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Myrmecophilous rove beetles (Coleoptera: Staphylinidae) associated with *Aenictus hodgsoni* (Hymenoptera: Formicidae) from Thailand, with description of two new genera and three new species

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Abstract

Three species of rove beetles (subfamily Aleocharinae) were collected from colonies of *Aenictus hodgsoni* Forel, 1901 in Khao Yai National Park, Thailand. They are classified into three genera, including two new genera, and described herein as: *Aenictobia siamensis* Maruyama, **sp. n.** (tribe Aenictoteratini), *Aenictosymbia cornuta* Maruyama, **gen. & sp. n.** (tribe Lomechusini) and *Aenictoxenides mirabilis* Maruyama, **gen. & sp. n.** (tribe Pygostenini). The systematic positions of the new genera are discussed.

Key words: Aleocharinae, Aenictoteratini, Lomechusini, Pygostenini, *Aenictoxenus*, *Aenictophila*, systematic position, Khao Yai National Park

Introduction

Various myrmecophilous insects are associated with army ants of the genus *Aenictus* (e.g., Seevers, 1965). In Peninsular Malaysia and Borneo, several researchers have conducted field surveys for myrmecophiles and found many genera and species of rove beetles associated with *Aenictus* (Kistner & Jacobson 1975; Kistner et al, 1997, 2009; Maruyama *et al.*, 2011). However, these insects have largely been uninvestigated in the other areas of Southeast Asia, and only a few species of rove beetles have been recorded (Seevers, 1965; Maruyama, 2008; Wheeler, 1932). In 2007, MM, TK and YK investigated the myrmecophilous guests of *Aenictus* ants in Khao Yai National Park, Thailand. Then they found many unknown species and genera of rove beetles. Among them were three species recovered from colonies of *Aenictus hodgsoni* Forel, 1901. These species belong to three genera, including two new genera. This paper describes these species.

Materials and method

Our investigation was conducted in the Khao Yai National Park, which is located about 40 km northeast of Bangkok, and is basically monsoon primary forest (dry evergreen forest), partly with grassland forming an elephant sanctuary.

Aenictus ants were generally rare and only occasionally found in the park. We walked forest trails to find

emigration or foraging column of *Aenictus* ants from 9:00 am to 8:00 pm during our two-week stay in the park (from September 22 to October 5, 2007). During the stay, we found five colonies of *A. hodgsoni* including two raiding columns and three bivouacs (colony numbers: MM-AE029, 032, 036). When the bivouac was found, we collected it in a bucket and sorted it on a white tray to separate myrmecophiles. The most effective way to obtain and observe myrmecophiles from *Aenictus* colonies is to find an emigration column in which the myrmecophiles can be seen walking together with the ants, as described in Maruyama *et al.* (2011). Unfortunately, we could not find emigration columns of *A. hodgsoni* during this research trip, and thus no behavioral information is available.

The methods of dissecting and line drawings follow Maruyama (2004, 2006). The photographs were taken using a Canon 60D camera with MP-E65 high magnification lens and EX-24 twin flash, and then combined using the automontage software CombineZP. Most specimens are deposited in M. Maruyama's collection in the Kyushu University Museum, Fukuoka, Japan (KUM), and some paratypes are in the Department of National Parks, Wildlife and Plant Conservation, Thailand (DNP). Measurements are abbreviated as follows: antennal length (AL); body length (BL); fore body length, from front margin of head to apices of elytra (FBL); hind tibial length (HTL); head width (HW); pronotal length at midline (PL); pronotal width (PW).

Tribe Aenictoteratini Kistner, 1993

Aenictoteratini Kistner, 1993: 242 (original description; type genus: *Aenictoteras* Wheeler, 1932).

Aenictobia Seevers, 1953

Aenictobia Seevers, 1953: 127 (original description; type species: *Aenictobia longicornis* Seevers 1952, by original designation); Kistner & Jacobson, 1975: 42 (redescription, description of one additional species); Kistner *et al.*, 1997: 175 (redescription, description of one additional species, species key, placed in subtribe Aenictobiina of tribe Lomechusini); Hlaváč *et al.*, 2011: 8 (transferred to Aenictoteratini); Maruyama *et al.*, 2011: 9 (diagnosis of *A. thoi* and *A. fergusonii*).

Comments. Four species, including the new species, are known: *A. longicornis* Seevers, 1952, *A. thoi* Kistner & Jacobson, 1975, *A. fergusonii* Kistner, 1997, and *A. thaiensis* Maruyama, **sp. n.**

Aenictobia siamensis Maruyama, **sp. n.**

(Figs. 1–9)

Type series. Holotype, ♂, "THAI: Nakhon Ratchasima, / Khao Yai National Park, / Heaw Suwat (750 m), / 30 IX 2007, Maruyama M., / Komatsu T. & Katayama Y. / MM-AE029 // HOLOTYPE / Aenictoxenides / mirabilis / det. Maruyama, 2014" (male 8th abdominal segment and aedeagus dissected and mounted in Euparal) (KUM). Paratypes, 1♀, 7 sex?, same data as holotype (KUM, DNP); 8 sex?, "THAI: Nakhon Ratchasima, / Khao Yai National Park, / Kong Kaew (700 m), / 1 X 2007, Maruyama M. / MM-AE032" (KUM, DNP); 2♂, 2♀, 25 sex?, "THAI: Nakhon Nayok, / Khao Yai National Park, / near Cafeteria (700 m), / 3 X 2007, Maruyama M., / Komatsu T. & Katayama Y. / MM-AE036" (KUM).

Description. Body (Figs. 1–3) small. Light reddish brown, but head, elytra and posterior part of abdomen darker; sometimes elytra dark brown.

Head (Figs. 1–3) with process between antennal cavities strongly projected; eyes large, more prominent than temples. Antennae (Figs. 1–3) slender, with all segments longer than wide; segment I as long as II and III combined; segment IV–X gradually becoming longer and wider toward apex; segment XI slightly longer than X.

