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Namtokocoris Sites, a new genus of Naucoridae (Hemiptera: Heteroptera) in waterfalls of Indochina, with descriptions of six new species

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Abstract

A new genus with six new species of Naucoridae inhabiting waterfalls of Indochina are described from a decade of aquatic insect collections in Thailand and Vietnam. *Namtokocoris* Sites NEW GENUS is diagnosed by a pair of prominent scutellar protuberances, the prosternal midline bears an expansive, thin, plate-like carina, the forelegs of both sexes have a one-segmented tarsus apparently fused with the tibia, and a single claw. Prominent linear series of stout hairs occur on the hemelytra, although this attribute is not unique within the subfamily. Despite the lack of sexual dimorphism in the forelegs, this new genus is a member of the subfamily Laccocorinae, an assignment based on other characters consistent with this subfamily. Character states of this genus are compared with those of other Asian genera of Laccocorinae. The type species, *Namtokocoris siamensis* Sites NEW SPECIES, is widely distributed from northern through eastern Thailand in waterfalls of several mountain ranges. *Namtokocoris khlonglan* Sites NEW SPECIES was collected only at Namtok Khlong Lan at Khlong Lan National Park. *Namtokocoris minor* Sites NEW SPECIES was collected at two waterfalls near the border with Burma in Kanchanaburi Province and is the smallest species known. *Namtokocoris akekawati* Sites NEW SPECIES occurs in waterfalls from Kanchanaburi Province south to Ranong Province along the Burmese border. In Vietnam, *Namtokocoris dalanta* Sites NEW SPECIES was collected in Thac Dalanta near Da Lat in Lam Dong Province. *Namtokocoris kem* Sites NEW SPECIES was collected from Thac Kem, a limestone waterfall in Pu Mat National Park in Nghe An Province, as well as in Nan Province of northern Thailand. Few characters are available to distinguish among the species; however, genitalic features are reliably diagnostic.

Key words: *Namtokocoris*, new genus, new species, waterfall, Naucoridae, Heteroptera, Thailand, Vietnam

Introduction

The subfamily Laccocorinae was originally proposed by Stål (1876) as division Laccocoraria and later elevated to subfamily Laccocorinae by Montandon (1897). The subfamily presently comprises seven genera (Štys & Jansson 1988). Of these, *Temnocoris* is endemic and restricted to Madagascar, *Decarloa* to Haiti and the Dominican Republic, and *Aneurocoris* is Afrotropical. The remaining four genera (*Ctenipocoris, Diaphorocoris, Heleocoris,* and *Laccocoris*) are the only laccocorines recorded from India through Southeast Asia.

A search for naucorids inhabiting Old World waterfalls (as an ecological analog to *Cataractocoris* of the New World) by RWS began in 1993 while conducting faunistic and biogeographic research in southern Thailand (see Sites et al. 1997, 2001). In 1994, W. D. Shepard collected a specimen in a waterfall in northern Thailand, which represents the earliest known record of this new genus. It was not until 1998, during fieldwork associated with the graduate research of AV, did we discover them in Phu Pan National Park in northeastern Thailand. Many additional collections have continued to add a wealth of data and taxa. Thus, the biogeographic data and collection information presented here represent over a decade of fieldwork in Thailand and a small portion of the graduate research of AV (e.g., Vitheepradit et al. 2003, Vitheepradit & Sites 2007a, b). Moreover, recent collections in Vietnam by RWS have yielded additional material.

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Presented here are the descriptions of *Namtokocoris* NEW GENUS and six inclusive new species. This genus is placed in the subfamily Laccocorinae; thus, eight genera are now recognized in the subfamily. Distributions based on 83 collections, diagnoses, illustrations, habitat descriptions, and a taxonomic key to the species are presented.

Materials and Methods

Collection techniques require that the collector is able to swim, because the base of the waterfall is frequently in a deep plunge pool where there might not be a rock ledge on which to stand. Samples were taken by hand picking the insects from the face of the rock with either fingers or forceps. A soft-bristled brush was used to sweep over the rock, which did not dislodge the insects, but disturbed them sufficiently that they moved, thereby enabling detection and collection.

Photographs of many of the sites (identified as L-numbers) in which these species were collected are available in a Locality Image Database via a link from the internet site of the Enns Entomology Museum, University of Missouri. Length and width are given as a mean and range for paratypes, and all measurements are given in mm. Length of the body is measured from the anterior margin of the head to the posterior margin of the abdomen. Abdominal segment numbers are expressed as Roman numerals. The primary types are deposited in the Enns Entomology Museum, University of Missouri (UMC).

Systematics

Namtokocoris Sites, NEW GENUS

Figs. 1, 2, 10–14

Type species—*Namtokocoris siamensis* Sites, NEW SPECIES

Description. Length 6.64–10.21, width 4.23–6.47. Body ovate, macropterous; widest across embolia; dorsoventrally robust for the subfamily; convex dorsally, flattened ventrally; broadly rounded anteriorly and posteriorly; dorsally head and pronotum light colored, heavily covered with brown punctures; wings dark. Finely punctate throughout; head with compound eyes strongly divergent, mesal and lateral margins slightly convergent anteriorly; lateral hyperoche widening anteriorly; series of several setal rosettes paralleling inner margin of eye; posterior margin of head slightly convex between eyes; apex of head deflexed, oriented posteriorly; labrum broad, rounded; rostrum short, segment three (first visible) partially concealed behind labrum, segment four narrower, reaching to middle of prothoracic coxae; antennae pale, segments one and two short and inconspicuous, three longest and widened apically, four half length of three. Pronotum concave behind eyes, dark band at anterior margin between eyes, covered with erect setae; lateral margins smooth, posterior margin broadly convex, transverse sulcus setting off more darkly colored posterior one third; propleura meeting prosternum; prosternal midline with expansive, thin, plate-like carina between coxae (Fig. 1b). Scutellum large, raised above level of wings, with pair of distinct protuberances (Fig. 1a), posterolateral margins sinuate. Mesosternum with broad tumescence, deeply inflected at midline. Meso- and metapleuron with dense patch of scale-like hairs along lateral margin; metaxyphus acuminate posteriorly. Forelegs with femur broad; tibia narrow; tarsi single-segmented in both sexes; single claw in both sexes, very short, conical (Figs. 1c, d). Middle and hind femora with anteroventral row of hairs and posteroventral row of short spines; middle femur curved dorsad and twisted ~45°, hind femur flat. Middle tibia short, stout; male with dense pad of hairs beginning at middle of ventral surface and widening distally, pad reduced on female; single row of posteroventral heavy spines, multiple rows of anterior heavy spines, single row of short spines on dorsal surface. Hind leg with tibia elongate, thin, multiple rows of spines on anterior and posterior margin, swimming hairs on tibia con-

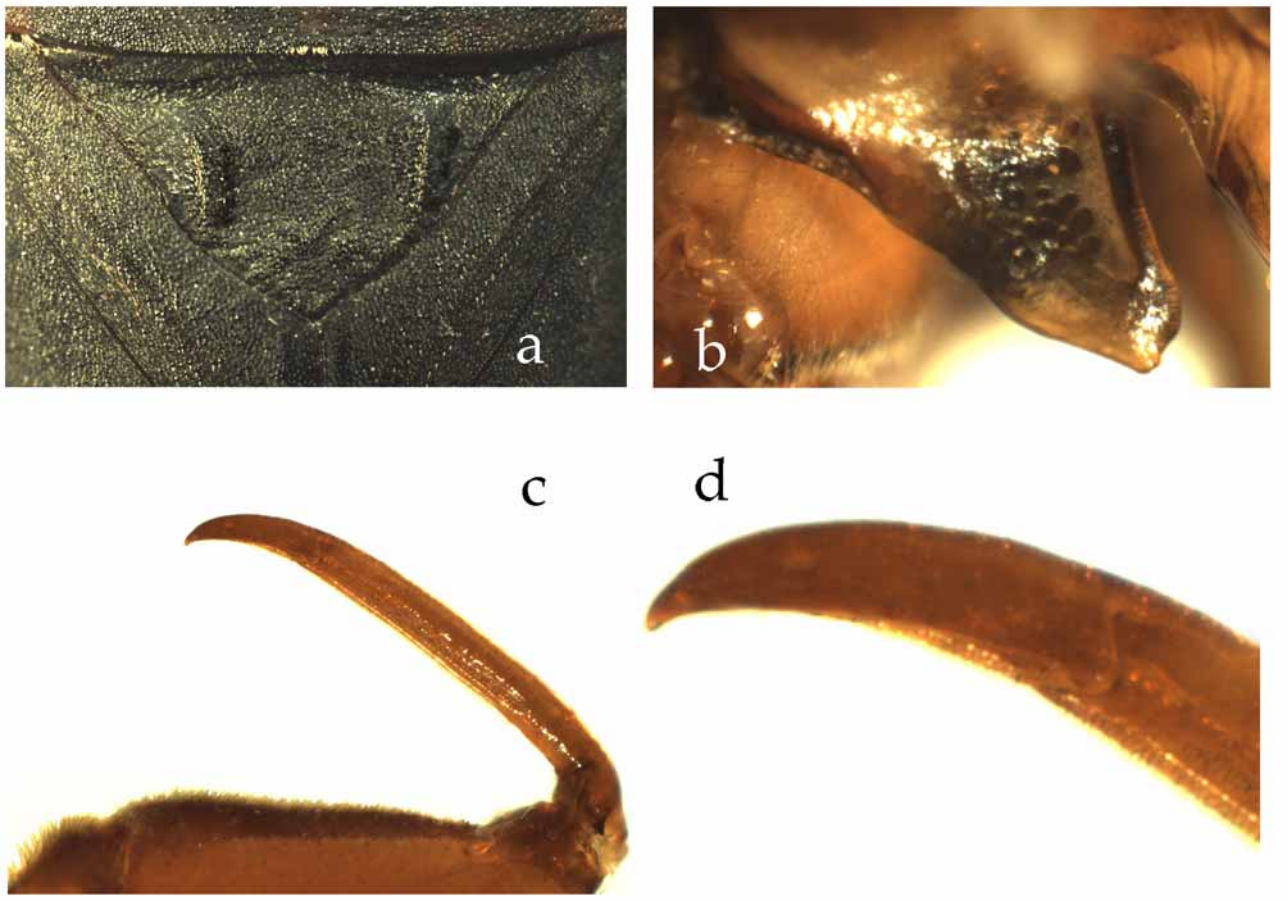

FIGURE 1. Diagnostic features of *Namtokocoris* n.gen: a) scutellar protuberances, b) lateral view of midventral prosternal carina, c) male foreleg with one-segmented tarsus and single pretarsal claw, enlarged in (d), of *Namtokocoris siamensis* n.sp

tinuing onto tarsi; tarsomere one short and produced beneath base of tarsomere two, two long, three longer and with well-developed unguifer; tarsi with heavy spines. Mid- and hind pretarsi with elongate empodia; claws long, curved, each with basal tooth. Mesothoracic coxae slightly and metathoracic coxae strongly recessed within thoracic venter; coxae with series of stout hairs along ventromesal ridge. Hemelytra with distinct clavus and embolium; clavus with longitudinal suture between claval suture and scutellum; multiple linear series of elongate, stout, slightly scale-like setae, including several longitudinal series within clavus, one extending from end of embolar suture, pair of short series flanking claval commissure and diverging posterolaterally, curved series beginning in middle of right corium extending posterolaterally and curving back posteromesally and then anteromesally to form open loop, series on left corium outlining edge where right wing overlaps. Single setae not in series scattered generally over surface. Membrane present but reduced, not obvious, but more flexible than corium and rugose along outer margin (rugosity evident with transmitted light and held at oblique angle). Hindwing with well-developed veins C, R, M, Cu, pCu, pCu-A, 1A, 2A; cells R, M; anal fold (Fig. 2). Abdomen dorsally brown, terga I-IV entire; V-VII dissociated into medio- and laterotergites in males, entire in females. Connexival margin smooth and continuous, without posterolateral segmental productions. Abdomen ventrally generally covered with fine, light colored setae; with glabrous lateral band set off by line of stout, elongate, erect setae; strong brush of brown hairs beginning near anterior margin of V, widening and continuing to posterior end of abdomen. Lateral margins of laterosternites III-VII with series of stout spines (absent anteriorly on III and IV; weakly developed on VI and VII), spines accompanied by elongate hairs. Spiracle on II at anterior margin concealed beneath metepimeron, spiracles III-VI evident between

and slightly anterior to paired glabrous patches. Male with aedeagus elongate, linear, nearly straight on left margin, curved along right margin and tapered distally, with series of striations on left, right, or both sides of median carina; parameres small, symmetrical; right side of median process of pygophore and right paramere slightly deflected ventrad. Female subgenital plate elongate, subtriangular with apex rounded or flattened.

