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**Pluskwiaki (*Heteroptera*) rzeki Raby,
niektórych jej dopływów i zbiorników przyrzecznych ***

Heteroptera of the River Raba,
some of its tributaries and riverine reservoirs

Mémoire présenté le 5 février 1973 dans la séance de la Commission Biologique
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Abstract — The paper presents the results of investigations on the fauna of *Heteroptera* which proved to be much richer in riverine reservoirs than in the River Raba itself and some of its tributaries. Scarcity of the fauna of these insects in flowing waters is, however, not a secondary but a primary phenomenon resulting from the mountainous character of these waters. Their division into characteristic section was made on the grounds of the distribution of two species of the genus *Micronecta* Kirk. and participation in their population of the specimens of the brachypterous (short-winged) and macropterous (long-winged) forms. The presence of these species demonstrates a high purity and low trophism of the populated waters. The two species of the *Micronecta* Kirk. develop only one generation in the course of a year, and their larvae can hibernate not only in the IVth but also in the IIIrd stage. It was found that for some species the riverine reservoirs play the role of refugia during flood periods.

As regards *Heteroptera* the River Raba has not been elaborated so far. Although Stobiecki (1915), Smreczyński (1910, 1954), and Wróblewski (1958) carried out investigations, among others also in the Beskid Zachodni, where the River Raba is in the central position, no materials have been published from this river as yet.

More detailed data on *Heteroptera* from some of our mountain rivers are known from the Jeleniogórska Valley in the Western Sudetens (Mielewczyk 1964). The habitats mentioned on these territories covered, however, parts of rivers flowing across a flat territory and

* Praca wykonana w ramach problemu resortowego PAN nr 21.

the composition of *Heteroptera* populating them remained under a strong influence of the fauna of these insects developing in masses in numerous fish ponds. From the mountainous parts of some rivers of the Carpathians and Sudetens (W ró b l e w s k i 1958) more detailed data concerning the occurrence of some species of the genus *Micronecta* K i r k. were given. Much information on *Heteroptera* from flowing waters can be found above all in faunistic ecological papers concerning the Wielkopolsko-Kujawska Lowlands. A detailed elaboration of the fauna of these insects on the whole river was made by K r a j e w s k i (1969). The data obtained so far are, however, of faunistic-ecological character, there being no elaborations with respect to hydrobiology, taking into consideration the division of the rivers into characteristic sections, their general evaluation, or character.

This gap, though only in a small degree, is filled by the present paper. The results of investigations on *Heteroptera* in the River Raba, some of its tributaries, and riverine reservoirs enlarge to a certain extent the knowledge of fauna, ecology, and biology of these insects and point to the necessity of taking them into consideration in the hydrobiological evaluation of mountain rivers.

Material

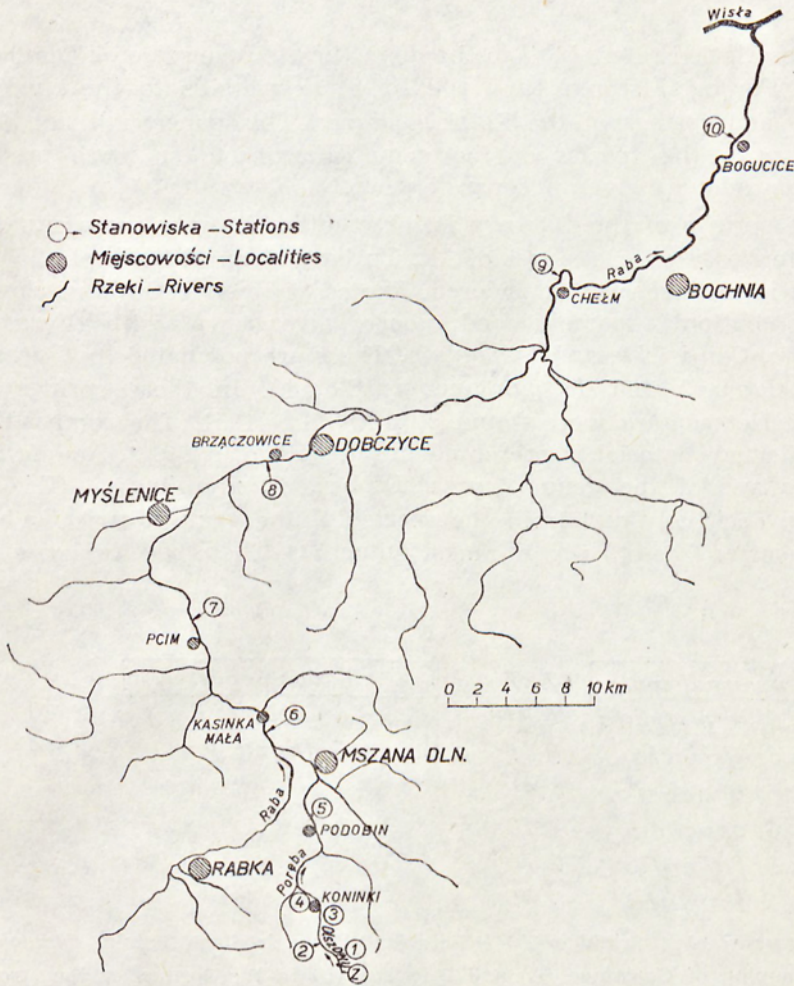
Field investigations were carried out during the spring-summer season in the years 1970—1971. A total number of 724 larvae and 1551 imagines belonging to 30 species were collected. A simplified presentation of the whole collected material is shown in Table I. On account of technical difficulties, methods of quantitative sampling were not applied. As a result of very precise searching and collecting of as many as possible specimens caught the quantitative relations between individual species were well preserved.