Pronotum (Figs. 1–3) almost circular, narrower than elytra, with postero-lateral corners indistinct, slightly depressed behind anterior margin. Elytra (Figs. 1–3) longer than pronotum,

Abdomen with tergite VIII (Fig. 4) shallowly emarginate at apex, with 4 short macrosetae; sternite VIII (Fig. 5) with 5 macrosetae.

Male: Median lobe of aedeagus (Figs. 6, 7) crista apicalis acutely prominent; apical lobe of paramere (Fig. 8) oblong oval, with 2 large setae near base.

Female: Spermatheca (Fig. 9) with apical part strongly swollen.

Measurements. BL, ca. 2.0–2.3; FBL, ca. 1.0–1.2; HW, 0.33–0.37; AL, 1.42–1.55; PL, 0.38–0.43; PW, 0.44–0.54; HTL, 0.36–0.41 (N=5).

Differential diagnosis. This species is similar to *A. longicornis* and *A. thoi* in the slender antennae but distinguished from them by the body being clearly bicolored, the smaller body length, the more circular pronotum, and the eyes being more prominent.

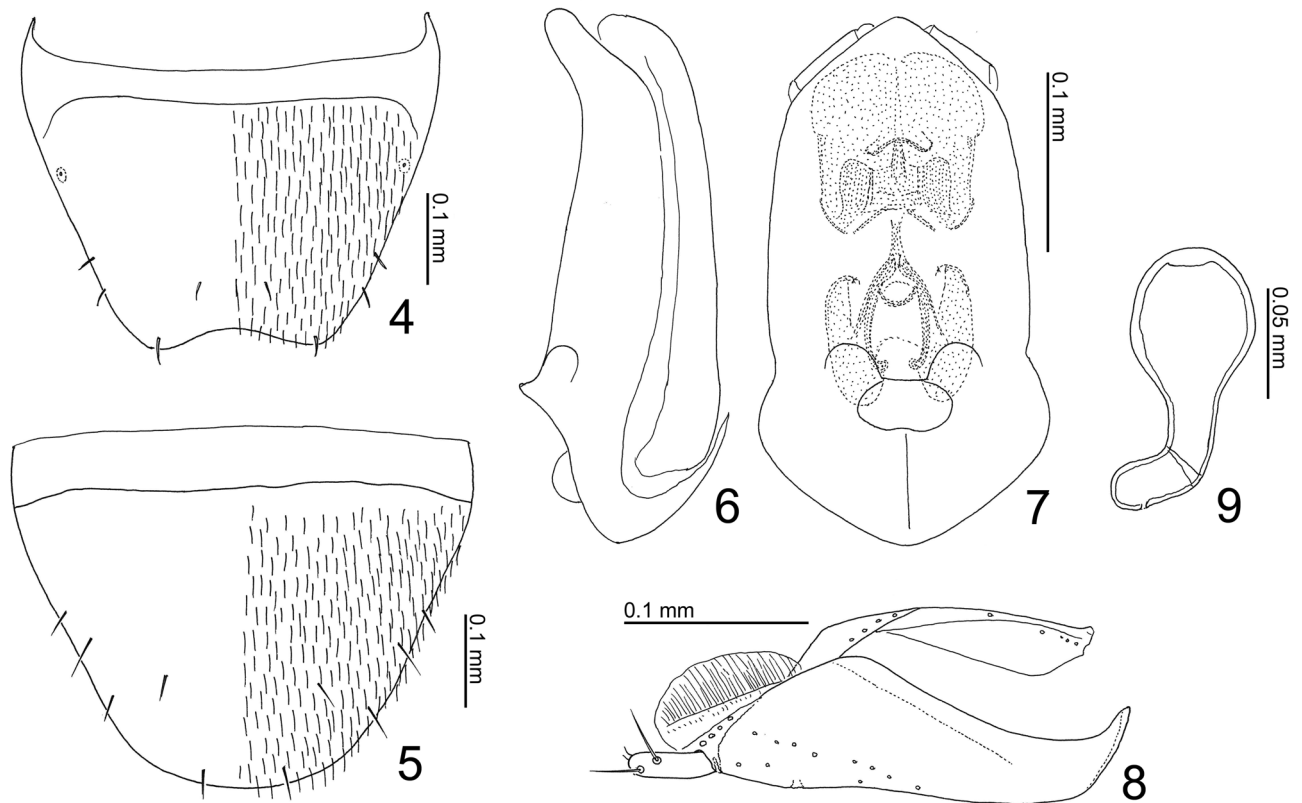
Etymology. Named after Siam, an old exonym of Thailand.

Symbiotic host. *Aenictus hodgsoni*.

Distribution. Central Thailand.



FIGURES 1–3. Habitus of *Aenictobia siamensis* Maruyama, **sp. n.** 1—dorsal view; 2—ventral view; 3—lateral view.



FIGURES 4–9. Body parts of *Aenictobia siamensis* Maruyama, **sp. n.** 4—male tergite VIII; 5—male sternite VIII; 6—median lobe of aedeagus, lateral view; 7—ditto, ventral view; 8—paramere; 9—spermatheca.

Tribe Lomechusini Fleming

Lomechusidae Fleming, 1821: 49 (type genus: *Lomechusa* Gravenhorst, 1806).

Aenictosymbia Maruyama, **gen. n.**

(Figs. 10–32)

Type species: *Aenictosymbia cornuta* Maruyama, **sp. n.**

Description. Body (Figs. 10–12) myrmecoid, slender, glossy.

Head (Figs. 10–13) almost spherical, with horn on anterior part of frons, gently narrowed posteriad, constricted at base to form “neck”; medial area of head slightly depressed; eyes moderate in size, prominent; antennae (Figs. 10–13) generalized, but segment I strongly thickened.

