroptera* there appears, common in the Tatra, *Ameletus inopinatus* ETN., from the *Plecoptera* there are found here *Arcynopteryx compacta* (MCLACHL.) and *Diura bicaudata* (L.). The *Trichoptera* are represented, among others, by *Chaetopteryx villosa* FABR. and *Apatania fimbriata* (PICT.), the *Coleoptera* by the boreo-alpine *Agabus solieri* (AUBÉ) and *Deronectes borealis* (GYLL.), while the *Diptera* are represented here mainly by the tendipedids *Macropelopia maculosa* (MEIG.), *Syndiamesa branickii* (NOW.), and *Heterotrissocladius marcidus* (WALK.).

The deep bottom zone, with highly mineralized detrital muddy deposits, is commonly inhabited by nematods such as, among others, *Dorylaimus carteri* BAST. and *Ethmolaimus pratensis* DE MAN, by true worms like *Stylodrilus heringianus* CLAP. common in the Tatra, *Marionina*

*tatrensis* KOWAL. reaching a depth of 20 m, as well as *Phreoryctes gordioides* HARTM. and *Tubifex tubifex* (MÜLL.). From the *Tendipedidae* the common *Procladius* SKUZE and *Lauterbornia* ex gr. *gracilenta* (HOLM.) inhabit the bottom.

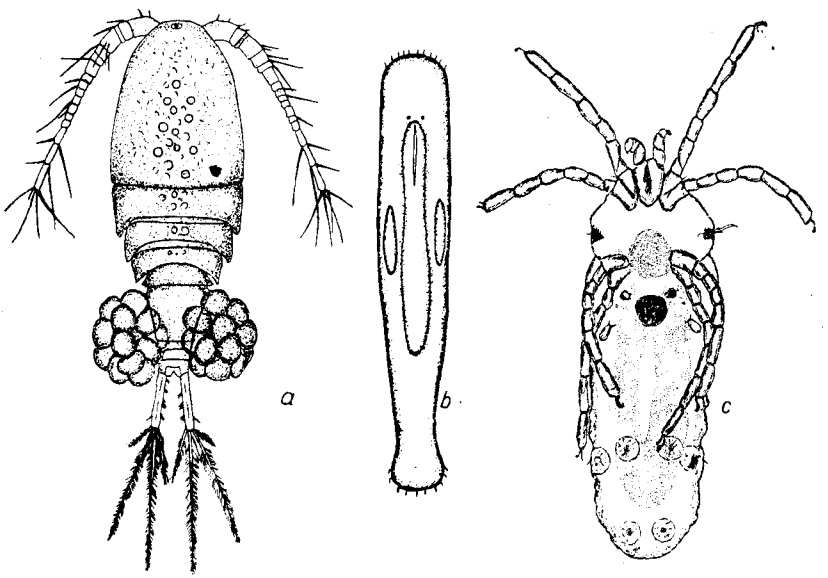



Fig. 1. a — *Cyclops tatricus* KOŹMIŃSKI; b — *Macrostomum catarractae* GIEYSZTOR; c — *Wandesia thori* SCHECHTEL, nymph.

