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***Rhyacophila hageni* (Trichoptera, Rhyacophilidae) - does the taxon exist?¹**

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A b s t r a c t: *Rhyacophila hageni* was synonymised with *Rhyacophila polonica* (McLachlan 1879) by Schmid (1970). Our studies of male genital structure of *Rhyacophila polonica* from the Sudetes as well as from the West and the East Carpathians revealed some taxonomic characters which indicate the presence of two populations, one in the West Carpathians and a second in the Sudetes Mountains. These taxonomic differences in populations of *R. polonica* from the Sudetes and the Carpathians may reflect periodic isolation of these two populations due to glaciations. The recovery of the taxon *hageni* in the rank of subspecies *R. polonica hageni* seems to be reasonable.

Key words: Trichoptera, caddis flies, *Rhyacophila hageni*, *Rhyacophila polonica*, taxonomy, zoogeography.

Introduction

Rhyacophila hageni was described by MCLACHLAN (1879, p. 446, pl. 47, 1-3) in a rank of species on the basis of several specimens coming from BRAUER's and HAGEN's collections. The specimens have been collected by STEIN, SCHNEIDER and BRAUER, all in Silesia in the Altvater Mts. (now the Czech Republic) and Warmbrunn village (now Poland), although the exact localities remain uncertain. All these localities are situated in the Sudetes Mts. Warmbrunn (in Polish Cieplice Śląskie) may be understood both as a collecting site or a place where collected specimens have been stored. The house where entomological collections have been stored since 1878 still exists - now as the Natural History Museum. More probable the specimens were collected in the neighbouring mountainous range of the Riesengebirge (in Polish the Karkonosze Mts.) the highest part of the Sudetes Mts. The Sudetes should be the *terra typica* for the taxon (Fig. 1).

Before *R. hageni* lost its validity as a species it was recorded by more than ten authors from the following countries (acc. to FISCHER 1960): the Balkans (Croatia, Bulgaria, Slovenia), Austria, Germany, the Czech Republic, Slovakia and Poland. The species was synonymised with *Rhyacophila polonica* by SCHMID (1970), who neither explained nor justified his decision.

R. polonica was also described by MCLACHLAN in the same paper as *R. hageni* was (MCLACHLAN 1879, p. 446, pl. 47, 1-3) on the basis of one male with a note: "Poland (one male in Brauer's collection)"; the precise origin place and the collector remain unknown. Both taxa were recorded by almost ten different authors from: Poland, Ukraine, Romania and Hungary (FISCHER 1960). In geographical sense all the data concern the Carpathian Mts.

¹ This paper is dedicated to Prof. Dr. Hans Malicky on the occasion of his 75th birthday.

It should be noted, that except MCLACHLAN both taxa were identified only by DZIĘDZIELEWICZ and KŁAPÁLEK. The first data on *R. polonica* by DZIĘDZIELEWICZ (1889) concern the Upper Prut River in the East Carpathians (now Ukraine) in the context of MCLACHLAN's note on the origin of the species. But in his next paper DZIĘDZIELEWICZ (1891) gave more detailed information by the following note "One specimen from the Imperial Museum in Vienna which I sent to Dr. F. BRAUER for identification was a basis for description of the new species".

Following the routes of entomological trips of DZIĘDZIELEWICZ to the East Carpathians before 1879 it could be supposed, that the specimen could be collected in the early 1870ties at left and right tributaries of the Prut River along the stretch between Mikuliczyn and Dora villages in the south-eastern parts of the Gorgany Mts. and the north-western parts of the Pokut's'ko Bukovyns'ki Beskydy Mts. That region should be considered as *locus typicus* for *R. polonica* (Fig. 1). Several other specimens of the series (syntypes) are stored in Museums in Krakow and Lvov. These caddis flies belong to the oldest in the collections of the Museums and may be recognised by the following data on labels: a - collecting place, villages: Dora, Waratek or Mikuliczyn vicinity, b - numbers: 22/8, 30/8, 8/9 which probably denote collecting date 22 and 30 August and 8 September respectively, c - lack of collecting year; at several no numbers at all.

