



## Three new species of *Ceraclea* Stephens 1829 (Trichoptera: Leptoceridae) from Southeast Asia

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### Abstract

Three new species of *Ceraclea* (Leptoceridae) from Southeast Asia are described and illustrated: *Ceraclea (Athripsodina) trisdikooni* n. sp. from Myanmar, *C. (A.) thongnooi* n. sp. from Thailand and Myanmar and *C. (A.) thongpongi* n. sp. from Laos. *Ceraclea trisdikooni* n. sp. is distinguished from other species by its inferior appendages recurved ventrad nearly 180° apically. The apex of the basal segment of each inferior appendage is more pointed. In ventral view, each inferior appendage of the new species has an obvious basoventral lobe with numerous long setae. *Ceraclea thongnooi* n. sp. is distinguished from those by inferior appendages that are each shaped like a seahorse head both in lateral view and ventral view. *Ceraclea thongpongi* n. sp. is distinguished from other species by the rectangular preanal appendages. In dorsal view, the apical end of segment X is oval and notched apically; in ventral view, the subapicodorsal lobe of each inferior appendage is rounded and straight.

**Key word:** caddisfly, Oriental Region, new species

### Introduction

The species diversity of caddisflies in the Oriental Region is enormous. More than 5,700 species of Trichoptera have been described from the Region, with more than 3,000 during the last 10 years (Morse 2016). However, there are still many areas in this region that have not been collected intensively such as Myanmar, southern Laos, and forest areas near the border of Thailand and Myanmar. As a result, there are many species that have not been discovered by science.

The family Leptoceridae is the highest in species number in the Oriental Region with 970 valid species, of which 380 species have been found in Southeast Asia (Malicky 2010; Malicky *et al.* 2016; Morse 2016). The genus *Ceraclea* is common and widespread in Southeast Asia. Its species have been reported from Myanmar, Thailand, Laos, Cambodia, Vietnam, Malaysia, and Indonesia (Kalimantan, Sumatra, Java, Lombok, and Bali) (Malicky, 2010; Oláh & Malicky 2011; Wityi *et al.* 2015). They live in cold aquatic habitats such as small streams in high mountains to large rivers (Bunlue *et al.* 2012; Laudee & Prommi 2011). In addition, leptocerids in this region have been described frequently; for example, *C. satasookae* was described recently from Myanmar (Laudee & Malicky 2016).

This research is part of a study of the biodiversity of caddisflies from Shan State in Myanmar, the Upper Tennesirim Mountain Range in Thailand and Myanmar, and southern Laos in the Lower Mekong Basin.

### Materials and methods

The caddisfly specimens were collected by a UV pan light trap (12 V, 10 W) near the river overnight. The

Trichoptera specimens were preserved in 70% ethanol and manually sorted afterwards. Male genitalia of the new species were cut and macerated in 10% KOH at 60°C for 30–60 minutes.

For the new species, the males were drawn by compound microscopy with a drawing tube, first with pencil and then with ink. Their holotypes and paratypes are stored in 70% ethanol and are deposited at Princess Maha Chakri Sirindhorn Natural History Museum (PSUNHM), Prince of Songkla University, Hat Yai Campus, Hat Yai District, Songkhla Province, Thailand. Some paratypes are deposited in the collection of Hans Malicky (CHM), Pongsak Laudee (CPL), and the Clemson University Arthropod Collection (CUAC).

## Taxonomy

### *Ceraclea (A.) trisdikooni* Laudee & Malicky, n. sp.

Figs. 1–4.

**Type material. Holotype male** (PSUNHM). **Myanmar:** Shan State, Keng Tung Province, Naw-awn, Salwin River, 21°13' 46"N, 98°42'32"E, ca. 251 m a.s.l., 04 May 2015, leg. Sai Aye.