FIGURE 2. Right hindwing of *Namtokocoris siamensis* n.sp.

Diagnosis. This genus can be recognized by the pair of prominent protuberances (Fig. 1a) on the scutellum, the prosternal midline bears an expansive, thin, platelike carina (Fig. 1b); the forelegs of males have a one-segmented tarsus that appears fused with the tibia (Figs. 1c, d), although a suture is visible, as is common throughout the other naucorid subfamilies; and the forelegs of both sexes bear a single claw. Similar to *Diaphorocoris*, linear series of stout hairs occur on the hemelytra. Like *Ctenipocoris*, the body form is relatively dorsoventrally robust and the mid and hind legs are heavily spined. Like both of these genera, a very dense band of hairs begins near abdominal sternum V and gradually widens to the posterior tip of the abdomen.

Discussion. Males have the well-developed pad of hairs on the mesotibia (present but reduced in females), which is consistent with the subfamily Laccocorinae. However, both sexes have a single nonarticulated protarsal segment and single claw, which is inconsistent with established subfamily attributes. Intraspecific variation in aedeagal striations exists such that the striations might be apparent on both sides of the midline, or on only one side. Whether or not these striations have stridulatory function is unknown. The secondary longitudinal suture within the clavus was observed in all specimens examined, and appears to correspond with macroptery (H. Zettel, pers. comm.). All specimens examined for hindwing condition were macropterous.

The subfamily Laccocorinae has been characterized by somatic dimorphism of the forelegs and middle legs. Specifically, the forelegs of laccocorine males have two-segmented, articulated tarsi; whereas females have one-segmented, articulated tarsi. This condition as a unifying feature of the subfamily is vitiated by the discovery of *Namtokocoris*. However, other features of the subfamily hold consistent, including that laccoco-

rine males have the mesothoracic tibia with a well-developed dense pad of hairs widening distally, and that in females this pad of hairs is weakly developed. In addition, the parameres are small, the labrum is well developed, and the morphological apex of the head is folded down and oriented posteriorly.

Based on the character states in common with other members of the subfamily, *Namtokocoris* appears to be most closely related to *Diaphorocoris*. Both genera have elevation and paired protuberances of the scutellum, and hair lines on the hemelytra (Table 1). These genera both have a dense midventral hair band in common with *Ctenipocoris*. Analysis including molecular data is needed to more effectively evaluate phylogenetic relationships.

TABLE 1. Character comparison of *Namtokocoris* with other Asian genera of Laccocorinae.

Character	*Namtokocoris*	*Diaphorocoris*	*Ctenipocoris*	*Laccocoris*	*Heleocoris*
male protarsal segments	1	2	2	2	2
articulated protarsi	no	yes	yes	yes	yes
pretarsal claws on foreleg	1	2	2	2	2
expansive, thin, prosternal carina	yes	no	no	no	no
scutellar protuberances	distinct	weak	no	no	no
scutellum elevated	yes	yes	no	no	no
hair lines on hemelytra	yes	yes	no	no	no
dense mid-ventral band of hairs on abdominal sterna V–VII/VIII	yes	yes	yes	no	no
dimorphic pad of hairs on mesotibia	yes	yes	yes	yes	yes
front of head folded posteroventrally	yes	yes	yes	yes	yes
well-developed labrum	yes	yes	yes	yes	yes

Ecological Notes. All known species, described here, are restricted to the rock surfaces of waterfalls and nearby wet rocks receiving spray from the waterfalls (Figs. 4–9). The insects have not been found in the plunge pool below the waterfall except after they fell in when dislodged from the rock. These insects are cryptic and difficult to see unless they move. They tend to occur away from the high shear forces of the waterfall, and there appears to be some species-specificity to the degree of hydraulic force they prefer. Most are at least in a film of sheeting water at the margins of the falling water. Frequently, they can be found in cracks or fissures of the substrate, beneath undercuts in the rock, or associated with rock surface irregularities. All species except two were found on rocks with gentle surface texturing. The two exceptions were a wet, smooth granite surface (Fig. 5) and a moderately-deeply pocketed limestone surface (Fig. 7). The latter was the only case in which we found *Namtokocoris* on a limestone waterfall, despite sampling many other limestone waterfalls. All other specimens were taken on granite. Algae was invariably present on the rocks wherever this insect was found. Many other insects were present on the rock surfaces of the waterfall, including mayflies, dryopoids, hydrophilids, earwigs, gerrids, and the naucorid *Cheirochela*. We have also encountered tadpoles, frogs, fish, and snakes on the near-vertical rock surfaces. A detailed account of species of *Oocyclus* (Hydrophilidae) corresponding with many of our localities in Thailand has been published by Short & Swanson (2005), and of *Eotrechus* (Gerridae) by Vitheepradit & Sites (2007a).

In northern Thailand, where surface water is present year round, *Namtokocoris* occurred continuously through an annual cycle. However, in the south during the dry season, some waterfalls in which the insects occur become dry to the point that no surface water is evident; nevertheless *Namtokocoris* persists and probably survives in protected wet cavities below the rock surface.

Waterfalls in southern Thailand from the border with Malaysia north to the area near Phuket in the Isthmus of Kra have been sampled for 15 years without discovering this insect. The farthest south we have collected *Namtokocoris* in Thailand is Ranong Province. We have collected it from throughout the rest of Thailand, including from < 1 km from the border with Burma to the west, internationally between Thailand and Laos in the north, to near the Cambodian border in the southeast. In addition, we have collected it in southern and northern Vietnam. Thus, this genus unquestionably occurs widely throughout much of Indochina (Fig. 3).

Etymology. This genus is particularly common in Thailand where five of the six species described here were found. The genus is named for its restriction to a waterfall habitat. "Namtok" means waterfall in the Thai language, and "coris" is Greek for bug.

Material examined. See species localities.

Key to the species of *Namtokocoris*

1. Posterolateral corners of pronotum not produced posteriorly* (Figs. 11a, b, f) 2
1'. Posterolateral corners of pronotum produced posteriorly* (Figs. 11c-e) 4
2. Small, body length < 8.0 mm; reddish-brown U-shaped marking on scutellum.. *Namtokocoris minor* n.sp.
2'. Body length > 8.0 mm; scutellum concolorous dark brown, but if reddish markings, never in continuous U-shape 3
3. Males with median process of pygophore shorter than wide and asymmetrically directed to left; aedeagus with right margin abruptly angled and apex strongly hooked (Figs. 12b, 13b). Females with well-developed lateral lobe on costal margin of right hemelytron at position of abdominal segment V; mediosternite VI with posterior margin flat or slightly concave; subgenital plate with apex flat with broadly rounded corners (Fig. 14b); embolium with anterolateral margin weakly curved (Fig. 11b)..... ..... *Namtokocoris akekawati* n.sp.
3'. Males with median process of pygophore longer than wide and symmetrical; aedeagus with right margin smoothly curved and apex weakly hooked (Figs. 12a, 13a). Females with very weak or no lateral lobe on costal margin of right hemelytron at position of abdominal segment V; mediosternite VI triangular with posterior margin pointed; subgenital plate with apex spatulate (Fig. 14a) or acuminate; embolium with anterolateral margin strongly curved (Fig. 11a) ..... *Namtokocoris siamensis* n.sp.
4. Claval commissure longer than pronotum at midline. Female with well-developed lateral lobe on costal margin of right hemelytron at position of abdominal segment V .....*Namtokocoris khlonglan* n.sp.
4'. Claval commissure shorter than pronotum at midline. Female with very weak or no lateral lobe on costal margin of right hemelytron at position of abdominal segment V 5
5. Aedeagus with tip nearly straight; apex of median process of pygophore digitate and rounded distally (Figs. 12c, 13c). Females with posterior margin of mediosternite VI slightly convex (Fig. 14c) .... *Namtokocoris dalanta* n.sp.
5'. Aedeagus with tip curved to right and pointed; apex of median process of pygophore broad, slightly concave distally with sharp corners (Figs. 12d, 13d). Females with posterior margin of mediosternite VI slightly concave or straight in middle (Fig. 14d)..... *Namtokocoris kem* n.sp.

* This key is for the macropterous form, which is the only form presently known. If brachypterous forms are discovered, the posterolateral corners of the pronotum will probably be of a different shape.

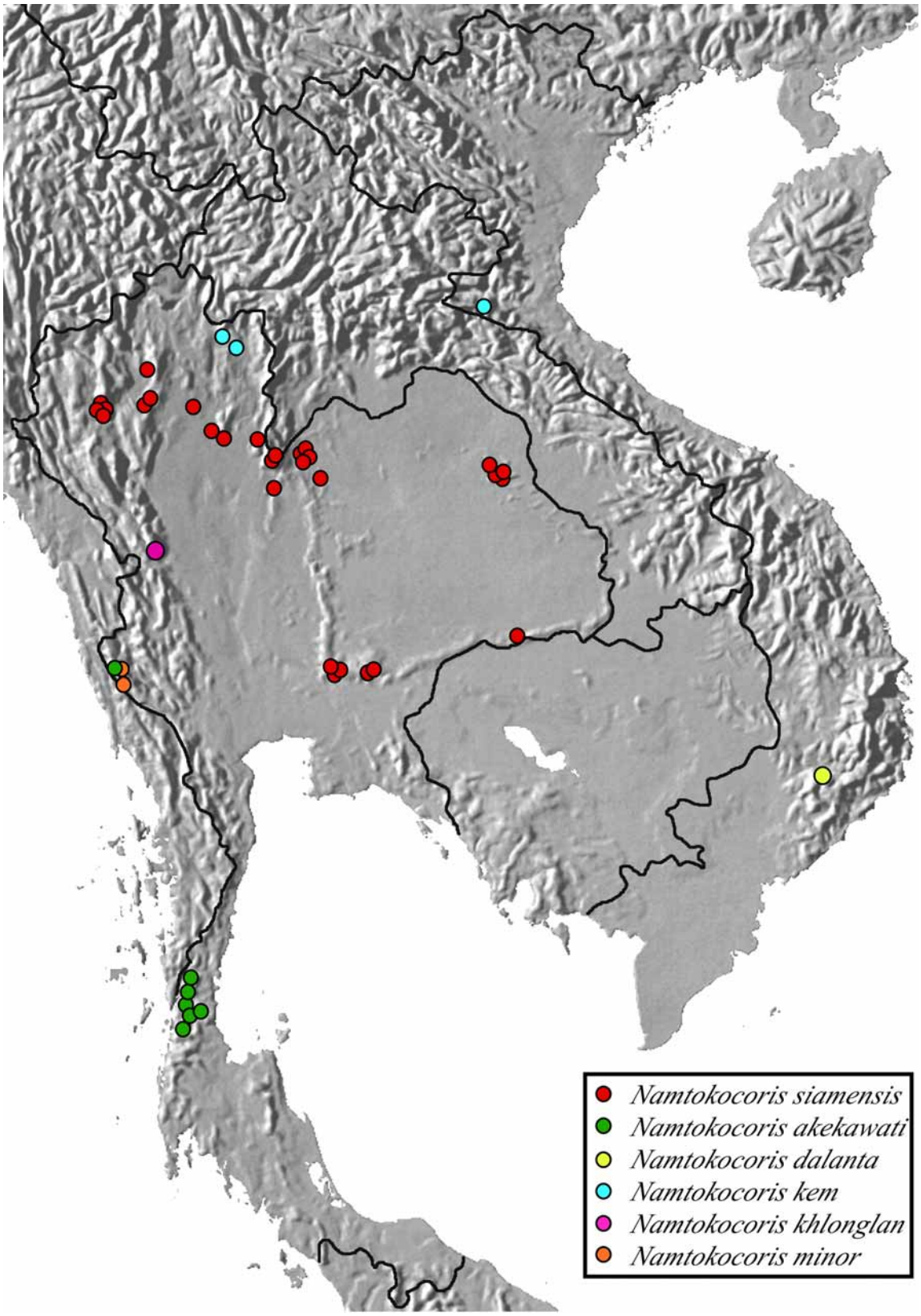

Figure 3.Map of Indochina showing collection sites for six new species of *Namtokocoris*.

