



Four new species of *Arixyleborus* Hopkins, 1915, ambrosia beetles from Thailand (Coleoptera: Curculionidae: Scolytinae: Xyleborini)

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Abstract

Four new species, *Arixyleborus halabala* Sittichaya, Beaver & Smith sp. nov., *Arixyleborus longicauda* Sittichaya, Beaver & Smith sp. nov., *Arixyleborus vellus* Sittichaya, Beaver & Smith sp. nov. are described from Thailand, and *Arixyleborus liratus* Sittichaya, Beaver & Smith sp. nov. from Thailand and East Malaysia (Sabah). With the inclusion of the species described here, the diversity of *Arixyleborus* is increased to 46 species, of which 20 occur in Thailand. A synoptic list with distributions and habitat types is provided.

Key words: Diversity, Oriental region, Thai fauna, Malaysia, Sabah, new species

Introduction

Hopkins (1915) erected the monotypic genus *Arixyleborus* Hopkins, 1915, and designated the newly described *A. rugosipes* Hopkins, 1915, from the Philippines, as type species. The genus was distinguished from related genera primarily by characters of the antenna and protibia (Hopkins 1915). Subsequently, Eggers (1923) described the genus *Xyleboricus* Eggers, 1923 for six species from Indonesia and New Guinea, but did not designate a type species. Schedl (1936) later designated *Xyleboricus canaliculatus* Eggers, 1923, as the type species of *Xyleboricus*. Schedl (1952) synonymised *Xyleboricus* with *Arixyleborus*, the latter genus having priority. This synonymy has been accepted by all later authors (e.g. Browne 1963; Wood 1986; Wood & Bright 1992; Maiti & Saha 2004; Hulcr & Cognato 2013; Smith *et al.* 2020). Diagnostic characters for the genus are given by Smith *et al.* (2020).

Arixyleborus species, like other xyleborines, are ambrosia beetles, wood-borers which are intimately associated with symbiotic fungi, upon which both adults and larvae feed in gallery systems constructed in the xylem (Kirkendall *et al.* 2015). The gallery system in *Arixyleborus* consists of a radial or curved entrance tunnel, sometimes with a few branches. The galleries do not penetrate very deeply into the wood. As the larvae develop, their feeding activity extends part of the main gallery into a single large, narrow brood chamber in the longitudinal plane (Browne 1961; Smith *et al.* 2020). Most of the species with known host trees are polyphagous, attacking a wide taxonomic range of hosts (Ruzzier *et al.* 2022, 2023). None of the species are known to attack healthy hosts, but some species may attack freshly sawn timber (Browne 1961).

Arixyleborus currently contains 42 species distributed throughout the Oriental and Papuan regions from India and Sri Lanka in the West, through Southeast Asia, the Philippines and Indonesia to New Guinea and the Solomon Islands in the East. The genus reaches its northern limit in Yakushima Island, Japan (30°N). Two species are known from the Afrotropical region (Smith *et al.* 2022). It is noteworthy that although an increasing number of species of xyleborine ambrosia beetle have successfully invaded other areas of the world (e.g. Gomez *et al.* 2018; Marchioro *et al.* 2022), no species of *Arixyleborus* is known to have done so.

In Thailand, sixteen *Arixyleborus* species were previously recorded (Hutachareern *et al.* 2007; Sittichaya *et al.* 2012; Beaver *et al.* 2014; Sittichaya *et al.* 2019; Smith *et al.* 2020). In this present study we describe four new species increasing the diversity of the Thai fauna to 20 *Arixyleborus* species and that of the genus to 46. We also provide the Thai provincial distributions and habitat types of all species found in Thailand.

Materials and methods

Specimens examined in this study of the new species were collected by the senior author (WS) from four provinces of Thailand using ethanol baited traps at different time periods. Specimens from Narathiwat Province (*A. halabala*, *A. liratus*) were collected with 20 ethanol baited traps between 2012–2015, whereas the specimens from Chiang Mai Province (*A. longicauda*) and Nan Province (*A. vellus*) were collected in the year 2012 each with 10 ethanol baited traps. Specimens from East Malaysia (Sabah) (*A. liratus*) were collected using flight intercept traps in 1987–1989. The new species were then compared with type specimens or photos of type specimens (MSNG, MSUC, NMNH, NHMUK, NHMW, NUFM) photographed by WS and SMS. Type material of the great majority, over 90%, of described species and synonyms have been examined by at least one of the authors and species descriptions were checked for those which photographs were unavailable. Photographs of type specimens of almost all the remaining described species have also been examined by at least one author (SMS). Photographs were taken with a Canon EOS R digital Camera with a Canon MP-E 65 mm Macro Photo Lens (Canon, Tokyo, Japan) and StackShot-Macrorail (Cognisys Inc, Michigan, USA). The photos were then combined with Helicon Focus 8.2.2. (Helicon Soft, Ukraine) and all photos were improved with Adobe Photoshop CS6 (Adobe Systems, California, USA). The antennal and pronotum types and characters follow those proposed by Hulcr *et al.* (2007) and subsequently elaborated by Smith *et al.* (2020). Length was measured from pronotal anterior margin to the apex of the declivity, and width was measured at the widest part of the specimen. Elytral length was measured from the anterior margin to the apex along the elytral medial suture. The pedicel is excluded from the count of number of funicle segments.