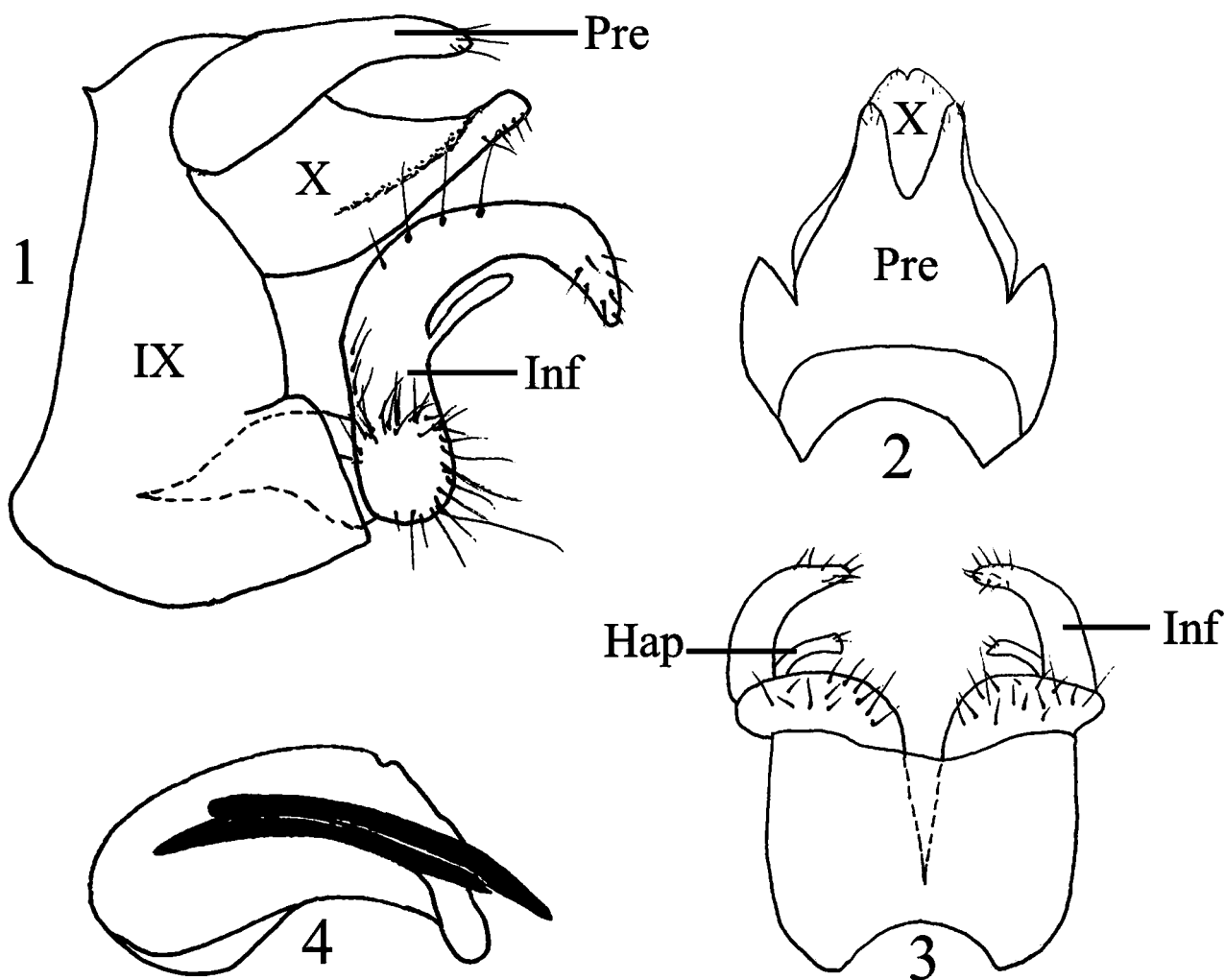
**Paratypes:** Same data as holotype, 10 males (PSUNHM), 2 males (CUAC, database number CUAC000044768). Myanmar: Shan State, Keng Tung Province, Nam Lok Stream, 21°22'50"N, 99°00' 49"E, 442 m a.s.l., 03 May 2015, leg. Sai Aye, 10 males (CHM).

**Etymology.** Dedicated to Assoc. Prof. Dr. Piti Trisdikoon who was Vice President of Prince of Songkla University, Trang Campus, during 2008–2013.

**Description.** Length of each male forewing 7–8 mm ( $n = 8$ ), antennal length 16–17 mm, specimens in alcohol with head and thorax dark brown, mesoscutum dark brown in middle and light brown laterally, forewings light brown, abdomen light brown with dark brown terga.