With respect to quality the fauna of aquatic *Heteroptera* in small riverine reservoirs was much richer than in the main flow considered in the present investigations (streams: Potok Olszowy, Koninka, Poręba, Mszanka, and the River Raba) (fig. 1). Among the *Heteroptera* collected in the River Raba typical rheophilous species such as *Aphelocheirus aestivalis* (F a b r.) and *Gerris najas* (D e G e e r) were found to be absent. These species more often populate streams with a slow water current and small rivers. *G. najas* occurs, above all, in flowing waters with steep, shaded banks, whereas *Aphelocheirus aestivalis* populates, for the most part, a sandy and gravelly bottom with little motion. The River Raba has, in the examined parts, mainly flat and open banks and very mobile coarse gravel or stone covered bottom, often undergoing erosion (P u n z e t 1969).

Tabela I. Pluskwiaki (Heteroptera) Raby, niektórych jej dopływów i zbiorników przyrzecznych. Stanowiska: 0 - zboczą Turbacza, źródła Potoku Olszowego; 2 - drobne zastoiska na Potoku Olszowym; 3a - kałuże nad Potokiem Olszowym; 3b - limnokren nad Potokiem Olszowym; 4a - Koninki, mokradło i helokren nad Koninką; 4b - Koninki, drobny strumyk - dopływ Koninki; 5a - Podobin, Poręba i zbiorniki zalewowe; 6+a - Kasinka Mała, Raba i zbiornik zalewowy; 7+a - Poim, Raba i starorzecze; 8+a - Brzączowice, Raba i zbiorniki zalewowe; 9 - Chełm, Raba; 9a - Chełm, zbiorniki przyrzeczne; 9b - Chełm, starorzecze Raby; 10 - Boguice, Raba; 1 - larwy, 1-imagines

Table I. Heteroptera of the River Raba, some of its tributaries and riverine water bodies. Stations: 0 - slopes of Mt. Turbacz, springs of the stream Olszowy; 2 - small marginal waters on the stream Olszowy; 3a - pools above the stream Olszowy; 3b - limnokren above the stream Olszowy; 4a - Koninki, bog and helokren above the Koninka; 4b - Koninki, small stream - tributary of the Koninka; 5a - Podobin, the Poręba and flood territory reservoirs; 6+a - Kasinka Mała, the Raba and flood territory reservoir; 7+a - Poim, the Raba and the old river bed; 8+a - Brzączowice, the Raba and flood territory reservoirs; 9 - Chełm, the Raba; 9a - Chełm, riverine water bodies; 9b - Chełm, the Raba old river bed; 10 - Boguice, the Raba; 1 - larvae; 1 - imagines

Gatunek Species	Stanowisko - Station															
	0	2	3a	3b	4a	4b	5+a	6+a	7+a	8+a	9	9a	9b	10		
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
<i>Corixa punctata</i> (Ill.)										1						
- <i>linnaei</i> (Fieb.)				1										1		
<i>Sigara praecusta</i> (Fieb.)	2					2				2				4		
- <i>concinna</i> (Fieb.)	1															
- <i>striata</i> (L.)										1				1		
- <i>distincta</i> (Fieb.)	3									1				2	1	
- <i>falleni</i> (Fieb.)	1									2				84	11	
- <i>fossarum</i> (Leach)														1		
- <i>semistriata</i> (Fieb.)	4	1		8										4		
- <i>limitata</i> (Fieb.)	1													5		
- <i>nigrolineata</i> (Fieb.)	25					12								12		
- <i>lateralis</i> (Leach)						1									1	
<i>Sigara</i> sp.												15				
<i>Micronecta griseola</i> Horv.										5	2				8	
- <i>poweri</i> (Dougl. et Sc.)							258	39	57	20	101	37	136	37	15	
<i>Micronecta glauca</i> L.				1										2	29	
<i>Ilyocoris cimicoides</i> (L.)															5	
<i>Hepa cinerea</i> L.						1				2				2	13	
<i>Microvelia reticulata</i> (Burm.)														2	7	
<i>Velia caprai</i> Tam.				12	21	8	20	45	175							
- <i>saulii</i> Tam.							26	14								
<i>Limnoporus rufocutellatus</i> (Latr.)	1			18		4								2	2	
<i>Gerris paludum</i> (Fabr.)				1						5		1		1	2	
- <i>argentatus</i> Schumm.										1						
- <i>gibbifer</i> Schumm.	5	3	27	26	7	61		3								
- <i>lacustris</i> (L.)					8	6			14	44	15	127	1	64	1	
- <i>lateralis</i> Schumm.					5									1	1	
- <i>odontogaster</i> (Zett.)	35	6		2	11	9			1	2		15		1	8	
- <i>thoracicus</i> Schumm.	1			2		6			1			9				
<i>Gerris</i> sp.														2		
<i>Hydrometra stagnorum</i> (L.)										6				2		
<i>Hebrus ruficeps</i> Thoms.							3									