Abbreviations used for entomological collections

MSNG Museo Civico di Storia Naturale Giacomo Doria, Genova, Italy
MSUC Albert J. Cook Arthropod Research Collection, Michigan State University, East Lansing, USA
NHMUK Natural History Museum, London, UK
NMNH Museum of Natural History, Washington, D.C., USA
NHMW Naturhistorisches Museum Wien, Austria
NUFM Nagoya University Furukawa Museum, Chikusa-ku, Nagoya, Japan
RABC Roger A. Beaver collection, Chiang Mai, Thailand
THNHM Natural History Museum of the National Science Museum, Pathum Thani, Thailand
WSTC Private collection of Wisut Sittichaya, Songkhla, Thailand

Taxonomic treatment

Arixyleborus Hopkins, 1915

Arixyleborus Hopkins, 1915: 59.
Xyleboricus Eggers, 1923: 212. Synonymy: Schedl 1952: 162.
Type species: *Arixyleborus rugosipes* Hopkins, 1915; original designation.

New Species

Arixyleborus halabala Sittichaya, Beaver & Smith sp. nov.

<http://zoobank.org/urn:lsid:zoobank.org:act:3AB69B89-BCCE-476B-9CC3-1AC062F33205>
(Fig. 1)



FIGURE 1. *Arixyleborus halabala* sp. nov. holotype female A) dorsal view B) lateral view C) postero-lateral view D) frons E) antenna.

Type material. Holotype, female: THAILAND: Narathiwat Province, Hala-Bala Wildlife Sanctuary, 5°48'02.4"N, 101°49'58.2"E, 140m, lowland tropical rainforest, ethanol baited trap, 01.vii.2014., W. Sittichaya (NHMW); **Paratypes**, female, same as holotype (6) (6, WSTC); same as holotype except; 01.iii.2012 (3) (1, RABC; 1, MSUC; 1, THNHM); same as holotype except; 01.xi.2014 (3) (3, WSTC).

Diagnosis: 2.10–2.28 mm long (mean 2.20, n = 12); 2.33–2.51× as long as wide. This species is distinguished by the pronotum type 7 in dorsal view, evenly rounded anteriorly, anterior margin without serrations; elytral disc almost flat, with a very weak transverse impression in middle; striae not impressed; declivity steep, matt, interstriae 1 raised and strongly convex near apex; declivital interstriae with dense, hair-like setae; apex angularly rounded; posterolateral margin tuberculate; protibiae with posterior surface inflated, granulate. This species resembles *A. okadai* Browne, but is distinguished by (*A. halabala* given first): larger size, 2.10–2.28 mm long vs 1.95–2.05 mm long; anterior margin of pronotum unarmed vs anterior margin of pronotum with a row of asperities; interstriae 1 raised and convex near apex vs interstriae 1 not raised on declivity; elytral apex angularly rounded vs elytral apex evenly rounded. It is distinguished from *A. moestus* (Eggers) by the following characters (*A. halabala* given first): smaller size, 2.10–2.28 mm long vs 2.50–2.70 mm long; elytral disc feebly transversely depressed vs elytral disc flat; elytral striae flat not impressed vs elytral striae weakly impressed; granules on elytra small vs granules on elytra larger.

Description (female) 2.10–2.28 mm long (mean 2.20, n = 12); 2.33–2.51× as long as wide. Body dark brown to black except appendages brown, body covered with grayish brown hair-like setae. **Head.** Epistoma complete,