Male genitalia (Figures 1–4). In lateral view (Fig. 1), segment IX forming isosceles triangle, rounded ventrally and dorsally; preanal appendages subtriangular, nearly as long as segment X, each with ventral margin concave and directed caudad apically; segment X somewhat triangular, ventral margins broadly rounded, upturned, blunt apically, with short subapicodorsal setae and long subapicoventral setae, ridged apicoventrally; basal segment of each inferior appendage shaped like elephant tusk (directed dorsad basally and recurved caudad and ventrad apically), with numerous long setae basomesally, long setae at midlength dorsally, and short setae apically; harpago cylindrical, inserted subbasoventrally on basal segment of each inferior appendage, slender, with apical setae. In dorsal view (Fig. 2), preanal appendages concave laterally, basally fused, with deep V-shaped incision between them for nearly half of their length; segment X slightly longer than preanal appendages, with small apical incision and very short, stout subapical setae. In ventral view (Fig. 3), basoventral lobe of basal segment of each inferior appendage oval, with numerous of long setae; subapicodorsal lobe cylindrical, bent mesad, and with numerous setae apically; each harpago curved mesad and with two setae apically. In lateral view (Fig. 4), phallus elongate-oval, convex dorsally and concave ventrally, with 2 dark, spear-like phallic spines curved slightly caudoventrad apically, membranous apicodorsally, with pair of sclerotized folds apicoventrally.

**Diagnosis.** The new species is a member of subgenus *Athripsodina* Kimmins 1963 (Morse 1975). The male genitalia of the new species are similar to those of several other species found in Southeast Asia including *C. troilos* Malicky 2006 from Vietnam; *C. hektor* Malicky & Bunlue 2004 (in Malicky *et al.* 2004) from Thailand; *C. itoae* Malicky 2006 from Cambodia; *C. hersilia* Malicky & Changthong 2002 (in Malicky *et al.* 2002) from Laos and Thailand; *C. helena* Malicky & Laudee 2002 (in Malicky *et al.* 2002) from Laos, Thailand, and Vietnam; *C. hebe* Malicky & Sompong 2002 (in Malicky *et al.* 2002) from Thailand; and *C. herse* Malicky 2002 (in Malicky *et al.* 2002) from Laos. All of these species including the new species have a similar lateral view of their genitalia, especially the peculiar caudad curvature of the long basal segment of each inferior appendage. *Ceraclea trisdikooni* n. sp. is distinguished from these species by its inferior appendages recurved ventrad nearly 180° apically. The preanal appendages of the new species are separated apically by a deep V in dorsal view, unlike very similar *C. hektor* and *C. hebe* that have the preanal appendages separated by a broad U-shaped excision. The apex of the basal segment of each inferior appendage is more pointed in the new species than in *C. hektor*, in which it is truncate, or in *C. hebe*, in which it is rounded. The harpago of each inferior appendage in the new species is longer and more slender than in *C. hebe*; in *C. hektor* it is absent. In ventral view, each inferior appendage of the new species has an obvious basoventral lobe with numerous long setae, but no such lobe is present in *C. hebe* and *C. hektor*.



**FIGURES 1–4.** Male genitalia of *Ceraclea (A.) trisdikooni* n. sp. 1, genitalia, left lateral; 2, segment IX, dorsal; 3, segment IX, ventral; 4, phallus, left lateral. Hap = harpago (paired), Inf = inferior appendages (paired), Pre = preanal appendages (paired), X = segment X.

***Ceraclea (A.) thongnooi* Laudee & Seetapan, n. sp.**

Figs. 5–8.

**Type material. Holotype male** (PSUNHM). **Thailand:** Prachuap Khiri Khan Province, Kuiburi River, 12°04'52"N 99°37'43" E, ca. 150 m a.s.l., 15 February 2015, leg. Pongsak Laudee.

