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Three new species of the *Rhithrogena hybrida* group from Poland and Czechoslovakia with a supplementary description of *R. hercynia* LANDA, 1969 (Ephemeroptera, Heptageniidae)

Trzy nowe gatunki grupy *Rhithrogena hybrida* z Polski i Czechosłowacji z uzupełniającym opisem *R. hercynia* LANDA, 1969 (Ephemeroptera, Heptageniidae)

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ABSTRACT. Three new species, *Rhithrogena circumtatica* n.sp. (imago male and female, subimago, nymph, egg), *R. podhalensis* n.sp. (imago male, subimago, nymph, egg) and *R. corconfica* n.sp. (imago male, nymph, egg) are described and illustrated from the Tatra Mts, Podhale region and the Krkonoše (Giant) Mts respectively. Distinguishing characters from other species of the *R. hybrida* group as well as supplementary description of *R. hercynia* LANDA, 1969 (imago male and female, subimago, nymph, egg) from the type-locality are given.

1. Introduction

The European species of *Rhithrogena* EATON, comprised in the *hybrida* group, are known to be very difficult for identification in both winged and larval stages. This seems to be confined to a relatively high similarity of external genitalia and difficulties in determining valuable differential morphological characters in nymphs and, on the other hand, to relatively brief original descriptions of some "earlier" species.

Recently, these difficulties should be, at least partially, eliminated by a very detailed descriptions and redescriptions and by using the egg chorionic characters (cf. SOWA 1971, 1984; BELFIORE 1983; SOWA and BELFIORE 1984; SARTORI and THOMAS 1984; SOWA et al. 1985).

The *R. hybrida* group is connected with montane streams and rivers of middle and high altitudes in Europe and comprises, according to our material, several still undescribed Alpine and Carpathian species. The present paper deals with a description of three of these new species. Two of these, *R. circumtatica* n.sp. and *R. podhalensis* n.sp., have been reported from Poland under the names of *R. hybrida* EATON and *R. hercynia* LANDA respectively (SOWA 1975a, 1975b). The third new species, *R. corcontica* n.sp., is closely related to the LANDA'S species. Based on the material from the type-locality the *R. hercynia* LANDA, 1969 is redescribed.

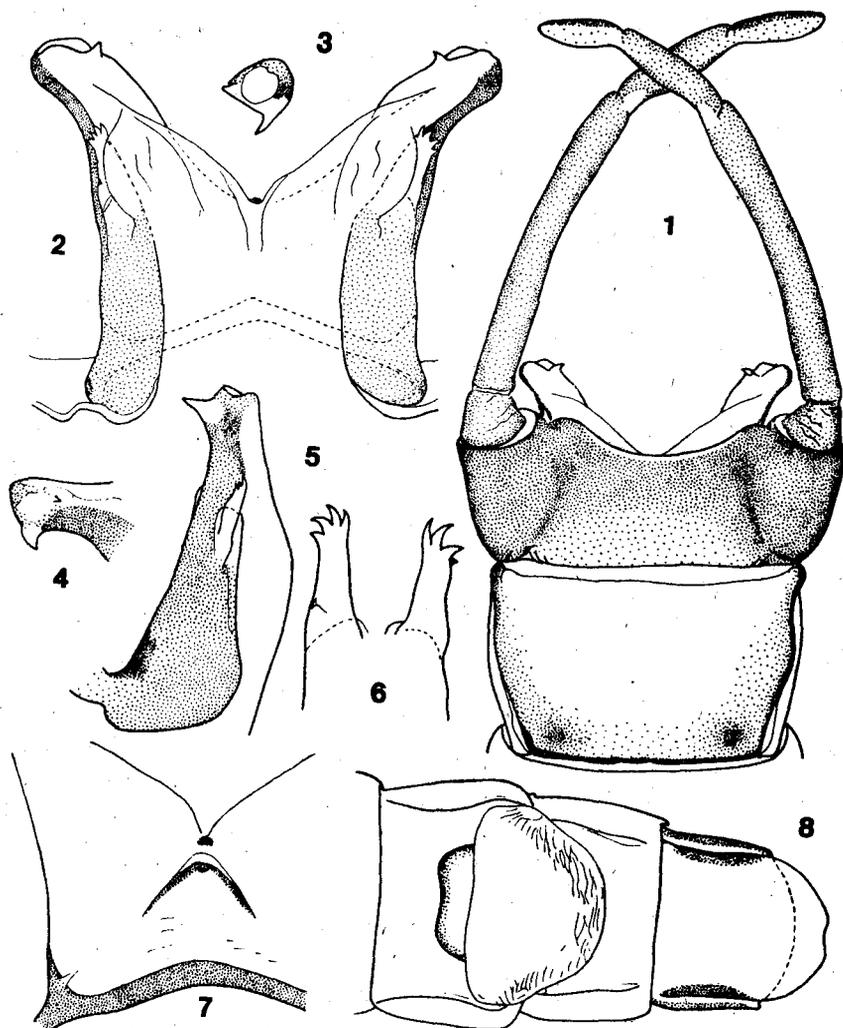
2. Description of the species (material in 75% alcohol)

2.1. *Rhithrogena circumtatica* n.sp.

Imago male. Body length 10–12 mm, length of fore wing 12–13.5 mm, of cerci 26–30 mm. Head and antennae dark brownish. Eyes brownish or silver-grey dorsally, darker laterally; longitudinal strips not distinguishable. Thorax pitch-brown, without special markings. Fore legs dark brownish, middle and hind ones paler, olive yellowish. All legs without dark spot or stippling on femora. Fore wings brownish in proximal half, progressively colourless towards the apex; longitudinal and cross veins unicolorous, dark brown; cross veins well apparent also in proximal part of costal membrane, simple cross veins in stigmatic area, big cross vein translucent. Abdomen paler than thorax, moderately translucent, without conspicuous markings. Nerve ganglia pale, whitish. Cerci dark brownish.

Genitalia. Styliger dark brownish, sometimes paler in the middle, its hind margin slightly and broadly incurved, lateral lobes directed slightly externally (Fig. 1). Styli dark brown. Penis lobes bow-like bent externally. In ventral view the medial portion of lobe, and partially also the titillator, covered with soft penial membrane (Fig. 2). In apical portion of lobe is apparent also its dorsal margin. Apical shape of right lobe in caudal view apparent from Fig. 3, and shape of left lobe, in parallel medial view apparent from Fig. 4; penial lobes moderately narrow proximally (Fig. 3) with slight incision between external tooth and hind lobe margin (Fig. 4). In lateral view (Fig. 5), external tooth and lobe apex form an obtuse angle. Dark, bumerang-like sclerotisation in the middle of penis apparent in dorsal view (Fig. 7). Titillators with apical teeth (Fig. 6).

