

Description of the larva and pupa of *Potamyia phaidra* Malicky and Chantaramongkol (Trichoptera: Hydropsychidae) from southern Thailand

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Abstract

Larvae and pupae of *Potamyia phaidra* Malicky and Chantaramongkol (Trichoptera: Hydropsychidae) were collected from montane streams in southern Thailand. Pupal identifications were based on genitalic features in common with described adults, and larvae were associated with the pupae. Herein, the final larval instar and pupa are described, diagnosed, and figured.

Key words: Trichoptera, Hydropsychidae, *Potamyia phaidra*, larva, pupa, description, Thailand

Introduction

Southern Thailand is topographically diverse with flat agricultural regions punctuated by disjunct mountain ranges and associated waterfalls and streams. These numerous lotic systems harbor a diverse aquatic insect fauna. Our taxonomic understanding of these insects is very poor, especially of the immature stages. In one of very few papers addressing this fauna, Sites *et al.* (2001) provided keys and notes on the immatures of the families and genera of mayflies (Ephemeroptera) of the southernmost 10 provinces of Thailand. No documentation of the immature stages of Trichoptera exists for this region, nor for any other region of Thailand.

Research on Trichoptera in Thailand has been restricted mainly to descriptions of the adult stage, of which more than 700 species have now been identified (Malicky &

Chantaramongkol 1999; Thapanya *et al.* 2004). However, very few larvae are known at the species level, and most reports concerning these insects are recent. For example, the larvae of four species in different families were described from Doi Inthanon in northern Thailand (Thamsenanupap *et al.* 2005). The only species of Hydropsychidae in Thailand known in the larval stage is *Trichomacronema paniae* Malicky (1991).

A total of 122 species of Hydropsychidae has been recorded from Thailand (Malicky & Chantaramongkol 1997, Thapanya *et al.* 2004), including 13 species of *Potamyia*. Specifically, *Potamyia phaidra* Malicky and Chantaramongkol is widespread throughout much of Thailand (Malicky & Chantaramongkol 1997). This species was previously known only in the adult stage, thus larvae and pupae were unknown. Presented herein are descriptions, diagnoses, and figures of the final larval instar and pupa of this species.

Material and methods

Hydropsychid larvae and pupae were collected from streams in southern Thailand (Chumphon, Nakhon Si Thammarat, Surat Thani, and Trang provinces). At each collection site, adults were collected using black light traps on timers to operate simultaneously from one hour before sunset to 1.5 hours after sunset near the stream margin. Insects attracted to the black light were collected in trays filled with water and a few drops of detergent and transferred into 80% ethyl alcohol the next morning.