***Namtokocoris siamensis* Sites, NEW SPECIES**
Figs. 1–4, 10a, 11a, 12a, 13a, 14a

Descriptions

Macropterous male. See generic description; only additional details provided here. Holotype, length 9.05; maximum width 5.56. Paratypes (n = 20), length 8.30–9.79 (mean = 9.15); maximum width 5.39–5.98 (mean = 5.74). Overall coloration dorsally dark brown with yellowish-brown head, pronotum, and wide band at anterior end of embolium gradually narrowing to obsolescence at or beyond posterior end of embolium; heavy dark punctation forming subtle, indistinct pattern on head and pronotum, heaviest near posteromesal angle of eye and pronotum in middle 2/3 and posterior to transverse sulcus (Fig. 10a). Ventrally, generally golden brown; yellowish on anteclypeus, lateral margins of prothorax, and exposed portion of hemelytra.

Head length 1.40, maximum width 3.53, synthlipsis at posteromesal corner 1.20, with four pairs of setal rosettes bordering inner margin of eyes, fifth pair further mesad and slightly ventrad to anterior margin. Antennal proportions 5:6:14:10. Pronotum broad, 2.7 x as wide as long; with elongate, erect setae especially evident laterally; length at midline 2.01; maximum width at posterolateral corners 5.41; posterolateral corners rounded, with pronounced bulge above wing base (Fig. 11a). Scutellum dark brown, heavily punctate, triangular with distinctly sinuate posterolateral margins, almost twice as wide as long, width 3.53, length 1.80, line of erect setae on each longitudinal protuberance. Claval commissure length 1.48. Embolium with anterolateral angle strongly curved (Fig. 11a), yellowish anterior band gradually narrowing posteriorly and becoming obsolete near posterolateral corner of embolium, length 3.81 (chord measurement), maximum width 0.94. All coxae yellowish brown, trochanters and femora golden brown, fore tibia/tarsus dark brown, middle and hind tibia/tarsus medium brown. Leg measurements as follows: foreleg, femur 1.88, tibia 1.10, tarsus 0.38; middle leg, femur 2.02, tibia 1.44, tarsomeres 1–3 0.14, 0.30, 0.32; hind leg, femur 2.60, tibia 2.58, tarsomeres 1–3 0.28, 0.66, 0.78. Posterior margin of mediosternite III straight, IV concave, V strongly concave, VI and VII convex, VIII broadly pointed. Posterior margin of laterosternite V sinuate. Genital operculum with posterolateral margins straight, apex narrowly rounded. Parameres symmetrical in shape, gently excavate laterally, rounded distally, flanking lateral margins of median process of pygophore, left slightly exceeding right anteriorly; right side of median process of pygophore and right paramere slightly deflected ventrad; median process of pygophore flat-tipped and with fine, elongate setae; aedeagus with mid-dorsal carina, left margin slightly convex, right margin gently curved and widest in basal half, slightly hooked to right at apex, series of striations at middle on left side, another series right of mid-dorsal carina in basal quarter (Figs. 12a, 13a).

Macropterous female. Paratypes (n = 20), length 8.55–10.46 (mean = 9.33); maximum width 5.64–6.14 (mean = 5.89). Similar to male in general structure and coloration; pad of hairs on middle tibia reduced; posterior margin of mediosternite V straight; mediosternite VI triangular, narrowly pointed; subgenital plate (VII) with sides convergent, apex terminating in spatulate process; posterolateral corner of laterosternite VI broadly pointed and produced posteriorly (Fig. 14a); nearly imperceptible lateral bulge on costal margin of right hemelytron at position of abdominal segment V.

Diagnosis

Males can be recognized by the characteristics of the genitalia. Specifically, the parameres and pygophore are elongate, and the median process of the pygophore is blunt-tipped. Females are readily recognized by the triangular 6th sternite, and spatulate process on the subgenital plate. However, the spatulate tip is pointed in eastern populations. Females also have the posterior margin of laterosternite VI strongly concave. The pronotal margin has a pronounced bulge above the wing hinge, immediately mesad of the rounded posterolateral corner. The scutellar protuberances are distinctly linear. Also, the anterolateral margin of the embolium is strongly and evenly, but not abruptly, curved.

Discussion. With our present knowledge, this is the most widespread of the six species described here. It

is found wherever suitable habitat exists, from the mountains near Chiang Mai in the northwest, south to the San Kampang Mountains north of Bangkok, east to the Phanom Dong Rak mountain range on the Cambodian border, and as far northeastward as Phu Pan National Park in Kalasin Province. In the farthest eastern localities of Kalasin, Mukdahan, Sakon Nakhon, and Sisaket provinces, the shape of the female subgenital plate and 6th mediosternite differs from those of specimens in central and northern Thailand. Specifically, the 6th sternite tends to be slightly asymmetrical, and the apex of the subgenital plate is pointed, rather than terminating in a spatulate process. Because of the paucity of nongenitalic characters to distinguish among species, these eastern Thai populations are provisionally assigned to *N. siamensis*, although further research and collecting is necessary to assess their taxonomic status.

This species occurs in the water film on near-vertical rock surfaces of waterfalls. It is particularly likely to be found in conditions with algal-covered rocks and a film of water moving over the surface. It is predictably found on dripping rock undercuts of the walls of waterfalls. It was collected together with *Onychotrechus esakii* Andersen (Hemiptera: Gerridae) at the type locality (Fig. 4).

This species is probably what was given as an unidentified species of *Diaphorocoris* by Chen et al. (2005). Although in their illustration, leg spination is not as profuse as in *Namtokocoris siamensis*, the forelegs appear to bear a single, non-articulated tarsal segment and single claw. Their specimen was collected from a quiet pool of a small stream in Chiang Mai. It is possible that this specimen drifted downstream from a waterfall, as we collected *N. siamensis* from several small waterfalls in Chiang Mai Province, some with a fall of less than 1 meter.

Etymology

This species is named for the country in which it was first found and throughout which it widely occurs.

Repositories

The holotype, allotype, and some paratypes are deposited in the Enns Entomology Museum, University of Missouri-Columbia, U.S.A. Additional paratypes will be deposited in the Royal Forestry Department, Bangkok, Thailand; Entomology Collection, Kasetsart University, Bangkok, Thailand; United States National Museum, Washington, D.C., U.S.A.; California Academy of Sciences, San Francisco, U.S.A; and the Natural History Museum – Vienna, Austria.

Material examined

Holotype, macropterous male, and allotype, macropterous female: THAILAND: **Chiang Mai Province**, Doi Suthep-Pui National Park, Namtok Mohk Fah, 19°06'N 98°46'E, 600 m, 27 June 2002, rock face of waterfall, Sites, Arnon, Penkae, Taeng-On, L-413. Paratypes: same data as primary type (34 males, 7 females, >100 nymphs); Doi Suthep-Pui National Park, Namtok Monthathan, 18°49'N 98°55'E, 700 m, 8 April 2002, rock face, UMC and CMU teams, L-330 (17 males, 5 females); same locality, 690 m, 15 March 2002, R. W. Sites, L-296 (11 males, 15 females, 3 nymphs); **Loei Province**, Amphur Phu Rua; Namtok Song Korn, 17°21'N 101°24'E, 728 m, 10 May 2004, Vitheepradit & Prommi, L-676 (10 males, 11 females, 13 nymphs); **Nakhon Nayok Province**, Khao Yai National Park, Namtok Salika, 14º18'N 101º15'E, 68 m, 7 April 2004, R. W. Sites & A. Vitheepradit, L-606 (76 males, 79 females, 30 nymphs). THAILAND/LAOS: **Loei Province**, Na Haew National Park, Tahd Heuang International Waterfall, 17°33.990' N 100°59.526'E, 500 m, 10 March 2002, rock face, Sites, Vitheepradit, Kirawanich, L-280 (9 males, 2 females, 8 nymphs).

Additional material examined.

THAILAND : **Chiang Mai Province**, Doi Suthep-Pui National Park, Namtok Mohk Fah, 19°06'N 98°46'E, 564 m, 13 October 2002, rock face, CMU team; same locality, 18 March 2002, G. W. Courtney; Namtok Monthathan, 18°49'N 98°55'E, 700 m, 5 March 2002, Vitheepradit, Kirawanich, Sites, L-263; same