Mouthparts: Labrum (Fig. 14) generalized, rather irregularly with setae, without pseudopores; hypopharynx (Fig. 14) with mesal area bearing 3 campaniform sensillae, 3 setulae antero-medially, 4 setulae along lateral margin. Mandibles (Fig. 15) almost symmetric, but left mandible slightly thicker, with 2 patches of minute pseudopores around mesal area of dorsal disc, and 2 setae near base of outer margin. Mentum (Fig. 16) sub-trapezoidal, with 2–4 pseudopores, several setae around lateral margin. Labium (Fig. 17): apodeme with lateral lobe short, gently curved, rounded at apex, without medial projection; prementum with 2 real pores and 1 setal pore antero-laterally, strongly sclerotized along anterior margin to connect both bases of palpi; palpus with segment I long, more than 2 times as long as II, with patch of some minute setae near base (Fig. 17: arrow; probably sensillae); segment III narrow, elongate; maxilla (Fig. 18) generalized, no or few pseudopores overall; lacinia with 5 spines near apex, densely with pubescence; galea curved near apex.

Pronotum (Figs. 10–12, 19, 20) elongate, constricted around basal 1/3, shallowly sulcate at midline; prosternite (Fig. 20) subtriangular, elongate, convex at midline; triangular sclerite present (Fig. 20: arrow) from middle to near base of cavity.

Mesoventrite (Fig. 21) short, completely fused with metaventrite, weakly carinate between processes of both; metaventrite long, more than 2 times as long as mesoventrite; mesocoxal cavity slightly margined postero-laterally. Elytra (Fig. 22) rounded, well convex above; hind wings developed.

Legs (Figs. 23–25) long, slender; claws developed; fore leg (Fig. 23) with coxa projected at base; base of femur projected ventrad; tarsal segments subequal in length; mid leg (Fig. 24) with coxa small, slightly longer than trochanter; tarsal segments becoming smaller from base to apex; hind leg (Fig. 25) with coxa deeply notched at middle (Fig. 25: arrow); tarsal segments becoming smaller from base to apex.

Abdomen strongly constricted at base (segments II–VI); tergite II rather long, shallowly emarginate on anterior margin; tergite III elongate, dilated apicad; sternite III with posterior area strongly triangularly convex (Fig. 11: arrow; no distinct gland openings); tergites IV–VII short, transverse; sternites IV–VII large, strongly convex; tergite VIII with anterior margin rounded, without pseudopores or minute setae; sternite VIII with anterior margin slightly produced, rounded; tergite and sternite IX fused at base of tergite X of which anterior margin submembranous, truncate.

Male: median lobe of aedeagus (Figs. 29, 30) urceolate, strongly produced paramerally at base, with a pair of exposed sclerites of internal sac; paramere (Fig. 31) with basal part of paramerite short, narrow; velum extended near apex of apical lobe.

Female: spermatheca (Fig. 32) coiled at base, with apical part small.

Differential diagnosis. This genus is similar to *Aenictophila* Seevers, 1965, in general appearance, the states of meso- and metaventrites, and abdomen, but the convexity of the abdominal sternites is simpler in *Aenictosymbia*. In *Aenictophila*, the posterior areas of both sternites III and IV are strongly convex, and their surfaces have distinct gland opening patches, including trichome-like bundles of pubescence on sternite III.

Etymology. A combination of the host genus name *Aenictus*, and the Greek words *syn* (meaning "with", "together") and *bios* (meaning "life", "living"), meaning a symbiont of *Aenictus* ants. Gender feminine.

Distribution. Central Thailand.

Systematic notes. This genus apparently belongs to the *Aenictophila* generic group, which is composed of myrmecoid genera of Lomechusini, namely, *Aenictophila*, *Mimaenictus* Kistner & Jacobson, 1975, *Procantonetia* Kistner & Jacobson, 1975, *Weissflogia* Kistner, 1997. These genera including *Aenictosymbia* share an exoskeletal modification of a gland on abdominal sternite III (III–V in some genera). This characteristic, including the presence of a gland on sternite III, is not observed in other Lomechusini genera and suggests monophyly of the generic group. Phylogenetics and a detailed morphological study are in progress by MM and his colleagues.

Aenictosymbia cornuta Maruyama, sp. n.

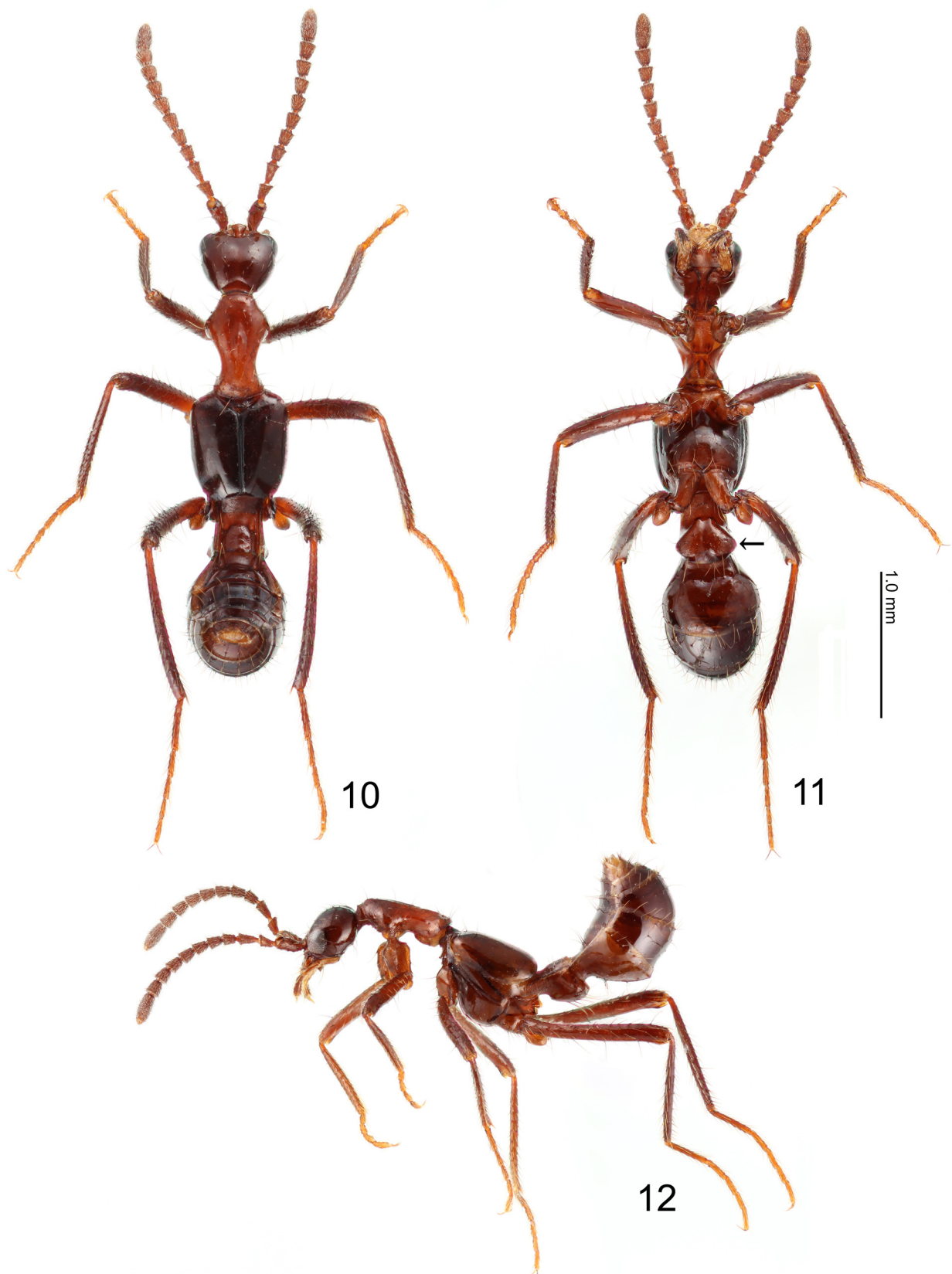
(Figs. 10–32)