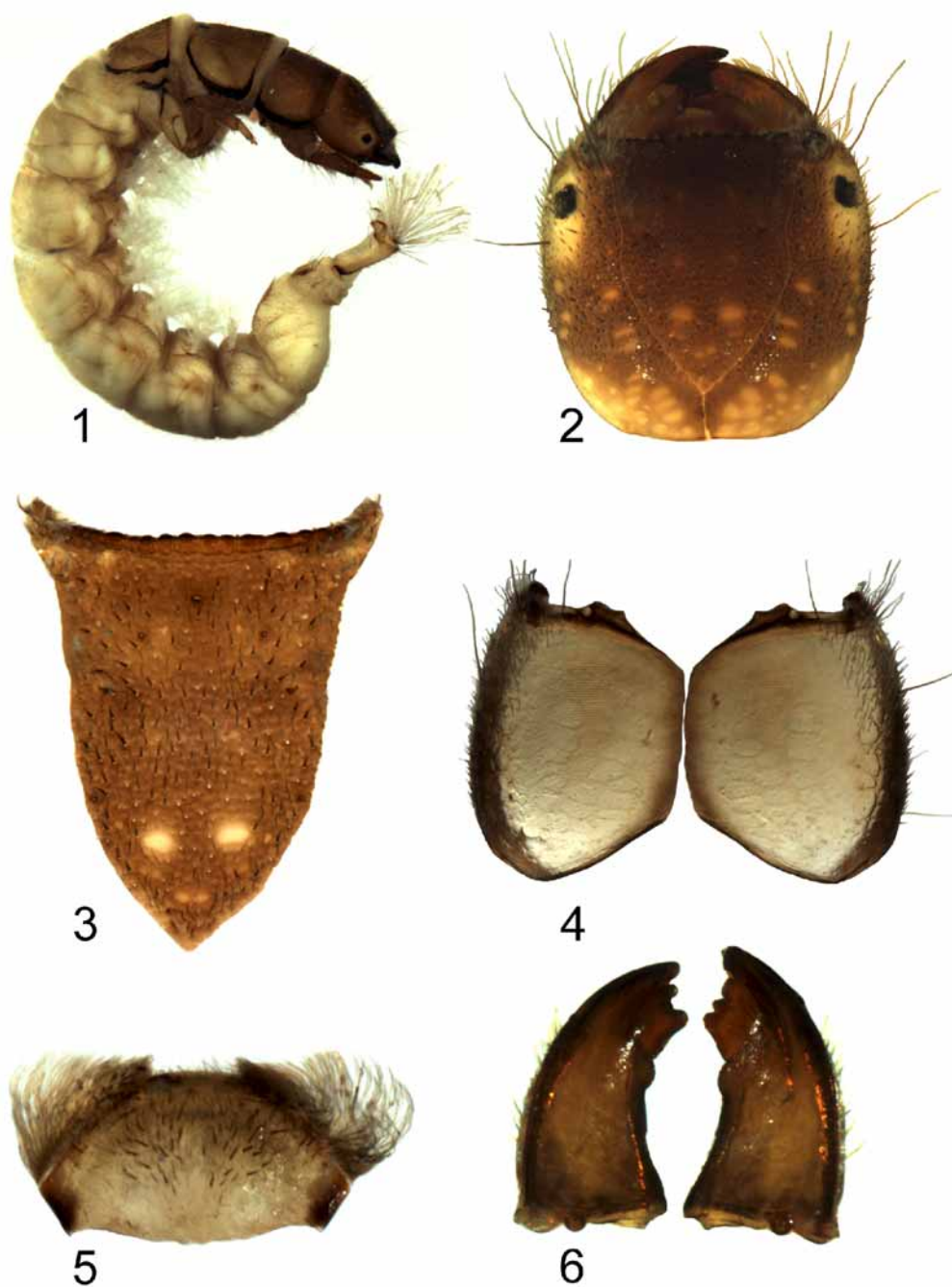
Larvae and pupae were collected by handpicking from the surfaces of stones, stone crevices, gravel, woody debris, and other stable substrates. The specimens were preserved in 95% ethyl alcohol and brought to the laboratory where they were sorted to morphospecies. Adult genitalia were cleared by heating in 10% NaOH at 70°C for 30 minutes. The association between the adult and the fully developed pupa was established with genitalic characteristics. Further, the identified pupa was then associated with the final larval instar. Morphological terminology is based on Wiggins (1996). Voucher specimens were deposited in the Department of Pest Management, Faculty of Natural Resources, Prince of Songkla University; and Enns Entomology Museum, University of Missouri-Columbia, U.S.A.

Description

Larva: Total length 10.86–13.03 mm (n=10). Overall body shape campodeiform (Fig. 1). Head yellowish to brown, with muscle scars on posterior half. Notal sclerites yellowish to brown, with muscle scars on posterior half of pronotum.