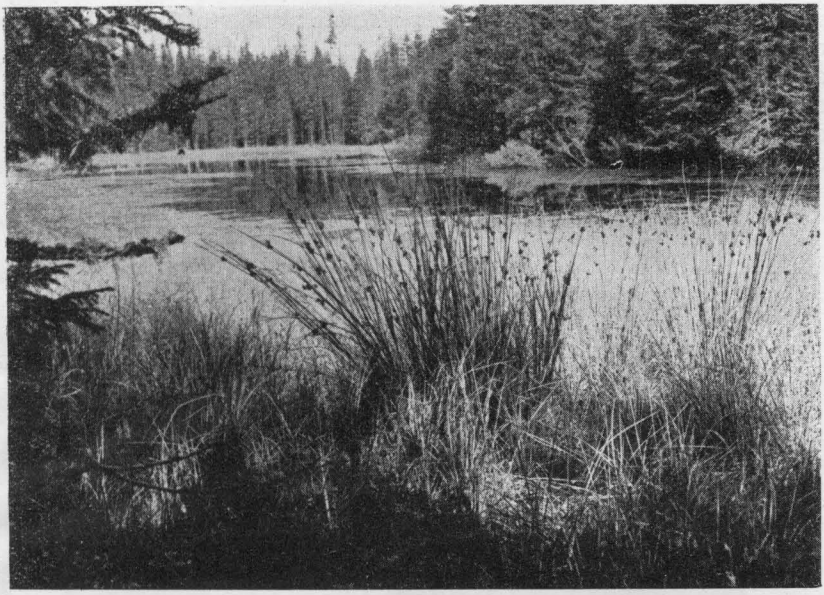
In the plankton of these lakes — which as a rule is not distinctly differentiated into pelagial and littoral because the pelagial zone begins almost at the shore — there appear among the *Rotatoria* the most common *Kellicottia longispina* (KELL.), *Polyarthra trigla* EHR. which reaches altitudes over 2000 metres, and also *Collotheca mutabilis* (HUDS.), *Keratella quadrata* (MÜLL.), and others. The *Cladocera* are represented here by *Holopedium gibberum* ZADD., *Eurycercus lamellatus* (MÜLL.), *Daphnia pulicaria* FORB. (= *D. wierzejskii* LIT.), a typical alpine species reaching over 2000 metres, *Polyphemus pediculus* (L.), and the common eurytopic *Chydorus sphaericus* (MÜLL.) which among the Tatra cladocers reaches the greatest altitudes, i.e. to 2200 m. Among the *Copepoda* there appear typically mountain species such as *Cyclops tatricus* KOŹM. (fig. 1a) and *Bryocamptus alpestris* (VOGT), *Bryocamptus mrazeki* (MINK.), known only in the Tatra region, and lastly, among others, also *Eucyclops serrulatus* (FISCH.), *Bryocamptus zschokkei* (SCHM.), and *Attheyella wierzejskii* (MRÁZ.).

In the Dwoisty Lake (1658 m above sea level) on the Hala Gąsienicowa, which dries up and freezes through to the bottom in winter, an ecologically interesting euphyllopod *Branchinecta paludosa* (O. B. MÜLL.) is found. This is a glacial remainder discovered in the Tatra by WIERZEJSKI in 1882, and known elsewhere in Central Europe only from the Wyżni Furkotny Lake on the Slovak slope of the Tatra. The fauna of this lake is supplemented among others by cladocers living near the bottom zones, such as: *Macrothrix hirsuticornis* NORM. and BR. and *Daphnia pulicaria* FORB., by copepods such as *Arctodiaptomus bacillifer* (KOELB.) and *Attheyella wierzejskii* (MRÁZ.), as well as by the flat worm *Gieysztoria ornata* (HOFST.).

The smaller, more or less shallow, oligotrophic lakes in the dwarf pine and alpine zone (e.g. the Kurtkowiec and Sobków Gąsienicowy Lake) are inhabited in the bottom zone by the flat worm *Opistomum tundrae* NAS. known only in the Tatra and the Kola Peninsula tundra, the hygropsammon rotifer *Cephalodella gracilis* (EHR.), the true worm *Aulodrilus pluriseta* (PIG.) rarely encountered in the Tatra, as well as the tendipedids *Macropelopia maculosa* (MEIG.) and *Spaniotoma tatrica* PAG. The caddisflies are represented here by the typically montane *Apatania fimbriata* (PICT.) and *Halesus digitatus* (SCHRK.), the water bugs by *Sigara nigrolineata* (FIEB.), and the beetles by *Rhanthus exsoletus* (FORST.) Among the planktonic rotifers there appear *Euchlanis dilatata* EHR., *Trichocerca lophoessa* (GOSSE), and *Lecane luna* (MÜLL.), all common in the Tatra waters. The cladocers are represented by *Macrothrix hirsuticornis* NORM. and BR., and the copepods by *Eucyclops serrulatus* (FISCH.) and *Attheyella wierzejskii* (MRÁZ.).