DZIĘDZIELEWICZ identified all specimens collected in the East Carpathians as *R. polonica*, but those from the West Carpathians (the Tatras including) as *R. hageni* (DZIĘDZIELEWICZ 1895, 1911). He had no doubts of the correct separation of both taxa. Moreover he stressed (1895, p. 31), that *R. polonica* is "exclusively observed in the East Carpathians" and gave taxonomical differences between them. Also KŁAPÁLEK (e.g. 1892, 1904) identified specimens from the Southern Carpathians as *R. polonica* and those from the Czech as *R. hageni*. In contrast RACIEŃKA (1933) verified *R. polonica* specimens collected (and identified) by DZIĘDZIELEWICZ in the East Carpathians as *R. hageni*. Finally, SCHMID (1970) synonymised these taxa; *polonica* was the older name. The specimen drawn by SCHMID was collected in the East Carpathians in the vicinity of Jasinia village (now Ukraine, before the Second World War Korosmezo in Hungary). The collection site is situated about 15 km in distance to the SW from the *terra typica* for the species (Fig. 1).

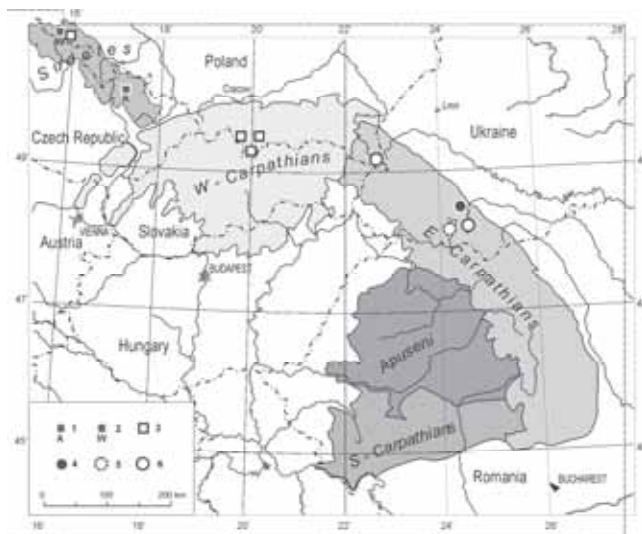


Fig. 1: Distribution of *R. polonica* and *R. polonica hageni* acc. to the studied material. Denotations: (1-2) loci typici of *R. hageni*: A–Altvater, W–Warmbrunn; (3) contemporary collecting sites of *R. hageni*; (4) locus typicus of *R. polonica*; (5) origin site of *R. polonica* specimen drawn by SCHMID (1970); (6) contemporary collecting sites of *R. polonica*.

Taxonomic key characters according to MCLACHLAN

MCLACHLAN (1879) noted, after short and concise description of *R. polonica*, “Although closely allied to the next species [i.e. *R. hageni*], it is evidently distinct”. At the end of description of the second taxon he gave the key characters for separation both taxa: “Differs from *polonica* in the form of the dorsal process, and in that of the second joint of the inferior appendages”.

Morphology of the dorsal process:

- in *R. polonica*: “somewhat boat-shaped, the sides deflexed; narrow at the base, and afterwards gradually dilated, if viewed laterally”.
- in *R. hageni*: “slender, flat, widened at the base, the sides nearly parallel, the apex truncate”.

Second joint of the inferior appendages:

- in *R. polonica*: “having the apical margin with a deep regular excision up to the lower apex, the lower edge being considerably prolonged into a broad, slightly curved process (hence this joint is almost furcate)”.
- in *R. hageni*: is “somewhat similar to *polonica*, but the lower apical portion is much broader, the apical margin being less concave, in consequence of being less deeply excised”.

It should be kept in mind that all the characters are based on only one specimen of *R. polonica*.

Material - new examination

Material studied of *Rhyacophila polonica - hageni*; all specimens preserved in ethanol.

