

A new species in the *Rhyacophila vagrita* group (Trichoptera: Rhyacophilidae) from Olympic National Park, Washington, USA

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Abstract. *Rhyacophila bifurcata* **sp. nov.** is described from males collected in Olympic National Park, Washington. The new species is most similar to *R. milnei* Ross, 1950. A diagnosis and discussion of the *R. vagrita* group are given.

Key Words. Trichoptera, Rhyacophilidae, *Rhyacophila*, *vagrita* group, Olympic National Park, new species.

INTRODUCTION

Rhyacophila vagrita Milne, 1936 was described from specimens collected in British Columbia and Alberta, Canada. Ross (1950), while examining *R. vagrita* paratypes from Alberta, discovered four males that did not fit the *R. vagrita* description. These he described and named *R. milnei* Ross, 1950. Ross (1956) established the *R. vagrita* group for *R. vagrita* and *R. milnei* based primarily on the synapomorphies of the “curious dorsal projections of both ninth and tenth tergites”, a very small simple aedeagus, and “a curious development of the apical band and anal sclerite”. Schmid (1970) indicated that males of the *vagrita* group have genitalia that are among the most unique in all of the species of *Rhyacophila*. While collecting in Olympic National Park, Washington, USA, we discovered an undescribed *Rhyacophila* species, most similar to *R. milnei*, with structures as remarkable as those described for *R. vagrita* and *R. milnei*.

METHODS AND MATERIALS

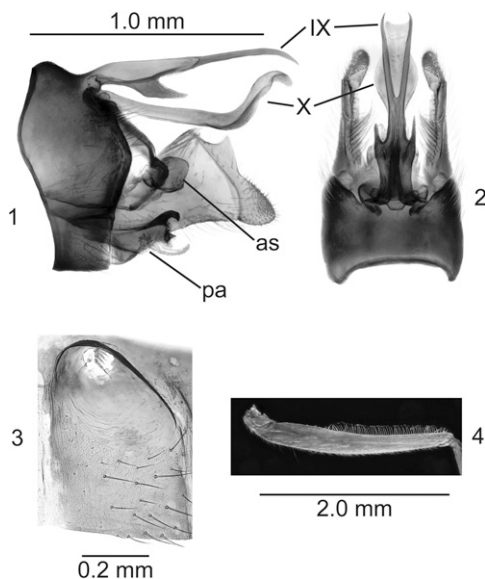
Adults were collected with a beating sheet and heavy-duty aerial net. The primary streamside vegetation of the streams being sampled was yellow cedar [*Cupressus nootkatensis* D. Don (Cupressaceae)]. The structure of these plants was not conducive to using a typical aerial net for sweeping. Adult caddisflies were extremely active at the time of collection because of warm temperatures, and individual adults would quickly fly off of the beating sheet after landing. The most effective collecting method was to beat the branches with the net while holding the beating sheet under the branch then quickly pulling the sheet downward while sweeping over the sheet surface with the net. Specimens were preserved in 75% ethanol. Abdomens were removed and cleared for study by soaking in a 10% KOH solution. Photos were taken using an Olympus CX41 compound scope, with a Martin Microscope Company MM-SLR adapter lens, and a Sony NEX 6 camera. Images were montaged using Zerene Stacker (Zerene Systems LLC, Richland, WA). Images were further modified and plates were laid out using Adobe PhotoShop.

RESULTS

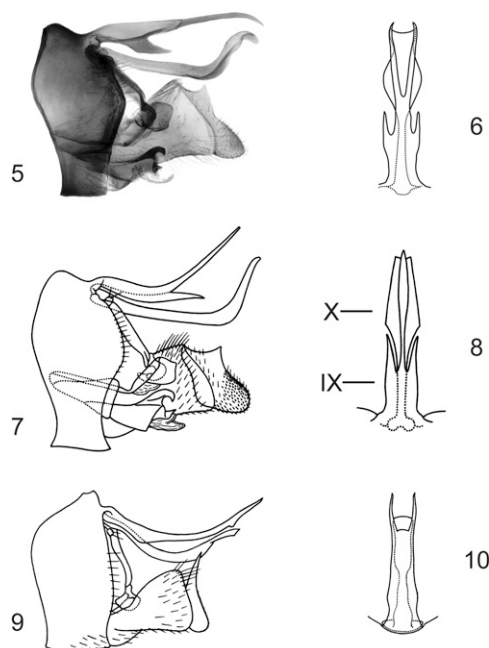
Rhyacophila bifurcata **sp. nov.**

(Figs. 1–6)

