

## TAXONOMIC AND ECOLOGICAL INVESTIGATIONS OF THE HUNGARIAN *RHITHROGENA SEMICOLORATA* SPECIES-GROUP

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### ABSTRACT

The *Rhithrogena semicolorata* species-group can be divided into four species in Hungary: *R. ferruginea*, *R. iridina*, *R. picteti*, and *R. semicolorata*. All of these species live in creeks running on limestone or andezite. *R. ferruginea* is the most common representative of the group in Hungary: it occurs with *R. semicolorata* in the slower, downstream sections of streams near the Alpine region while it occurs with *R. iridina* and *R. picteti* in the northeastern chain of mountains.

### INTRODUCTION

There are about 50 *Rhithrogena* species known from Europe west of the Caucasus (Sowa 1984). Although Central Europe has been very well investigated (Sowa and Soldán 1984), description of new species continues (Sowa and Degrange 1987). In addition, these closely related, very similar species are now placed into different species-groups (Jacob 1974, Sowa 1984). Jacob (1974) placed 20 species into six species-groups on the basis of characters in the imago and larvae, while Sowa (1984) placed 37 species into seven species-groups. The *R. semicolorata*-group contained nine species in Sowa's (1984) revision. Later Sowa and Degrange (1987) found a new species, *R. puytoraci*, among specimens of *R. ferruginea* Navás from France and Poland and returned *R. picteti* Sowa to species status, bringing to 11 the total number of representatives of the *R. semicolorata* species-group in Europe.

A comprehensive guide to Hungarian mayfly species living in the lower parts of Carpathian Basin (Üjhelyi 1959) and a checklist containing the description of a new species *Baetis pentapleobodes* containing the description of a new species *Baetis pentapleobodes* (Üjhelyi 1966) were published more than 25 years ago. Üjhelyi (1959, 1966) listed only two recorded and nine potential species of *Rhithrogena* in Hungary. The recorded species were *R. semicolorata* (Curtis) and *R. germanica* Eaton. Three of the nine potential

species (*R. semitincta* (Pictet), *R. grisoculata* Bogoescu, *R. vulpecula* Klapalek) are now considered synonyms of *R. semicolorata*, representing different extremes of a very variable basic species. One (*R. haarupi* Esben-Petersen) is a synonym of *R. germanica*. Of the remaining five, two are synonyms of other species (*R. aurantiaca*: Eaton NEC Burmeister = *R. diaphana* Navás; *R. tatrica* Klapalek = *R. loyolaeae* Navás), and three (*R. alpestris* Eaton, *R. gorganica* Klapalek, *R. hybrida* Eaton) remain valid, but none of these species has ever been collected in Hungary.

The present status of *R. semicolorata* in Hungary is the subject of this paper. The second species recorded by Űjhelyi (1959, 1966), *R. germanica*, was based on a single specimen found in Pilismarót (Visegrádi Mountains) at the beginning of this century (Pongrácz 1914). I believe that this should be *R. sowai* Puthz. As *R. germanica* has not been found in any collections up to now, I doubt that the species occurs in Hungary.

It should be evident that the older guides to Hungarian mayflies (Űjhelyi 1959, 1966) cannot be used for species of *Rhithrogena*. In this paper, I intend to review the taxonomy, distribution, and ecology of members of the *Rhithrogena semicolorata* species-group occurring in Hungary.

## MATERIALS AND METHODS

Characteristic creeks in the Zempleni-, Aggteleki-, Bukk-, Matra-, Borzsony-, Soproni-, Keszegi- and Mecsek Mountains (all belonging to the southern part of the Alpine-Carpathian zone) were collected for several years (Fig. 1). Imagos were caught with nets and emergence traps and larvae were caught with aquatic nets. In some cases, larvae were also reared to subimagos or imagos.

Since the older identification guides could not be used, identifications were made from original drawings, descriptions, and keys of Sowa (1971, 1984), Jacob (1974) and Belfiore (1983) and representative material supplied by Drs. Landa and Soldan of the Czechoslovak Academy of Sciences.