anterior margin transverse, with a row of hair-like setae. Frons convex from epistoma to upper level of eyes; moderately shiny, lower half alutaceous, upper half reticulate; surface with rounded, shiny granules of varying size, densely placed near epistoma, more sparsely toward vertex, each with an erect, hairlike seta inserted close to it; upper part of frons with a weakly raised, shiny median line. Eyes deeply emarginate above level of antennal insertion, upper part of eyes almost equal in size to lower part. Submentum strongly impressed, broadly triangular. Scape clavate, approximately as long as club. Pedicel as long as funicle. Antennal funicle 4-segmented, segment 1 shorter than pedicel. Club as long as wide, type 2; segment 1 corneous, anterior margin completely costate, feebly concave on anterior face, occupying approximately basal half of club; segment 2 narrow, partly corneous on anterior side, margin costate, visible on posterior face. **Pronotum.** 1.01–1.20× as long as wide. In dorsal view, type 7, sides parallel in basal 2/3, evenly rounded anteriorly; anterior margin without serrations. In lateral view with disc much longer than anterior slope, type 8; summit low, indistinct. Anterior half with small, low, densely placed asperities, becoming lower posteriorly. Disc convex, alutaceous, sub-shining, finely, moderately densely punctured, each puncture bearing a short, curved, semi-erect, posteriorly-directed, hair-like seta, some longer hairlike setae on margins. Lateral margins obliquely costate. Base weakly bisinuate. **Elytra.** 1.22–1.33× as long as wide, 1.10–1.20× longer than pronotum. Elytral bases transverse, edge oblique, weakly costate near scutellum, humeral angles rounded. Scutellum moderately sized, linguiform, flat, flush with elytra, its surface finely punctate, shiny. Elytral sides parallel from base for 3/4 of elytral length, then angularly rounded to apex; disc longer than declivity, very feebly transversely impressed in middle, densely covered with semi-recumbent, moderately long, moderately thick, grayish hair-like setae (some abraded in holotype); disc in basal 1/3 mostly shiny (except dull close to suture in holotype and some paratypes), rugulose, striae and interstriae indistinct, flat, with some minute, confused granules, slightly increasing in size from dorsal surface to lateral margins; posterior part of disc matt, with densely spaced granules increasing in size posteriorly; interstriae with 2–3 irregular rows of granules, striae with a single row of smaller granules. Declivity steep, shagreened, matt, flat on upper middle part, interstriae 1–4 extending to apex of declivity, interstriae 1 raised and strongly convex near apex; granules much smaller than those on disc; densely covered with moderately thick, hair-like setae, shorter than setae on declivital summit, but of similar size and form on all interstriae; posterolateral margin tuberculate to interstriae 7. **Legs.** Protibiae slender, broadest at apical 1/3, posterior face strongly inflated, granulate, outer margin with five comparatively large, shorter than wide, socketed denticles in apical 2/3. Meso- and metatibiae flattened, posterior face unarmed; mesotibiae outer margin rounded with ten socketed denticles; metatibiae outer margin evenly rounded, more slender than mesotibiae, with nine socketed denticles.

Male: Unknown.

Etymology: Halabala (ฮาลา-บาลา), Thai name of the Hala-Bala Wildlife Sanctuary, the collection locality of the type series. Noun in apposition.

Distribution: THAILAND: Narathiwat Province.

***Arixyleborus liratus* Sittichaya, Beaver & Smith sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:57FE3DEA-04CF-4378-BF2D-7F5BEE3C141E>

(Fig. 2)

Type material. Holotype, female: THAILAND: Narathiwat Province, Hala-Bala Wildlife Sanctuary, 5°48'02.4"N, 101°49'58.2"E, 140m, lowland tropical rainforest, ethanol baited trap, 01.iv.15, W. Sittichaya (NHMW); **Paratypes**, female, same as holotype (9) (1, MSUC; 1, THNHM; 7, WSTC); Malaysia, Sabah, Sipitang, Mendolong, 8.xii.1987, S. Adebratt (2) (2, RABC), same collection data except; 20.iii.1989 (2) (2, RABC).

Diagnosis. 1.88–2.00 mm long (mean 1.91, n = 10); 2.44–2.57× as long as wide. This species is distinguished by the antennal club wider than long; pronotum type 7 in dorsal view, evenly rounded anteriorly, anterior margin without serrations; elytral disc with striae impressed and interstriae raised from close to base; declivity angularly separated from disc, apex angularly rounded; posterolateral margin acute with a series of small teeth; protibiae with posterior surface inflated, tuberculate. This species is similar to *A. mediosectus* (Eggers) but is distinguished by (*A. liratus* given first): body distinctly stouter, 2.44–2.57× as long as wide vs body elongate 2.86–3.33× as long as wide; pronotum 1.1–1.3× as long as wide vs pronotum 1.3–1.4× as long as wide; elytral disc with striae impressed and interstriae raised from basal 1/5 vs elytral disc almost flat, striae impressed and interstriae raised only in apical 1/5; declivital interstriae with a row of strong, rounded granules vs declivital interstriae with minute granules.



FIGURE 2. *Arixyleborus liratus* sp. nov. holotype female A) dorsal view B) lateral view C) postero-lateral view D) frons E) antenna.