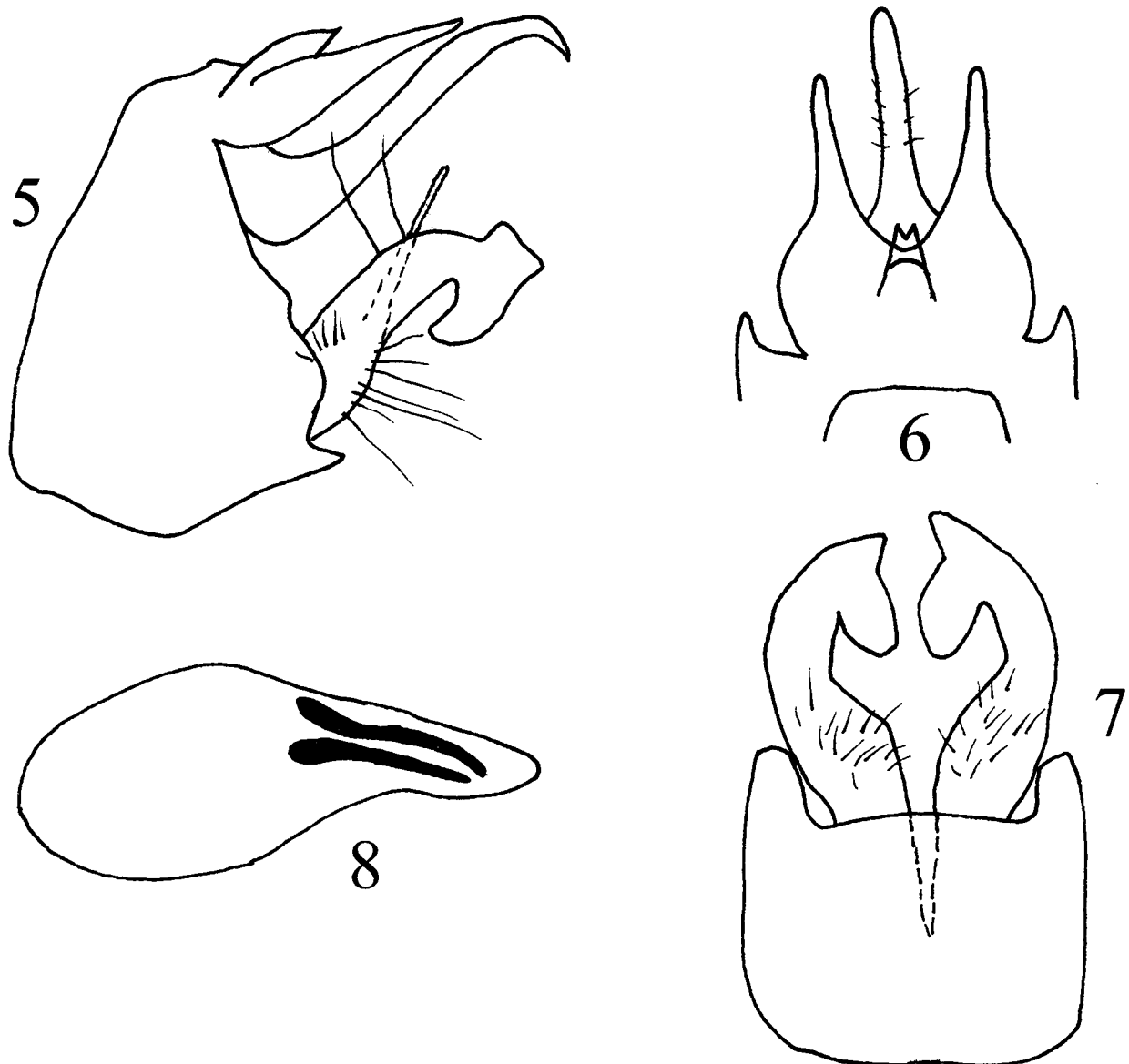
**Paratypes: Myanmar,** Tanintharyi Division, Myeik, Tanintharyi, Ngawun Chaung River, 12°03'49"N 99°00'57" E, 18/11/2016, 15 a.s.l. m. leg. Pongsak Laudee, 16 males: 4 males (PSUNHM), 4 males (CHM), 4 males (CPL), and 4 males (CUAC, database number CUAC000044767).

**Etymology.** Dedicated to Assoc. Prof. Dr. Kerkchai Thongnoo who was Vice President of Prince of Songkla University, Hat Yai Campus, during 2013–2015.

**Description.** Length of each male forewing 7–8 mm (n = 12), specimens in alcohol with head and thorax dark brown, mesoscutum dark brown in middle and light brown laterally, forewings light gray, abdomen light brown with dark brown terga.

Male genitalia (Figures 5–8). In lateral view (Fig. 5), segment IX forming triangle, straight ventrally and with acuminate process dorsally; preanal appendages subtriangular, 3/4 as long as segment X, each bulbous basally, with