About 5000 *Rhithrogena* imagos (males, females, subimagos) and about 2000 larvae were examined. Body size, colour (the wings in details), shape and size of the penis lobes and size and teeth on the titillators were studied on the males; females could sometimes be studied. Besides colour and habitat, the number of denticles on the tarsal claws and size of the fold on the first pair of abdominal gills were studied in detail on larvae.

## RESULTS AND DISCUSSION

### Taxonomy

Four species belonging to the *Rhithrogena semicolorata* species-group are very common in mountains of medium altitude in Hungary. Zurwerra *et al.* (1987) considered these to be subspecies; however, in Hungary they appear to be distinct and can be separated by characters given in Sowa (1971) and Sowa and Degrange (1987). The four species are discussed below in order of

decreasing frequency.

1. *Rhithrogena ferruginea* Navás, 1905. This species has been redescribed by Thomas (1968) and Sowa (1971). Some specimens formerly identified as *R. ferruginea* in France and Poland have recently been found to represent a new species *R. puytoraci* (Sowa & Degrange 1987). The break on the apical region of the penes is not visible on Hungarian specimens, so the possible presence of *R. puytoraci* in Hungary will not be resolved until investigation of the eggs.

The colour of the wings of the Hungarian male *R. ferruginea* is as described in the literature (Sowa 1971). Females are a bit lighter and the fore wing colour is light yellow basally fading gradually to hyaline at the wing apex.

On femora of the larvae, the pale, central region nearly surrounds the dark central macula except for a small point where the macula touches the darker surface band (Fig. 35 in Sowa 1971). There are two denticles on tarsal claws of most specimens and the fold on the dorsum of the first pair of abdominal gills is a good character for identification.

2 and 3. *Rhithrogena iridina* (Kolenati, 1859) and *Rhithrogena picteti* Sowa, 1971. The most characteristic difference between *R. iridina* and *R. picteti* is the colour of the wings which is consistent with the literature (Sowa 1971, Sowa and Degrange 1987): the fore wings of male *R. iridina* are dark yellow and those of *R. picteti* are distinctly banded with yellow in the basal half. The penes and the titillators are the same as described by Sowa (1971).

Larvae of these two species can only be separated from each other by the shape of the spines on the surface of the femora, and they are difficult to distinguish from the other members of the *R. semicolorata* species-group. On the femora of the larvae, the central macula is violet red in fresh specimens and it is partially merged with the darker shading of the femora (Fig. 36 in Sowa 1971). Setae on the central part of the femora are often parallel.

4. *Rhithrogena semicolorata* (Curtis, 1834). The penes of *R. semicolorata* males are obliquely truncated in lateral view as described by Sowa (1971).

In the larvae, the fold of the first pair of abdominal gills is definitely triangular. The central dark macula on the femora is small and completely surrounded by the pale, central region (Fig. 34 in Sowa 1971). There are frequently three denticles on the tarsal claws.

## DISTRIBUTION

In Hungary, the most common species is *R. ferruginea*. The typical *R. semicolorata* is quite rare. Only a few specimens were collected in the Koszegi- and Soproni Mountains which border the Alps from the East (Fig. 1). Table 1 shows the ratios of the four species in the different study sites; about 90% of the undetermined material of the *R. semicolorata* species-group (Table 1) were females, subimagos, or very young larvae.

It can be seen that *R. ferruginea* occurs with *R. semicolorata* in the mountains bordering the Alps. Only *R. ferruginea* was collected in the Mecsek Mountains and *R. ferruginea* populations occur with smaller populations of *R. picteti* and *R. iridina* in the isolated, northeastern mountains.