locality, 25 March 2003, Sites, Vitheepradit, Prommi, L-415; same locality, 29 March 2003, UMC and CMU teams, L-427; same locality, 29 April 2003, Vitheepradit, Thamsenanupap, Ferro, L-489; same locality, 19 May 2004, Vitheepradit, Prommi, Laudee, L-697; same locality, 7 June 2002, CMU team; same data, 9 July 2002; same data, 10 August 2002; same data, 25 September 2002; same data, 17 November 2002; same data, 11 December 2002; same data, 12 January 2003; same data, 15 February 2002; same data, 24 April 2003; Namtok Sai Yoi, 18°48'N 98°55'E, 1100 m, 5 April 2002, UMC and CMU teams, L-326; same locality, 5 May 2002, Thamsenanupap; same data, 7 June 2002; same data, 9 August 2002; same data, 17 November 2002; same data,15 February 2003; same data, 5 April 2003; same data, 12 January 2003; Namtok Huay Pa Lad, 18°48'N 98°54'E, 1250 m, 29 April 2003, Vitheepradit, Thamsenanupap, Ferro, L-488; same locality, 24 March 1994, W. D. Shepard; same locality, 5 March 2002, Vitheepradit, Kirawanich, Sites, L-264; Doi Inthanon National Park, Namtok Mae Klang; 18°29'N 98°40'E, 415 m, 3 April 2002, UMC and CMU teams, L-320; Namtok Siritharn, 18°32'N 98°34'E, 829 m, 2 May 2003, UMC & CMU teams, L-497; Namtok Pha Dum, 18°36'N 98°31'E, 1379 m, 3 May 2003, UMC and CMU teams, L-499; **Kalasin Province**, Phu Pan National Park, Namtok Huay Yai, 5 June 1998, stream w/ waterfall & vegetation, Sites, Simpson, Vitheepradit, L-154; same data, 7 June 1998, sheeting water film on rock, L-164; Amphur Khao Wong, Namtok Tad Tong, 16°45'N 104°07'E, 204 m, 25 April 2004, A. Vitheepradit, L-642; **Loei Province**, Phu Rua National Park, Namtok Huay Pai, 10 June 1998, rock face of waterfall, Sites, Simpson, Vitheepradit, L-175; Namtok Hin Sahm Shan, 10 June 1998; rock face of waterfall, Sites, Simpson, Vitheepradit, L-176; Namtok Phah Paw, Huay Kang Station of Phu Luang Wildlife Sanctuary, 11 June 1998, tiny waterfall trickle, Sites, Simpson, Vitheepradit, L-181; Na Haew National Park; Namtok Wahng Tahd, 17°33.990'N 100°59.526'E, 750 m, 9 March 2002, Vitheepradit, Kirawanich, Sites, L-277; same locality, 17°28'N 100°57'E, 977 m, 25 April 2003, Vitheepradit, Prommi, Setaphan, L-484; Amphur Phu Rua, Namtok Plan Ba, 17°23'N 101°22'E, 649 m, 10 May 2004, Vitheepradit & Prommi, L-675; **Mukdahan Province**, Phu Pa Yon National Park ; Namtok Keang Pho, 16°45'N 104°14'E, 314 m, 23 April 2004, A. Vitheepradit, L-634; **Nakhon Ratchasima Province**, Khao Yai National Park; Namtok Heaw Su Wat, 14º25'N 101º24'E, 380 m, 6 April 2004, Sites & Vitheepradit, L-605; Tab Lan National Park, Namtok Suan Horm, 14º20'N 101º53'E, 340 m, 13 April 2004, Sites & Vitheepradit, L-623; Namtok Huey Yai, 14º20'N 101º53'E, 338 m, 14 April 2004, Sites & Vitheepradit, L-624; Namtok Pha Tabak; 6 April 2004, 14º21'N 101º20'E, 395 m, Sites & Vitheepradit, L-604; **Phitsanulok Province**, Phu Hin Rongkla National Park; Namtok Romglao, 16°59'N 101°00'E, 1190 m, 11 March 2002, Sites, Vitheepradit, Kirawanich, L-288; same locality 6 May 2003, Vitheepradit, Prommi, Ferro, L-507; same locality, 23 Aug 2002, CMU team; same data, 12 Jan 2003; same data, 22 May 2002; same data, 21 June 2002; same data, 15 Dec 2002; **Phrae Province**, Wieng Ko Sai National Park, Namtok Punjane, 17°56'N 99°34'E, 430 m, 28 March 2003, Sites, Vitheepradit, Prommi, L-424; same locality, 24 Aug 2002, CMU team; same data, 23 May 2002; same data, 24 April 2002; **Sakon Nakhon Province,** Namtok Huey Yai, 17°01'N 103°59'E, 259 m, 22 April 2004, A. Vitheepradit, L-632; Phu Pa Yon National Park, Namtok Kam Sang, 23 April 2004, 16°55'N 104°09'E, 236 m, A. Vitheepradit, L-635; **Sisaket Province**, Phanom Dongrak Wildlife Sanctuary, Namtok Samrong Kiat, 14º30'N 104º29'E, 187 m, 12 April 2004, rock face of waterfall, Sites & Vitheepradit, L-621; **Uttaradit Province**, Phu Soi Dao National Park; Namtok Soi Dao, 17°47'N 100°57'E, 608 m, 24 April 2003, Vitheepradit, Prommi, Setaphan, L-482; Klong Tron National Park; Namtok Klong Tron, 17°36'N 100°44'E, 662 m, 26 April 2003, Vitheepradit, Prommi, Setaphan, L-486; Namtok Mae Cheuy, 17°47'N 100°10'E, 231 m, 27 April 2003, Vitheepradit, Prommi, Setaphan, L-487. THAILAND/LAOS: **Loei Province**, Na Haew National Park, Tahd Heuang International Waterfall, 17°33'N 100°59'E, 500 m, 10 March 2002, G. W. Courtney; same locality, 25 April 2003, Vitheepradit, Prommi, Setaphan, L-485.

FIGURE 4. Namtok Mohk Fah in Chiang Mai Province, Thailand, the type locality of *Namtokocoris siamensis* n.sp.

***Namtokocoris akekawati* Sites, NEW SPECIES**
Figs. 3, 5, 10b, 11b, 12b, 13b, 14b

Descriptions

Macropterous male. See generic description; only additional details provided here. Holotype, length 9.46; maximum width 5.98. Paratypes (n = 10), length 8.55–9.63 (mean = 9.26); maximum width 5.73–6.22 (mean = 6.03). Overall coloration dorsally dark brown with yellowish-brown head, pronotum, and wide band at anterior end of embolium gradually narrowing to obsolescence near membrane; heavy dark punctation forming subtle, indistinct pattern on head and pronotum, heaviest near posteromesal corner of eye and pronotum in middle 2/3 and posterior to transverse sulcus (Fig. 10b). Ventrally, medium brown, darker laterally on meso- and metathorax; yellowish on anteclypeus, lateral margins of prothorax, and exposed portion of hemelytra.

Head length 1.58, maximum width 3.85, synthlipsis at posteromesal corner 1.20, with four pairs of setal rosettes bordering inner margin of eyes, fifth pair further mesad and slightly ventrad to anterior margin.

Antennal proportions 5:7:13:9. Pronotum broad, 2.8 x as wide as long, with scattered elongate, erect setae; length at midline 2.00; maximum width at posterolateral corners 5.70; posterolateral corners rounded, straight immediately mesad of corner to level of wing base (Fig. 11b). Scutellum dark brown, occasionally with reddish on protuberances on apex, heavily punctate, triangular with distinctly sinuate posterolateral margins, 2.1x as wide as long, width 3.81, length 1.80, longitudinal protuberances broad, tumescent, each with line of erect setae. Claval commissure length 1.52. Embolium with anterolateral corner gently, evenly arcuate (Fig. 11b); yellowish anterior band gradually narrowing posteriorly and becoming obsolete near posterolateral end of embolium; length 4.02 (chord measurement); maximum width 0.98. All coxae yellowish brown; trochanters and femora medium brown, femora lighter distally; fore tibia/tarsus dark brown; middle and hind tibia/tarsus light brown, tip of tarsomere 3 dark brown. Leg measurements as follows: foreleg, femur 1.90, tibia 1.32, tarsus 0.38; middle leg, femur 2.18, tibia 1.56, tarsomeres 1–3 0.18, 0.30, 0.36; hind leg, femur 2.80, tibia 2.68, tarsomeres 1–3 0.36, 0.74, 0.92. Posterior margin of mediosternite III straight, IV concave, V strongly concave, VI nearly straight, VII convex, VIII broadly pointed. Posterior margin of laterosternite V straight with rounded posteromesal corner. Genital operculum with posterolateral margins straight, apex acuminate. Parameres symmetrical, rounded distally, double the size of median process of pygophore, with transverse excavation just above base deepening laterally; median process of pygophore abruptly glabrous and shining, rounded, asymmetrically oriented to left, slightly overlapping mesal margin of left paramere; aedeagus with mid-dorsal carina, left margin nearly straight, right margin angulate, narrowed and concave in distal quarter, hooked to right at apex, series of striations at middle on both sides of mid-dorsal carina (Figs. 12b, 13b).

Macropterous female. Paratypes (n = 10), length 9.13–9.96 (mean = 9.67); maximum width 5.89–6.31 (mean = 6.19). Similar to male in general structure and coloration; pad of hairs on middle tibia reduced; posterior margin of mediosternite V and VI straight; subgenital plate (VII) about as long as wide, lateral margins convergent, posterior margin straight, posterolateral corners broadly rounded; posterolateral corner of laterosternite VI rounded and slightly produced posteriorly (Fig. 14b); pronounced lateral lobe on costal margin of right hemelytron at position of abdominal segment V.

Diagnosis

Males can be recognized by the abruptly angled right margin of the aedeagus and asymmetrically oriented (to the left) median process of the pygophore. Females have a distinct lobe on the costal margin of the right hemelytron at the level of abdominal segment V, a condition which is shared with *N. khlonglan* (see below). Females of these species differ in that the posterolateral corners of mediosternite VI in *N. akekawati* are not distinctly deflected ventrad from the sternum. Using somatic characters, this species can be recognized by the broad tumescent protuberances on the scutellum, whereas they are more linear in *N. siamensis*. Also, the anterolateral margin of the embolium is gradually, shallowly, and evenly curved, whereas in *N. siamensis* the curvature is stronger. In addition, the tips of the middle and hind tarsi are more distinctly dark brown.

Discussion

This species has been collected from the Tennaserim mountain range in Kanchanaburi Province and the Phuket mountain range in Rangong Province. At Namtok Jok Kra Din, *N. akekawati* occurred syntopically with *N. minor* (see below), which was the only waterfall in which we found more than one species of *Namtokocoris*. This species exhibits a broader range of habitat selection in that it was found on vertical to horizontal wet, algae-covered rocks that received distant misting from the waterfall at Haew Lome. Thus, at the type locality, these insects were not immersed within a water film. However, at Namtok Jok Kra Din and Namtok Ngao, they were collected in a film of water associated with the waterfall, which is typical habitat for the genus. It was collected with *Onychotrechus esakii* Andersen (Hemiptera: Gerridae) at the type locality (Fig. 5).

Etymology

This species is named for Akekawat Vitheepradit, doctoral student at the University of Missouri. His dedication to field work led directly to the discovery of this species and many other undescribed aquatic Heteroptera in Thailand.

Repositories

The holotype, allotype, and some paratypes are deposited in the Enns Entomology Museum, University of Missouri-Columbia, U.S.A. Additional paratypes will be deposited in the Royal Forestry Department, Bangkok, Thailand; Entomology Collection, Kasetsart University, Bangkok, Thailand; United States National Museum, Washington, D.C., U.S.A., California Academy of Sciences, San Francisco, U.S.A; John T. Polhemus Collection, Englewood, Colorado, U.S.A.; and the Natural History Museum – Vienna, Austria.

Material examined

Holotype, macropterous male, and allotype, macropterous female: THAILAND: **Ranong Province**: Khun Mae Yam Oum Wildlife Sanctuary, Namtok Haew Lome, 09º43.740'N 98º40.953'E, 122 m, 14 June 2004, R. W. Sites, L-765. Paratypes: same data as primary type (90 males, 36 females); Namtok Ngao National Park, Namtok Ngao, 9º51'N 98º37'E, 50 m, 2 April 2005, T-O Prommi (6 males, 3 females, 1 nymph).

Additional material examined.

THAILAND: **Chumphon Province:** Khun Mae Yam Oum Wildlife Sanctuary, Namtok Chum Poon, 09°47'N 98°54'E, 100 m, 30 May 2004, Vitheepradit & Prommi, L-731; **Kanchanaburi Province**: Amphur Thong Pha Phum, Namtok Jok Kra Din, 14°41.43'N 98°23.18'E, 4 June 2006, rock face of waterfall, Sites, Vitheepradit, Prommi, L-916; **Ranong Province**: Khun Mae Yam Oum Wildlife Sanctuary, Namtok Haew Lome, 09º43.740'N 98º40.953'E, 122 m, 21 May 2003, Vitheepradit & Ferro, L-555; same locality, 7 June 2006, Sites, Vitheepradit, Prommi, L-921a; same locality, 22 May 2005, Sites, Vitheepradit & Prommi, L-785b; Thung Raya-Na Sak Wildlife Sanctuary, Namtok Chumsang, 10°30'N 98°53'E, 176 m, 20 May 2003, Vitheepradit & Ferro, L-550; Amphur Muang, Namtok Pun Ya Ban, 10°03'N 98°40'E, 86 m, 20 May 2003, Vitheepradit & Ferro, L-553; Namtok Khao Pha Na Rai, 09°36'N 98°35'E, 94 m, 21 May 2003, Vitheepradit & Ferro, L-554; Namtok Ngao National Park, Namtok Ngao, 9º51'N 98º37'E, 50 m, 23 May 2005, Sites, Vitheepradit, Prommi, L-787.