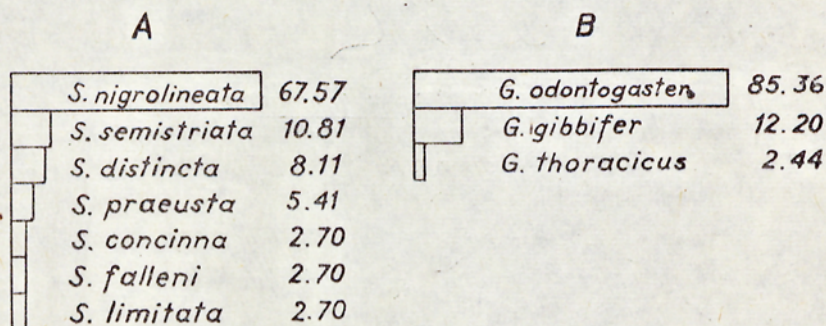
Ryc. 1. Dorzecze Raby (Z — źródło)
Fig. 1. Catchment basin on the River Raba (Z — spring)

In the lower parts of the Poręba and later on in the Raba there occur among the interesting *Heteroptera* species of the genus *Micronecta* Kirk.: the partly rheophilous *M. griseola* Horv. and the fairly rheophilous *M. poweri* (Dougl. et Sc.). They will thus be given more attention since of the collected *Heteroptera* they constitute the main basis of hydrobiological division of the river and its evaluation. Only relatively few specimens belonging to these species were collected (560 larvae and 346 imagines) but nevertheless they constituted 40 per cent of the collected material.

General description of the fauna of water-bugs

The description refers both to the main flow (streams: Potok Olszowy, Koninka, Poreba, Mszanka, and the Raba) as well as to the riverine reservoirs and springs of the Potok Olszowy. This paper will not deal in detail with the species of the genus *Micronecta* as more precise remarks on them are given in separate parts.

Of the springs of the Olszowy Potok (Station Z) only those situated on open territory on the slopes of Mt. Turbacz at an altitude of 1250 m above sea level have been considered. There are small hollows of clayey or slimy bottom, sparsely and poorly overgrown with *Veronica beccabunga*, *Callitriche*, and *Sphagnum*. These are populated by *Triturus alpestris* (Laur.) and *T. montandoni* (Boul.). In these springs 10 species of *Heteroptera* were found on 15th May 1951. The composition of the collected material is presented in percentage in fig. 2. Among the representatives of the genus *Sigara* Fabr., *S. nigrolineata* (Fieb.) dominated decisively and from the species of the genus *Gerris* Fabr., *G. odontogaster* (Zett.) was the most numerous. These species, however,



Ryc. 2. Zgrupowanie *Corixidae* (A) i *Gerridae* (B) w źródłach Potoku Olszowego
 Fig. 2. Grouping of *Corixidae* (A) and *Gerridae* (B) in the springs of the stream Olszowy Potok

are characteristic neither of the springs nor of mountain regions. *S. nigrolineata* is a species populating above all small reservoirs, *G. odontogaster* mainly populates the surfaces of ponds and lakes. Among other species, *G. gibbifer* Schumm., occurring exclusively on the surface of small reservoirs shows great attachment to mountain regions.

The stream Potok Olszowy and further on the Koninka (stations 1—4) represent the most mountainous part of the examined flow. Owing to a great slope of the ground and strong water current, the absence of even rheophilous species of the genus *Velia* Latr. and of the highly rheophilous *Micronecta poweri* was noted. Individual specimens of *Sigara semistriata* (Fieb.) and *Limnoporus rufoscutellatus* (Latr.) and not

numerous specimens of *Gerris gibbifer* and *G. odontogaster* (region of station 2) were encountered for a time during the spring season. They do not represent a rheophilous element, all of them occurring in greater numbers of specimens in the limnokren situated below station 3. Hence, during the spring season the mentioned species migrate from this limnokren by air up the stream and sometimes remain on its marginal waters. Great expansion is shown by species of the family *Gerridae*, encountered also in periodical pools formed on the stream Potok Olszowy in the region of station 2, where they sometimes undergo development. On the surface of a pool 0.3 m² in area 27 larvae (stage IV and V) and 23 imagines of *G. gibbifer* were found on 10th July, 1971.