Pools and bogs at different altitudes, but principally in the zone of coniferous forest and dwarf pine (e.g. the Troiściaki Gąsienicowe, Młaka pod Capkami) are inhabited by the psammonic rotifers *Lecane mira* (MURR.) and *Trichocerca myersi* (HAUER); among the cladocers the most commonly encountered is the eurytopic *Daphnia pulex* (DE GEER) as well as *Alona guttata* SARS and *Moina rectirostris* (LEYD.), rarely found in the Tatra; of the copepods the exclusively montane *Mixodiaptomus tatricus* (WIERZ.) and *Acanthocyclops vernalis* (FISCH.) appear. The dragonflies are abundantly represented, among others by *Aeschna juncea* (L.), one of the most common in the Tatra and reaching 1400 m, as well as the *A. cyanea* (MÜLL.) and the boreo-alpine *Somatochlora alpestris* (SEL.). In the forest pools the beetles *Hydroporus memnonius* NICOL. and *H. incognitus* SHARP can be found.

Dystrophic forest lakes (Toporowy Niżni and Smreczyński) with an area somewhat above 0·5 ha. and a maximum depth of 6 m, with shores overgrown by *Potamogeton*, *Carex*, and *Equisetum*, and with thick layers of bottom deposits („Dy"), have a specific fauna with more lowland elements and many species or even groups not to be found



Lake Toporowy Niżni. Photo Z. ZWOLIŃSKA

in oligotrophic lakes. Among the plankton groups there live here: *Brachionus diversicornis* v. *homoceros* (WIERZ.), *Conochilus hippocrepis* (SCHR.) and *Microcodon clavus* (EHR.) from the rotifers; *Acantholeberis curvirostris* (MÜLL.), common in overgrown waters, *Simocephalus vetulus* (MÜLL.) and *Alona affinis* (LEYD.) from the cladocers; *Acanthodiaptomus denticornis* (WIERZ.) typical for the Toporowy Lake, *Macrocyclops albidus* (JUR.), living in overgrown parts, and *Elaphoidella gracilis* (SARS), often encountered near the bottom, from the copepods.

The bottom and overgrown shores are inhabited by the nematods *Ironus intermedius* STEF. and *I. tenuicaudatus* DE MAN, commonly found in mud, as well as the leeches *Erpobdella monostriata* (GEDR.) PAWŁ. and *E. octoculata* (L.), and the dragonfly *Anax imperator* (LEACH). Typical for the caddisflies found here are *Neuronia ruficrus* (SCOP.), *Molannodes zelleri* MCLACH., known in the Tatra only from the Toporowy Lake, and *Phryganea striata* L. Among other groups, the sponges *Spongilla lacustris* (L.) and *Meyenia muelleri* (LIEB.) as well as the pipe moss *Plumatella repens* (L.) are found in these lakes.

The Tatra streams, running with clear and very cold water, have beds covered with rock rubble, large roughly scattered boulders on the bottom and on the margins, and sometimes rock forming falls. Together with steep gradients, this causes a characteristic violent downflow of

water which forms cascades and waterfalls, often alternating with lenitic pools or streams around larger stones and boulders in a complicated and many directional current pattern. The habitats differentiated in these streams during the investigations, namely stones, gravel, moss, and still water areas, usually lie close together, sometimes over a small area.

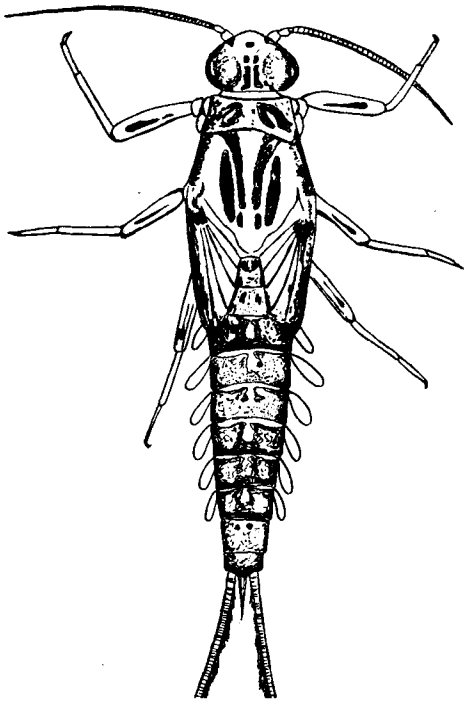


Fig. 2. *Baetis carpaticus* MORTON, nymph.