FIGURE 5. Namtok Haew Lome in Ranong Province, Thailand, the type locality of *Namtokocoris akekawati* n.sp.

***Namtokocoris dalanta* Sites, NEW SPECIES**
Figs. 3, 6, 10c, 11c, 12c, 13c, 14c

Descriptions

Macropterous male. See generic description; only additional details provided here. Holotype, length 10.21; maximum width 6.31. Paratypes (n = 8), length 9.13–10.21 (mean = 9.72); maximum width 5.89–6.47 (mean = 6.24). Overall coloration dorsally dark brown with yellowish-brown head, pronotum, and wide band at anterior end of embolium gradually narrowing to obsolescence near membrane of hemelytra; heavy dark punctation forming indistinct pattern on head and pronotum, heaviest near posterior margin of head and pronotum in middle 2/3 and posterior to transverse sulcus (Fig. 10c). Ventrally, generally medium brown; yellow on anteclypeus, lateral margins of prothorax, and exposed portion of hemelytra.

Head length 1.54, maximum width 3.57, synthlipsis at posteromesal corner 1.30, with four pairs of setal rosettes bordering inner margin of eyes, fifth pair further mesad and slightly ventrad to anterior margin. Antennal proportions 5:6:13:9. Pronotum broad, 3.1 x as wide as long; yellowish spot on midline posterior to transverse sulcus; with elongate, erect setae especially evident laterally; length at midline 1.80; maximum width at posterolateral corners 5.58; posterolateral corners rounded, produced posteriorly (Fig. 11c). Scutellum dark reddish-brown, heavily punctate, triangular with distinctly sinuate posterolateral margins, 2.2x as wide as long, width 3.28, length 1.52, pair of longitudinal protuberances each with line of erect setae. Claval commissure length 1.68. Embolium with anterolateral corners abruptly curved (Fig. 11c), yellowish anterior band gradually narrowing posteriorly and becoming obsolete near membrane of hemelytra, length 3.85 (chord measurement), maximum width 0.98. All coxae pale yellow, trochanters and femora golden brown, fore tibia/tarsus darker brown, middle and hind tibia/tarsus golden brown. Leg measurements as follows: foreleg, femur 2.06, tibia 1.20, tarsus 0.36; middle leg, femur 2.12, tibia 1.42, tarsomeres 1–3 0.12, 0.32, 0.32; hind leg,

femur 2.72, tibia 2.58, tarsomeres 1–3 0.32, 0.74, 0.76. Posterior margin of mediosternite III straight, IV concave, V strongly concave, VI-VIII increasingly convex. Posterior margin of laterosternite V straight. Genital operculum with posterolateral margins straight, apex acuminate. Parameres rounded distally, flanking lateral margins of and extending to same level as median process of pygophore, stout hairs on mesal 2/3 of dorsal surface; pygophore slightly asymmetrical, median process digitate with long hairs and rounded apex; aedeagus with mid-dorsal carina, basal half parallel sided and straight, penultimate quarter arcuate on right side, narrowing to a parallel-sided, slender distal quarter, series of striations in basal half on right side of mid-dorsal carina (Figs. 12c, 13c).

Macropterous female. Paratypes (n = 7), length 9.21–10.04 (mean = 9.65); maximum width 5.81–6.31 (mean = 6.14). Similar to male in general structure and coloration; pad of hairs on middle tibia reduced; posterior margin of mediosternite VI slightly convex; subgenital plate (VII) evenly rounded; posterior margin of laterosternite VI straight (Fig. 14c).

Diagnosis

Males of this species can be easily recognized by the nearly straight tip of the aedeagus, whereas all other known species have some degree of curvature to a sharp point to the right. The median process of the pygophore is elongate, digitate, and rounded distally. The female subgenital plate has the apex rounded and the posterior margin of mediosternite VI is slightly convex. The posterolateral corners of the pronotum are rounded and produced posteriorly, which is similar to those of *N. kem* and *N. khlonglan* (see below). Specimens in alcohol have a yellow spot completely interrupting the dark band along the posterior margin of the pronotum, although in dried specimens this characteristic is less pronounced. The pronotum is more lightly punctate, thus appearing more yellow than in most congeners, except *N. minor*, with which it differs substantially in size. The anterolateral margin of the embolium is strongly and abruptly curved.

Discussion

This species was collected at only Thac Dalanta in the vicinity of Da Lat, Vietnam. We sampled other nearby waterfalls (Tiger Waterfall and Thac Premm), but *Namtokocoris* was not found at these locations. Elephant Falls was not safely approachable. At Thac Dalanta, this insect was in the film of sheeting water on near-vertical rock faces and rock undercuts with a layer of algae (Fig. 6).

Etymology

This species is named for the waterfall, Thac Dalanta, in which it was collected at the type locality.

Repositories

The holotype, allotype, and some paratypes are deposited in the Enns Entomology Museum, University of Missouri-Columbia, U.S.A. Additional paratypes will be deposited in the California Academy of Sciences, San Francisco, U.S.A; the Natural History Museum – Vienna, Austria; and eventually to a museum in Vietnam to be identified.

Material examined

Holotype, macropterous male, and allotype, macropterous female: VIETNAM: **Lam Dong Province**, Thac Dalanta nr Dalat, N 11° 54.067, E 108° 26.906, elev. 1458 m, 7 July 2007, R. W. Sites & Quang Xuan, rock face of waterfall, L-1011. Paratypes: same data as primary type (7 males, 6 females, 8 nymphs).

FIGURE 6. Thac Dalanta in Lam Dong Province, Vietnam, the type locality of *Namtokocoris dalanta* n.sp.

***Namtokocoris kem* Sites, NEW SPECIES**
Figs. 3, 7, 10d, 11d, 12d, 13d, 14d

Descriptions

Macropterous male. See generic description; only additional details provided here. Holotype, length 8.47; maximum width 5.56. Paratypes (n = 10), length 8.22–8.63 (mean = 8.39); maximum width 5.39–5.73 (mean = 5.56). Overall coloration dorsally dark brown with yellowish-brown head, pronotum, and wide band at anterior end of embolium gradually narrowing to obsolescence near membrane of hemelytra; heavy dark punctation forming pattern on head and pronotum, heaviest near posterior margin of head and pronotum in middle 2/3 and posterior to transverse sulcus (Fig. 10d). Ventrally, generally medium brown; golden brown on anteclypeus, lateral margins of prothorax, and exposed portion of hemelytra.

Head length 1.40, maximum width 3.36, synthlipsis at posteromesal corner 1.22, with four pairs of setal rosettes bordering inner margin of eyes, fifth pair further mesad and slightly ventrad to anterior margin. Antennal proportions 5:7:14:9. Pronotum broad, 2.7 x as wide as long; with elongate, erect setae especially evident laterally; length at midline 1.89; maximum width at posterolateral corners 5.17; posterolateral corners rounded, produced posteriorly (Fig. 11d). Scutellum dark brown, heavily punctate, triangular with distinctly sinuate posterolateral margins, twice as wide as long, width 3.03, length 1.48, longitudinal protuberances broad, tumescent, each with line of erect setae. Claval commissure length 1.52. Embolium with anterolateral margin abruptly curved (Fig. 11d), yellowish anterior band gradually narrowing posteriorly and becoming

obsolete near membrane of hemelytra, length 3.57 (chord measurement), maximum width 0.94. All coxae pale yellow, trochanters and femora yellowish brown, fore tibia/tarsus darker brown, middle and hind tibia/tarsus yellowish brown. Leg measurements as follows: foreleg, femur 1.82, tibia 1.20, tarsus 0.32; middle leg, femur 2.02, tibia 1.44, tarsomeres 1–3 0.16, 0.28, 0.30; hind leg, femur 2.58, tibia 2.60, tarsomeres 1–3 0.30, 0.70, 0.68. Posterior margin of mediosternite III straight, IV concave, V strongly concave, VI straight or with slight concavity in middle third, VII convex, VIII broadly rounded. Posterior margin of laterosternite V broadly sinuate. Genital operculum with posterolateral margins straight, apex acuminate. Parameres rounded distally, flanking lateral margins of and slightly surpassing median process of pygophore, stout hairs on mesal 2/3 of dorsal surface; pygophore slightly asymmetrical, median process concave-tipped and with distal angles sharp; aedeagus with mid-dorsal carina, left margin gently arcuate with distinct convexity in distal fifth, right margin convex in basal 4/5 and concave in distal fifth to parallel convexity of left, series of striations in basal third on both sides of mid-dorsal carina (Figs. 12d, 13d).

Macropterous female. Paratypes (n = 10), length 7.80–8.47 (mean = 8.18); maximum width 5.48–6.06 (mean = 5.59). Similar to male in general structure and coloration; pad of hairs on middle tibia reduced; posterior margin of mediosternite V slightly concave, mediosternite VI straight or slight concavity at middle; subgenital plate (VII) evenly rounded; posterolateral corner of laterosternite VI with broad, rounded posterior production (Fig. 14d).

Diagnosis

Males of *N. kem* can be recognized by the tip of the aedeagus, which is not expanded distally, but bends slightly to the right with a pointed apex. The parameres are similar to those of *N. siamensis*, but the median process of the pygophore is concave distally with acute anterolateral corners. In females, the subgenital plate has a rounded apex. The right hemelytron has a very subtle lateral expansion at the level of abdominal segment V; however, it is far less distinct than in *N. akekawati* and *N. khlonglan* (see below). The posterior margin of laterosternite VI has a concavity near the middle. In both sexes, the head and pronotum generally are more darkly patterned than in its congeners, and the thin, yellow lateral band tends to appear complete around the wings, although becoming thin posteriorly. The posterolateral corner of the pronotum is produced posteriorly, as in *N. dalanta* and *N. khlonglan*. Also, the anterolateral margin of the embolium is abruptly curved, although less so than in *N. dalanta*.

Discussion

This species has been taken in northern Vietnam and northern Thailand. The habitat in Vietnam is the only limestone waterfall at which members of the genus have been collected (Fig. 7). Many limestone waterfalls in Thailand were sampled, but never yielded *Namtokocoris*. At the type locality (Fig. 7), this species was collected from the moderately deeply pitted surface of the algae-covered rocks in areas where the shear force of the water was high, as well as toward the margin of the waterfall on rocks with only a standing film of water and algae. In the area of higher shear force, it was collected syntopically with nymphs of *Cheirochela*, a very large naucorid.

Etymology

This species is named for the waterfall, Thac Kem, in which it was found at the type locality.

Repositories

The holotype, allotype, and some paratypes are deposited in the Enns Entomology Museum, University of Missouri-Columbia, U.S.A. Additional paratypes will be deposited in the California Academy of Sciences, San Francisco, U.S.A; the Natural History Museum – Vienna, Austria; and eventually to a museum in Vietnam to be identified.

Material examined

Holotype, macropterous male, and allotype, macropterous female: VIETNAM: **Nghe An Province**, Pu Mat National Park, Thac Kem, N18º 58.381, E104º 42.688, elev 256 m, 15 July 2007, rock face of limestone waterfall, R. W. Sites, L-1021. Paratypes: same data as primary type (7 males, 7 females, many nymphs); same locality, 12 July 2007, R. W. Sites & Trung Cao, L-1012, (8 males, 11 females, 25 nymphs).

Additional material examined

THAILAND: **Nan Province**, Namtok Tak Man, 19°17'N 100°47'E, 352 m, 21 April 2003, Vitheepradit, Prommi, & Setaphan, L-471; Namtok Sa Pan, 19°11'N 101°11'E, 532 m, 22 April 2003, Vitheepradit, Prommi, Setaphan, L-475.