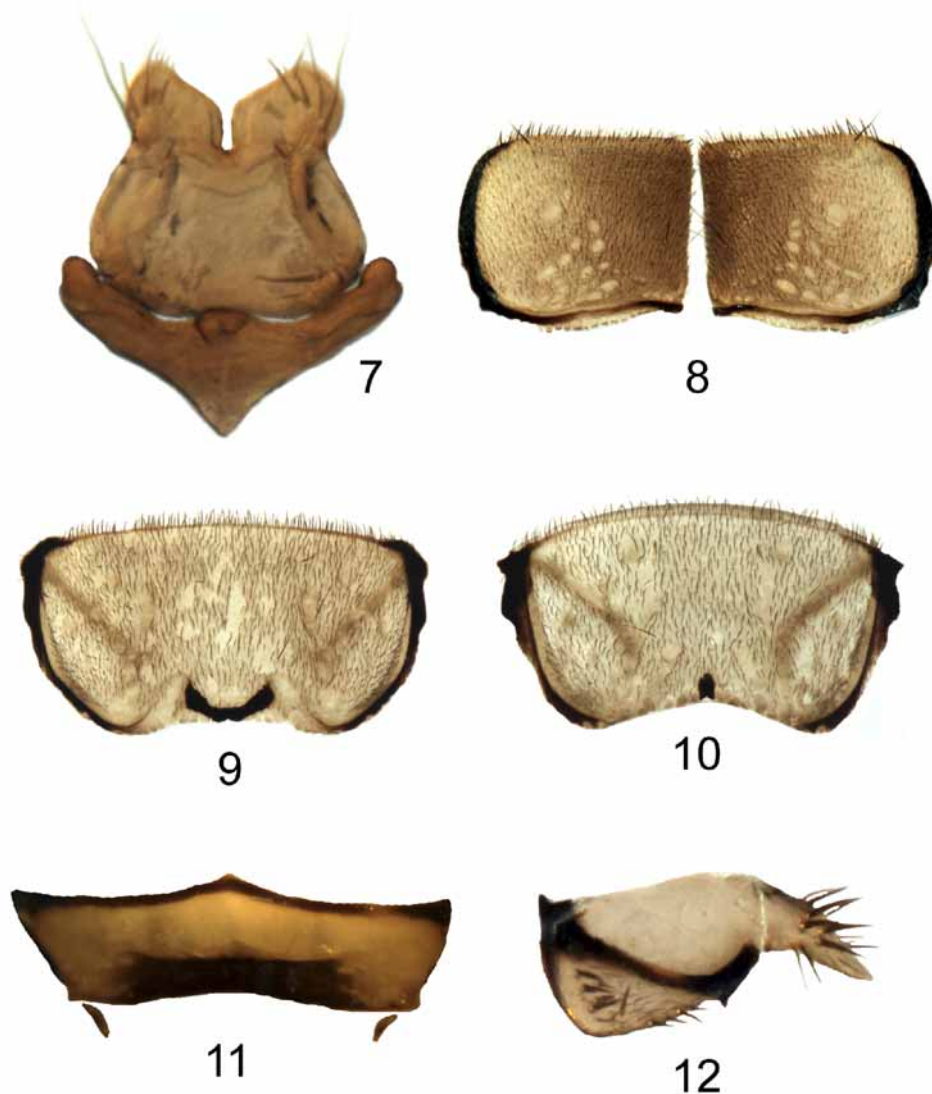
Head: Head capsule width 1.00–1.16 mm (n=10). Dorsum of head dark brown anteriorly, becoming lighter posteriorly, with yellowish ring around each eye (Fig. 2). Posterior half of dorsum and area near eyes with numerous muscle scars. Frontoclypeus

with anterior margin concave, slightly crenulate; posteromedian portion with 1 pair each of large and small muscle scars (Fig. 3). Head with numerous short and long setae on