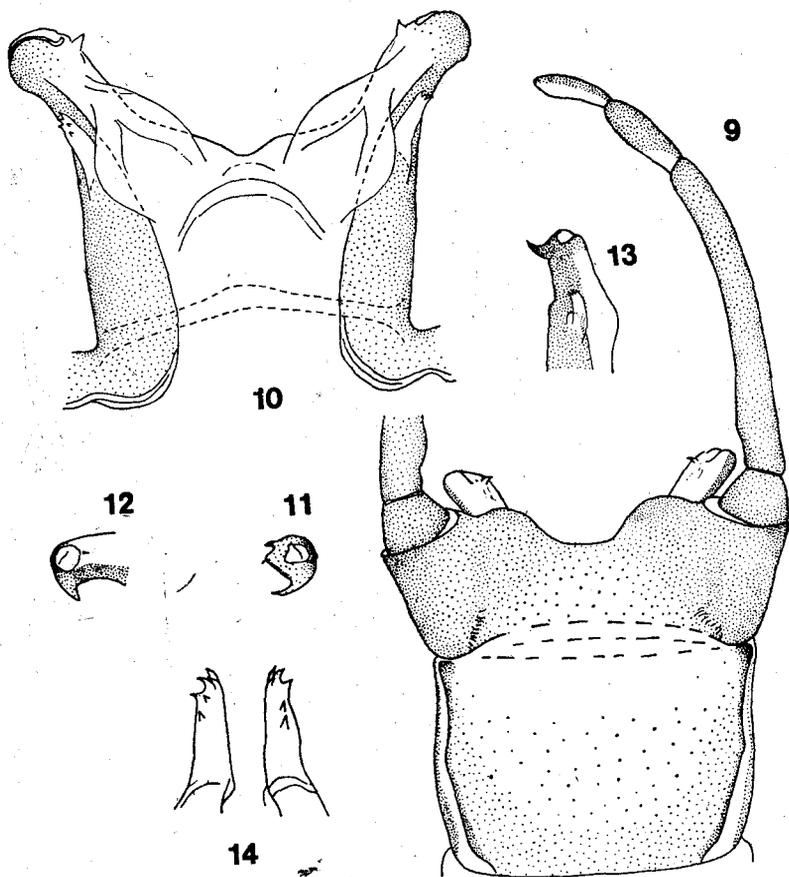
Subimago male: Body length 11 mm, length of fore wing 13 mm, length of cerci 16 mm. Head greyish dorsally, eyes coloured as in the male. Body paler, yellow brownish with greyish stippling. Wings grey, unicolorous, rath-



1-8. *Rhithrogena circumtatica* n.sp., imago ♂ (1-7) and ♀. 1 — genitalia, ventral view — organy płciowe, widok brzuszny, 2 — penis, ventral view — prącie, widok brzuszny, 3, 4 — apical part of the right penial lobe in caudal view, and proximal part of the left penial lobe in parallel medial view — szczytowa część prawego płata prącia widziana od ogona i proksymalna część lewego płata widziana odpowiednio od środka, 5 — penis in lateral view — prącie widziane z boku, 6 — titillators — łechtaczki, 7 — fragment of penis, dorsal view — fragment prącia, widok grzbietowy, 8 — terminal part of abdomen, ventral view — końcowa część odwłoka, widok brzuszny

er lights. Veins yellowish grey, cross veins without bordering. Hind margin of styliger deeply incurved, V-shaped. Posterolateral emarginations moderately pointed.

Female imago. Body length 11–12 mm, length of fore wings 12–14 mm, length of cerci 17 mm. Head grey, antennae brown, eyes dark. Thorax brown, fore legs brown, intermediate and hind legs greyish yellow. Fore wings transparent, veins unicolorous, dark brownish. Pterostigma milky, big cross vein



9–14. *Rhithrogena corcontica* n.sp., imago ♂. 9 – genitalia, ventral view – organy płciowe, widok brzuszny, 10 – penis, ventral view – prącie, widok brzuszny, 11, 12 – apical part of the right penial lobe in caudal view, and proximal part of the left penial lobe in parallel medial view – szczytowa część prawego płatu prącia widziana od ogona i proksymalna część lewego płatu widziana odpowiednio od środka, 13 – fragment of penis, lateral view – fragment prącia widziany z boku, 14 – titillators – łechtaczce

pale clear. Abdomen paler than thorax, sometimes of orange colour caused by the eggs inside. Posterior abdominal segments in ventral view as seen in Fig. 8. Cerci light brown, darker in basal part.

Subimago female — unknown.

Egg oval. Polar caps relatively large, situated on both egg poles (Fig. 31a), consisting of large adhesive elements and rather great rounded granulations (Fig. 31b). Exochorionic surface evenly covered with smaller adhesive elements and macrogranules (some of them with central incision) which tend to group themselves. These groups of several macrogranules often possess adhesive elements in the middle (Figs. 31a, 31b). Exochorionic surface covered also with numerous microgranules and irregular projections (Fig. 31b). Two or three micropyles in the equatorial area; their margins granulated.

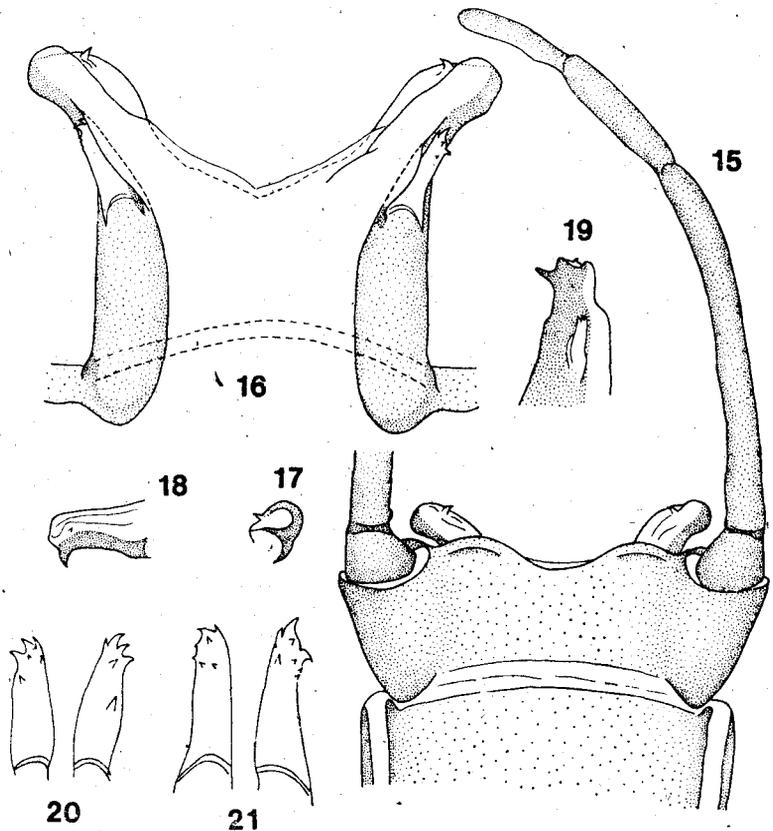
Nymph.

Body length 12–14 mm, cerci 10–12 mm. Body olive brownish, ventral side of body paler. Femora of all legs without dark spot or stippling in pale central area. Abdominal terga similar in colouration: Tergum 10, similarly to terga 9 and 8 pale, terga 7–4 darker, terga 3–1 gradually lighter. Nerve ganglia clear, pale. Middle combs of a distal part of maxillae consisting of 7–9 teeth. Spines of central portion of upper femur surface of hind legs of female nymph as in Fig. 39. Lamella of 1 gill apparently broader in its posterior part, anterior part of the lamella relatively long (Fig. 35). Medial sclerous of lamella of 2 gill conspicuously broader in its basal portion (Fig. 36). Lamella of the 6 gill conspicuously extended posteriorly (Fig. 37). Gill 7 as in Fig. 38. Central part of the posterior margin of 5 tergum as in Fig. 40. Teeth pointed, regularly triangular, broad at base, approximately the same length, fine; numerous microtrichia situated submarginally.

Material examined: Poland, Tatra Mts: holotype (imago male), paratype (imago male), Kościeliski stream, 1050 m, 9.08.1965. Other paratypes: 2 i. ♂♂, 1 i. ♀, 10 nymphs, idem., 950 m, 30.07.1962; 16 i. ♂♂, 2 i. ♀♀, 1 si. ♂, 2 nymphs, 1 ex. nymph., Chochołowski stream, 990 m, 23.06.1970; 10 nymphs, Olczyski stream, 980 m, 10.04.1963; Podhale: 2 nymphs, Białka River near Jurgów, 780 m, 10.05.1965; Beskidy, Babia Góra Range, 21 i. ♂♂, 1 i., ♀, 11 nymphs, Słonów stream, 745 m, 10.05.1960 and 24.06.1965. Leg. R. SOWA. For other localities in Poland see also SOWA (1975a) under the name *R. hybrida* ETN. Holotype (genitalia on slide) and most of the paratypes in the collection of R. SOWA (Jagiellonian University, Kraków); some paratypes in the collection of junior author.