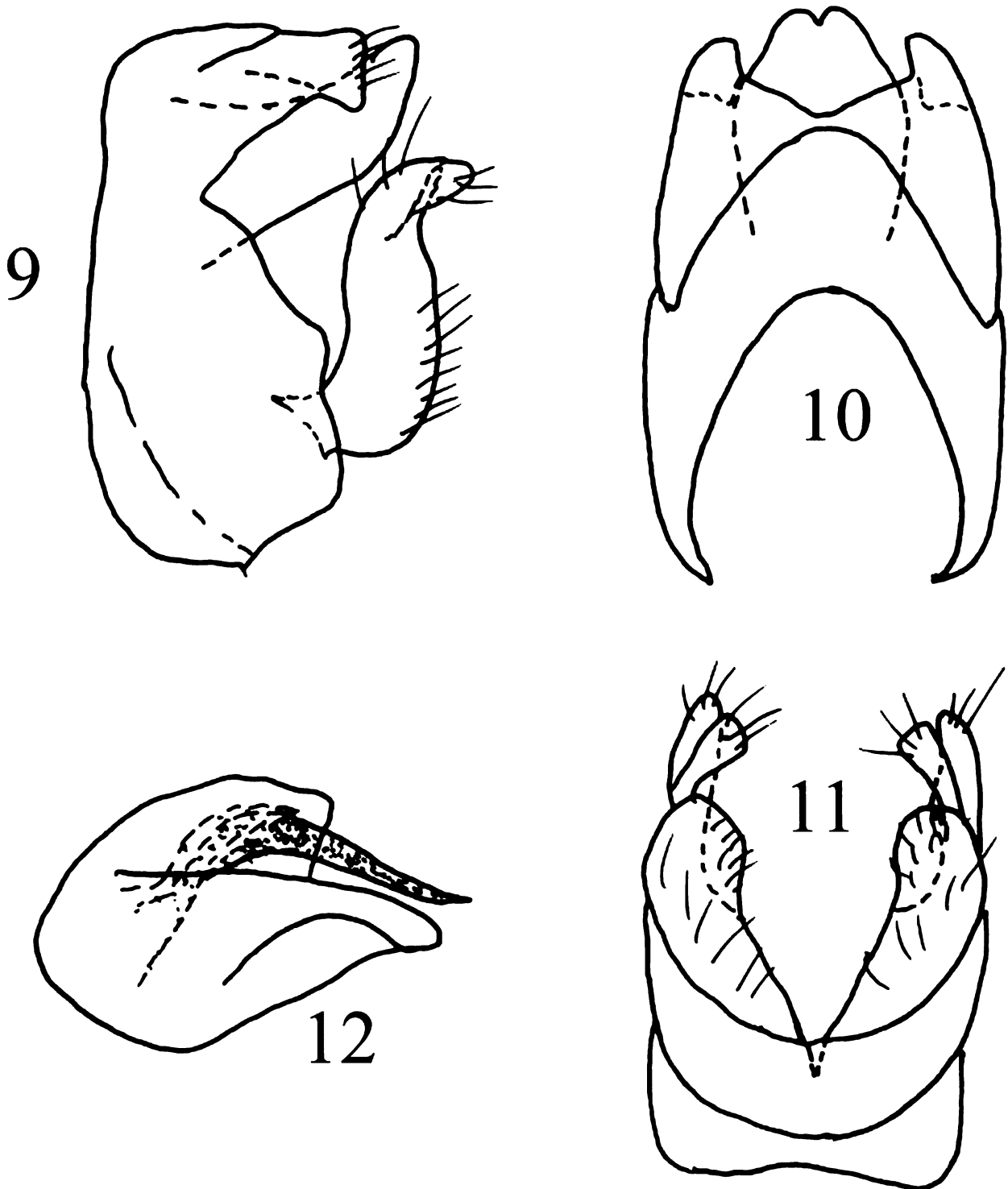
ventral margin very slightly concave, tapered and directed caudad apically; segment X sigmoid, broad basally, with posterior ventral margin concave, apex directed caudad and curved downward, longer than ventral margin of segment IX. Inferior appendages each shaped like head of seahorse with numerous short setae basomesally, long setae basoventrally; harpago needle-like. In dorsal view (Fig. 6), dorsomesal process of segment IX triangular with small V-shaped apical incision, preanal appendages fused basally, rounded basolaterally, concave subapicolaterally, directed caudad, and separated by deep U-shaped incision for nearly 2/3 of their length; segment X parallel-sided, slender, slightly longer than preanal appendages, with short setae mesolaterally. In ventral view (Fig. 7), segment IX quadrilateral, each side projecting caudad; inferior appendages shaped like head of seahorse, with numerous mesobasal and basoventral setae. Phallus elongate-oval, convex dorsally and concave ventrally, with 2 dark spear-like paramere spines (Fig. 8).