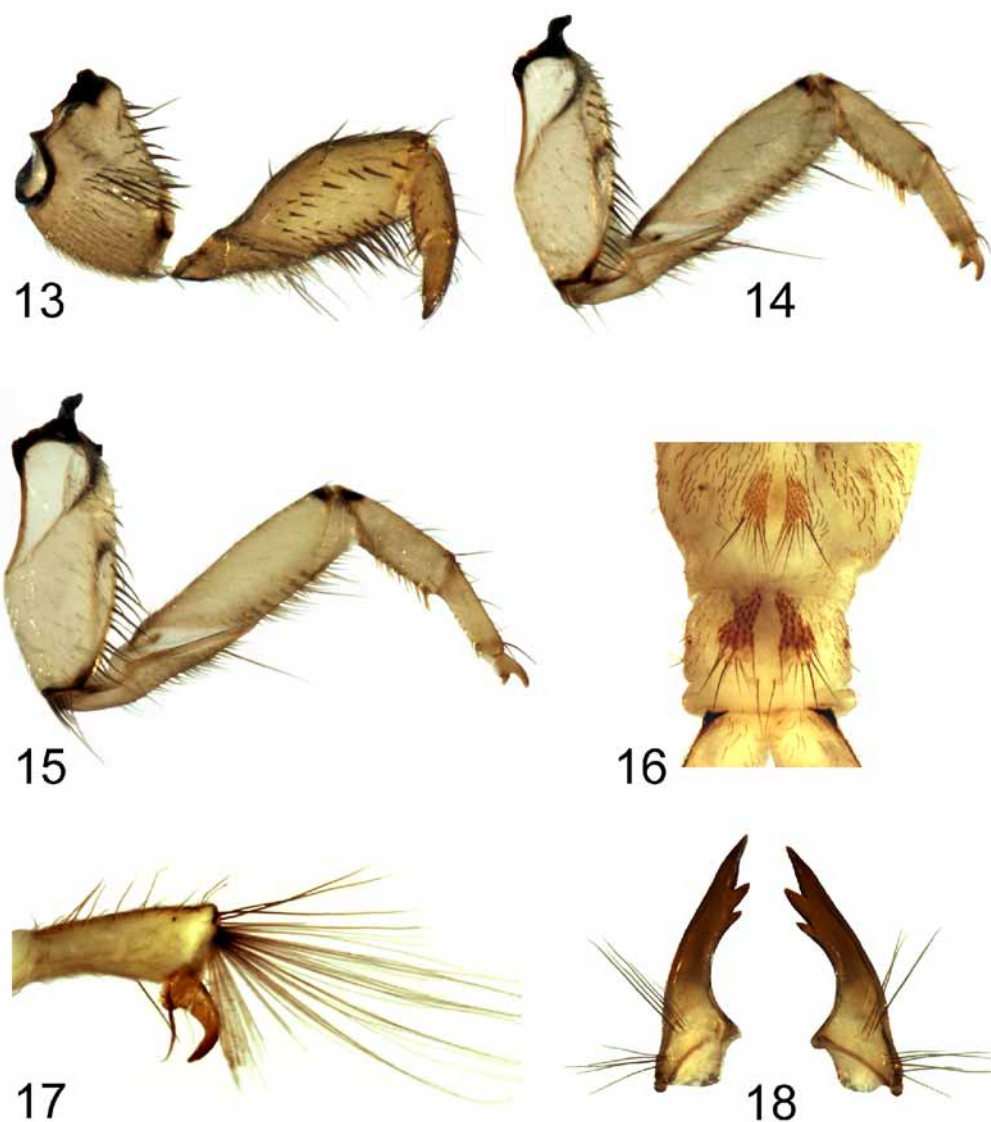


FIGURES 1–6. Larval features of *Potamyia phaidra*: 1, larva; 2, dorsal aspect of head; 3, frontoclypeal apotome; 4, ventral aspect of head; 5, dorsal aspect of labrum; 6, ventral aspect of mandibles.