The limnokren situated on the stream Potok Olszowy below the station 3 is of boggy character overgrown with *Equisetum*, *Caltha*, *Lysimachia nummularia*, *Juncus effusus*, and *Glyceria fluitans*. It is shaded, to a great extent, by *Picea excelsa* and *Salix cinerea*, which influences the faunistic composition of aquatic *Heteroptera*. 10 species were found here, of which *Gerris lateralis* S c h u m m. (1 ♂ f. *macroptera*, 4 ♀♀ f. *microptera*) and the rheophilous *Velia caprai* T a m. are among the most interesting ones. These species are characteristic of shaded habitats. Of other species *Limnoporus rufoscutellatus*, mainly populating small overgrown water bodies and marshes, was fairly numerous.

At station 4 on the stream Koninka there is a small peatbog of helokren character overgrown with marshy vegetation and mosses including *Sphagnum*. Among *Heteroptera* the tyrophilous *Hebrus ruficeps* T h o m s. was encountered there.

The helokren situated at the edge of this peatbog, partly shaded and overgrown with *Equisetum*, *Caltha*, *Cardamine*, *Juncus*, and grass was populated by 11 species of *Heteroptera*. From the representants of the *Gerridae*, *G. gibbifer* dominated decisively, the family *Corixidae*, on the other hand, being represented by *Sigara nigrolineata*. The two rheophilous species of the genus *Velia*, with *V. saulii* T a m. slightly dominating (56.5 per cent) over the preferring shadowy places *V. caprai*, were rather poorly represented.

On a small, greatly shaded stream flowing out from the mentioned helokren and falling into the stream Koninka individual specimens of *G. gibbifer*, were rarely encountered, whereas *V. caprai* were very numerous there and dominated decisively (92.6 per cent) over the *V. saulii*. Among the usually apterous specimens of *V. caprai* individual specimens of f. *macroptera* appeared (18th June, 1970, 1 ♀, 10th July, 1971, 1 ♀), this being a phenomenon often encountered in dense populations (M i e l e w c z y k 1964).

The lower situated riverine reservoirs (stations 5—8) were to a greater extent connected with the flowing waters of the main flow. They lay

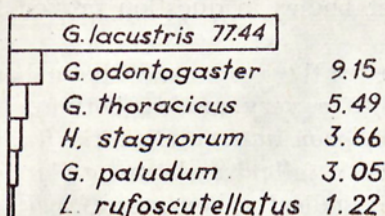
either in the bed of the river or adjacent to it. The fauna of *Heteroptera* often mixed, especially when the water level was higher.

In the periodically forming individual reservoirs and marginal pools on the sides of the river bed of the stream Poręba by Podobin (station 5) the common *Gerris lacustris* (L.) occurred in great numbers, whereas only individual specimens of *G. odontogaster* and *G. thoracicus* Schumm. were encountered there. Similarly as in the river, larvae of *Micronecta* sp. occurred there in spring as well. These were most probably larvae of *M. poweri* as at this station, as well as near Kasinka imagines of this species only were found.

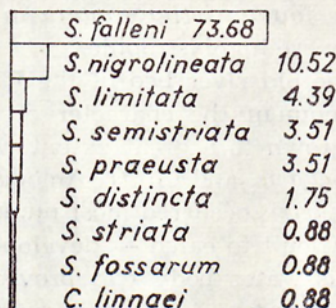
In a transient reservoir near Kasinka (station 6) filled by the waters of River Raba, besides numerous encountered *Gerris lacustris*, individual specimens of *G. odontogaster*, *G. argentatus* Schumm., and *Nepa cinerea* L., this last usually populating normal biotopes of pool character, were found. In spring, similarly as in the River Raba, larvae of *Micronecta* sp. were found. As the result of floods in the second half of July 1970 the mentioned reservoirs ceased to exist and investigations carried out on the River Raba on May 14th and August 10th, 1971 failed to reveal the presence of *M. poweri* any longer, though this species survived in the lower part of the Poręba (higher lying station).