Description (female). 1.88–2.00 mm long (mean 1.91, n = 10); 2.44–2.57× as long as wide. Body tending to be bicolored, head, pronotum and declivity dark brown to black; elytral disc and appendages paler brown or reddish brown to reddish black. **Head.** Epistoma entire, transverse, with a row of hair-like setae. Frons feebly convex from epistoma to upper level of eyes, without distinct vertical medial line; surface alutaceous, shiny, sparsely granulate punctate; minutely granulate above epistoma, finely, shallowly punctate near upper level of eyes and laterally near gena; each granule and puncture with a fine hair-like seta. Eye deeply, triangularly emarginate above level of antennal insertion, upper and lower parts of eyes approximately equal in size. Submentum strongly impressed, triangular. Antenna with scape thick, slightly longer than club. Pedicel as long as funicle. Funicle 4-segmented, segment 1 shorter than pedicel. Club slightly wider than long (8/7), rounded, type 1, obliquely truncate, sutures not visible on posterior face; segment 1 corneous, anterior margin completely costate, concave on anterior face, occupying approximately basal half; segment 2 narrow, pubescent with narrow corneous part, visible on anterior face only. **Pronotum.** 1.1–1.3× as long as wide. In dorsal view, elongate, sides parallel in basal 3/4, type 7; anterior margin rounded without serrations. In lateral view, elongate with disc much longer than anterior slope, type 8, summit low. Anterior slope finely asperate, asperities low, densely placed, becoming lower towards summit. Disc alutaceous, subshiny, with moderately dense, minute, shallow punctures, each puncture bearing a very short, fine, hairlike seta directed anteriorly. Lateral margins obliquely costate. Base weakly concave. **Elytra.** 1.17–1.35× as long as wide, 1.0–1.1× longer than pronotum. Scutellum moderately sized, linguiform, distinctly raised, surface rugulose, subshiny, impunctate. Elytra opaque, dull, except interstriae 2–4 shiny on basal half of the disc. Elytral bases weakly sinuate, edge costate, feebly elevated, margin with a row of minute granules, a semicircular area around scutellum distinctly

impressed, humeral angles rounded. Sides straight from base to apical 1/2 of declivity then angularly rounded, apex slightly projecting at suture. Disc twice as long as declivity, distinctly angularly separated from it; basal part of disc smooth, weakly shining on interstriae, striae weakly impressed close to base, deepening posteriorly, each with a row of closely-placed punctures increasing in size posteriorly; interstriae flat at base, becoming narrower and more convex posteriorly, rather coarsely rugose-granulate before declivity, finely, irregularly punctured. Declivity steep, weakly convex with striae weakly impressed on upper part, the punctures smaller than on posterior part of disc, and decreasing in size towards apex, striae 1–3 extending to elytral apex, striae 4 and 5 convergent, extending about halfway down declivity, striae 6 curved around lateral margin of declivity to meet striae 3 near apex; interstriae coarsely, uniseriate granulate, granules decreasing in size posteriorly, sutural interstriae raised on lower half of declivity, and with more closely placed granules; interstriae on disc with very short, semi-recumbent, hairlike setae; setae longer and coarser on declivity, each tapering to a fine point, uniseriate except on declivital interstriae 1 where forming 2–3 irregular rows; striae with short, appressed hairs only on declivity; posterolateral margin acute from apex to interstriae 7, with a series of small teeth. **Legs.** Protibiae slender, slightly broadened distally; posterior face inflated, rather robustly tuberculate; outer margin with six socketed denticles in apical 2/3. Mesotibiae and metatibiae flattened, outer margin evenly rounded, with nine socketed denticles, posterior face unarmed.

Male. Unknown.

Etymology: Latin adjective, *liratus* = having ridges, referring to the ridged interstriae of the elytra.

Distribution: MALAYSIA: Sabah; Thailand: Narathiwat Province.

***Arixyleborus longicauda* Sittichaya, Beaver & Smith sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:ED529319-BF73-4948-A81D-ACE0E8D452A8>

(Fig. 3)

Type material. Holotype, female: THAILAND: Chiang Mai Province, Chiang Dao Wildlife Sanctuary, 19°21'38.5"N 98°55'12.5"E, 540m, mixed deciduous forest, ethanol baited trap, 04.vi.12, W. Sittichaya (NHMW);

Paratypes, same as holotype (9) (1, RABC; 1, MSUC; 1, THNHM; 6, WSTC).

Diagnosis. 1.80–1.90 mm long (mean 1.84, $n = 10$); 2.78–3.03× as long as wide. This species is distinguished by the pronotum type 7 in dorsal view, evenly rounded anteriorly, anterior margin without serrations; elytral disc with striae impressed and interstriae raised from basal third; disc evenly rounded into declivity, apex angularly rounded; declivital face steeply sloping, weakly convex, dull; declivital interstriae 1–4 with flattened, stout, bristle-like setae, outer interstriae with long hairlike setae; posterolateral margin costate and denticulate; protibiae with posterior surface inflated, strongly granulate. This species resembles *A. rugosipes* but is distinguished by (*A. longicauda* given first): body color very dark brown to pitchy black vs body paler, ferruginous to brown; punctures on pronotal disc larger and deeper vs punctures minute, shallow, inconspicuous; elytra more elongate, 1.56–1.67× as long as wide vs less elongate, 1.39–1.50× as long as wide; elytral disc gradually curving into declivity vs disc angularly separated from declivity.