dorsal and lateral regions in anterior 3/4 (Figs. 2, 4). Head ventrally with stridulatory lines in anterior half (Fig. 4). Labrum elliptical in dorsal view, bearing well-developed, lateral, reddish-brown brushes and thick and thin short setae on dorsal surface, posterior margin slightly convex medially (Fig. 5). Mandibles with prominent lateral flanges, each with a row of setae along lateral groove. Each mandible with 3–5 apical and subapical teeth (Fig. 6). Submentum with posterolateral corner broadly rounded; anterior margin broadly V-shaped with median cleft; cleft with sides parallel (Fig. 7). Anterior ventral apotome with prominent anteromedian tubercle, lateral arms long, narrow, slightly enlarged at apex; each apex usually cleft (Fig. 7).



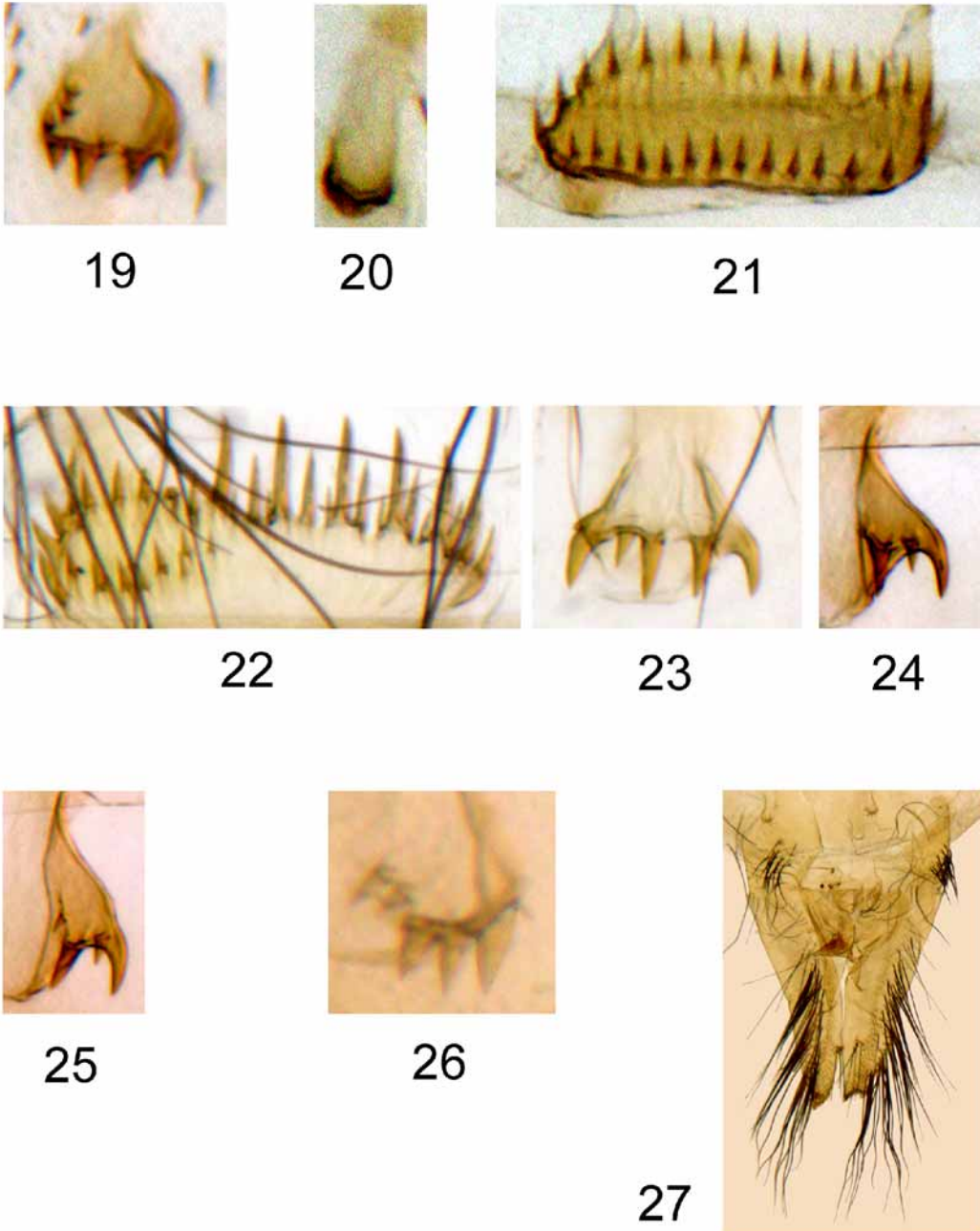
FIGURES 7–12. Larval features of *Potamyia phaidra*: 7, submentum and anterior ventral apotome; 8, pronotum; 9, mesonotum; 10, metanotum; 11, prosternum; 12, right propleuron and prosternum and trochantin.