Etymology: Named after distributional pattern of this species showing a circle round the Tatra Mts with several localities also in Czechoslovakia (see e.g. LANDA, 1969, 1970 as *R. hybrida* ETN.).

Affinities. *R. circumtetrica* n.sp. seems to be closely related to the *R. hybrida* ETN. It is distinguished from this species by larger body size and mainly by details in the form of penis: only moderately triangular (rather quadrate) shape of apical portion of lobe in caudal view and presence of the bumerang-like sclerite in the middle of penis in dorsal view. Also the shape of sternum 9 (male) and of subgenital plate (female) are different. More distinctive characters contain the structure of egg chorion and the form of posterior margin of nymphal terga.



15-21. *Rhithrogena podhalensis* n.sp., imago ♂. 15 — genitalia, ventral view — organy płciowe, widok brzuszny, 16 — penis, ventral view — prącie, widok brzuszny, 17, 18 — apical part of the right penial lobe in caudal view, and proximal part of the left penial lobe in parallel medial view — szczytowa część prawego płata widziana od ogona i proksymalna część lewego płata widziana odpowiednio od środka, 19 — fragment of penis, lateral view — fragment prącia widziany z boku, 20, 21 — titillators — łechtaczce

2.2. *Rhithrogena corcontica* n.sp.

Imago male: Body length 11.5 mm, length of fore wing 12.0–12.5 mm, cerci 28–30 mm. Head and antennae brown. Eyes large, beige grey dorsally, basal portion darker, dark silver. Thorax dark brown, especially metathorax, soft lateral parts of thorax light yellowish. Fore wing rather conspicuously coloured with brown in basal half. Veins unicolorous, dark brown, big transversal vein light. Fore legs brown, middle and hind legs yellowish brown; femora of all legs with elongate dark spot situated dorsally in their central part. Abdomen dark, terga darker than sterna, segment borders paler. Terga with light markings: in the centre of tergum a longitudinal tiny line, near the anterior margin of tergum a pair of spots and near their posterior margin another pair of smaller spots. Nerve ganglia very slightly stippled with violet. Cerci dark brown.

Genitalia. Styliger brown laterally, paler in the middle. Posterior margin of styliger deeply incurved (Fig. 9). Penis with well developed membranous part at the base of lobes in ventral view (Fig. 10). Inner margin of penis lobe slightly convex in distal portion, covered with a membranous folds in proximal portion. In caudal view, penis lobe semi-quadratic, margins not convergent in internal (proximal) part (Fig. 11). In parallel medial view apical margin of penis lobe straight, not concave (Fig. 12). In lateral view external tooth and apical margin of penis lobe apparent as rounded, concave contour (Fig. 13). Titillators with teeth at apex, covered with supplementary teeth on their surface (Fig. 14).

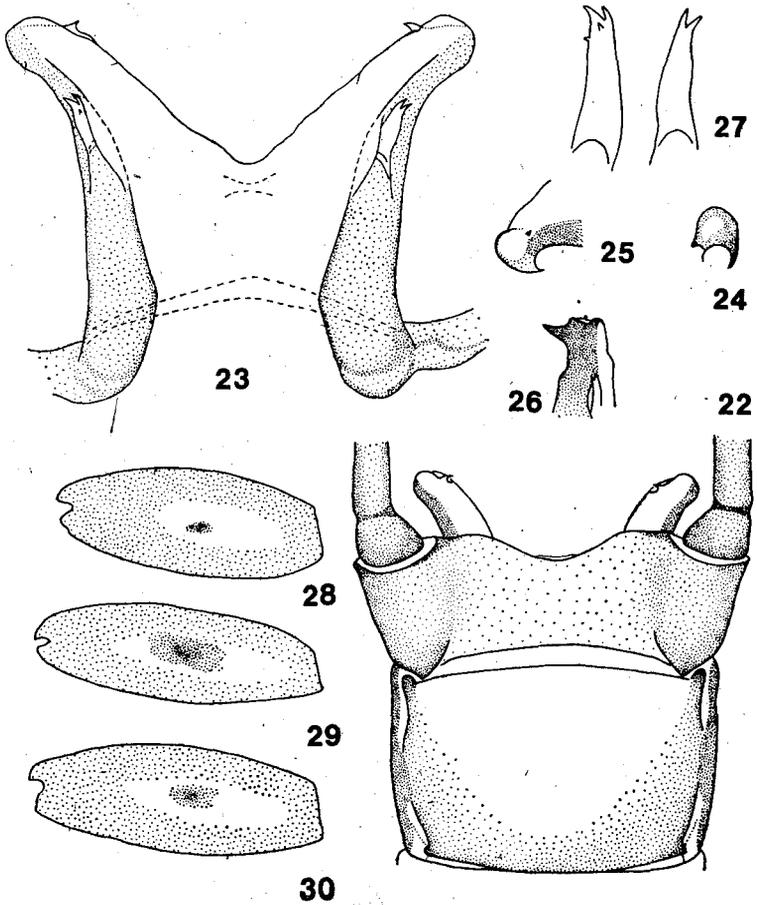
Imago female and subimagos — unknowns.

Egg (from mature nymph).

Egg oval; polar cap situated at only one of the poles (Fig. 32a), smaller than that of *R. circumtrica*, with rounded granules among adhesive elements. Smaller granulation also on the opposite pole. Exochorionic surface with sparse adhesive elements evidently smaller than those in the polar cap. Macrogranules on chorion surface tend to concentrate into groups consisting of 3–5 granules. Macrogranules usually pointed and directed obliquely to the pole without polar cap (Fig. 32b). Microgranules scattered randomly on the egg surface. Two or three micropyles in the equatorial area; their margins granulated.

Nymph. Body length 10–11 mm, cerci 9.0–9.5 mm. Body generally pale, yellowish brown. Head sometimes paler between eyes. Femora of all legs with small dark spot in middle of light central area (Fig. 28); this spot sometimes hardly distinguishable. Nerve ganglia light, sometimes slightly stippled with violet. Tergum 10 dark brown, darker than remaining terga; a pair

of large pale spots separated by dark elongated central band on the terga 9–7 (characteristic for this species!); terga 6 and 5 dark, terga 4–1 gradually paler. Middle combs of distal part of maxilla consisting of 11–13 teeth (Fig. 47). Spines from the central part of dorsal surface of hind femora as in Fig. 45 (male nymph). Claws with 2 teeth. Anterior margin of lateral sclerite of first



22–30. *Rhithrogena hercynia* LANDA, imago ♂ (22–27), nymph (29), *R. corcontica* n.sp., nymph (28) and *R. podhalensis* n.sp., nymph (30). 22 – genitalia in ventral view – organy płciowe, widok brzuszny, 23 – penis, ventral view – prącie, widok brzuszny, 24, 25 – apical part of the right penial lobe in caudal view, and proximal part of the left penial lobe in parallel medial view – szczytowa część prawego płatu prącia widziana od ogona i proksymalna część lewego płatu widziana odpowiednio od środka, 26 – fragment of penis, lateral view – fragment prącia widziany z boku, 28–30 – markings on dorsal surface of hind femora – uplamienie na grzbietowej stronie tylnego uda

abdominal sternum directed very slightly posteriorly. Posterior portion of lamella of gill 1 not broader than the anterior one; anterior portion relatively short, with concave inner margin (Fig. 41). Medial sclerite of lamella of gill 2 narrow, of the equal width from base to its apex (Fig. 42). Lamella of gill 6 conspicuously extended apically (Fig. 43). Gill 7 as in Fig. 44. Central portion of the posterior margin of abdominal tergum 5 as in Fig. 46: teeth bluntly pointed or rounded at apex, relatively narrow, slender and evidently separated at their base. Submarginal microdenticles scarce.