The old river bed of the River Raba near Pcim (station 7) in spite of being periodically flooded with the waters of the present river, has the character of a permanent water body. It is overgrown mainly with *Sparganium ramosum*, *Scirpus silvaticus*, and *Myriophyllum spicatum*, less frequently with *Alisma plantago-aquatica*, *Potamogeton natans*, *Veronica beccabunga*, *Typha latifolia*, *Juncus* and *Carex*. Its bottom is loamy-muddy and sandy in places. In this relatively permanent and floristically fairly rich water body the fauna of *Heteroptera* is also rich, including 13 species. With respect to quantity, species from the group *Amphibicorisae* (fig. 3) dominated, among them *Gerris lacustris* being especially numerous. Between the old river bed and the Raba itself temporary mixing of some components of the fauna of *Heteroptera* took place. In the old river bed, flooded occasionally with the waters of the River Raba, *Micronecta poweri* and *M. griseola* populated places with a distinct current, whereas in the River Raba larger hollows in the river bed changed, during the period of very low water level, into individual pools in which, besides species of the genus *Micronecta* single specimens of *Corixa punctata* (III), *Sigara praeusta* (Fieb.), *S. falleni* (Fieb.), and *Gerris thoracicus* appeared. During periods of average water levels these species were not encountered in the River Raba.

A periodical marginal reservoir of the River Raba near Brzączowice (station 8) was richly populated with *Gerris lacustris* and concurrent *G. paludum* (Fabr.), *G. odontogaster* and *Hydrometra stagnorum* (L.).



Ryc. 3. Zgrupowanie *Amphibicorisae* w starorzeczu Raby koło Pcimia
 Fig. 3. Grouping of *Amphibicorisae* in the old river bed of the River Raba near Pcim



Ryc. 4. Zgrupowanie *Corixidae* w drobnych zbiornikach nad rzeką Rabą koło Chelma
 Fig. 4. Grouping of *Corixidae* in small water bodies on the River Raba near Chelm

Micronecta poweri, and *M. griseola* assembled here also in large numbers.

The River Raba near Chelm (station 9) was especially poor in *Heteroptera*. Individual specimens only of *G. lacustris* and *Micronecta* sp. were found there. Whereas several riverine reservoirs in this region had a rich fauna of *Heteroptera*. These were small and rather shallow pools (about 50 cm deep) with a loamy-muddy bottom and fairly rich vegetation: *Phragmites communis*, *Typha latifolia*, *Alisma plantago-aquatica*, *Butomus umbellatus*, *Glyceria fluitans*, *Potamogeton natans*, *Elodea canadensis*, *Myriophyllum*, and others. They were often flooded with the waters of the Raba during flood periods. In these reservoirs 17 species of *Heteroptera* were found, hence the fauna of these insects was richer here than elsewhere because at other stations a maximum of 10–13 species were found. Numerous representatives of the sub-family *Corixinae* (fig. 4) were grouped here with absolute predominance of *Sigara falleni*, which in lowland conditions mainly populates ponds and terrains close to the banks of lakes and slowly flowing rivers (Wróblewski 1939, Mielewczyk 1963, Grygorowicz 1965, Midak 1965).

In the valley of Jelenia Góra this species occurred mainly in fish ponds, where it usually dominated (Mielewczyk 1964). In riverine reservoirs near Chelm, besides *Sigara falleni*, there were *S. nigrolineata* frequent in small water bodies — and *S. limitata* (Fieb.), characteristic of water bodies with a loamy and clayey bottom (Mielewczyk 1963), whereas among the representatives of *Gerridae*, *G. lacustris* dominated, similarly as along the whole middle course of the River Raba. Fairly numerous were *Notonecta glauca* (L.) and *Nepa cinerea*. The composition

of the fauna of *Heteroptera* in the water bodies in question proved that they were highly trophic.

The old river bed of the River Raba by the road near Chelm has at the moment the character of a pool with a very muddy bottom. It is overgrown to a great extent with *Potamogeton natans*, *Glyceria fluitans*, *Heleocharis*, and *Carex*. Among *Corixinae* *S. falleni* and among *Gerridae*, *G. lacustris* occurred most numerously. Periodically, however, *G. paludum* — difficult to catch — developed in great numbers. The high eutrophism of this water body was proved by the occurrence of *Notonecta glauca*, *Nepa cinerea*, *Microvelia reticulata* (Burm.), and *Ilyocoris cimicoides* (L.) for which this was the only habitat in the basin of the River Raba. *I. cimicoides* is as a rule common in the lowlands but it evidently avoids mountain regions. The old river bed is occasionally flooded with the waters of the River Raba during flood periods.

In the River Raba near Bogucice (station 10), flowing in a regular bed without any marginal pools, the fauna of *Heteroptera* was qualitatively very poor. Among the *Gerridae* individual specimens of *G. paludum* were found, whereas *Micronecta griseola*, which greatly dominated over *M. poweri*, occurred in great numbers. Such proportions in simultaneous occurrence of these species are found more frequently in some lowland rivers and poorly eutrophicated lakes (cf. Wróblewski 1958).

The fauna of *Heteroptera* of the River Raba and some of its tributaries is poor as a whole. The occurrence of species of the genus *Micronecta* indicates that it is not a secondary scarcity caused by the economy but results from the mountainous character of this river and its tributaries. The presence of these species, especially of *M. poweri*, is evidence of the great purity of these rivers and, as may be concluded, their low trophic content.