FIGURES 13–18. *Potamyia phaidra*: 13, inner face of left foreleg; 14, inner face of left middle leg; 15, inner face of left hindleg; 16, sterna VIII and IX; 17, lateral aspect of anal claw; 18, ventral aspect of pupal mandibles.

Thorax: Nota yellow to brown with a dense covering of dark brown setae. Pronotum with numerous long setae on anterior margin; muscle scars midway between midline and lateral margin in posterior half (Fig. 8). Mesonotum and metanotum each with setae projecting beyond anterior margin (Figs. 9, 10). Prosternite transverse, narrow, with broad dark band along posterior margin, with pair of small sclerites posterolaterally (Fig. 11). Propleuron with numerous setae in ventral portion; trochantin acuminate with stout setae (Fig. 12). Foreleg with long setae on anterior surface of coxa; femur with long setae on ventral surface (Fig. 13). Mid- and hind legs similar in size, shape, and structure; with

branched setae only on posterior surface of femur; no branched setae on tibia or tarsus (Figs. 14, 15). Mesosternum with 1 pair of gills; metasternum with 2 pairs of gills; gills consisting of central stem bearing many lateral filaments.



FIGURES 19–27. 19–26, Segmental association and positioning of pupal dorsal abdominal hookplates: 19, III anterior; 20, IV anterior; 21, III posterior; 22, IV posterior; 23, V posterior; 24, VI posterior; 25, VII posterior; 26, VIII posterior. 27, Pupal apical abdominal appendages.

Abdomen: Abdominal segments with dark, recumbent setae, more dense ventrally. First segment with 2 pairs of gills on sternum; gills with adjacent bases. Segments II–V each with 1 pair of median gills. Segments II–VI each with 1 pair of lateral gills; each gill arising from a common base. Segment VIII with 1 pair of lateral gills. Sterna of segments VIII and IX each with a pair of spine-bearing plates, only sterna of segment IX with spines emanating from prominent sockets. Each sclerite of abdominal sternum IX distinct, not fused (Fig. 16). Tergum IX with small lateral sclerite and pair of large dorsal sclerites. Anal prolegs with a bent claw and cluster of long bristles, without spine-like setae on ventral surface (Fig. 17).

Pupa: Total length 7.01–7.68 mm (n=4). Mandibles tapering regularly to pointed apex; inner margin with 2 large teeth; widened basally, with 2 groups of elongate setae on lateral and ventral surfaces (Fig. 18). Dorsally, with 1 pair of anterior hook plates on abdominal segments III–VIII (Figs. 19, 20); 1 pair of posterior hook plates on segments III–IV (Figs. 21–26), posterior hook plate of segment IV covered with row of long setae (Fig. 22). Apical processes with wide base narrowing to apex; ventral surface and lateral margins bearing elongate setae (Fig. 27).