Material examined: Czechoslovakia: Krkonoše (Giant) Mts. Holotype imago male, paratypes 11 i. ♂♂, 88 nymphs, Lysečinský stream, Lysečiny, 700 m, 10.06.1982. Leg. T. SOLDÁN. Holotype and paratypes in the collection of T. SOLDÁN, some paratypes in the collection of the senior author.

Etymology: named after the Latin name of the Krkonoše (Giant) Mountains, situated on the border of Poland and Czechoslovakia.

Affinities. *R. corcontica* n.sp. seems to be closely related to *R. hercynia* LANDA, especially as to the shape of apical part of penis lobe in caudal and medial views. It differs from this species in the following characters: colouration of nerve ganglia, shape of posterior margin of styliger, broader and more convex apical margin of penis lobe in ventral view with partially visible also the dorsal margin, and well developed membranous part at the base of penis lobes. The latter character also distinguishes *R. corcontica* n.sp. from other species of the *hybrida* group. Structure of egg chorion and of abdominal terga of nymph as well as colouration of nymphal abdomen furnish the other additional distinctive features.

2.3. *Rhithrogena podhalensis* n.sp.

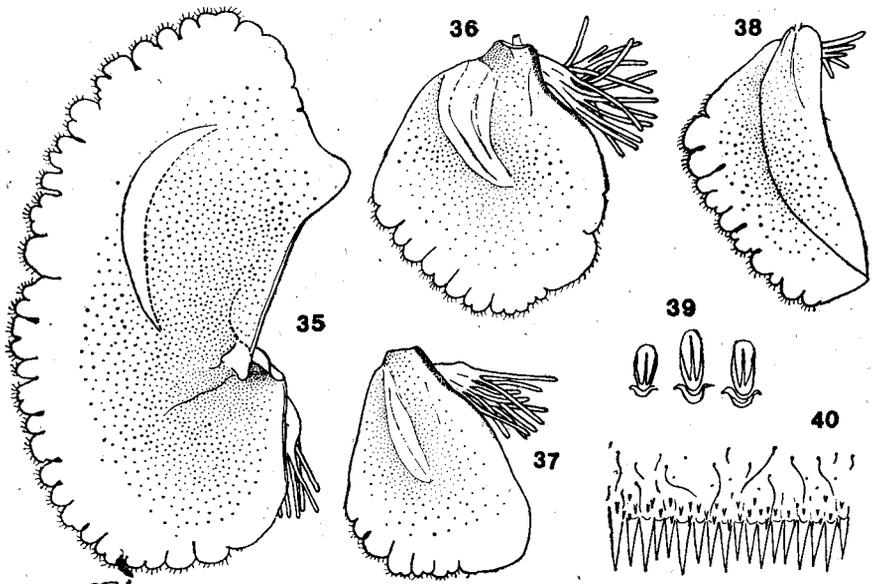
Imago male: Body length 11 mm, length of fore wing 12 mm, cerci 25 mm. Head brown, antennae pale brownish. Eyes silver greyish, dark in basal portion. Thorax dark brown, paler laterally. Fore wings transparent, near the very base inconspicuously brown. Veins dark brown, C and Sc lighter. Big transversal vein light. Cross veins in proximal half of costal area hardly distinguishable. Pterostigma milky, with simple cross veins. Fore legs dark brown, middle and hind ones paler, grey yellowish; femora of all legs with well visible elongated dark spot in the middle. Abdomen light brown without any conspicuous markings. Nerve ganglia clear, incolorous. Cerci brown.

Genitalia. Styliger light brownish, darker laterally; its posterior margin rather deeply and narrowly incised. Styli relatively slender (Fig. 15). Inner margin of penis lobe strongly convex, covered (by 1/2 of its length) with a flat membranous fold in ventral view: the fold extended to the portion

of internal tooth, dividing the lobe into two parts (Fig. 16). In caudal view apex of penis lobe semitriangular, its margins convergent proximally (Fig. 17); in parallel medial view, margin of penis lobe between external tooth and apex of lobe concave; in lateral view, the upper margin of external tooth and apex of lobe form the right angle (Fig. 19). Titillators with supplementary teeth on their surface (Fig. 20 and 21).

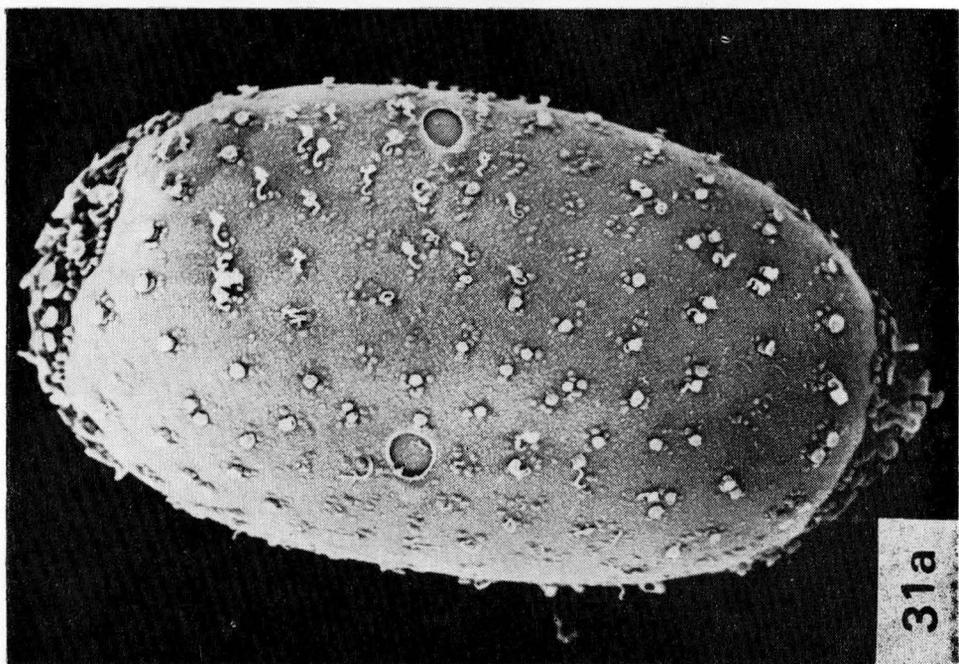
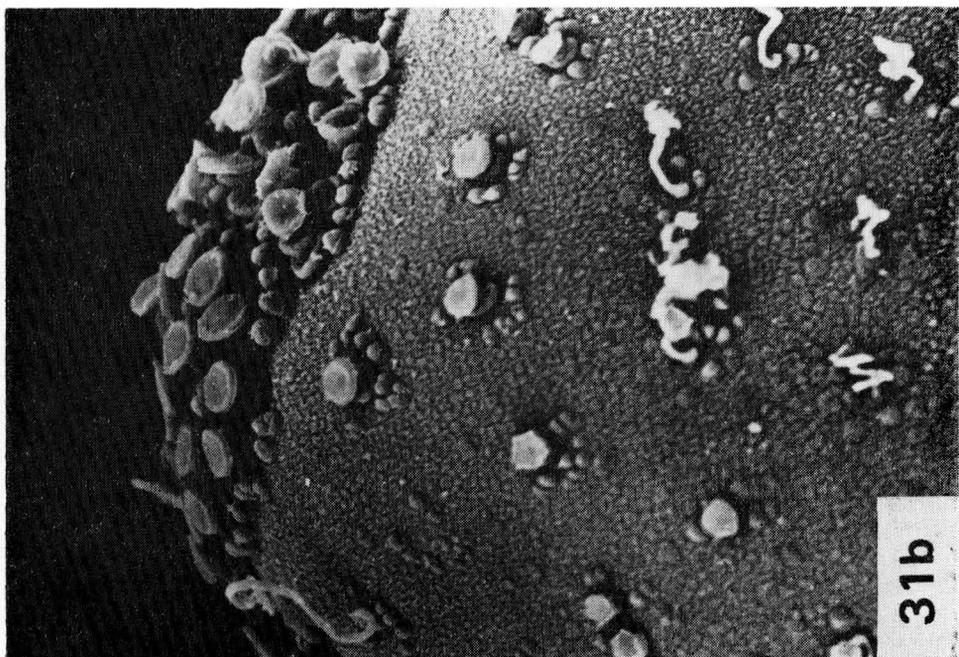
Subimago male and imago female — unknown.