East Carpathians:

- 2♂♂, 9.X.1995, the Czarnohora Massive at the Breskulec stream 1400 m a.s.l.; 1♀, 18.VII.1995, the Svydivets Mt. at the Malaja Szopurka stream 600 m a.s.l., the East Carpathians – Ukraine.
- 271♂♂, 17♀♀, 23.VII-18.X., 600-1135 m a.s.l. the Bieszczady Mts. (the East Carpathians – Poland).

West Carpathians:

- ≈300♂♂ + ♀♀, the Gorce Mts.
- ≈400♂♂ + ♀♀, the Tatras.
- 58♂♂ + 14♀♀, the Babia Góra Mtn.

Sudetes:

- 2♂♂, 6.X.2008, the Polana Pławska in the Karkonosze Mts, leg. K. MAJECKA.

Verification of the key characters proposed by MCLACHLAN on the material from the Carpathians and the Sudetes revealed some important observations. The most general is that the descriptions and the drawings presented by MCLACHLAN do not reflect precisely the taxonomic situation of both taxa. First of all the shape of the dorsal process is variable among the populations from the area studied. Different types can be seen, some are of “boat-shaped”, some irregularly widened at the base or in more distal parts, other with the sides more or less parallel (Fig. 2). Both specimens from the Sudetes have the sides almost parallel (Fig 2: Su(a) and Su(b)).

The shape of the distal joint of the inferior appendages is also variable. An excision on the apical margin of the joint is usually more or less deep but irregularly in shape. The lower apical process may be prolonged and straight but frequently its distal end is a little bit turned up. Also the upper and lower edges of the joint may be almost straight but usually they are bent upwards and downwards. In some specimens from the Carpathians the lower process may be slightly broader than in the other ones. It is broad in both specimens from the Sudetes (Fig. 3) as well as the apical excision is weakly marked. Unfortunately we have too few specimens from the Sudetes to determine the variability of these characters.

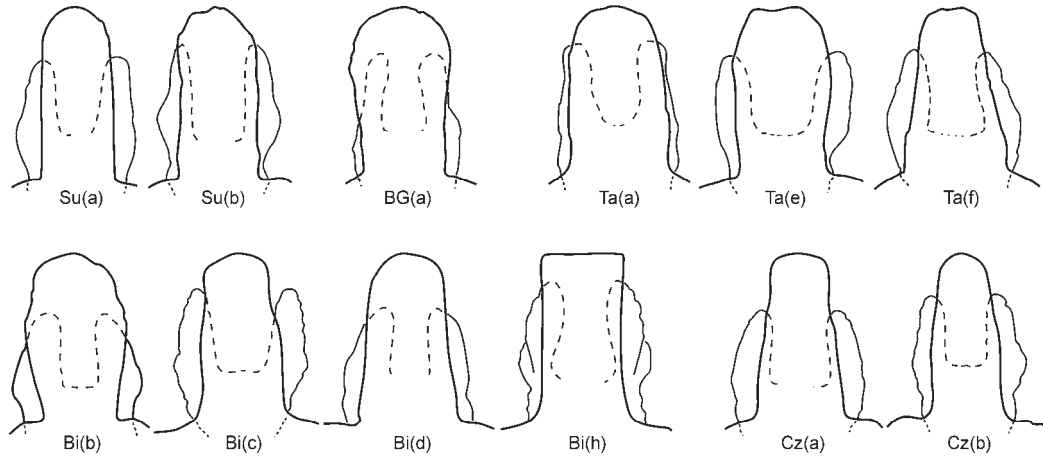


Fig. 2: Dorsal processes of *R. polonica - hageni*, examples of variability. Denotations: Su – Sudetes, Ta – Tatras, BG – Babia Góra, Bi – Bieszczady, Cz – Czarnohora; in parenthesis determined specimens.