FIGURE 7. Thac Kem in Nghe An Province, Vietnam, the type locality of *Namtokocoris kem* n.sp.

***Namtokocoris khlonglan* Sites, NEW SPECIES**
Figs. 3, 8, 10e, 11e, 12e, 13e, 14e

Descriptions

Macropterous male. See generic description; only additional details provided here. Holotype, length 8.38; maximum width 5.39. Paratypes (n = 4), length 8.30–8.71 (mean = 8.47); maximum width 5.23–5.39 (mean = 5.25). Overall coloration dorsally dark brown with yellowish-brown head, pronotum, and wide band at anterior end of embolium gradually narrowing to obsolescence beyond embolium; heavy dark punctation forming subtle, indistinct pattern on head and pronotum, heaviest near posterior margin of head and pronotum in middle 2/3 and posterior to transverse sulcus (Fig. 10e). Ventrally, medium brown; darker thin band laterally on meso-, metathorax, and abdomen; yellowish-brown on anteclypeus, lateral margins of prothorax, and exposed portion of hemelytra.

Head length 1.42, maximum width 3.24, synthlipsis at posteromesal corner 1.08, with four pairs of setal rosettes bordering inner margin of eyes, fifth pair further mesad and slightly ventrad to anterior margin. Antennal proportions 6:7:11:7. Pronotum broad, 2.8 x as wide as long, with scattered elongate, erect setae; length at midline 1.76; maximum width at posterolateral corners 5.00; posterolateral corners rounded, produced posteriorly (Fig. 11e). Scutellum dark reddish-brown, occasionally, heavily punctate, triangular with distinctly sinuate posterolateral margins, twice as wide as long, width 3.16, length 1.56, longitudinal protuberances each with line of erect setae. Claval commissure length 1.97. Embolium with anterolateral margin strongly curved basally (Fig. 11e), yellowish anterior band gradually narrowing posteriorly and becoming obsolete beyond posterior end, length 3.57 (chord measurement), maximum width 0.86. All coxae golden brown; trochanters and femora medium brown; fore tibia/tarsus dark brown; middle and hind tibia/tarsus medium brown. Leg measurements as follows: foreleg, femur 1.76, tibia 1.14, tarsus 0.30; middle leg, femur 1.86, tibia 1.40, tarsomeres 1–3 0.12, 0.26, 0.32; hind leg, femur 2.38, tibia 2.54, tarsomeres 1–3 0.30, 0.64, 0.74. Posterior margin of mediosternite III straight, IV concave, V strongly concave, VI concave, VII straight or slightly concave, VIII semicircular. Posterior margin of laterosternite V straight. Genital operculum with posterolateral margins straight, apex acuminate. Parameres symmetrical, mesal margins straight, oriented convergently, anteromesal corners sharply right-angled, distal margins straight to slightly concave, anterolateral corners rounded, larger than and extending beyond median process of pygophore, series of stout setae near apex, long setae in lateral half; median process of pygophore short, broad, apex rounded and with long hairs; aedeagus with mid-dorsal carina, with basal quarter narrow, rapidly widening to greatest width, above basal quarter left margin nearly straight and right margin convex until concave distal fifth, strongly hooked to right at apex, series of striations at middle on right side of mid-dorsal carina (Figs. 12e, 13e).

Macropterous female. Paratypes (n = 10), length 8.13–9.05 (mean = 8.61); maximum width 5.31–5.56 (mean = 5.44). Similar to male in general structure and coloration; pad of hairs on middle tibia reduced; posterior margin of mediosternite V and VI slightly concave; subgenital plate (VII) 1.4x as wide as long, lateral margins convergent, posterior margin slightly convex, posterolateral corners broadly rounded; posterior margin of laterosternite VI straight (Fig. 14e); pronounced lateral lobe on costal margin of right hemelytron at position of abdominal segment V.

Diagnosis

The claval commissure is longer than the pronotum measured at the midline in *N. khlonglan*, whereas in all other known species it is shorter than the pronotum. The posterolateral lobes of the pronotum are rounded and produced posteriorly. Males of this species can be recognized by the parameres, which appear to have a straight to slightly concave anterior margin and a sharp right angle in the anteromesal corner in strict dorsal view. Females can be recognized by the posterolateral corners of mediosternite VI distinctly deflected ven-

trad from the sternum. Also, females have a pronounced lateral lobe extending from the costal margin of the right hemelytron at about the position of abdominal segment V, similar to females of *N. akekawati*.

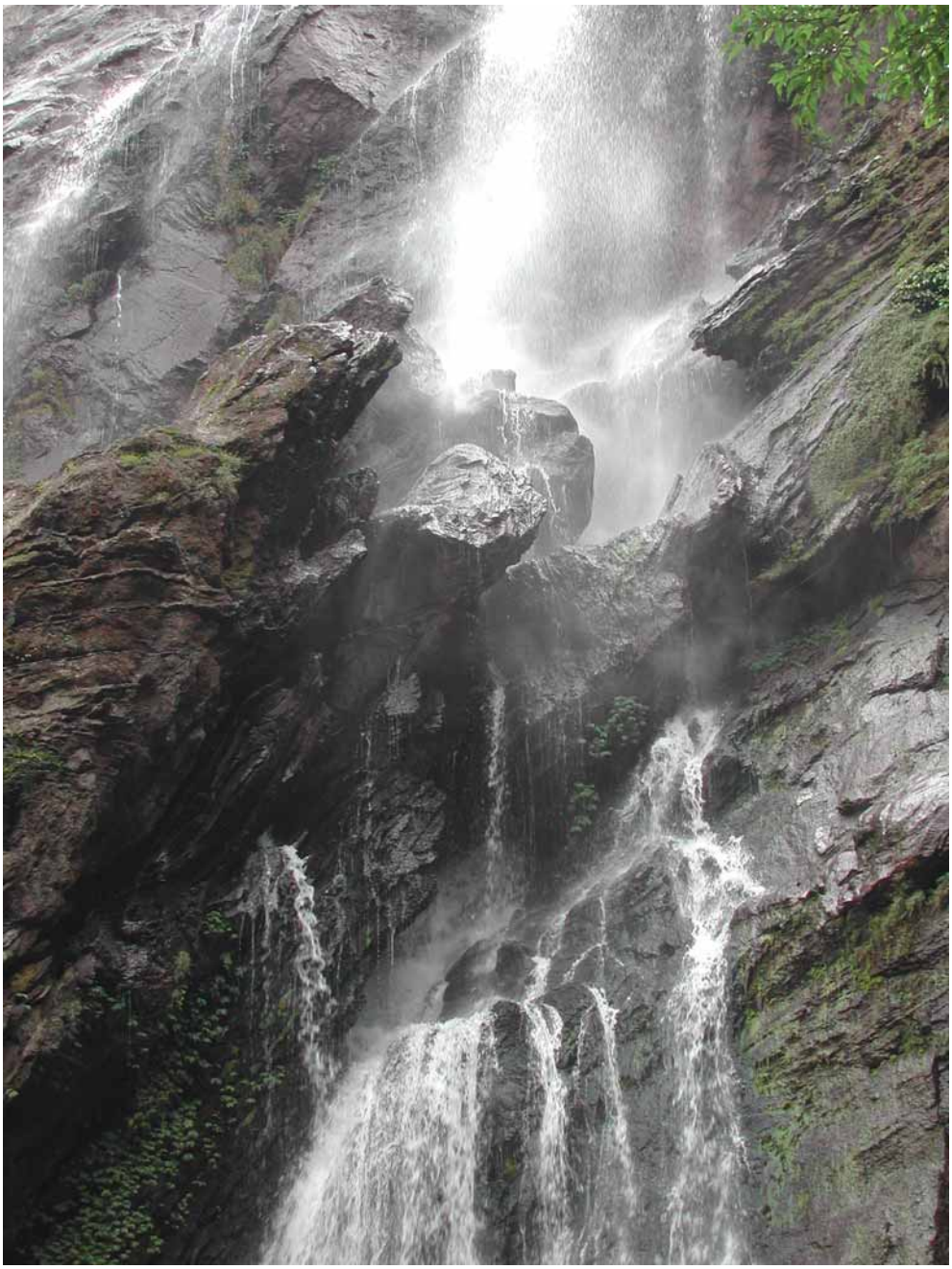

FIGURE 8. Namtok Khlong Lan in Kampaeng Phet Province, Thailand, the type locality of *Namtokocoris khlonglan* n.sp.

Discussion

This species has been found only in Namtok Khlong Lan (Fig. 8) at Khlong Lan National Park, which is in the Thanon Thong Chai mountain range near the border with Burma. This species occurs on the near-vertical algae-covered rock face at the margin of the high shear forces of the waterfall. This species was collected with *Oocyclus melinoventris* Short & Swanson (Coleoptera: Hydrophilidae) and *Onychotrechus esakii* Andersen (Hemiptera: Gerridae).

Etymology

This species is named for the national park and waterfall in which it was collected.

Repositories

The holotype, allotype, and some paratypes are deposited in the Enns Entomology Museum, University of Missouri-Columbia, U.S.A. Additional paratypes will be deposited in the Royal Forestry Department, Bangkok, Thailand; Entomology Collection, Kasetsart University, Bangkok, Thailand; United States National Museum, Washington, D.C., U.S.A., California Academy of Sciences, San Francisco, U.S.A; and the Natural History Museum – Vienna, Austria.

Material examined

Holotype, macropterous male: THAILAND: **Kampaeng Phet Province**, Khlong Lan National Park, Namtok Khlong Lan, 16°07'N 99°16'E, 310 m, 21 August 2002, CMU team. Paratypes, including allotype, macropterous female: same locality as primary type, 6 April 2003, Sites, Vitheepradit, Prommi, & Setaphan, L-449 (2 males, 8 females, many nymphs).

Additional material examined

Same data as holotype, 19 July 2002; same data, 20 April 2002; same data 19 June 2002; same locality, 8 March 2002, R. W. Sites, L-273; same data, 7 April 2003, L-453.

***Namtokocoris minor* Sites, NEW SPECIES**

Figs. 3, 9, 10f, 11f, 12f, 13f, 14f

Descriptions

Macropterous male. See generic description; only additional details provided here. Holotype, length 7.05; maximum width 4.56. Paratypes (n = 10), length 6.64–7.14 (mean = 6.89); maximum width 4.23–4.56 (mean = 4.39). Overall coloration dorsally reddish-brown with yellowish-brown head, pronotum, and wide band at anterior end of embolium gradually narrowing to obsolescence near membrane of hemelytra; heavy dark punctation forming indistinct pattern on head and pronotum, heaviest on vertex and near posterior margin and of head and middle 2/3 of pronotum, especially near midline and posterior to transverse sulcus (Fig. 10f). Ventrally, generally medium brown; golden brown on anteclypeus, lateral margins of prothorax, and exposed portion of hemelytra.