Type series. Holotype, ♂, "THAI: Nakhon Ratchasima, / Khao Yai National Park, / Heaw Suwat (750 m), / 30 IX 2007, Maruyama M., / Komatsu T. & Katayama Y. / MM-AE029 // HOLOTYPE / *Aenictoxenides* / *mirabilis* / det. Maruyama, 2014" (male 8th abdominal segment and aedeagus dissected and glued on paper card together with body) (KUM). Paratypes, 1♂, 3♀, "THAI: Nakhon Ratchasima, / Khao Yai National Park, / Kong Kaew (700 m), / 1 X 2007, Maruyama M. / MM-AE032" (KUM, DNP).

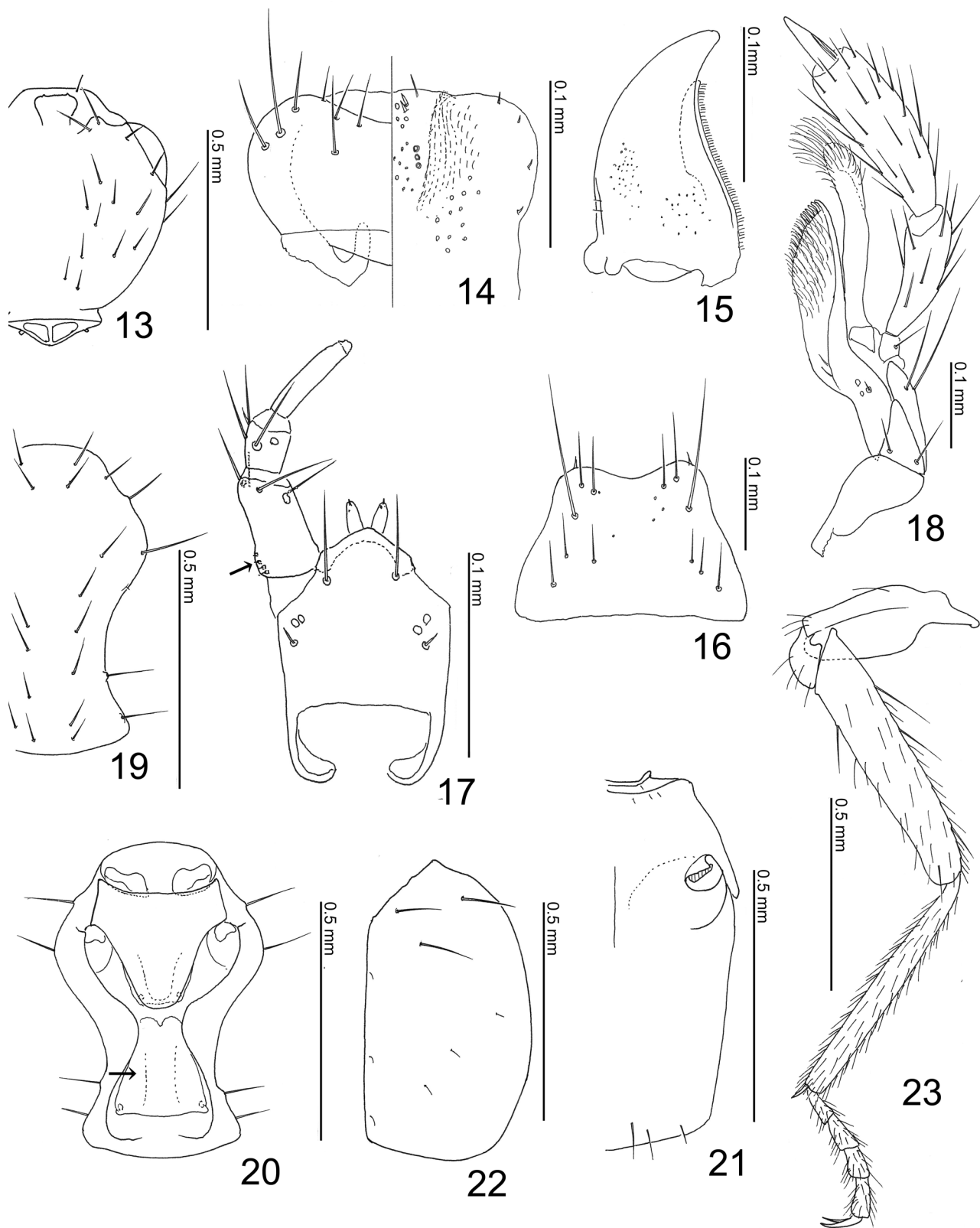
Description. Body (Figs. 10–12) small. Reddish brown, but head and elytra darker; mouthparts reddish yellow.