The fauna of riverine reservoirs is not without influence on the fauna of the main flow. Some species can fly over to the flowing waters and temporarily enrich their fauna. On the other hand, during a high water level of the flowing waters some species transfer to the riverine reservoirs where they may survive unfavourable conditions and avoid long distance transportation. Such cases, though not numerous, were observed both with respect to *Heteroptera* and larvae of dragonflies (Mielewicz 1973). Riverine reservoirs, especially the relatively durable ones, can thus play the role of temporary refugia for some rheophilous species.

Distribution of species of the genus *Micronecta* Kirk. and their significance for the hydrobiological division of flowing waters

Species of the genus *Micronecta* populate, above all, lakes, rivers, and streams, being less frequent in ponds and clay pits. This mainly refers to *M. meridionalis* (Costa) and *M. minutissima* (L.). As imagines they prefer to stay in the littoral with a mineral substratum, mostly free from any vegetative and organic sediments. Five species are known in the territory of Poland. They differ in their ecological requirements and are hence of great importance for hydrobiological investigations (Wróblewski 1958).

In the River Raba the species *M. griseola* and *M. poweri* were found, the latter species also populating the lower part of the stream Poręba. Among Polish species *M. poweri* extends farthest north and in South Europe it mainly populates the waters of mountain rivers. Its occurrence in Poland is chiefly associated with flowing waters, especially mountain ones, and with poorly eutrophicated lakes of Pomerania and Mazury. It shows clearly a greater demand for oxygen than other species of this genus (Wróblewski 1958), being to a great extent a rheophilous species. As concerns ecology, *M. griseola* is congenial with *M. poweri*, chiefly populating lakes and larger slowly flowing rivers. It shows a fairly great rheophilous tendency.

In Polish territories species of the genus *Micronecta* have two forms: the commonly encountered f. *brachyptera* and the rarely occurring f. *macroptera*. The brachypterous form, unadapted to flying, shows absolute attachment to the habitat. Thus, the presence of this form in a water body indicates favourable ecological conditions for this species. The appearance in the population of a certain number of macropterous specimens adapted to migration by air would, thus indicate deterioration of the conditions of their biotope.

The given remarks concerning ecology and dimorphism of wings constitute the basis for interpretation of the obtained scheme of distribution of *M. poweri* and *M. griseola* in the examined waters (Table II). This in turn justifies the division of these waters into individual sections that was made.

The upper course of the investigated water flow covers the Potok Olszowy and Koninka (stations 1—4). Owing to the great slope of this territory and strong water current, species of the genus *Micronecta* were completely absent there.

The middle course, covering the stream Poręba from the mouth of the stream Koninka, the lower part of the Mszanka, and the River Raba below Mszana Dolna down to Brzączowice (stations 5—8), can be divided into two sections. The upper part of the course (stations 5—6) was populated by one species of the genus *Micronecta*. The *M. poweri*

developing here occurred only in the brachypterous form, indicating favourable conditions and permanent stay. In the lower part of the middle course (stations 7—8) *M. poweri* most probably did not find such favourable conditions, since in this population the macropterous form (13.5—40.5 per cent), able to fly and migrate by air was already encountered (Table II). Another species, still very scanty, occurred here simultaneously, i.e. *M. griseola* (on the average 8.64 per cent of the composition of the population taking the two species together) and was represented, like *M. poweri*, in higher lying station, by the brachypterous form only.

The lower course covers, presumably, the River Raba from the vicinity of Chełm to its mouth at the River Vistula (stations 9—10) though near Chełm the author did not succeed in catching any of the species in question, one specimen only being observed. On the basis of the example of station 10 (near Bogucice) this section was characterized by a decisive domination of *M. griseola* (92.7 per cent) over *M. poweri*, whose participation in this two-species community fell to 7.3 per cent. At this station the macropterous form, in the already scanty population of *M. poweri*, reached 33.3 per cent, whereas in the rich population of *M. griseola* only the first specimens of this form (4.7 per cent) were encountered. The qualitative relations between the two species and their forms prove a considerable deterioration of conditions at this station in comparison with higher lying ones.

The division of the investigated flow carried out on the basis of distribution of the two species and their forms differs from the hydrobiological division by P u n z e t (1969). This author, however, had at his disposal a larger material collected from a greater number of stations covering the whole River Raba. The present division is not complete, as the small number of adopted stations did not permit a more

Tabela II. Procentowe współwystępowanie *Micronecta poweri* (Dougl. et Sc.) i *M. griseola* Horv. oraz ich form krótkoskrzydłej (f.bpt.) i długoskrzydłej (f.mpt.)