Subimago female: Body length 9–11.5 mm, length of fore wing 11.0–12.5 mm, cerci 9–10 mm. Body pale, grey yellowish, abdomen shaded with orange. Fore wings lights, grey yellowish, unicolorous. Veins well apparent, slightly darker. Cerci grey brown. Femora of all legs with dark spot as in imago male. Tergum 10 with slight incurvation in the middle of its posterior margin.

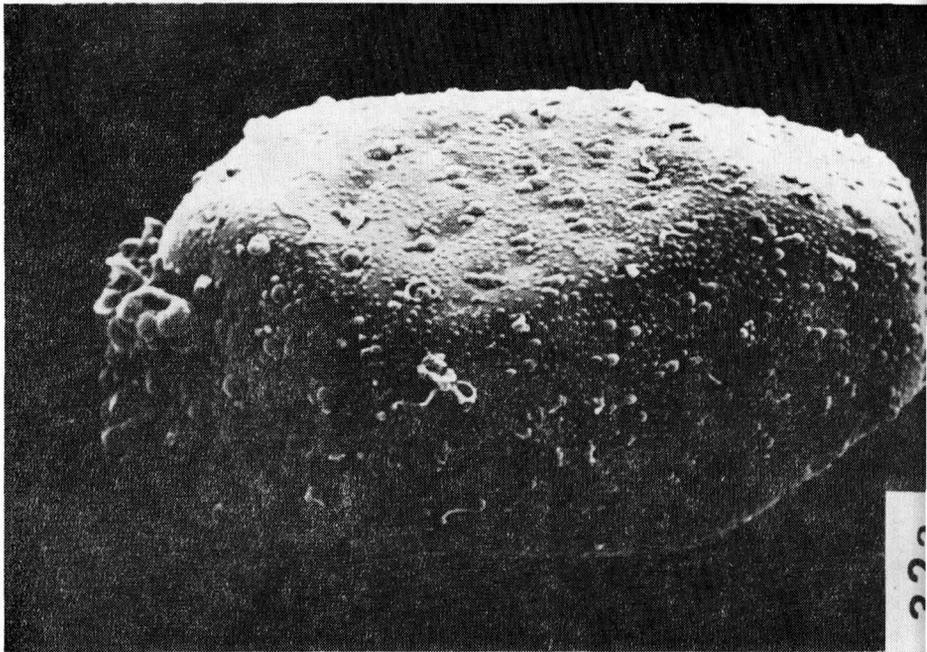
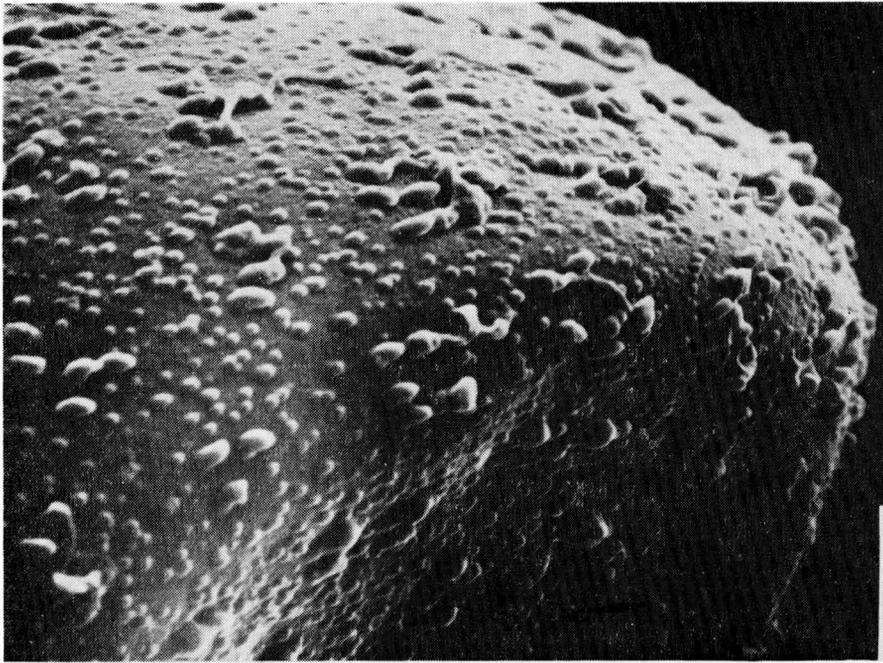


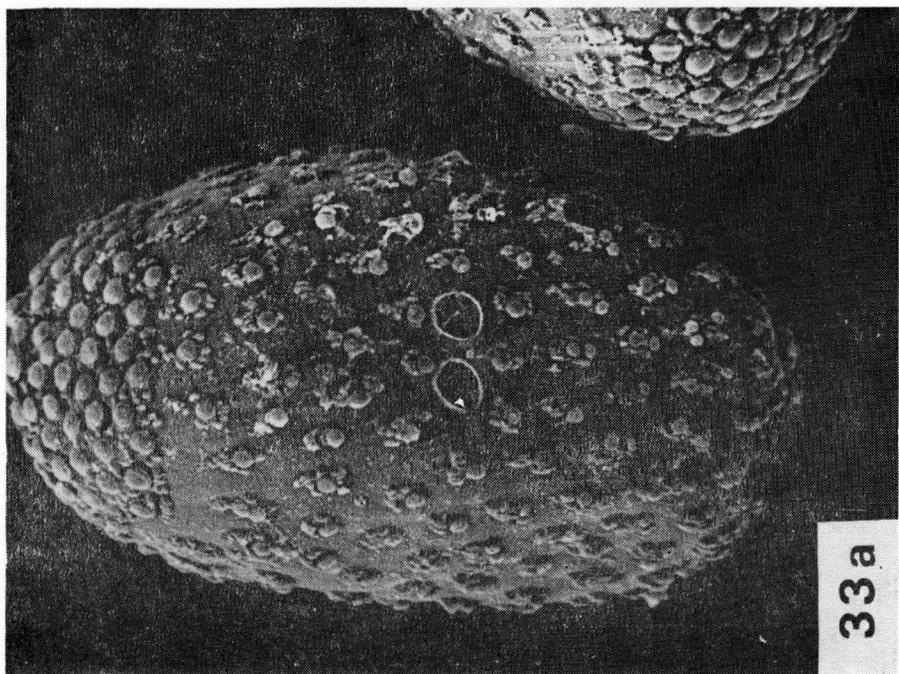
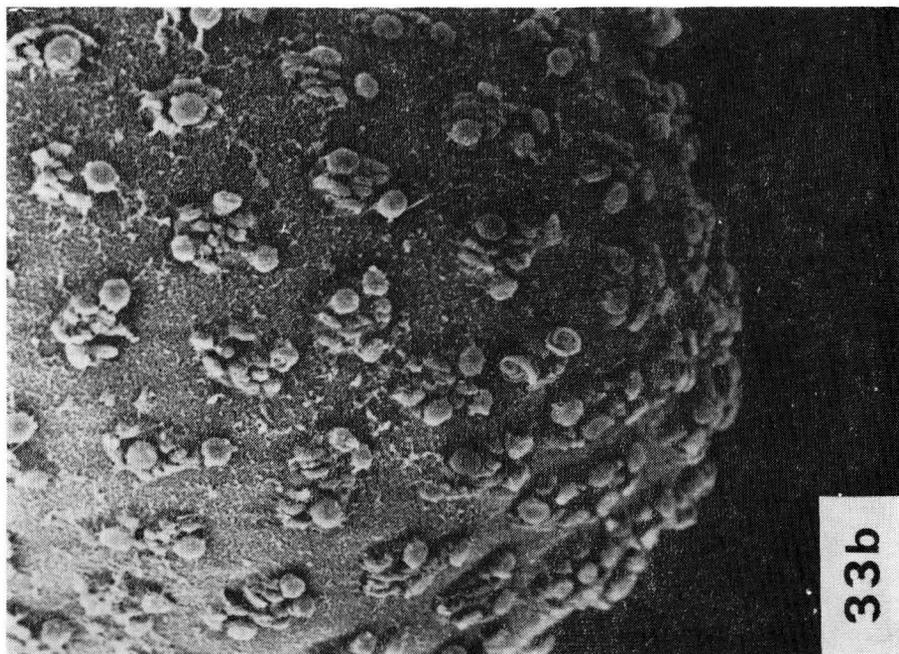
35–40. *R. circumtatica* n.sp., nymph — nimfa. 35 — first gill — pierwsza skrzelotchawka, 36 — second gill — druga skrzelotchawka, 37 — sixth gill — szósta skrzelotchawka, 38 — seventh gill — siódma skrzelotchawka, 39 — spines from central part of hind femur — kolce z środkowej części tylnego uda, 40 — central portion of the posterior margin of abdominal tergum 5 — środkowa część tylnego brzegu 5. tergitu odwłoka