Head length 1.14, maximum width 2.75, synthlipsis at posteromesal corner 0.86, with four pairs of setal rosettes bordering inner margin of eyes, fifth pair further mesad and slightly ventrad to anterior margin. Antennal proportions 4:5:10:9. Pronotum broad, 2.9 x as wide as long; with elongate, erect setae especially evident laterally; length at midline 1.43; maximum width at posterolateral corners 4.10, posterolateral corners evenly rounded (Fig. 11f). Scutellum dark reddish-brown with lighter reddish-brown U-shape marking on tumescent protuberances and posterolateral borders; heavily punctate; triangular with distinctly sinuate posterolateral margins; 2.2x as wide as long, width 2.75, length 1.27; pair of broad, tumescent, longitudinal protuberances without lines of erect setae, although scattered setae present. Claval commissure length 1.02. Embolium with anterolateral margins evenly curved (Fig. 11f), yellowish anterior band gradually narrowing posteriorly and becoming obsolete near membrane of hemelytra, length 2.83 (chord measurement), maximum width 0.66. All coxae pale yellow, trochanters and femora golden brown, fore tibia/tarsus darker brown, middle and hind tibia/tarsus golden brown. Leg measurements as follows: foreleg, femur 1.40, tibia 0.86, tarsus 0.30; middle leg, femur 1.52, tibia 1.12, tarsomeres 1–3 0.14, 0.24, 0.24; hind leg, femur 1.96, tibia 1.86, tarsomeres 1–3 0.24, 0.58, 0.58. Posterior margin of mediosternite III straight, IV concave, V strongly concave, VI slightly concave, VI broadly rounded, VIII semicircular. Posterior margin of laterosternite V straight. Genital operculum with posterolateral margins straight, apex narrowly pointed. Parameres symmetrical, dis-

tal margin rounded with notch near mesal angle, flanking lateral margins of and extending to approximately same level as median process of pygophore, hairs on mesal 2/3 of dorsal surface; median process of pygophore digitate with rounded apex; aedeagus with mid-dorsal carina, left margin gently arcuate with distinct convexity in distal quarter, right margin broadly convex in basal 4/5 and concave in distal fifth to form distinct apical hook, series of striations in basal third on right side of mid-dorsal carina (Figs. 12f, 13f).

Macropterous female. Paratypes (n = 10), length 6.89–7.64 (mean = 7.20); maximum width 4.40–4.73 (mean = 4.55). Similar to male in general structure and coloration; pad of hairs on middle tibia reduced; posterior margin of mediosternite V and VI slightly concave, subgenital plate (VII) with posterior margin nearly flattened with broadly posterolateral angles; posterior margin of laterosternite VI nearly straight (Fig. 14f).

Diagnosis

This species can be recognized by its small size. Its coloration, especially that of the hemelytra, is slightly lighter than that of its known congeners. The scutellum has a large, reddish-brown U-shaped marking on broad, tumescent protuberances and posterolateral margins. Distinct hair lines are absent from the scutellar protuberances, although a few scattered stout hairs are present. The anterolateral margin of the embolium is gradually and evenly curved. Males have a strongly hooked apex of the aedeagus, and the parameres are distinctly concave along the distal margin in dorsal view.

Discussion

This species has been collected only in two locations in Kanchanaburi Province, near Thong Pha Phum. At the type locality, the water in which the insects occurred was reduced to a barely detectable trickle, although the insects were in a film of water with substantial algal growth on the rocks. At the Jok Kra Din site, a substantial volume of water was present and conditions were typical as for congeners. This species was collected with *Oocyclus sitesi* Short & Swanson (Coleoptera: Hydrophilidae), *Onychotrechus esakii* Andersen, and *Eotrechus hygropetricus* Andersen (Hemiptera: Gerridae) (see Vitheepradit & Sites 2007a) at the type locality.

Etymology

The specific epithet “minor”refers to the small size of this species relative to its five known congeners.

Repositories

The holotype, allotype, and some paratypes are deposited in the Enns Entomology Museum, University of Missouri-Columbia, U.S.A. Additional paratypes will be deposited in the Royal Forestry Department, Bangkok, Thailand; Entomology Collection, Kasetsart University, Bangkok, Thailand; United States National Museum, Washington, D.C., U.S.A., California Academy of Sciences, San Francisco, U.S.A; John T. Polhemus Collection, Englewood, Colorado, U.S.A.; and the Natural History Museum – Vienna, Austria.

Material examined

Holotype, macropterous male, and allotype, macropterous female: THAILAND: **Kanchanaburi Province**, Amphur Thong Pha Phum, small waterfall 6.3 km W of Border Police Stn. at Ban Padsadoo Klang, 14°32.399'N 98°32.753'E, 568 m, 10 April 2003, UMC and CMU teams, L-463. Paratypes: same data as primary type (4 males); same locality, 4 June 2006, Sites, Vitheepradit, Prommi, L-913 (13 males, 4 females, 2 nymphs).

Additional material examined

Same locality as primary type, 25 Feb 2002, G. W. Courtney; Namtok Jok Kra Din,14°41.43'N 98°23.18'E, 4 June 2006, Sites, Vitheepradit, Prommi, L-916.

FIGURE 9. Unnamed roadside cascade in Kanchanaburi Province, Thailand, the type locality of *Namtokocoris minor* n.sp.

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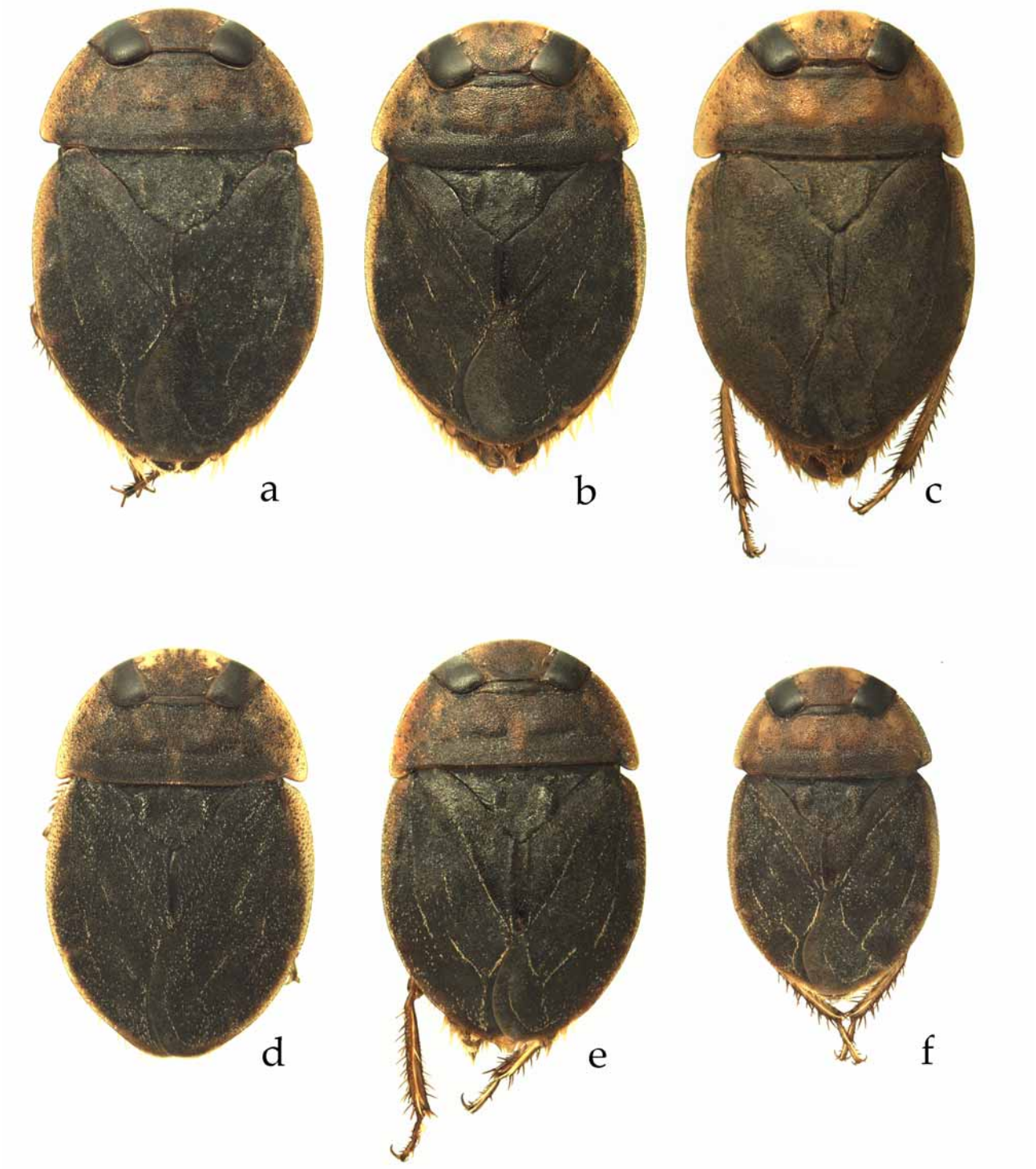

FIGURE 10. Holotypes of a) *Namtokocoris siamensis*, b) *Namtokocoris akekawati*, c) *Namtokocoris dalanta*, d) *Namtokocoris kem*, e) *Namtokocoris khlonglan*, and f) *Namtokocoris minor.*

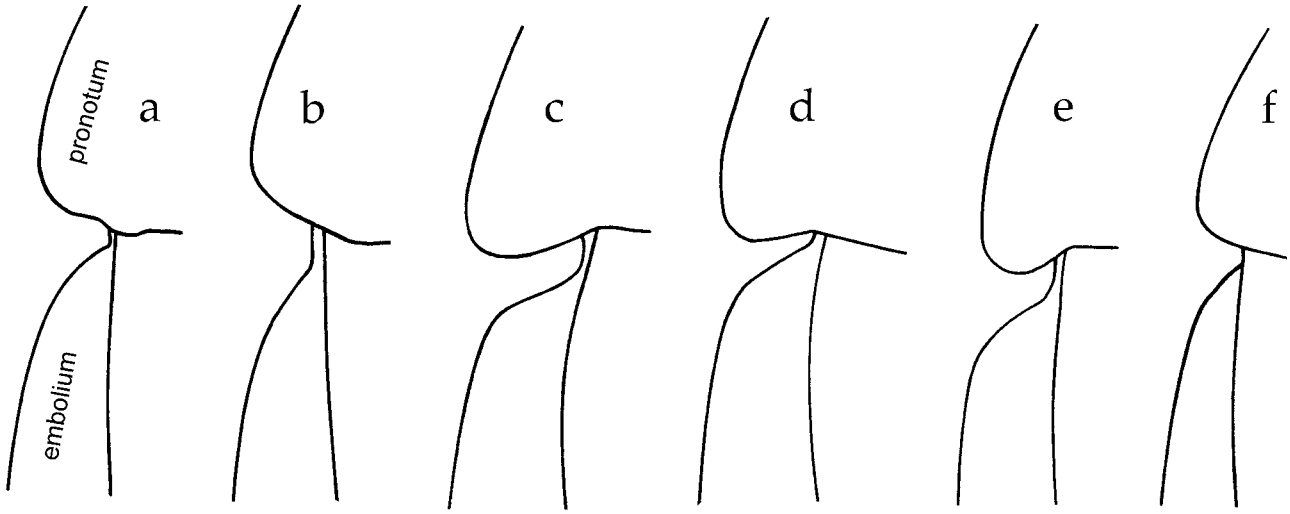

FIGURE 11. Left margin of pronotum and embolium of macropterous a) *Namtokocoris siamensis*, b) *Namtokocoris akekawati*, c) *Namtokocoris dalanta*, d) *Namtokocoris kem*, e) *Namtokocoris khlonglan*, and f) *Namtokocoris minor.*