Table II. Simultaneous occurrence of *Micronecta poweri* (Dougl. et Sc.) and *M. griseola* Horv.; their short-winged (f.bpt.) and long-winged (f.mpt.) forms in percentage

Stanowisko Station	<i>M. poweri</i>	<i>M. griseola</i>	<i>M. poweri</i>		<i>M. griseola</i>	
			f.bpt.	f.mpt.	f.bpt.	f.mpt.
5. Podobin: Poręba the Poręba	100		100			
6. Kasinka Mała: Raba the Raba	100		100			
7. Poim: Raba + starorzecze the Raba + old river bed	88.1	11.9	86.5	13.5	100	
8. Brzączowice: Raba the Raba	94.9	5.1	59.5	40.5	100	
10. Bogucice: Raba the Raba	7.3	92.7	66.7	33.3	95.3	4.7

precise border-line to be established between the upper and the middle course, and especially between the middle and lower course. Individual stations, however, can be included in corresponding sections of the river and of all the collected *Heteroptera* the discussed species of the genus *Micronecta* proved to be most suitable for this purpose.

Remarks on the development of *Micronecta poweri* and *M. griseola*

The vast majority of the species of the family *Corixidae* hibernate in the imago stage. Only species of the genus *Micronecta* hibernate as larvae. On the basis of investigations carried out on the territory of Great Britain, Walton (1938) established that larvae of *M. poweri* hibernate in stage III. It may be suspected, however, that the author did not determine the stage correctly (Wróblewski 1958). In a monograph of Polish species of the genus *Micronecta* Wróblewski (1958) found that larvae of these insects hibernate in stage IV. Only a small number of summer larvae, i.e. those originating from eggs laid the latest, reach no further than the III developmental stage.

The decrease in the rate of development of larvae from the species of the genus *Micronecta* and increase in the percentage of specimens hibernating in the III developmental stage is also unquestionably influenced by unfavourable thermal conditions. In mountainous regions in Poland the climatic conditions are more severe and the vegetative period is shorter than in the lowlands. These conditions are reflected in the data concerning the development of *M. poweri* and *M. griseola* in the River Raba and the lower course of the Poręba, which depart from the principal regularities established by Wróblewski (1958).

The first spring catches (11th May) made in Poręba near Podobin (station 5), i.e. in the highest lying station where *M. poweri* occurred in the examined flow, showed the presence of larvae in stage V with still relatively numerous larvae in stage IV, one larva in stage III being found (Table III). The number of hibernating larvae in stage III must have been here rather high; however, they passed into stage IV as the majority of larvae from stage IV had already reached stage V. The first imagines appeared at this station in the middle of June, as on June 18th only a few imagines were caught, with a considerable domination of males which reach the stage of imago earlier than females. Still very numerous larvae in stage V and very few in stage IV (Table III) were found at that time. In comparison with the vicinity of Poznań (Wróblewski 1958), the development of *M. poweri* was retarded in the lower part of the stream Poręba by 4—5 weeks.

At the lower lying station 8 (Raba near Brzączowice) besides *M. poweri*, *M. griseola* also occurred. On 12th May, 1970, among the

Tabela III. Występowanie larw i imagines *Micronecta poweri* (Dougl. et Sc.) i *M. griseola* Horv.; formy krótkoskrzydłe (f. bpt.) i długoskrzydłe (f. mpt.)

Table III. Occurrence of larvae and imagines of *Micronecta poweri* (Dougl. et Sc.) and *M. griseola* Horv.; short-winged (f. bpt.) and long-winged (f. mpt.) forms

Nr No	Stanowisko Station	Data Date	Larwy Larvae					M. poweri				M. griseola			
			I	II	III	IV	V	f.bpt.		f.mpt.		f.bpt.		f.mpt.	
								♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
5. Podobin:	Poręba the Poręba	11.V.1970			1	17	30								
		18.VI.1970				7	181	23	6						
		15.VII.1970						1	4						
		10.VIII.1971	1	6	15			3	2						
6. Kasinka:	Raba the Raba	12.V.1970				11									
		18.VI.1970				11	35	8	5						
		15.VII.1970						1	6						
7. Peim:	Raba + starorzecze the Raba + old river bed	14.V.1971				56	39								
		17.VI.1970					6	20	12		5	4	1		
8. Brzączowice:	Raba the Raba	12.V.1970				50	52								
		17.VI.1970					13	15	7	1	14	1	1		
		8.IX.1970			2	19									
10. Boguice:	Raba the Raba	17.VI.1970					8	4	6		5	56	126	2	7

numerous larvae of *Micronecta* sp., stages IV and V occurred in almost equal numbers and on 14th May, 1971, stage IV being even more numerous (64.4 per cent). In relation to the higher lying station 5, where at that time stage IV dominated, the development was found to be considerably retarded. This phenomenon could be explained by the presence of the other species, *M. griseola* which develops in spring a little later than *M. poweri* (Wróblewski 1958).