### ECOLOGY

About 80% of the identified specimens were *R. ferruginea*, a very common species in the rocky beds of small first or second order, clear creeks on limestone or andezite. *R. ferruginea* appears in large numbers at altitudes above 200-300 m, but smaller populations live at lower altitudes if the water is clean. In streams with the largest populations, current speed ranged from 0.6 to 1 m/sec. Maximum population density frequently reached 80 larvae/m<sup>2</sup>, and occasionally was as high as 180 larvae/m<sup>2</sup>.

*R. ferruginea* occurred with *R. iridina* and *R. picteti* in the Visegrádi-, Bukk- and Matra Mountains (Fig. 1, Table 1). These two species always occurred in more downstream sections of streams than *R. ferruginea*; they are also found in the Polish Carpathians (Sowa 1971). Populations lived together with other species of Heptageniidae, for example members of the *Electrogena lateralis* (Curtis) species-group, *Ecdyonurus submontanus* Landa, *E. starmachi* Sowa and *Epeorus sylvicola* (E. Pictet).

*R. ferruginea* has a univoltine life cycle in Hungary. Its emergence period lasts from April until July; peak emergence occurs in the middle of May.

It can be concluded that although a few other species may be found in the creeks of the eastern, western and southern isolated mountains of the Carpathian Basin (Table 1), contrary to our expectations *R. ferruginea* is the dominant species in Hungary.

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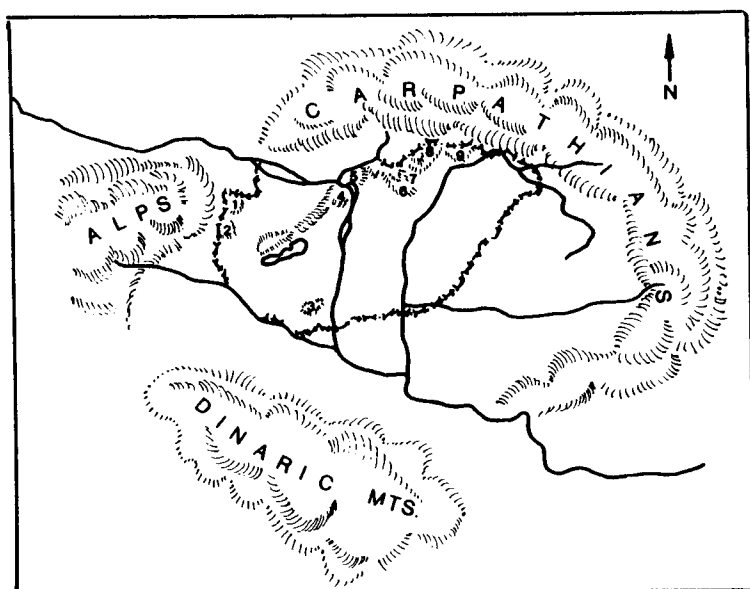


Fig. 1. Location of study sites in Hungary (1 = Soproni-, 2 = Kőszegi-, 3 = Mecsek, 4 = Visegrádi-, 5 = Büzzsony-, 6 = Mátra-, 7 = Bükk-, 8 = Aggteleki, 9 - Zempléni Mountains).

Table 1. Number of specimens of members the *Rhithrogena semicolorata* species-group collected at the study sites.

		STUDY SITES																	
		1	2	3	4	5	6	7	8	9									
		M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L
		—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —	—, —
<u>R. ferruginea</u>	80 40	160 82	30 116	1900 120	220 150	314 110	350 60	102 71	170 121										
<u>R. iridina</u>	— —	— —	— —	60 18	54 30	45 20	23 16	39 20	12 6										
<u>R. picteti</u>	— —	— —	— —	40 12	18 10	10 13	4 5	7 8	2 6										
<u>R. semicolorata</u>	2 8	10 20	— —	3 2	— —	— —	— —	— —	— —										
<u>R. semicolorata</u> group indet.	4 4	2 6	6 21	121 62	33 14	63 25	47 30	85 30	35 40										

Notes: M = males, L = larvae; study sites are given in Fig. 1.