Head (Figs. 10–14) with horn truncate at apex, with 12–15 macrosetae on dorsal disc. Antennae (Figs. 10–13) slender, with all segments longer than wide; segment I shorter than II and III combined; segment II slightly shorter than III; segment IV–X equally in length but becoming wider toward apex; segment XI slightly shorter than IX and X combined.

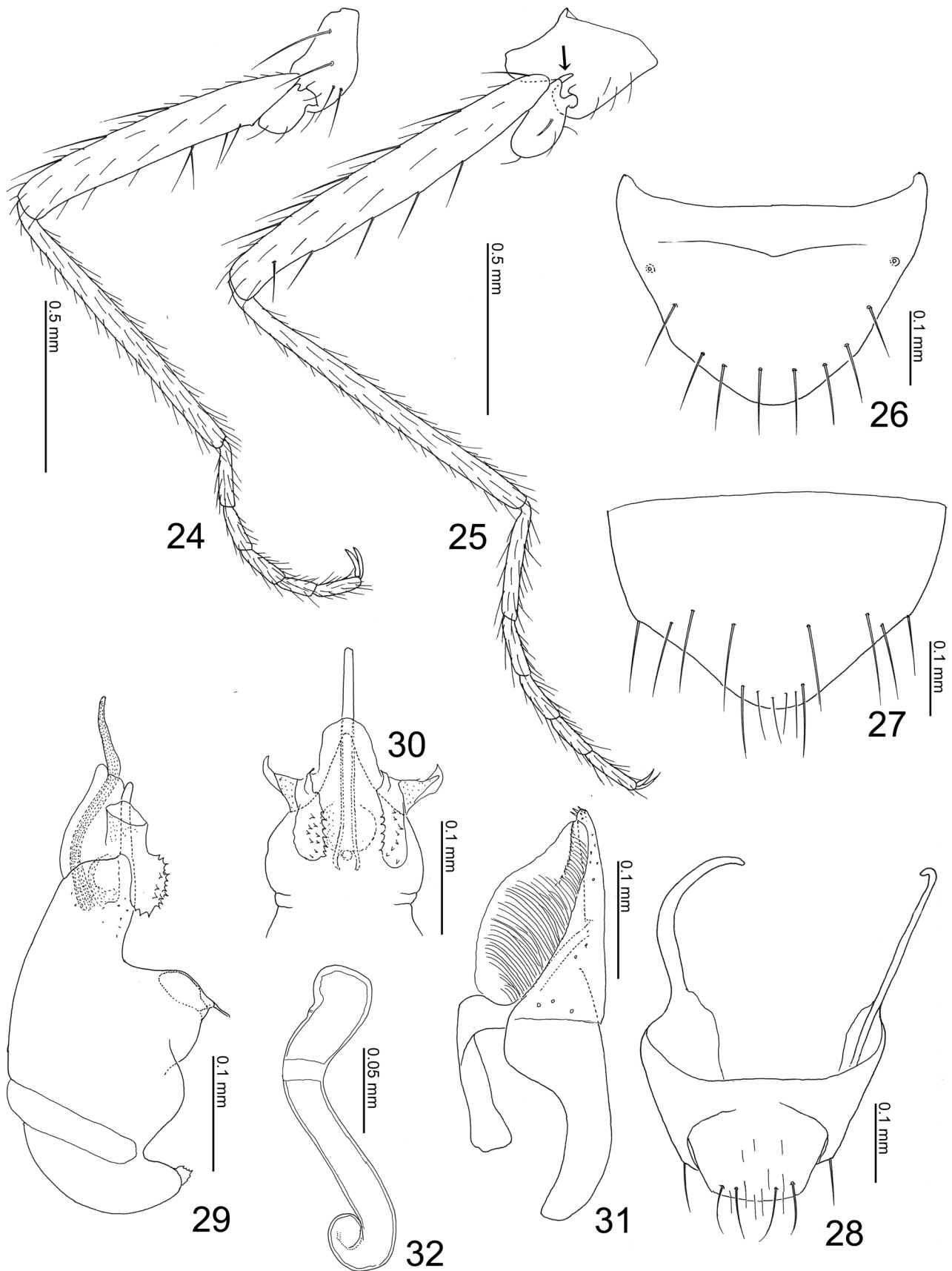
Pronotum (Figs. 10–13, 19, 20) constricted at basal 1/3; PL/PW= 1.53, with 12–14 macrosetae on dorsal disc and lateral margin. Elytra (Figs. 10–13, 22) almost as long as pronotum, with 3 macrosetae and several minute setae.



FIGURES 10–12. Habitus of *Aenictosymbia cornuta* Maruyama, **gen. & sp. n.** 10—dorsal view; 11—ventral view; 12—lateral view.



FIGURES 13–23. Body parts of *Aenictosymbia cornuta* Maruyama, **gen. & sp. n.** 13—head, dorsal view; 14—labrum (right, epipharynx); 15—left mandible; 16—mentum; 17—labium; 18, right maxilla; 19—pronotum, dorsal view; 20—ditto, ventral view; 21—meso- and meta traces; 22—right elytra; 23—left fore leg.



FIGURES 24–32. Body parts of *Aenictosymbia cornuta* Maruyama, **gen. & sp. n.** 24—left mid leg; 25—left hind leg; 26—male tergite VIII; 27—male sternite VIII; 28—male abdominal tergites IX and X; 29—median lobe of aedeagus, lateral view; 30—ditto, apical part, ventra view; 31—paramere; 32—spermatheca.