Diagnosis: Although diagnostic features to distinguish larval *P. phaidra* from Southeast Asian congeners cannot be determined until the larvae of other species are described, several features distinguish the larva of this species from those of *P. flava* (Hagen) and *P. czekanowskii* (Martynov). Specifically, the anterior ventral apotome of *P. phaidra* has a prominent anteromedian tubercle and cleft apices, whereas *P. flava* has a prominent anteromedian tubercle, but the apices are not cleft. *Potamyia phaidra* has the ventral sclerites of abdominal sternum IX separate, fully covered with spines, and with the inner margins concave, whereas for *P. flava*, the ventral sclerites are less spinose near the lateral margins, and the inner margins are straight. The lateral margin of the mandible is narrowly flanged for its entire length in *P. phaidra*, whereas for *P. flava* and *P. czekanowskii*, the flange is well-developed, although apparently only in the basal half of the mandible in the latter species. The fore trochantin of *P. phaidra* is not forked, whereas it is forked in *P. flava*. The anterior margin of the frontoclypeus in *P. phaidra* and *P. flava* is concave and weakly crenulate, whereas in *P. czekanowskii* the anterior margin appears to be relatively straight. Other noteworthy features that might be useful in distinguishing among the larvae of species of *Potamyia* include the size and shape of the black maculation on the midline of the posterior margin of the metanotum, color pattern on the head, and overall size.

Material examined: **THAILAND:** Chumphom Prov.: Khuan Mae Yay Mhom Wildlife Sanctuary, stream from Hawe Lome Waterfall, 2.iv.2005, Prommi, 17 larvae, 2 pupae, 8 adults; Nakhon Si Thammarat Prov.: Yong Waterfall National Park, stream from Yong Waterfall, 10.viii.2004, Prommi, 28 larvae, 5 pupae, 6 adults; same locality, 11.X.2004, 15 larvae, 4 pupae, 10 adults; Khao Luang National Park, stream from Ai Khaew Waterfall, 3.xii.2004, Prommi, 13 larvae, 14 adults; stream from Yord Luang Waterfall, 7.iv.2005,

Prommi, 35 larvae, 2 pupae; same locality, 26.v.2005, 57 larvae, 4 pupae; Surat Thani Prov.: Tai Rom Yen National Park, stream from Dad Fah Waterfall, 9.viii.2004, Prommi, 53 larvae, 4 pupae, 6 adults; Khao Sok National Park, stream from Sib-Et-Chan Waterfall, 7.x.2004, Prommi, 10 larvae, 2 pupae, 30 adults; Trang Prov.: Khao Chong Wildlife Management Station, 5.viii.2004, Prommi, 4 larvae, 1 adult; same locality, 5.x.2004, 2 larvae.

Discussion: Of the 13 species of *Potamyia* known from Thailand, *P. phaidra* and *P. flavata* Banks have the most widespread distribution (Malicky & Chantaramongkol 1997; Thapanya *et al.* 2004). The other 11 species known to occur in Thailand appear to have more restricted distributions. However, the known distribution of a species does not necessarily represent its actual distribution, in part because of regionally disparate sampling efforts. For example, *P. flavata* was not found in southern Thailand, but is widespread and common in northern Thailand and further south in Sumatra, Java, and Bali. Other congeners might be endemic to particular areas further north (Malicky & Chantaramongkol 1999). In other geographic regions, adults of *Potamyia* are known from China, however the larval stage has not been recorded (Dudgeon 1999). More attention has been given to the immature stages of insects in North America and Europe. As a consequence, the larval and adult stages have been described for *P. flava* in North America (Ross 1944) and *P. czekanowskii* in Russia (Lepneva 1948). The Oriental biogeographical region has the highest known species diversity and species density of Trichoptera (Morse 2003). Because the taxonomy of Trichoptera is largely based on male genitalia, most taxonomic research has focused on adults. As a consequence, very few taxonomic studies have addressed the immature stages, which ironically, are more important from a water quality perspective. Clearly, many more descriptions of larvae are needed to enable a refined understanding of the benthic fauna in Southeast Asian streams.

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