New character

MCLACHLAN examined adult specimens in the dry state when he described and figured these taxa. This could be the reason why MCLACHLAN did not draw a phallus from lateral, though he did it from dorsal and ventral. Without a maceration of the genitals he had no possibility to look at it. Just only at the macerated specimens the shape of parameres from lateral is easily visible. The parameres are widened at the distal end at specimens from the Sudetes (Fig. 3) and the West Carpathians (Figs 4, 5, 6, 7, 8) (i.e. the Babia Góra Mtn., the Tatras, the Gorce Mts.). However these are slender and of the same diameter (Figs 9, 10, 11, 12) in specimens from the East Carpathians (the Bieszczady Mts., the Czarnohora Massif).

Comparative studies on a vast material from the West Carpathians revealed that the extension of parameres is variable in shape and size but usually distinct at least in 95% of specimens. However there are also cases (2-3% of specimens) which could be determined as not widened. Contrary, there are also a number of specimens (not numerous!) in populations from the East Carpathians (the Bieszczady Mts.) which have slightly widened parameres at the distal end.

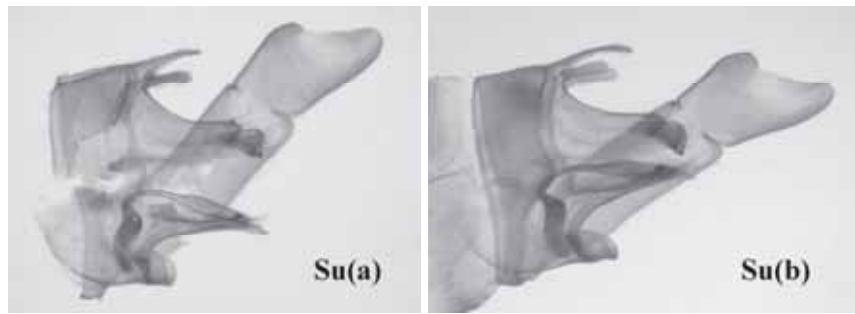


Fig. 3: Male genital structure of *R. hageni* lateral view; specimens from the Sudetes: Su(a) and Su(b).

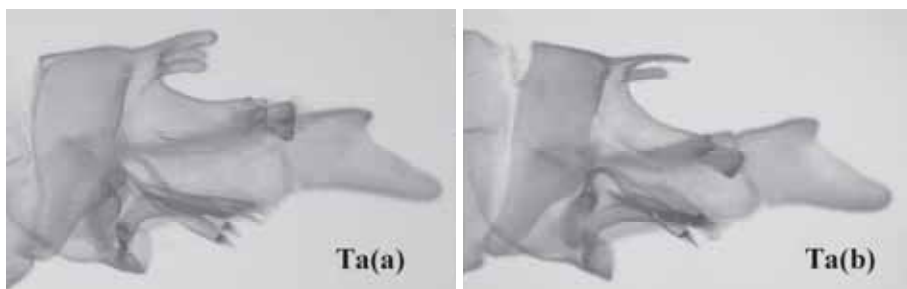


Fig. 4: Male genital structure of *R. hageni* lateral view, typical shape of parameres; specimens from the Tatras: Ta(a), Ta(b).

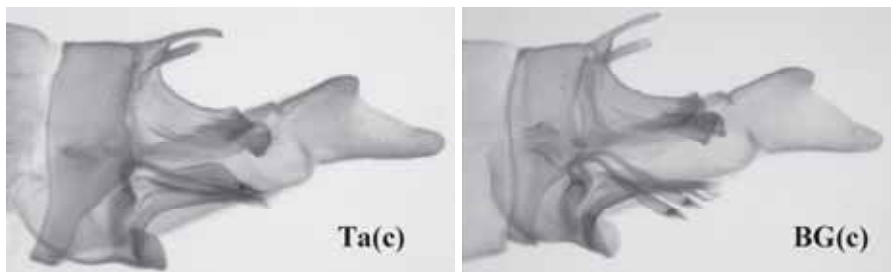


Fig. 5: Male genital structure of *R. hageni* lateral view, atypical shape of parameres; specimens from the Tatras: Ta(c) and the Babia Góra Mtn. BG(c).