Abdomen with convexity of sternite III (Fig. 11) large, flattened ventrally, slightly notched on anterior margin in ventral view, shallowly depressed in midline; tergite VIII (Fig. 26) shallowly emarginated at apex, with 4 short macrosetae; sternite VIII (Fig. 27) with 5 macrosetae and 2 or 3 thin setae postero medially.

Male: Median lobe of aedeagus (Figs. 29–30) with basal ridge small, serrate at apex; sclerites of internal sac dentate; apical lobe of paramere (Fig. 31) long, thick, with 4 small setae.

Female: Spermatheca (Fig. 32) with basal part about 3 times as long as apical part, which is slightly swollen at apex.

Measurements. BL, ca. 2.6–2.7; FBL, ca. 1.6–1.7; HW, 0.47–0.53; AL, 1.55–1.63; PL, 0.65–0.67; PW, 0.40–0.41; HTL, 0.99–1.02 (N=3).

Differential diagnosis. This species is similar to *Aenictophila thailandica* Seevers, 1965 in general appearance, but easily distinguished from it by the much smaller body. See also Diagnosis of the genus.

Etymology. The Latin adjective *cornuta* meaning "horned", bringing attention to a horn on the frons of the head.

Symbiotic host. *Aenictus hodgsoni*.

Distribution. Central Thailand.

Aenictoxenides Maruyama, gen. n.

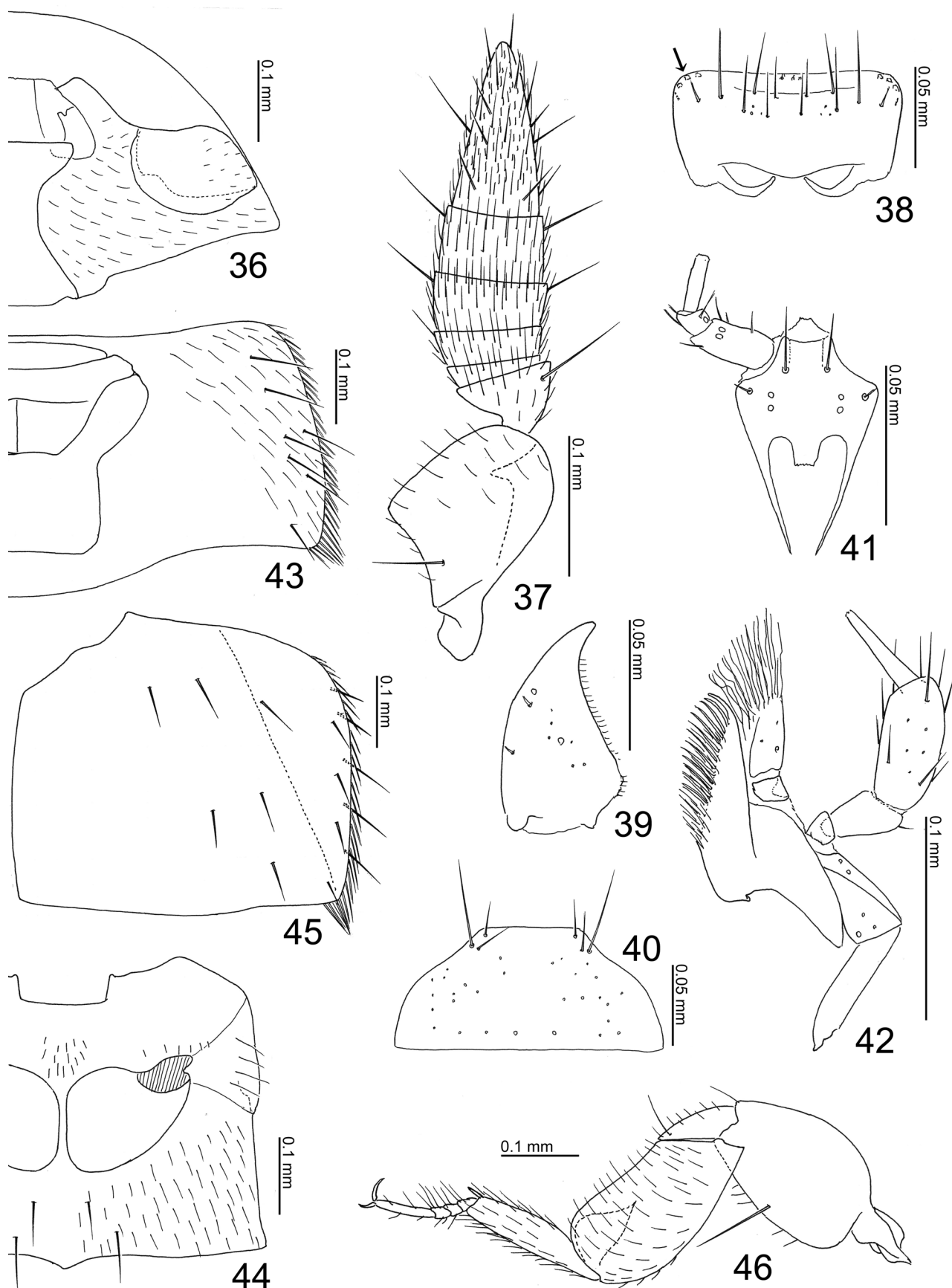
(Figs. 33–52)

Type species: *Aenictoxenides mirabilis* Maruyama, sp. n.