Description. Female. 1.80–1.90 mm long (mean 1.84, $n = 10$); 2.78–3.03× as long as wide. Body dark brown to pitchy black, appendages paler. **Head.** Epistoma entire, transverse, with a row of dense, long, hair-like setae. Frons feebly convex from epistoma to upper level of eyes; surface alutaceous, subshiny, densely finely granulate in lower half, more sparsely above; punctures minute, each with a short, fine, erect, hair-like seta. Frons without distinct medial line or if present developed on upper half of frons (3 of 10 type specimens present). Eyes emarginate above level of antennal insertion, upper portion of eyes slightly smaller than lower part. Submentum deeply impressed, very narrow, triangular. Scape thick, as long as club. Pedicel as long as funicle. Antennal funicle 4-segmented, segment 1 shorter than pedicel. Club longer than wide, type 1, obliquely truncate, segment 2 not visible on posterior face; segment 1 occupying approximately basal half, concave on anterior side, with sharp marginal costa; segment 2 narrow, pubescent with very narrow corneous part, visible on anterior face only. **Pronotum.** 1.24–1.39× as long as wide. In dorsal view type 7, long and rounded frontally, sides parallel in basal 2/3; anterior margin without serrations. In lateral view type 8, disc much longer than anterior slope, summit low. Anterior slope finely asperate, asperities low, closely spaced, with very fine, short hair-like setae. Disc alutaceous, shiny, with small, moderately deep, moderately dense punctures, each with a very short, suberect seta. Lateral margins obliquely costate. Base weakly concave. **Elytra.** 1.56–1.67× as long as wide, 1.12–1.29× longer than pronotum. Scutellum moderately