Male. Length to tip of folded wings 9–10 mm. General color brown, thorax and coxae darker brown, remaining leg segments light brown, hind femur bearing distinct dorsal comb of erect, apically hooked setae over distal two-thirds (Fig. 4). Wings brown, veins darker, pterostigma cloudy. Abdomen reddish brown dorsally, brown ventrally. Genitalia as in Figs. 1 and 2. Segment IX annular with elongate dorsomesal posterior projecting process. Process with pair of acute lateral arms and elongate, bifid mesal arm. In lateral view (Fig. 1) segment IX process with small dorsal hump basally; pair of acute lateral arms directed posteriorly and slightly ventrad appearing ventral to mesal arm, reaching approximately midpoint of mesal arm, mesal arm narrowing at mid length where process forks, tines directed posteriorly with slight ventral curve in apical one-fourth. In dorsal view (Fig. 2) segment IX process trifid in proximal half, with pair of acute lateral arms and mesal arm that forks near mid-length, the two tines slender, elongate, apically acute with slight inward curve at the tips. Lateral to base of segment X are one-segmented, knob-like cerci. Segment X with elongate dorsal and ventral processes, dorsal process approximately same length as mesal process of IX. Dorsal process of X “S”-shaped in lateral view (Fig. 1), from base directed posteriorly then dorsally beyond mid length, then posteriorly before apex. Apex of dorsal process of X fits between the apical fork of IX in undamaged specimens. In dorsal view (Fig. 2) process narrow basally expanding beyond middle then narrowing before expanded truncate, shallowly emarginate apex, with bluntly acute corners. Ventral process of X directed posteroventrad ending in bulb-like process fitting between plate-like lateral flaps of “cupped” anal sclerite. Apical band of tergal strap apparently attached to



Figures 1–4. *Rhyacophila bifurcata*: 1. genitalia, left lateral view; 2. genitalia, dorsal view; 3. sternite V showing gland; 4. right femur, medial view. Abbreviations: as = anal sclerite, pa = phallic apparatus.



Figures 5–10. *Rhyacophila* spp. genitalia. 5–6. *R. bifurcata*: 5. left lateral view; 6. dorsal view of IX and X. 7–8. *R. milnei*: 7. left lateral view; 8. dorsal view. 9–10. *R. vagrita*: 9. left lateral view; 10. dorsal view. Figures 7–10 reproduced from Schmid (1981).

outer part of flaps of anal sclerite. Phallic apparatus simple; heavily sclerotized beak-like dorsal process; small sclerotized nipple-like median process, membranous tongue-like ventral process extending posteriorly. Inferior appendage with basal segment approximately twice as long as wide, widest apically; distal segment slender, narrowest dorsally, with acuminate subdorsal lobe, narrowly rounded ventrally, mesal surface bearing spicules, densest near margin.

Female. Unknown.

Larvae. Unknown.

Material examined. Holotype: ♂, USA, Washington, Clallam County, Olympic National Park, Heart of the Hills Road, stream at Switchback Trail, 47.98642°N, 123.46116°W, 1360 meter elevation, J. Lee, R. Lee, 10-IX-13 (deposited at the California Academy of Sciences). Paratypes: same data as holotype, 1 ♂; same data as holotype except 12-IX-13, 3 ♂ (Olympic National Park Collection, Jonathan J. Lee Collection, J. Joseph Giersch Collection, David E. Ruiter Collection).

Etymology. The species name refers to the dorsally bifurcate medial process of segment IX.

Diagnosis. The unique structure of the dorsal process of segment IX should separate *R. bifurcata* from other known *Rhyacophila*. *Rhyacophila bifurcata* is most similar to *R. milnei* (Figs. 7, 8). The cerci, ventral process of segment X, anal sclerite, phallic apparatus, and inferior appendage are very similar. The dorsal process (IX) of *R. bifurcata* and *R. milnei* are similar in the basal half but the medial process in the apical half is fusiform and directed dorsally in *R. milnei*, and bifid and curved ventrad in *R. bifurcata*. The dorsal process of segment X is similar between the two species

but can be differentiated by the shape of the apical third. It is somewhat “L”-shaped in *R. milnei* and “S”-shaped in *R. bifurcata*. *Rhyacophila vagrita* (Figs. 9, 10) can be most easily separated from *R. milnei* and *R. bifurcata* by the lack of the lateral arms of segment IX and in possessing an acute dorsal extension of the distal segment of the inferior appendage.