**FIGURES 5–8.** Male genitalia of *Ceraclea (A.) thongnooi* n. sp. 5, genitalia, left lateral; 6, segments IX, X, and preanal appendages, dorsal; 7, segment IX and inferior appendages, ventral; 8, phallus, left lateral.

**Diagnosis.** The new species belongs to subgenus *Athripsodina* Kimmins 1963. The male genitalia of the new species are similar to those of several other species found in Southeast Asia including *C. hersilia* Malicky & Changthong 2002 (in Malicky *et al.* 2002) from Laos and Thailand; *C. hesione* Malicky 2002 (in Malicky *et al.* 2002) from Sumatra; *C. hebe*; and *C. hektor*. The genitalia of all of these species including the new species are

similar in lateral view. *Ceraclea thongnooi* n. sp. is distinguished from these species by its segment X longer than its inferior appendages, unlike to *C. hersilia*, *C. hesione*, *C. hebe*, and *C. hector* that have segment X shorter than or as long as their inferior appendages, in lateral view. The lateral view of the inferior appendages of *C. hersilia*, *C. hesione*, *C. hebe*, and *C. hector* are tubular and very different from those of the new species in which the inferior appendages are each shaped like a seahorse head.



**FIGURES 9–12.** Male genitalia of *Ceraclea (A.) thongpongi* n. sp. 9, genitalia, left lateral; 10, segments IX, X, and preanal appendages, dorsal; 11, segment IX and inferior appendages, ventral; 12, phallus, left lateral.

***Ceraclea (A.) thongpongi* Laudee & Malicky, n. sp.**

Figs. 9–12.

**Type material. Holotype male** (PSUNHM). **Laos:** Muang Khong Village, Don Klon Island, Li Phi Falls, Mekong River, 13°57'27"N, 105°55'27"E, 77 m a.s.l., 16 April 2016, leg. Pongsak Laudee.

**Paratypes:** Same data as holotype, 4 males: 2 males (CHM), 2 males (PSUNHM)

**Etymology.** Dedicated to Asst. Prof. Sompong Thongpong, who was Vice President of Prince of Songkla University, Pattani Campus, during 2008–2016.

**Description.** Length of each male forewing 6–7 mm (n = 3). Specimens in alcohol with head and thorax dark brown, mesoscutum dark brown in middle and light brown laterally, forewings light brown, abdomen light brown with dark brown terga.

Male genitalia (Figures 9–12). In lateral view (Fig. 9), segment IX rectangular, posterior margin with large V-shaped incision at upper 1/3, rounded anteroventrally; preanal appendages rectangular, truncate apically; segment X stout, triangular, nearly as long as inferior appendages, ventral margin obliquely angled upward from middle; each inferior appendage stout, tubular, subapicodorsal lobe bent caudad from 3/4 of its length, with long setae basoventrally and subbasoventrally, harpago very short, slender. In dorsal view (Fig. 10), preanal appendages triangular, fused basally for very short distance, convex laterally, widely separated distally; segment X oval, slightly longer than preanal appendages, with small apical incision. In ventral view (Fig. 11), basoventral lobe of each inferior appendage crescentic, broader before insertion of harpago, with numerous short setae ventrally. In lateral view (Fig. 12), phallus oval, convex dorsally, ventral margin slightly concave, with one long, curved, spear-like paramere spine.

**Diagnosis.** The new species is in subgenus *Athripsodina* Kimmins 1963. The male genitalia of the new species are similar to those of *C. troilus* and *C. hebe*. All of these species including the new species have similar lateral views of their genitalia. *Ceraclea thongpongi* n. sp. is distinguished from these species by the rectangular preanal appendages of *C. thongpongi* versus the triangular preanal appendages of *C. troilus* and *C. hebe*. Segment X of *C. hebe* is divided into two lobes but not those of *C. troilus* and *C. thongpongi* in which they are triangular. The apex of segment X of *C. troilus* is straight and directed caudad, but curved upward in the new species. The phallus of *C. hebe* has 2 phallic spines, but the new species only 1. The phallus of *C. troilus* is longer and more nearly tubular, but oval in lateral view in *C. thongpongi* n. sp. In dorsal view, the apical end of segment X of *C. hebe* is truncate and deeply incised, it is rounded and entire in *C. troilus*, but oval and notched apically in *C. thongpongi* n. sp. In ventral view, the subapicodorsal lobe of each inferior appendage of *C. troilus* is pointed and curved inward, in *C. hebe* it is rounded and curved inward, but in *C. thongpongi* n. sp. it is rounded and straight.

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