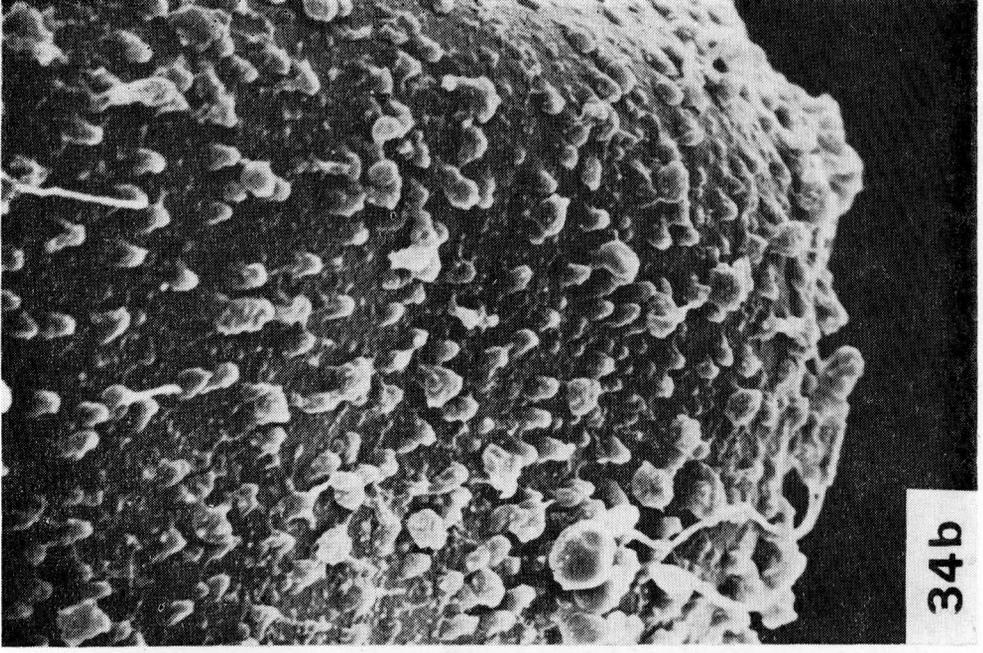
Egg. Egg oval; very wide polar cap only on one of the egg poles (Fig. 33a). Among large adhesive elements a low macrogranules, absent on the opposite pole. Exochorionic surface with macrogranules, tending to concentrate themselves into groups of 6–10 elements, of irregular shape and differ-



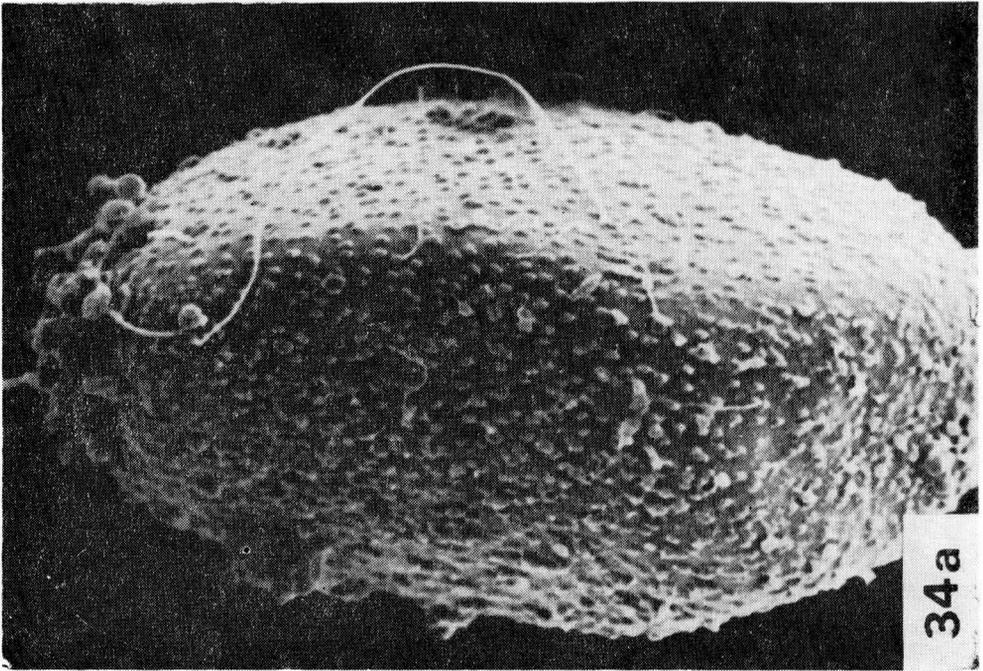
31–34. *Rhithrogena circumtatica* n.sp. (31a, 31b), *R. corcontica* n.sp. (32a, 32b), *R. podhalensis* n.sp. (33a, 33b) and *R. hercynia* LANDA (34a, 34b), eggs – jaja. 31a–34a – egg in total ($\times 370$) – jajo w całości, 31b–34b – fragment of egg, more enlarged ($\times 1100$) – fragment jaja w powiększeniu. Critical point dried, gold coated, Tesla BS 300 at 15kV







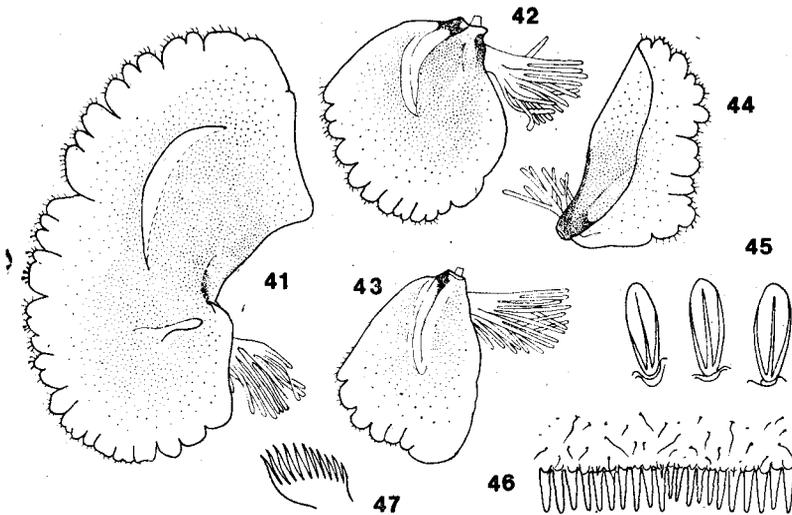
34b



34a

entiated size. Single adhesive elements, smaller than those in polar cap, often present in middle of groups of macrogranules (Fig. 33b). Microgranules practically lacking, chorionic surface of egg divided into numerous delicate fields. Two or three micropyles in the equatorial area of egg. Margins of micropyles slightly elevated with small, rounded projections.