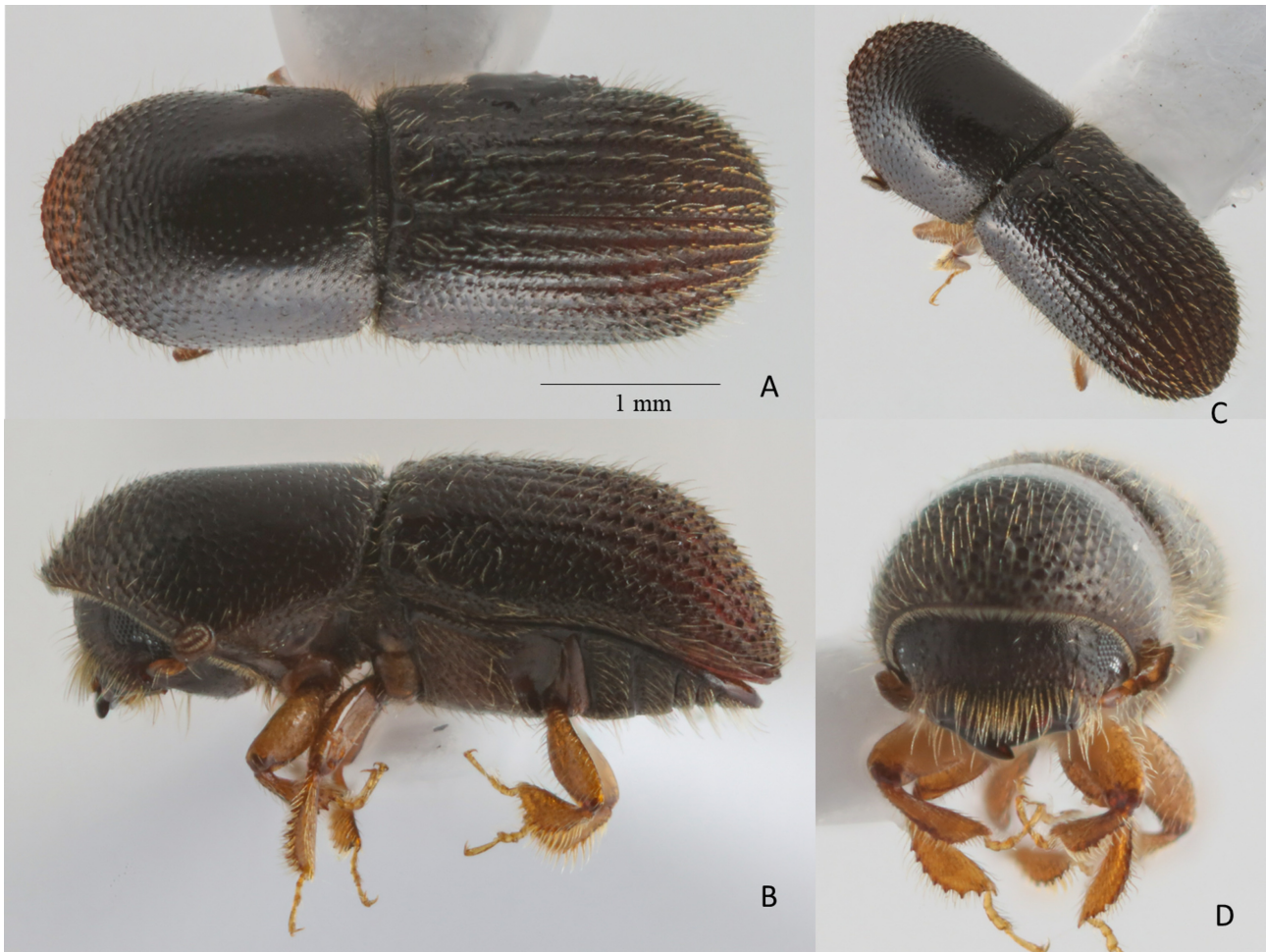


FIGURE 3. *Arixyleborus longicauda* sp. nov. holotype female A) dorsal view B) lateral view C) postero-lateral view D) frons E) antenna.

sized, linguiform, slightly elevated above adjacent part of elytra. Elytral bases weakly bisinuate, edge oblique, humeral angles rounded. Sides parallel from base to apical 1/2 of declivity, then angularly rounded to apex. Disc 1.5× as long as declivity, basal 1/2 shiny, apical 1/2 matt; striae and interstriae flat in basal 1/3, densely, shallowly punctured, each puncture bearing a very fine, hairlike seta, very short on striae, longer on interstriae; apical 2/3 of disc with striae increasingly deeply impressed towards apex; interstriae raised, each with a single row of granules increasing in size posteriorly; vestiture similar to basal part with striae hairlike setae minute, and interstriae with 2 or 3 irregular rows of longer, stouter setae. Disc evenly rounded into steeply sloping declivity; declivital face feebly convex, strongly shagreened, dull; striae feebly impressed, impunctate, glabrous, wider than on disc and wider than interstriae; interstriae ridgelike, with a single row of granules, decreasing in size towards apex; interstriae 1–4 reaching apex of declivity, bearing flattened, stout, bristle-like setae, biseriate on interstriae 1, uniseriate on interstriae 2–4; outer interstriae abbreviated, not reaching apex, with long, hairlike setae as on disc. Posterolateral margin of elytra costate, denticulate, to interstriae 7. **Legs.** protibiae slender, widest in apical 1/4; posterior face inflated, strongly granulate; outer margin with five distinctly separated, socketed denticles in apical half. Meso- and metatibiae flattened, outer margin evenly rounded with eight socketed denticles; posterior face unarmed.

Male. Unknown.

Etymology. Latin adjective, from *longus* = long, and *cauda* = tail, referring to the elongate elytra compared to related species.

Distribution. THAILAND: Chiang Mai Province.

***Arixyleborus vellus* Sittichaya, Beaver & Smith sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:2C7E7B78-0903-4117-9E38-5E4B49BE0C60>

(Fig. 4)

Type material. Holotype, female: THAILAND: Nan Province, Pua District, Doi Phu Kha National Park, 19°12'18.5"N 101°04'39.5"E; 1320m, montane forest, ethanol baited traps, 01.vi.12, W. Sittichaya (NHMW); **Paratypes**, as holotype (2) (1, RABC; 1, WSTC).

Diagnosis. 2.50–2.60 mm long (mean 2.55, $n = 3$); 2.43–2.60× as long as wide. This species is distinguished by the pronotum type 7 in dorsal view, evenly rounded anteriorly, anterior margin without serrations; elytral disc with striae impressed and interstriae raised from basal fifth; declivity angularly separated from disc, apex angulate; declivital face truncate, flattened, dull; striae not impressed, punctures forming slightly raised discs, interstriae flattened, biseriate granulate on upper portion, becoming uniseriate on apical half, except for interstriae 1, each granule with a long semi-erect hair-like seta; posterolateral margin denticulate; protibiae with posterior face inflated, granulate. This species is similar to *A. puberulus* but is distinguished by (*A. vellus* given first): pronotal disc approximately as long as anterior slope, summit in middle of pronotum vs disc shorter, 0.8× as long as anterior slope, summit behind middle of pronotum; declivity abruptly truncate, apex angulate vs declivity broadly rounded, apex broadly rounded.