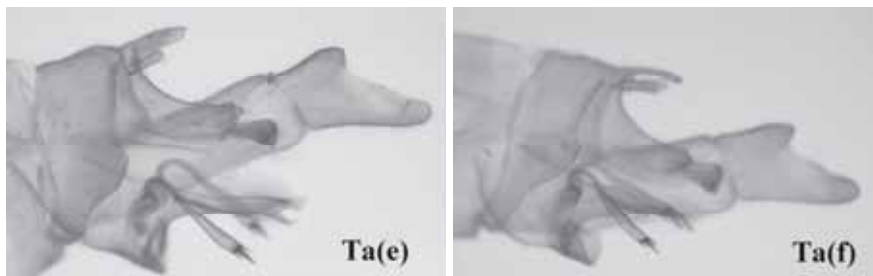


Fig. 6: Male genital structure of *R. hageni* lateral view, atypical shape of parameres; specimens from the Tatras: Ta(e), Ta(f).

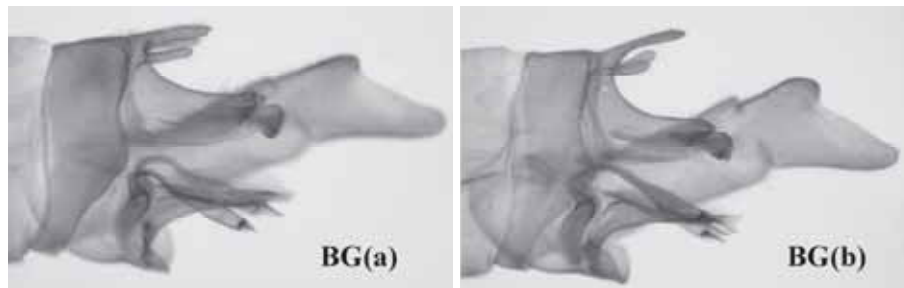


Fig. 7: Male genital structure of *R. hageni* lateral view, typical shape of sheaths; specimens from the Babia Góra Mtn: BG(a), BG(b).

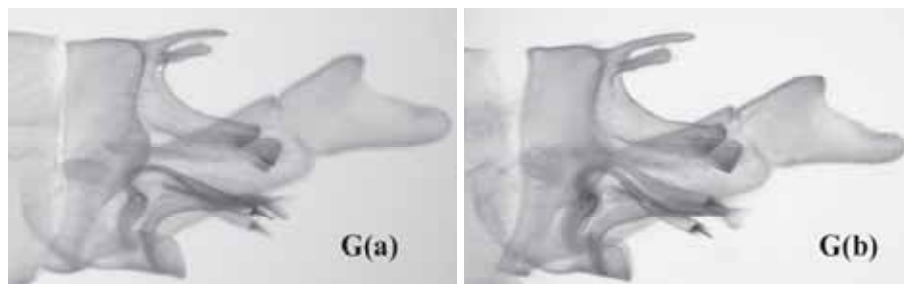


Fig. 8: Male genital structure of *R. hageni* lateral view, typical (a) and atypical (b) shape of parameres; specimens from the Gorce Mts.: G(a), G(b).

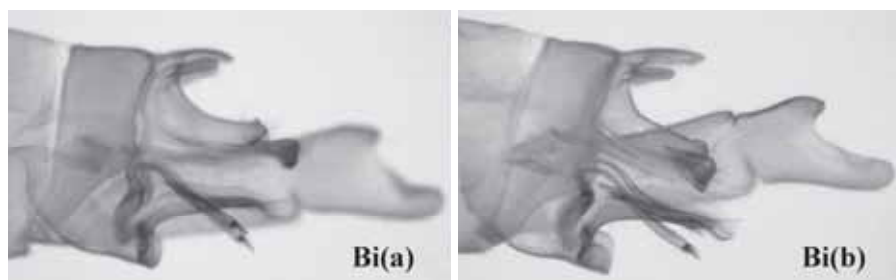


Fig. 9: Male genital structure of *R. polonica* lateral view, typical shape of parameres; specimens from the Bieszczady Mts.: Bi(a), Bi(b).