Nymph. Body length 11–12 mm, cerci 8–10 mm. Body generally olive brown. Femora of all legs with large dark spot in light central area (Fig. 30). Nerve ganglia clear. Tergum 10 dark brown; terga 9 and 8 whole or nearly whole light; terga 7–4 dark brown, terga 3–1 progressively lighter. Central combs of distal portion of maxillar lacinia with 7–9 teeth. Spines of central part of dorsal surface of hind femora (female nymph) as in Fig. 51. Claws of legs with 1–2 teeth. Posterior part of lamella of gill 1 not broader than the anterior one, anterior part relatively long, its inner margin slightly concave (Fig. 48). Central sclerite of lamella of gill 2 relatively broad (Fig. 49); lamella of gill 6 rather slightly extended apically (Fig. 50). Central portion of posterior margin of abdominal tergum 5 as in Fig. 52: teeth pointed, triangular, of different length; numerous submarginal microdenticles.



41–47. *R. corcontica* n.sp., nymph – nimfa. 41 – first gill – pierwsza skrzelotchawka, 42 – second gill – druga skrzelotchawka, 43 – sixth gill – szósta skrzelotchawka, 44 – seventh gill – siódma skrzelotchawka, 45 – spines from central part of hind femur – kolce z środkowej części tylnego uda, 46 – central portion of the posterior margin of abdominal tergum 5 – środkowa część tylnego brzegu 5. tergitu odwłoka, 47 – pectinate spine from the terminal part of maxilla – grzebyk z końcowej części żuchwy

Material examined: Poland: Podhale Region. Holotype (imago male) Białka River at Białka Tatrzańska, 600 m, 27.05.1971. Paratypes: 6 si ♀♀, 32 nymphs, 9 nymphal exuviae, idem., 3.06.1970; 3 nymphs, idem., 19.05.1966; 1 nymph, Biały Dunajec River above Nowy Targ, 595 m, 24.04.1961. Leg. R. SOWA. For other localities in Poland see SOWA (1975a) under the name *R. hercynia* LANDA. Holotype (genitalia on slide) and paratypes in the collection of R. SOWA (Jagiellonian University, Kraków); some paratypes in the collection of the junior author.

Etymology: Named after the Podhale Region, the place of the first discovery of this species.

Affinities. *R. podhalensis* n.sp. is distinguished from all remaining species of *hybrida* group by a characteristic shape of penis lobes in ventral view. It differs from *R. hercynia* LANDA in having triangular shape of apical portion of penial lobe in caudal and medial views, and from all the species described here by apparently paler the first two longitudinal veins of fore wings. Egg chorionic structure, colouration of terga of nymphs as well as form of posterior margin of nymphal terga are also distinctive.

2.4. *Rhithrogena hercynia* Landa, 1969

Since this species has been described by LANDA (1969, 1970) in detail, we concentrate below only on precision of the original description, intraspecific variability, and details of some differential characters.

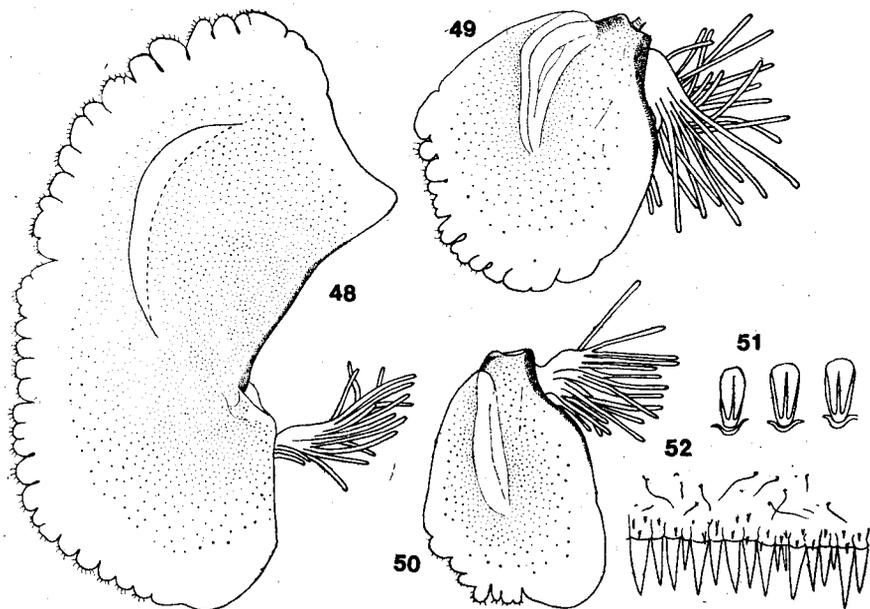
Imago male: Body length 10.5 mm, length of fore wing 11.5 mm, cerci 24 mm. Fore wings transparent, slightly light brown only near the very base. Femora of all legs with elongated large dark spot, nearly as long as 1/3 of femur length. Nerve ganglia not pigmented, clear. Big cross vein light. Cross veins of costal area hardly distinguishable.

Genitalia. Posterior margin of styliger moderately concave (Fig. 22). Penis lobes narrowed to the apex in ventral view, dorsoapical margin not visible, internal tooth situated near the apex of lobes (Fig. 23). Membraneous part at the base of penis lobes not developed. In caudal view the apex of penis lobe rounded, the margins not convergent proximally (Fig. 24). In parallel medial view, the apical margin of penis lobe rounded as well, not concave (Fig. 25). In lateral view, the right angle apparent between apical margin of lobe and hind margin of its external tooth; external tooth of lobe situated nearly apically (Fig. 26). Titillators with 2-4 apical teeth (Fig. 27).

Imago female. Body length 11 mm, length of fore wing 12.5 mm, cerci 14 mm. Eyes greyish silver with two dark bands situated laterally. Fore wing transparent, venation unicolorous, dark brown. Cross veins in the costal

area hardly visible. Big cross vein light. Femora of all legs with dark elongated spot, as long as $1/3$ of the femur length. Subgenital plate slightly incised at hind margin.

Subimago male: Body length 10 mm, length of fore wing 11.5 mm, cerci 16 mm. Fore wings grey, unicolorous, venation slightly darker. Femora of all legs with large diffuse dark spot.