Description (female): 2.50–2.60 mm long (mean 2.53, $n = 3$); 2.43–2.60× as long as wide. Body dark brown to black, appendages paler. **Head.** Epistoma entire, transverse, with a row of hair-like setae. Frons strongly convex from epistoma to upper level of eyes, subshiny, reticulate with moderately sized, densely placed, rounded granules near epistoma, sparser, weaker rugosities in mid-part, upper part of frons punctate to just above upper level of eyes, each puncture with a moderately long, very fine, hair-like seta; frons with a raised, smooth, median line from lower level of eyes to just above upper level; vertex strongly reticulate, impunctate. Eyes deeply emarginate above level of antennal insertion, upper part of eyes slightly smaller than lower part. Submentum deeply impressed, small, triangular. Scape short, moderately thick, approximately equal in length to the club. Pedicel as long as funicle. Antennal funicle 4-segmented, first segment the longest. Club as long as wide, type 1; segment 1 corneous, encircling anterior face, concave on anterior side, with sharp marginal costa; segment 2 narrow, concave, corneous on anterior face; sutures absent on posterior face. **Pronotum.** 1.07–1.10× as long as wide. In dorsal view, type 7, elongate, sides parallel in basal 2/3; anterior margin rounded without serrations. In lateral view, type 8, disc much longer than anterior slope, summit low. Anterior slope finely asperate, asperities low, closely placed, decreasing in size towards summit, each asperity with a fine, tapering hair-like seta. Disc with surface reticulate, subshiny, moderately densely, minutely punctured, each puncture with a short, fine hair-like seta directed anteriorly, some longer setae present along margin. Lateral margins obliquely costate. Base weakly bisinuate. **Elytra.** 1.26–1.32× as long as wide, 1.18–1.23× as long as pronotum. Scutellum moderately sized, linguiform, raised above surrounding impressed elytra, finely punctured. Elytral bases transverse, edge oblique, humeral angles rounded, sides subparallel for 2/3 of length, feebly widened posteriorly, rounded to apex. Disc 2× as long as declivity, shiny in basal half, matt posteriorly, basal 1/5 flat, then striae impressed, furrowed, increasing deeply posteriorly, punctate; punctures large, circular, shallow, separated by about half the diameter of a puncture; interstriae 2× width of striae, increasingly elevated posteriorly, biseriate punctate in basal half of disc; punctures minute, each with a semi-appressed, moderately long hair-like seta; posterior half of disc with interstriae densely, coarsely tuberculate, tubercles uniseriate on interstriae 1, biseriate on other interstriae. Declivity abruptly truncate, angularly separated from disc, flattened, shagreened, dull; striae not impressed, narrower than on the disc, punctures forming flat, circular discs with a slightly raised circumference, each with a very short fine hair-like seta; interstriae flattened, biseriate granulate on upper portion, becoming uniseriate on apical half, except for interstriae 1, granules mostly coarse, densely spaced, each bearing a moderately long, semi-erect, hair-like seta. Posterolateral declivital margin denticulate. **Legs.** Protibiae slender, broadest at apical 1/3; posterior face inflated, granulate; outer margin with five or six small socketed denticles. Meso- and metatibiae flattened, posterior face unarmed, outer margin evenly rounded with ten and eleven socketed denticles respectively.

Male: Unknown.

Etymology: Latin noun, *vellus* = wool, referring to the wool-like setae on the declivital face.

Distribution: Thailand: Nan Province.



FIGURE 4 *Arixyleborus vellus* sp. nov. holotype female A) dorsal view B) lateral view C) postero-lateral view D) frons E) antenna.

Discussion

Most previous studies of *Arixyleborus* in Thailand have concentrated on only a few provinces: Chiang Mai in the North, and three provinces (Chumphon, Nakhon Sri Thammarat and Songkhla) in Southern Thailand, and in few habitat types (Hutacharern *et al.* 2007; Sittichaya *et al.* 2012; Beaver *et al.* 2014; Sittichaya *et al.* 2019; Smith *et al.* 2020). More recent collecting by WS throughout Thailand has provided further information on the distribution of the species within the country and on the habitat types in which the species occur. Details of these collections will be published elsewhere, but we provide in Table 1 a summary of information currently available.

Almost half of the species listed in Table 1 (9 of 20) occur only in the south of the country below the Isthmus of Kra and not to the north of it. This isthmus forms an important biogeographic dividing line between the fauna of mainland Southeast Asia to the north, and that of Malaysia and the western islands of Indonesia to the south (de Bruyn *et al.* 2005; Hughes *et al.* 2011; Parnell 2013). Its importance for the distribution of the Scolytinae and Platypodinae of Thailand has previously been noted by Beaver & Liu (2013) and Beaver *et al.* (2014) respectively. Seven species have a widespread distribution within the country, occurring both in the southern and more northerly provinces. The majority of the species in both these groups are widely distributed in Sundaland (including the Malay Peninsula, Bali, Borneo, Java, Sumatra, and smaller Indonesian islands West of Wallace's line), and sometimes as far as Sri Lanka in the west and New Guinea in the east. The remaining four species are known only from the north of the country. Two of these, *A. longicauda* and *A. vellus*, described in this paper are currently known only from

Thailand, *A. silvanus* is known also from two provinces in southern China, and *A. yakushmanus* is distributed from northern India to Japan. None of them is known to occur in Sundaland (Smith *et al.* 2020).