Stony habitats in the current are inhabited by the mayflies *Rhithrogena tatrica* ZEL. and *Baetis carpaticus* MORT. (fig. 2) which are common and reach the source zones, typical carpathic species. Among the stoneflies, *Brachyptera seticornis* (KLAP.), *Rhabdiopteryx neglecta* (ALB.), and *Perlodes intricata* (PICT.) are often encountered, while in the source zones *Diura bicaudata* (L.) and *Isoperla sudetica* (KOL.) also occur. The beetles are represented, among others, by *Elmis latreillei* BED. and *E. obscura* MÜLL. Among the flies living here are: the rheobiontic *Liponeura cinerascens* LOEW., *Simulium noelleri* FRIED., *Odagmia monticola* (FRIED.) and *Prosimulium hirtipes* (FRIES.), common in the Tatra

*Chrysanthemum Zawadzkii* HERB. Photo Z. ZWOLIŃSKA

streams, as well as *Diamesa gaedei* MEIG. and *Eukiefferiella longicalcar* (KIEFF.). From the caddisflies the *Odontocerum albicorne* (SCOP.), *Ecclipsopteryx guttulata* (PICT.) and *Rhyacophila polonica* MCLACHL., rarely found in the Tatra may be encountered.

Still water areas, often with mud deposits or gravel on the bottom, are inhabited by the triclad *Crenobia alpina* (DANA) which spreads up to the sources, the rotifer *Trichocerca tigris* (MÜLL.), which is

characteristic for the psammon, and the true worms *Eiseniella tetraedra* (SAV.) and *Stylodrilus parvus* HRABĚ and ČERN., both typical for source zones. The stoneflies are represented, among others, by *Capnia vidua vidua* KLAP. and *C. vidua rilensis* RAUŠ., the latter known besides only from the Bulgarian mountains, and the *Leuctra rosinae* KEMP., a typical alpine species. The tendipedids appearing here are *Heterotrissocladius marcidus* (WALK.) and *Prodiamesa olivacea* (MEIG.), and the caddisflies are, among others, *Halesus rubricollis* (PICT.), *Chaetopteryx villosa* (FABR.), and *Acrophylax vernalis* DZIĘDŹ., known only in the Carpathians. The amphipod *Niphargus tatrensis* WRZEŚN. is often found in source areas and underground water outflows.

In bottom growing water moss live the flat worms *Macrostomum catarractae* GIEYSZ. (fig. 1b), hitherto known only in the Tatra, and *Dalyellia tatrica* GIEYSZ., found only in the Tatra and the Appenines. Among the rotifers, among others *Adineta vaga* (DAV.), *Philodina denticornis* v. *minor* PAX and WULF, and *P. flaviceps* BRYCE are typical here. In the moss in the source zones the snail *Bythinella austriaca* (FRFLD.) and the flies *Hermione dives* (LOEW.) and *H. pygmaea* (FALL.), are commonly encountered. In waters trickling on rocks the fly *Dactolabis wodzickii* (NOW.) lives amid algae. Among other representatives of stream animals an interesting species of water mite deserves attention. This is *Wandesia thori* SCHECHTEL (fig. 1c), until 1944 known as the only species of the genus described from the Tatra.

Of the terrestrial vertebrate animals living in the Tatra Mts. the following are particularly worthy of note:

Birds: the golden eagle *(Aquila chrysaëtos)*, now only rarely nesting in the Slovak Tatra, the eagle owl *(Bubo bubo)*, the Ural owl *(Strix uralensis)*, and some others.

Among mammals mention should be made in the first place of the chamois *(Rupicapra rupicapra)*, the marmot *(Marmota marmota)*, and the no longer numerous brown bear *(Ursus arctos)*. The lynx *(Lynx lynx)* and the wild cat *(Felis silvestris)* are also becoming very rare.

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