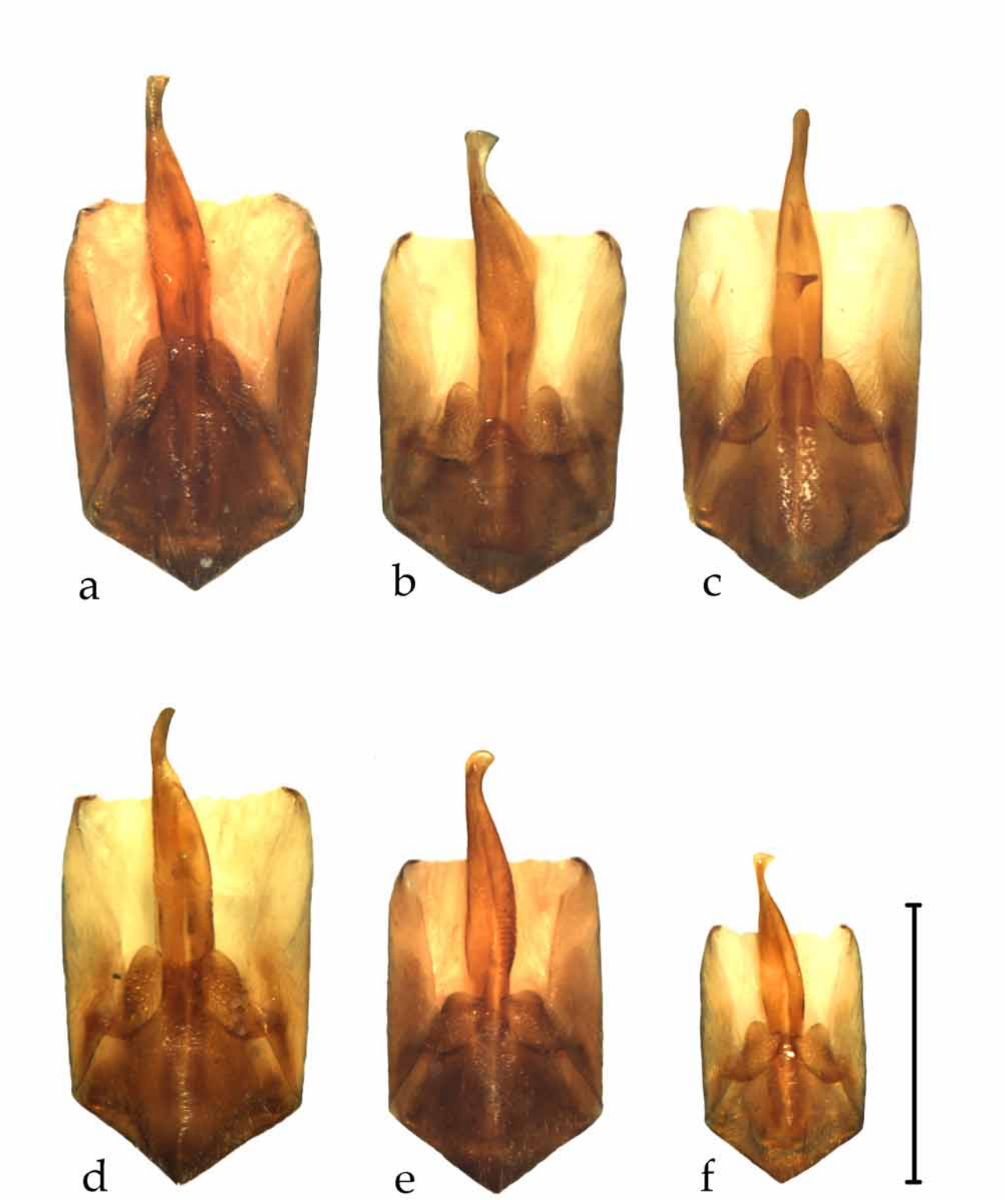

FIGURE 12. Genital capsule of males of a) *Namtokocoris siamensis*, b) *Namtokocoris akekawati*, c) *Namtokocoris dalanta*, d) *Namtokocoris kem*, e) *Namtokocoris khlonglan*, and f) *Namtokocoris minor.* Scale bar = 1.0 mm

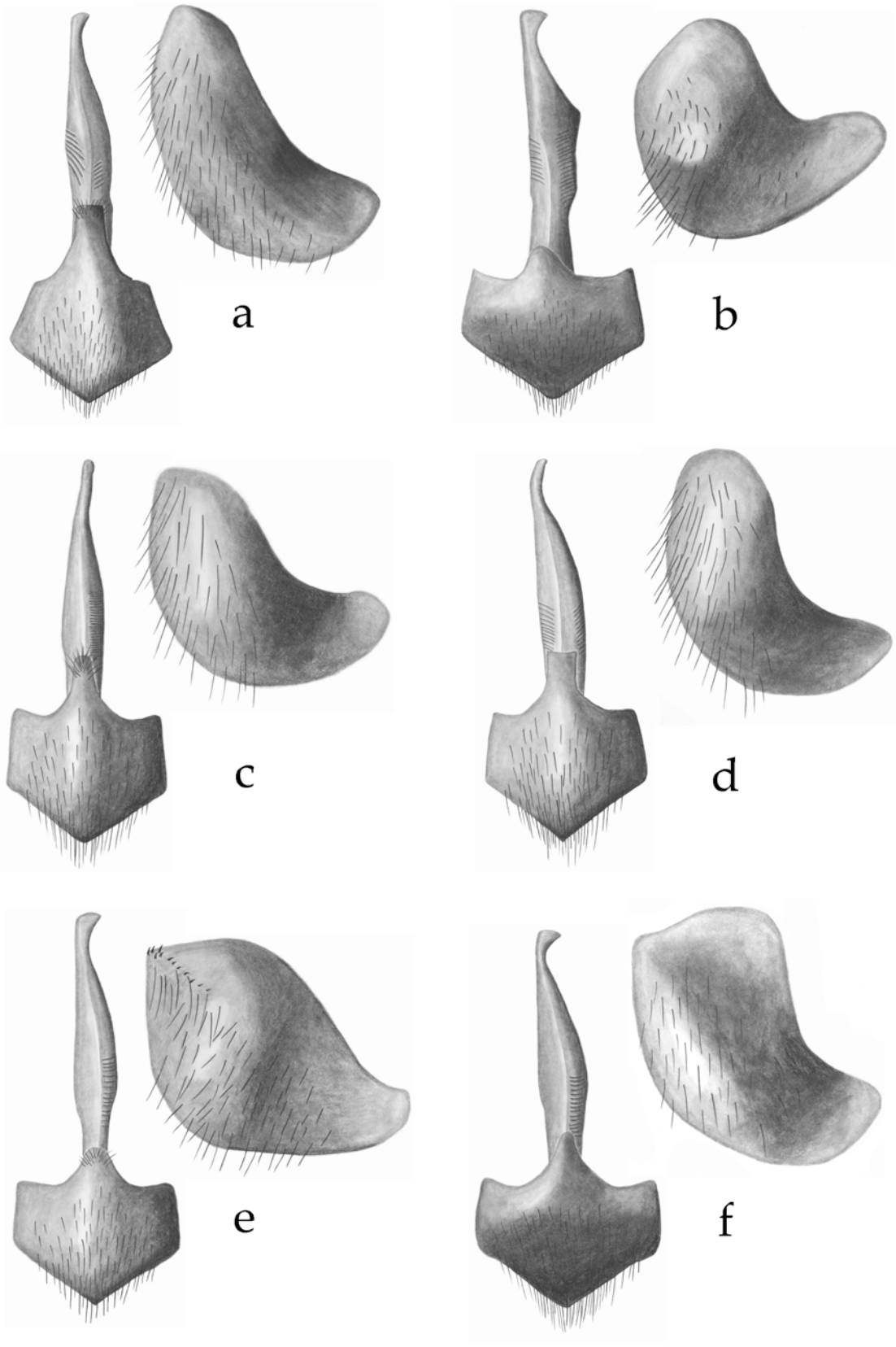

FIGURE 13. Aedeagus with pygophore and dorsolateral aspect of right paramere (laid flat) of a) *Namtokocoris siamensis*, b) *Namtokocoris akekawati*, c) *Namtokocoris dalanta*, d) *Namtokocoris kem*, e) *Namtokocoris khlonglan*, and f) *Namtokocoris minor.* Sizes are not relative within or among species. See Fig. 12 for correct size relationships.

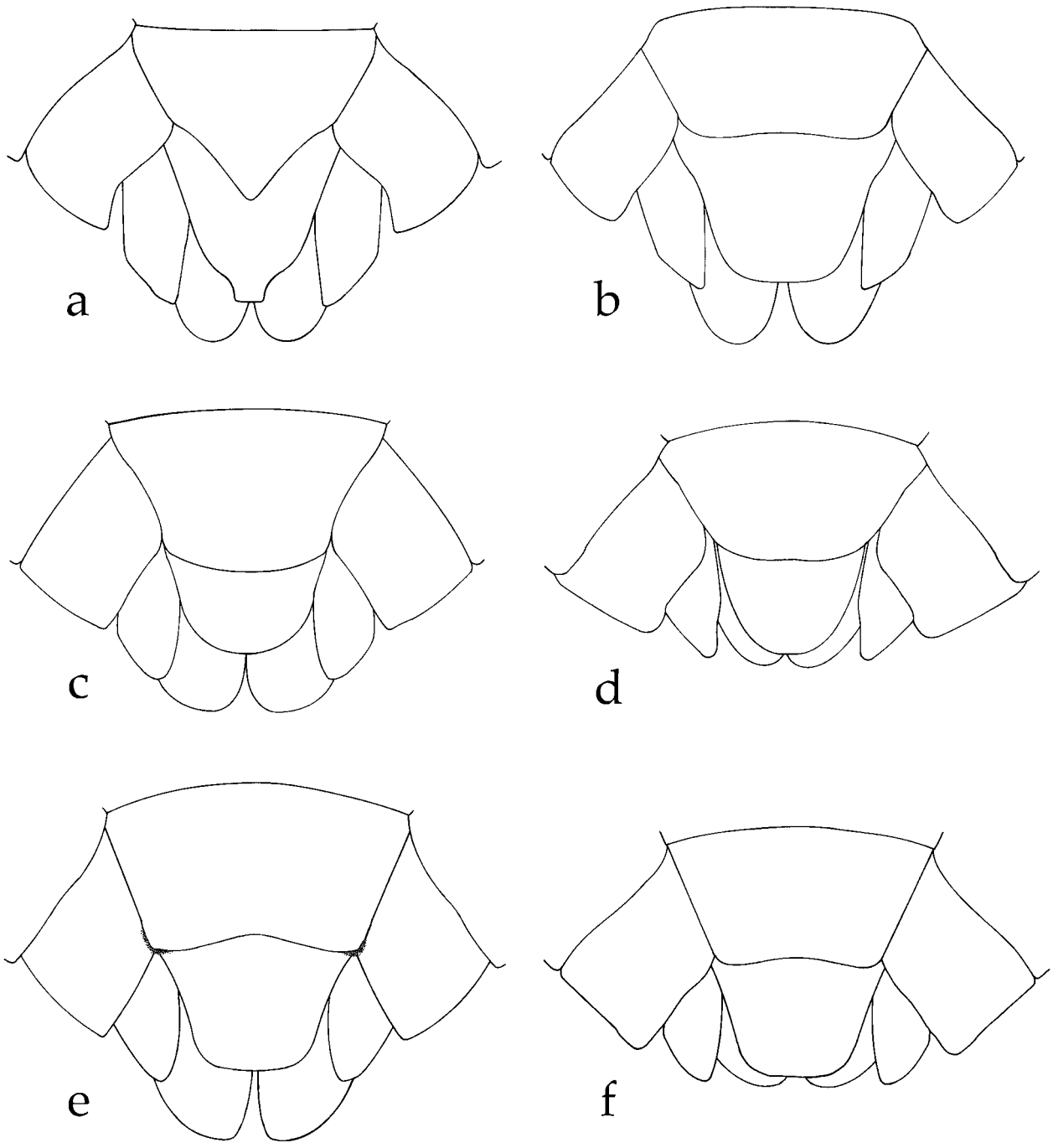

FIGURE 14. Ventral aspects of terminal abdominal segments of females of a) *Namtokocoris siamensis*, b) *Namtokocoris akekawati*, c) *Namtokocoris dalanta*, d) *Namtokocoris kem*, e) *Namtokocoris khlonglan*, and f) *Namtokocoris minor.*