The influence of higher temperatures, increasing with the course of the river (Bomówna 1969), on the rate of development of the larvae and time of their metamorphosis is very great. On June 18th at the highest lying station where these insects were found (Poręba) imagines of *M. poweri* were still scanty and males dominated (beginning of metamorphosis with the concomitant presence of numerous larvae in stages V and IV. At the same time (17th June) in the lower course of the River Raba a few larvae, only in stage V, already appeared. In the population of *M. griseola*, developing a little later, males dominated (69.6 per cent). This indicates the final phase of metamorphosis of larvae of this species.

Berg (1938)* in Denmark and Walton (1938) in Great Britain found in *M. poweri* the occurrence of only one generation in the year.

* It is true that Berg mentioned *M. minutissima* (L.) but in fact his material refers to *M. poweri* (Dougl. et Sc.) (cf. Wróblewski 1958).

W r ó b l e w s k i (1958), on the other hand, found that this species, like other Polish representatives of the genus *Micronecta* is able to develop two generations in the year. According to the author only one generation can develop in the conditions of mountain rivers. This is confirmed by the present materials collected in the River Raba and in the lower part of the stream Poręba.

In the sample from 10th August, 1971 collected in the stream Poręba (station 5) imagines of *M. poweri* were already scarce and among larvae dominated specimens in stage III; stage II was only poorly represented and one specimen in stage I was found. The absence of larvae in stage V indicated a new generation of larvae whose development could reach stages IV and III by the end of the vegetation period.

In the sample from 8th September, 1970 collected in the River Raba near Brzączowice (station 8) imagines of both species, *M. poweri* and *M. griseola* were completely absent. Among larvae specimens in stage IV dominated, individual specimens in stage III being also present. If at this station two generations developed, imagines at least of *M. griseola*, which in warmer waters of the lowlands (no retardation) were caught even till 27th September (W r ó b l e w s k i 1958) would have been found.

More severe climatic conditions, in relation to the lowlands, prevailing in the basin of the River Raba and a shorter vegetation period thus cause retardation of the development of larvae of the discussed species of the genus *Micronecta* so that only one generation can develop in the year and by the end of summer some of the larvae reach only stage III.

STRESZCZENIE

W latach 1970—71 w Rabie, niektórych jej dopływach i zbiornikach przyrzecznych stwierdzono występowanie 30 gatunków pluskwiaków, co stanowi 46% gatunków znanych w Polsce. Owady te zasiedlały głównie zbiorniki przyrzeczne. Okresowo jednak część z nich przelatywała na wody bieżące wzbogacając ich faunę. Z drugiej zaś strony przy wysokich i powodziowych stanach wód Raby niektóre gatunki (z rodzaju *Micronecta* K i r k.) przedostawały się do zbiorników przyrzecznych, gdzie mogły przetrwać niekorzystne warunki unikające dalekiego przetransportowania w dół rzeki. Podobne obserwacje poczyniono również odnośnie do larw niektórych gatunków ważek. W okresach powodziowych zbiorniki przyrzeczne mogą zatem spełniać dla niektórych gatunków rolę refugium.

Fauna pluskwiaków wód bieżących okazała się bardzo uboga, zwłaszcza pod względem jakościowym. Zasiedlały je głównie *Micronecta poweri* (D o u g l. et S c.) i *M. griseola* H o r v., których obecność stwierdzono w dolnym odcinku Poręby i dalej w Rabie aż do Bogucic. Na podstawie rozmieszczenia tych gatunków oraz ich form krótkoskrzydłej i długoskrzydłej przeprowadzono podział badanego cieku wodnego na bieg środkowy i dolny. Natomiast do górnego biegu zaliczono tę jego część (od źródła Potoku Olszowego aż po ujście Koninki), w której nie stwierdzono obecności gatunków z rodzaju *Micronecta*. We wszystkich uwzględnionych zbiornikach przyrzecznych towarzyszących górnemu biegowi występował *Gerris gibbifer* S c h u m m., którego nie było już na niżej położonych stanowiskach. Gatunek ten wykazuje duże przywiązanie do obszarów górskich.

Występowanie *M. poweri* i *M. griseola* w Rabie i w dolnym odcinku Poręby świadczy o dużej czystości tych wód i stosunkowo niskiej ich troficzności. Ogólne zatem ubóstwo jakościowe fauny pluskwiaków w badanych wodach bieżących nie jest zjawiskiem wtórnym spowodowanym gospodarką człowieka, lecz wynikającym z naturalnego charakteru tych wód.

Z analizy zebranego materiału wynika, że *M. poweri* i *M. griseola* mają tu tylko jedno pokolenie w roku i że ich larwy mogą zimować nie tylko w IV, lecz także w III stadium. Zjawisko to wiąże się niewątpliwie z surowszymi, w stosunku do niżej, warunkami klimatycznymi i krótszym okresem wegetacyjnym.

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ERRATA

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