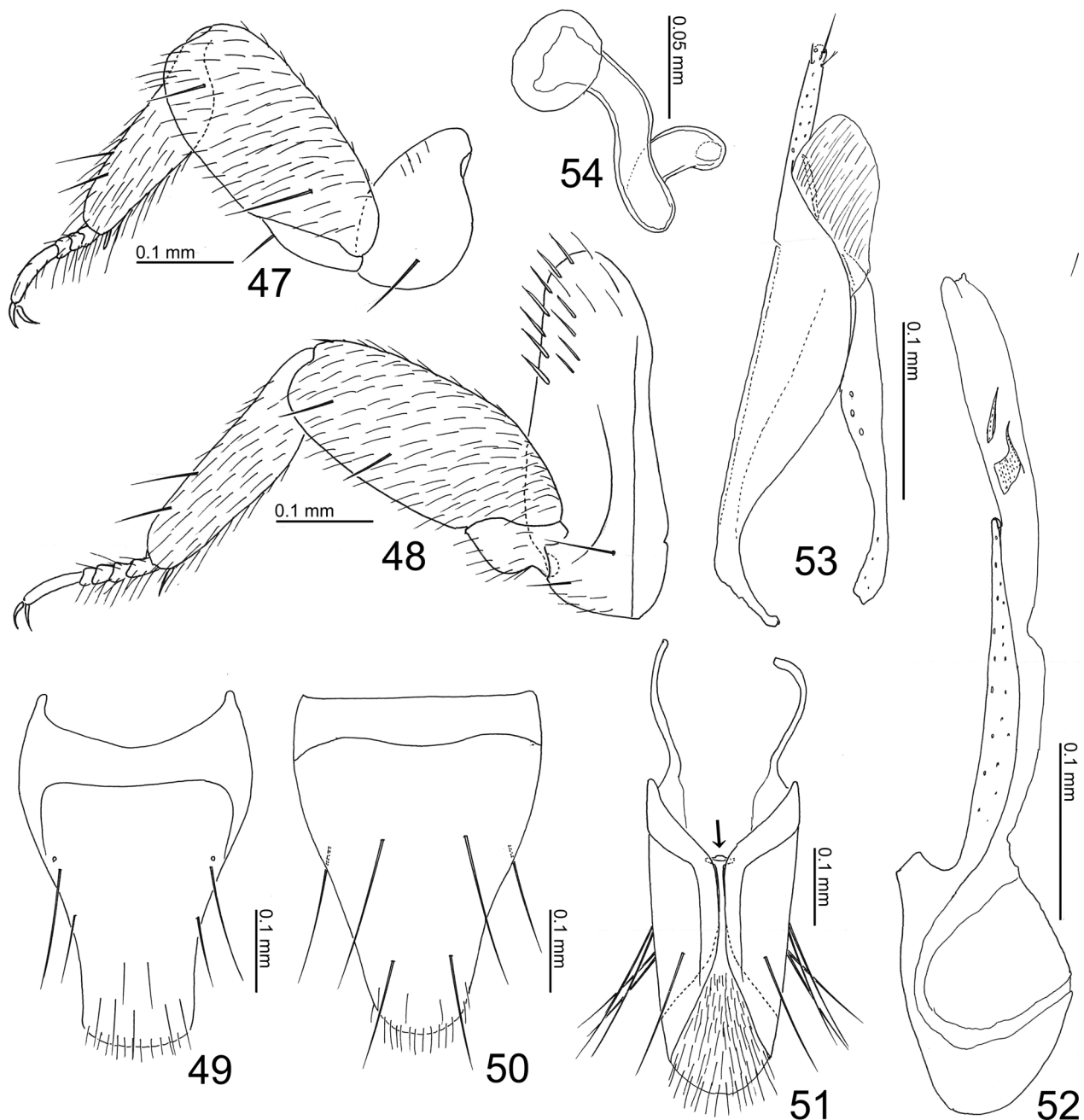
Description. Body (Figs. 33–35) foliaceous, flattened, glossy.



FIGURES 33–35. Habitus of *Aenictoxenides mirabilis* Maruyama, gen. & sp. n. 33—dorsal view; 34—ventral view; 35—lateral view.



FIGURES 36–46. Body parts of *Aenictoxenides mirabilis* Maruyama, **gen. & sp. n.** 36—head, dorsal view; 37—left antenna; 38—labrum; 39—left mandible; 40—mentum; 41—labium; 42, right maxilla; 43—pronotum, ventral view; 44—meso- and meta traces; 45—right elytra; 46—left fore leg.



FIGURES 47–54. Body parts of *Aenictoxenides mirabilis* Maruyama, **gen. & sp. n.** 47—left mid leg; 48—left hind leg; 49—male tergite VIII; 50—male sternite VIII; 51—male abdominal tergites IX and X; 52—median lobe of aedeagus, lateral view; 53—paramere; 54—spermatheca.

Head (Figs. 33–36) semicircular, strongly flattened above; frons protruded anteriorly and laterally to form “arcade” which conceals eyes, mouthparts, bases of antennae underside of head; temples projected laterally, pointed at apex; eyes rather large, located laterally, underside of head; antennae (Figs. 33–35, 37) 7-segmented, inserted near mouthparts; segment I large, thin, concealed in antennal cavity; segments II–VII connected closely, fusiform overall.

Mouthparts: Labrum (Fig. 38) rather generalized, with some pseudopores, and a row of 3 campaniform sensilla around antero-lateral corner (Fig. 38: arrow). Mandibles (Fig. 39) almost symmetric, with 2 setae around middle of outer margin. Mentum (Fig. 40) sub-trapezoidal, but lateral margin rounded, truncate on anterior margin, sparsely with pseudopores, some setae around antero-lateral area. Labium (Fig. 41): apodeme with lateral lobe short, narrowed toward pointed apex, with apically truncate medial projection; prementum with 2 real pores and 1 setal pore antero-laterally; palpus with segment I long, 3 times as long as II; segment III narrow, elongate; maxilla (Fig.

42) with cardo elongate; lacinia with 4 spines near apex, densely with pubescence; galea short, with tuft of long pubescence at apex; palpus sparsely with pseudopores; segment IV narrowed.

Pronotum (Figs. 33–35, 43) transverse, with a row of thick setae on lateral margin; hypomera laterally not visible, with several macrosetae; prosternite (Fig. 20) trapezoidal, carinate at midline.