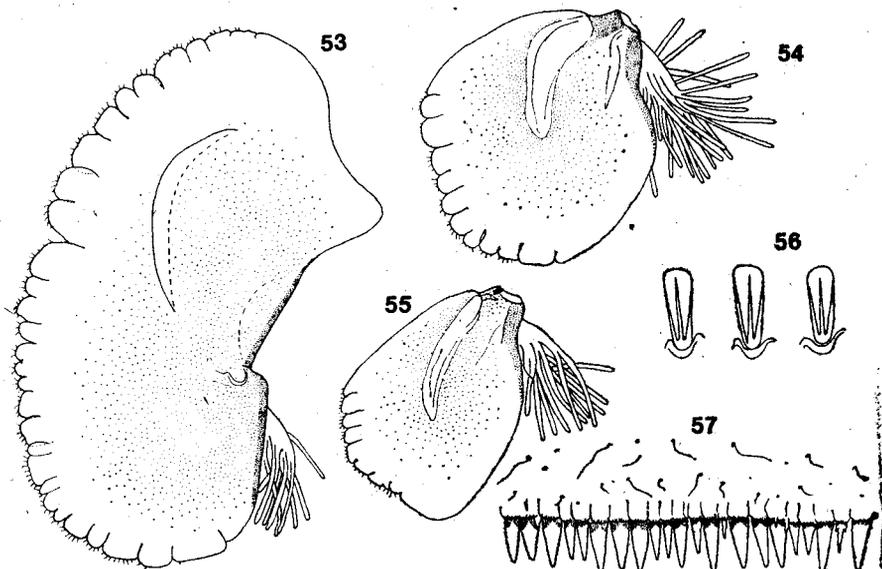


48-52. *R. podhalensis* n.sp., nymph - nimfa. 48 - first gill - pierwsza skrzelotchawka, 49 - second gill - druga skrzelotchawka, 50 - sixth gill - szósta skrzelotchawka, 51 - spines from central part of hind femur - kolce z środkowej części tylnego uda, 52 - central portion of the posterior margin of abdominal tergum 5 - środkowa część tylnego brzegu 5. tergitu odwłoka

Subimago female: Body length 11-12 mm, length of fore wing 12.5 mm, cerci 13 mm. Wing colouration as in subimago male; dark spot on femora of all legs as in imago female. Abdomen without apparent markings.

Egg. Egg oval; polar cap small, present only on one of the egg poles (Fig. 34a). Smaller, single adhesive elements sparsely situated also on the rest of the exochorionic surface. Macro- and mesogranules randomly dispersed on the chorion; tendency to their grouping into irregular rings apparent only in areas adjacent to the polar cap. Similarly to *R. corcontica* n.sp., these acuminate granules are obliquely oriented to the pole opposite to polar cap. Mi-

crogranules also present, apparently differentiated in size (Fig. 34b). Two or three micropyles in the equatorial position; margins of micropyle and sperm guide conspicuously granulated.



53–57. *R. hercynia* LANDA, nymph – nimfa. 53 – first gill – pierwsza skrzelotchawka, 54 – second gill – druga skrzelotchawka, 55 – sixth gill – szósta skrzelotchawka, 56 – spines from central part of hind femur – kolce z środkowej części tylnego uda, 57 – central portion of the posterior margin of abdominal tergum 5 – środkowa część tylnego brzegu 5. tergitu odwłoka

Nymph. Body length 10.0–11.5 mm, cerci 8–9 mm. Body generally olive brown, dark; mesonotum with large, light anchor-like spot. Femora of all legs with large dark, elongated spot with diffuse margins; this spot, as long as 1/3 of femur length, filling nearly the whole light central area of femur (Fig. 29). Nerve ganglia light. Colour pattern of abdominal terga similar to those of *R. podhalensis* n.sp. Central combs of distal part of maxillar lacinia with 8–10 teeth. Spines from central part of dorsal surface of hind femur as in Fig. 56. Claws with 1–2 teeth. Gills (Figs 53–55) similar to those of *R. podhalensis* n.sp. except more quadratic lamella of gill 2 (Fig. 54). Central part of posterior margin of abdominal sternum 5 as in Fig. 57: teeth differentiated in length, brownish at base; submarginal microdentacles scarce.

Material examined: Czechoslovakia, South Bohemia: Otava River, Sušice, 615 m, 1♂i, 3♀♀i, 2♂♂si, 5♀♀si, 45 nymphs, 3 nymphal exuviae; 14.05.1984; idem., 6 nymphs, 5.04.1974. Leg. T. SOLDÁN.

3. Distribution and biology

R. circumtatrica is distributed in larger streams of the Polish as well as of Czechoslovak part of the Tatra (High Tatra) Mts reaching the altitudes of about 1000 m a.s.l. It occurs also in montane rivers of the northern Tatra slopes (Czarny Dunajec and Białka Rivers) descending to about 600 m; probably not spread in the Biały Dunajec river because of pollution downstream of Zakopane. *R. circumtatrica* cohabits with *R. podhalensis* (Białka, Czarny Dunajec) at some localities, as well as with *R. loyolaea* NAVÁS in the Tatra and Babia Góra Range (SOWA 1975a) where it inhabits principally the localities downstream to those of *R. loyolaea*. *R. podhalensis* possesses, similarly to *R. corcontica* (single locality in the eastern part of the Krkonoše) and to *R. hercynia* (the Bohemian Forest), relatively very restricted area of distribution. Nymphs of *R. corcontica* were found in several small and shallow streams at altitudes of 600–900 m, those of *R. hercynia* prefer large streams and, preferably submontane rivers at altitudes of 400–750 m.

All the above species belongs to the monovoltine "winter" developmental type (cf. LANDA 1969, SOWA 1975b); adults fly in spring. *R. circumtatrica* starts to fly in the late spring and continue the emergence in high altitudes during the summer. At common localities in the Białka River, *R. podhalensis* starts to fly a little earlier — from the end of April. Adults of *R. hercynia* and *R. corcontica* fly in the end of April and during the May (LANDA 1969, 1970) or June, to the beginning of July respectively at the type localities. Nymphs of all these species appear in streams in autumn (SOWA 1975b) those of *R. hercynia* even in August (Šumava Mts).

STRESZCZENIE

Opisano i zilustrowano trzy nowe gatunki *Rhithrogena* EATON z grupy *hybrida*, odszukane w Polsce i na terenie Czechosłowacji: *R. circumtatrica* n.sp. (dorosłego samca i samicę, subimago, larwę i jajo; fig. 1–8, 31a, 31b, 35–40), *R. corcontica* n.sp. (dorosłego samca, larwę, jajo; fig. 9–14, 28, 32a, 32b, 41–47), *R. podhalensis* n.sp. (dorosłego samca, subimago, larwę i jajo; fig. 15–21, 30, 33a, 33b, 48–52). Uzupełniono opis pokrewnego gatunku *R. hercynia* LANDA, 1969 (dorosłego samca i samicę, subimago, larwę i jajo; fig. 22–27, 29, 34a, 34b, 53–57). Przeprowadzono dyskusję różnic systematycznych w stosunku do innych pokrewnych gatunków z grupy *hybrida*.

R. circumtatrica żyje w dużych potokach po północnej i po południowej stronie Tatr, dochodząc do wysokości 1000 m n.p.m. Znajdywana jest też w rzekach podhalańskich, gdzie schodzi aż do około 600 m wysokości.

R. podhalensis znana jest z rzek Podhala: Czarnego Dunajca i Białki. Starsze stanowiska w Białym Dunajcu są prawdopodobnie nieaktualne ze względu na znaczne zanieczyszczenie tej rzeki (SOWA 1975a, jako *R. hercynia* LANDA). Również *R. corcontica* ma ograniczony areał występowania: jedno stanowisko we wschodniej części Karkonoszy po stronie czzechosłowackiej.

Wszystkie cztery gatunki mają roczny cykl życiowy, należąc do tzw. gatunków zimowych: larwy są obecne także w zimie. *R. circumtetrica* wylatuje późną wiosną, a na wyższych stanowiskach kontynuuje wylot w ciągu lata. *R. podhalensis* rozpoczyna wylot wcześniej bo od końca kwietnia. Postacie dorosłe *R. corcontica* i *R. hercynia* obecne są od końca kwietnia aż do czerwca lub nawet do początku lipca w zależności od wysokości n.p.m. Dające się rozpoznać larwy pojawiają się w ciekach w jesieni.

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