DISCUSSION

We examined a male paratype of *R. milnei* and numerous males of *R. vagrita*. We include *R. bifurcata* as the third North American member of the *vagrita* group as proposed by Ross (1956) and accepted by Schmid (1970) based on the two elongate dorsal processes and the articulation of the apical band with segment X by way of the modified anal sclerite. Another character shared by all three species of the group is the dorsal comb of hooked setae on the hind femur (Fig. 4). Schmid (1970) considers this character as plesiomorphic and postulated these setae might help spread pheromones produced by glands located on the sternite of segment V (Fig. 3). Levanidova and Schmid (1977) described two Asian species that they placed in the *vagrita* group: *R. mirabilis* and *R. montrosa*. We did not examine specimens of these species but descriptions and illustrations presented in Levanidova and Schmid (1977) clearly indicate that these two species are easily separable from their North American counterparts.

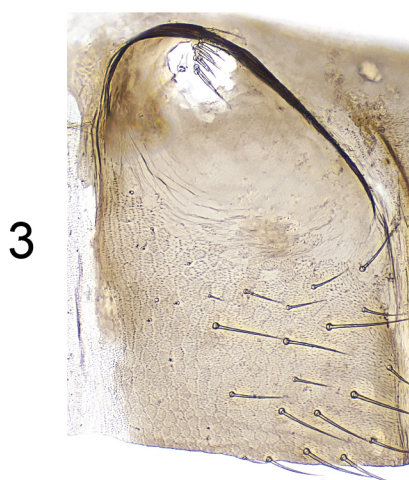
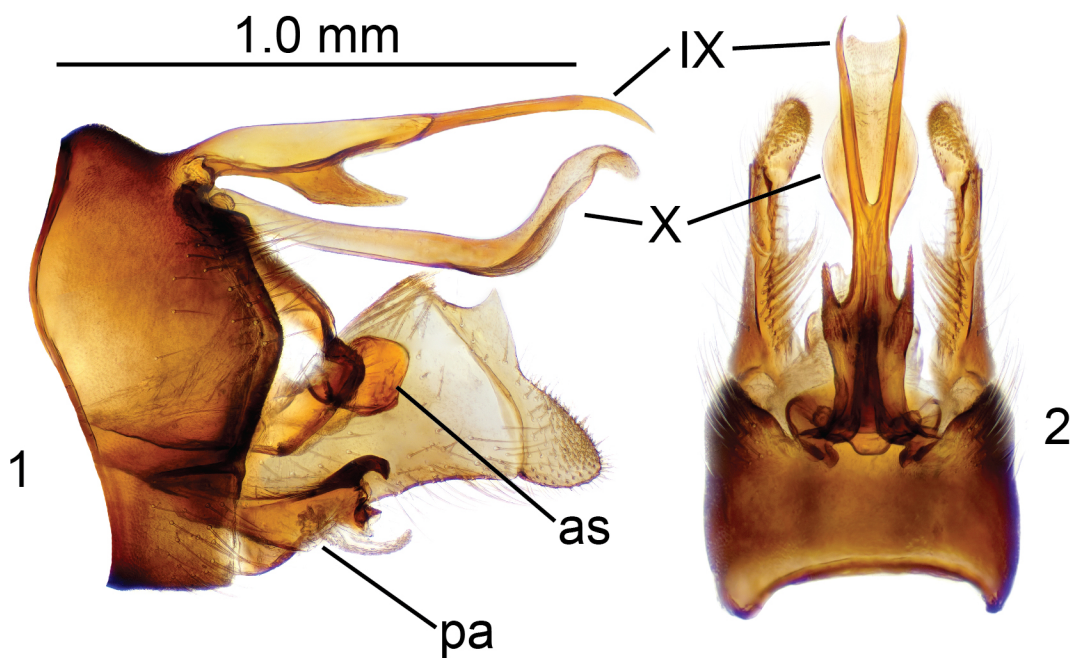
ACKNOWLEDGMENT