Mesoventrite (Fig. 44) with process not differentiated from that of metaventrite; mesocoxal cavity well margined, clearly separated. Elytra (Fig. 45) transverse, slightly convex above, with a row of thick setae on lateral margin; hypomera laterally not visible, with several macrosetae along lateral margins; hind wings developed.

Legs (Figs. 34–35, 46–48) short, compressed, with inner margins of femora sulcate to hold tibia; tarsal formula 4–4–5; fore leg (Fig. 46) with tibia slender widest at middle; tarsal segments I–III subequal in length; mid leg (Fig. 47) with coxa oval; tibia thick, widest around basal 1/3; tarsal segments I–III subequal in length; hind leg (Fig. 48) with coxa transverse, with thick setae around lateral area; tibia thick, widest around basal 1/3; tarsal segments I–III subequal in length; segment IV smallest.

Abdomen (Figs. 33–35) widest at segment IV, gently narrowed toward apex; tergite VIII (Fig. 49) narrowed apicad, sub-parallel near apex, rounded on apical margin; sternite (Fig. 50) gently narrowed apicad, rounded at apex; tergites IX and X (Fig. 51) cylindrical; tergite IX narrowed around base; sclerite at base of tergite IX well developed, transverse (Fig. 51: arrow); tergite X emarginate on anterior margin in dorsal view.

Male: median lobe of aedeagus (Fig. 52) bulbous at base; apical lobe elongate, pointed at apex; paramere (Fig. 53) with apical lobe elongate.

Female: spermatheca (Fig. 32) coiled around base, with apical part spherical.

Differential diagnosis. This genus is closely related to *Aenictoxenus* Seevers, 1953 in numerous character states, especially those of the mouthparts and thorax, but distinguished from it by the temples which widen behind the eyes, forming acute posterior head angles (although *Aenictoxenus* has an “arcade” formed by a fronto-lateral expansion of the head, the temples are not expanded, and instead narrow smoothly and roundly to the head base), the antennae which are 7-segmented (in *Aenictoxenus*, 8-segmented), the sub-trapezoidal mentum (in *Aenictoxenus*, the anterior margin is rounded), and tergite X more shallowly emarginate on the anterior margin in dorsal view (in *Aenictoxenus*, it is deeply emarginate, deeper than 1/2 of the length of tergite X).

Etymology. A combination of the related genus name *Aenictoxenus*, and the Latin suffix *oides* (meaning “similar”), indicating a similar genus of *Aenictoxenus*. Gender masculine.

Distribution. Central Thailand.

Systematic notes. Tribal affiliations of *Aenictoxenus* are controversial. Jacobson & Kistner (1975) stated the genus does not belong to Pygostenini. However, the related genus *Aenictoxenides* shares a sclerite at the base of the tergite IX which is one of autapomorphies of Pygostenini (Maruyama *et al.*, in prep.), and the well-sclerotized, cylindrical abdominal segments IX + X are also characteristic in Pygostenini. Although *Aenictoxenus* does not share the sclerite at base of tergite X, it could be a secondary loss of the state due to extreme miniaturization of the body. This sclerite is ill-defined also in some other minute-sized pygostenines. We propose that both *Aenictoxenus* and *Aenictoxenides* are members of Pygostenini.

Aenictoxenides mirabilis Maruyama, sp. n.

(Figs. 33–52)

Type series. Holotype, ♂, “THAI: Nakhon Ratchasima, / Khao Yai National Park, / Heaw Suwat (750 m), / 30 IX 2007, Maruyama M., / Komatsu T. & Katayama Y. / MM-AE029 // HOLOTYPE / *Aenictoxenides mirabilis* / det. Maruyama, 2014” (male 8th abdominal segment and aedeagus dissected and mounted in Euparal) (KUM). Paratypes, 2♂, 2♀, 7 sex?, same data as holotype (KUM, DNP); 2 sex?, “THAI: Nakhon Nayok, / Khao Yai National Park, / near Cafeteria (700 m), / 3 X 2007, Maruyama M., / Komatsu T. & Katayama Y. / MM-AE036” (KUM, DNP).

Description. Body (Figs. 33–35) small. Light reddish brown overall.

Head (Figs. 33–36) sparsely covered with short, recumbent setae, with 9 or 10 macrosetae. Antenna (Figs. 37) short, with some erecting setae on each segment; segment III shortest, 1/2 as long as IV; segment V widest; segment VI longest, narrowed apicad; segment VII conical. .

Pronotum (Figs. 33–35, 43) with anterior margin shallowly emarginate; posterior margin convex medially; disc glabrous, with 12 macrosetae around mesal area and 6 short macrosetae along lateral margin; hypomera

sparsely covered with setae, with 7 macrosetae. Metasternum (Fig. 44) with 2 macrosetae antero-medially. Elytra (Figs. 33–35, 45) glabrous; disc with 6 macrosetae around mesal area and 4 short macrosetae along lateral margin; hypomera sparsely covered with setae, with 5 macrosetae along lateral margin.

Abdomen (Figs. 33–35, 49, 50): tergites II–VIII with following numbers of macrosetae: 0–3–3–3–3–2–2; sternites III–VIII with those: 10–10–10–8–3–3 (III–VI with variation, ± 1).

Male: Median lobe of aedeagus (Figs. 52) with crista apicalis truncate at apex in lateral view; sclerites of internal sac small; apical lobe of paramere (Fig. 53) covered with pores, with 4 setae.

Female: Spermatheca (Fig. 54) with basal part coiled at middle.

Measurements. BL, ca. 1.8–2.0; FBL, ca. 0.9–1.1; HW, 0.64–0.70; AL, 0.25–0.27; PL, 0.33–0.36; PW, 0.80–0.88 (N=3).

Differential diagnosis. This species is similar to *Aenictoxenus* species but easily distinguished from them by the more elongate body, and the temples of head which strongly extend laterally. See also Diagnosis of the genus.

Etymology. The Latin adjective *mirabilis* meaning "amazing", "strange", for the amazingly beautiful and strange habitus of this species.

Symbiotic host. *Aenictus hodgsoni*.

Distribution. Central Thailand.

Acknowledgments

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