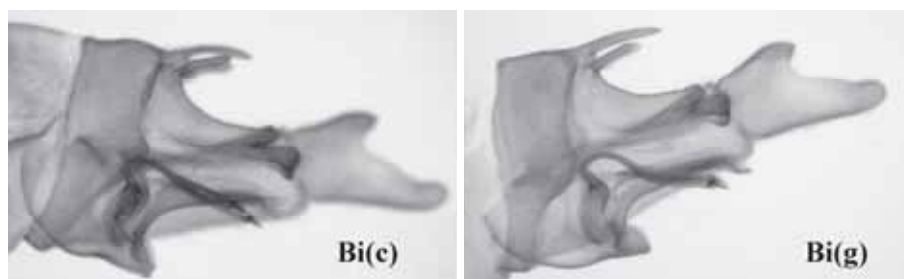


Fig. 10: Male genital structure of *R. polonica* lateral view, typical shape of parameres; specimens from the Bieszczady Mts.: Bi(c), Bi(g).

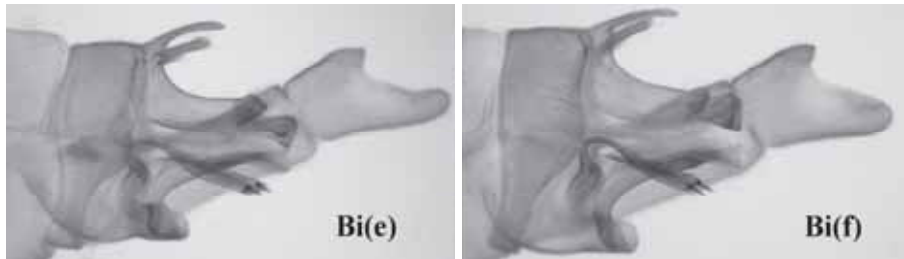


Fig. 11: Male genital structure of *R. polonica* lateral view, atypical shape of parameres; specimens from the Bieszczady Mts.: Bi(e), Bi(f).

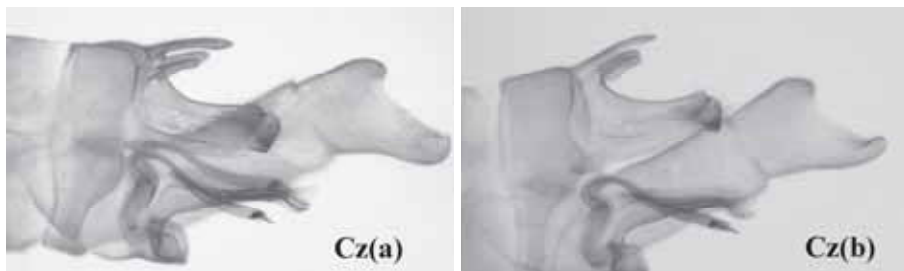


Fig. 12: Male genital structure of *R. polonica* lateral view, specimens from the Czarnohora Massive: Cz(a), Cz(b).

Conclusions

Studies of male genital structure of *Rhyacophila polonica* from the Sudetes as well as from the West and the East Carpathians revealed some taxonomic characters which indicate the presence of two populations, one in the West Carpathian and the Sudetes (with widened parameres) and the other in the East Carpathian (with not widened parameres). These taxonomic differences in populations of *R. polonica* from the Sudetes and the Carpathians may reflect periodic isolation of these two populations due to glaciations. The recovery of the taxon *R. hageni* in the rank of the subspecies *R. polonica hageni* seems, therefore, reasonable. More studies on variability of these taxa in other mountains in Central Europe are necessary.

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Zusammenfassung

SCHMID (1970) synonymisierte *Rhyacophila hageni* mit *R. polonica*. Unsere Untersuchung der männlichen Genitalstrukturen ergaben einige Unterschiede zwischen den Tieren von den Sudeten einerseits und von den West- und Ostkarpaten andererseits. Sie mögen bei einer angenommenen Isolation während des Pleistozäns entstanden sein, und die Erhebung von *R. hageni* als Subspezies von *R. polonica* wäre angemessen.

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