Thanks to the senior author's brother, Rob Lee, for collecting assistance in Olympic National Park. Dr. Jerry Freilich, Research Coordinator, Olympic National Park, allowed us to collect in the Park. Dave Ruiter provided taxonomic assistance with the new species and helped with preparing the figure plates. Jamie Zahniser, Illinois Natural History Survey, provided the loan of a *R. milnei* paratype. The Entomological Society of Canada allowed the use of figures 7-10. We gratefully acknowledge the receipt of a C. P. Alexander grant from the Pacific Coast Entomological Society to help defray the publishing costs of this manuscript. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

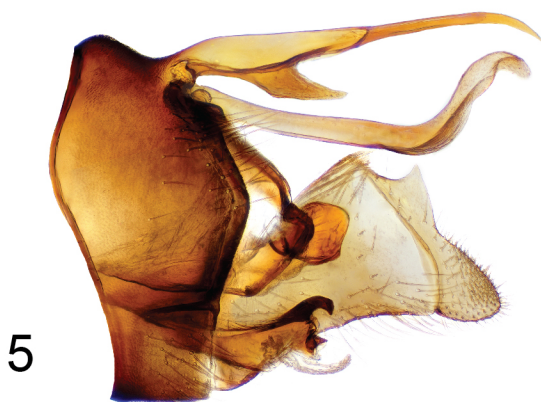
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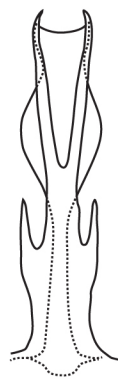
Received 29 Jan 2014; Accepted 2 Feb 2014 by R. S. Zack, Jr.; Publication date 23 Jul 2014



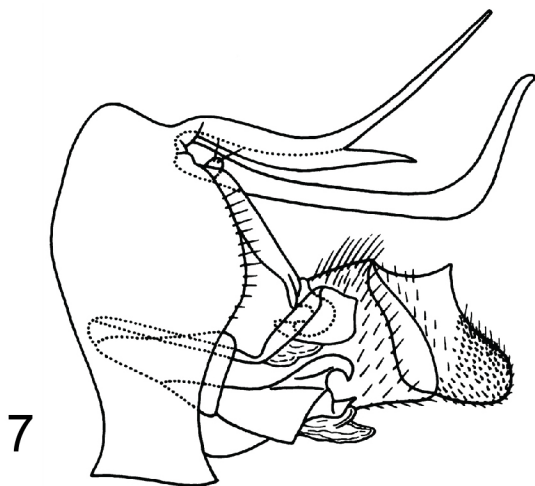
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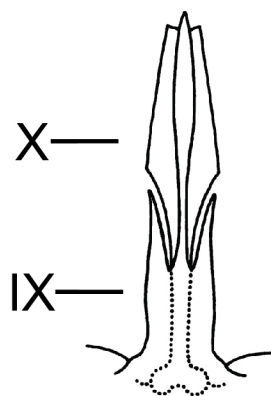
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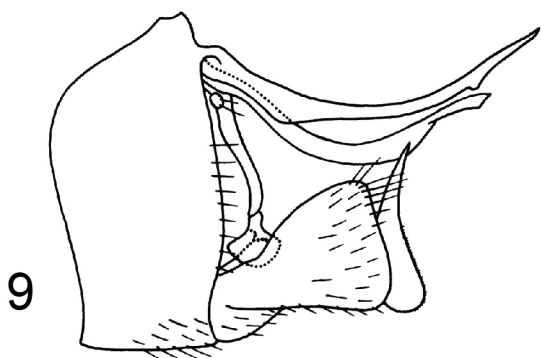
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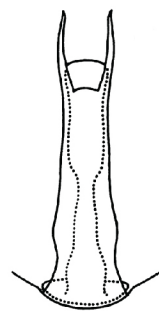
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Figures 5–10. *Rhyacophila* spp. genitalia. 5–6. *R. bifurcata*: 5. left lateral view; 6. dorsal view of IX and X. 7–8. *R. milnei*: 7. left lateral view; 8. dorsal view. 9–10. *R. vagrita*: 9. left lateral view; 10. dorsal view. Figures 7–10 reproduced from Schmid (1981).