



<http://dx.doi.org/10.11646/zootaxa.3640.2.5>

<http://zoobank.org/urn:lsid:zoobank.org:pub:0C450CE0-F119-4B5D-912B-CE70FBD59147>

Three new species of *Rhyacophila* (Trichoptera: Rhyacophilidae) from Taiwan and Nepal

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Abstract

Three new species of the *Rhyacophila scissa* Group in the genus *Rhyacophila* (Trichoptera, Rhyacophilidae), i.e., *Rhyacophila matanyii* n. sp. from Taiwan (Republic of China), *Rhyacophila steinmanni* n. sp. and *Rhyacophila kisszoltani* n. sp. from Nepal are described and illustrated with drawings of the genitalia.

Key words: Caddisflies, new species, taxonomy, diagnosis, distribution, Asia

Introduction

In 2009, the number of Trichoptera species was estimated to be about 13,574, of which Rhyacophilidae were represented by 753 species and were distributed in the East Palearctic, West Palearctic and the Oriental Biogeographic Regions. Among these, 4,865 species of 28 Trichoptera families were reported from the Oriental Biogeographic Region where the density of known, valid, extant Trichoptera species is about 370 species per square gigameter (Morse, 1997, 2011). The three new *Rhyacophila* species inhabit the Oriental Biogeographic Region.

Rhyacophila larvae live in running water habitats, and are free-living until the pupal stage. At the end of its last instar, the larva builds a pupal cocoon where it moults and pupates. During the moulting process an exuvial liquid is secreted, which creates osmotic pressure inside the semipermeable cocoon (Wichard *et al.* 2002).

The caddisflies of Taiwan (Republic of China) were described by Ulmer (1906, 1911, 1913, 1927, 1932), Tsuda (1940, 1942), Ross (1956), Kobayasi (1987), Chen & Morse (1991), Tian *et al.* (1991), Hsu (1997), Hsu & Chen (1996a, 1996b, 1996c 1997, 2003), Mey (1997, 1998, 1999), Morse & Yang (1992), Tanida (1997), and Yang & Leng (1998).

Martynov (1935) described one new *Rhyacophila* species from Taiwan. L. F. Yang (personal communication 2012) reported 4 additional *Rhyacophila* species and L. P. Hsu (personal communication 2012) listed 10 other *Rhyacophila* species from Taiwan. Thus, the the total number of *Rhyacophila* species from Taiwan is 16 (Table 1).

Kimmins (1952, 1964) and Kiss & Malicky (2003) described 12 *Rhyacophila* species from Nepal. Melnitsky (2005) also reported several new *Rhyacophila* species from western Nepal. Malicky (2006) published a preliminary list of Trichoptera from Nepal, including 23 *Rhyacophila* species. Kiss (2011a, 2011b,) described four new *Rhyacophila* species from Nepal, increasing the total number of Nepalese *Rhyacophila* species to 38 (Table 2).

Material and methods

The specimens in this study were captured with light traps and are stored in 75% ethanol. The posterior half of the abdomen of the holotype male was cleared in 20% lactic acid and the phallic apparatus everted (Blahnik & Holzenthal 2004). Then they were placed in ethanol for examination under a stereomicroscope (Nikon, SMZ-10-2x) and sketched. For the identification of species the works by Hsu & Chen (1996b, 2003), Hwang (1957),