The majority of species inhabit more than one forest type (Table 1). The more widespread species occur in both the tropical rainforest of the south and in the deciduous forests of the more northerly parts of the country. The four species with a more northerly distribution are confined to the dry deciduous and montane forests. Many species are also found in plantations of tree crops such as durian, but are not known to be pests.

TABLE 1. Synoptic list and habitat types of the *Arixyleborus* fauna of Thailand. References are to records of the species in Thailand. Thai distribution follows that of Sittichaya and Smith (2022) which lists the following abbreviations: C = Central; N = North; NE = Northeast; S = South.

Species	Thai distribution	Habitat types	Reference
<i>Arixyleborus grandis</i> (Schedl)	S: Chumphon, Songkhla, Nakhon Sri Thammarat.	Durian plantation, tropical rainforest, suburban area	Sittichaya (2012), Beaver <i>et al.</i> (2014) Sittichaya (unpublished)
<i>Arixyleborus granifer</i> (Eichhoff)	N: Chiang Mai, Tak; S: Nakhon Sri Thammarat, Narathiwat, Ranong, Trang	Dry dipterocarp forest, tropical rainforest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)
<i>Arixyleborus granulifer</i> (Eggers)	C: Nakhon Nayok; N: Tak; N-E: Nakhon Ratchasima; S: Nakhon Sri Thammarat, Songkhla, Surat Thani	Moist evergreen forest (Dry evergreen forest), tropical rainforest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)
<i>Arixyleborus halabala</i> sp. nov.	S: Narathiwat	Tropical rainforest	This publication
<i>Arixyleborus hirsutululus</i> Schedl	S: Narathiwat, Nakhon Sri Thammarat	Tropical rainforest	Sittichaya <i>et al.</i> (2019), Sittichaya (unpublished)
<i>Arixyleborus leprosulus</i> Schedl	S: Chumphon, Narathiwat, Surat Thani	Durian plantation, tropical rainforest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)
<i>Arixyleborus liratus</i> sp. nov.	S: Narathiwat	Tropical rainforest,	This publication
<i>Arixyleborus longicauda</i> sp. nov.	N: Chiang Mai	Mixed deciduous forest	This publication
<i>Arixyleborus malayensis</i> (Schedl)	N: Chiang Mai, Mae Hong Son, Nan; C: Kanchanaburi, Nakhon Nayok, Rayong; S: Chumphon, Surat Thani	Durian plantation, mixed deciduous forest, low montane forest	Sittichaya & Beaver (2009), (Beaver <i>et al.</i> 2014), Sittichaya (unpublished)
<i>Arixyleborus mediosectus</i> (Eggers)	N-E: Sakon Nakhon, Kalasin, Ubon Ratchathani; S: Chumphon, Nakhon Sri Thammarat, Narathiwat, Songkhla	Durian plantation, mixed deciduous forest, tropical rainforest	Beaver <i>et al.</i> (2014) Sittichaya (unpublished)
<i>Arixyleborus minor</i> (Eggers)	S: Songkhla, Surat Thani	Durian plantation, tropical rainforest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)
<i>Arixyleborus puberulus</i> (Blandford)	S: Nakhon Sri Thammarat, Narathiwat, Phangnga, Ranong, Songkhla, Suratthani, Trang	Tropical rainforest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)
<i>Arixyleborus rugosipes</i> Hopkins	C: Chanthaburi, Kanchanaburi, Nakhon Nayok, Petchaburi; S: Chumphon, Nakhon Sri Thammarat, Phangnga, Surat Thani; Trang (Beaver 1999 as <i>Arixyleborus medius</i> (Eggers))	Durian plantation, tropical rainforest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)
<i>Arixyleborus scabripennis</i> (Blandford)	C: Nakhon Nayok; N: Chiang Mai, Tak; S: Chumphon, Nakhon Sri Thammarat.	Durian plantation, evergreen rain forest, tropical rain forest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)

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TABLE 1. (Continued)

Species	Thai distribution	Habitat types	Reference
<i>Arixyleborus silvanus</i> Smith, Beaver & Cognato	N: Chiang Mai; N-E: Loei; C: Kanchanaburi, Phetchaburi	Low montane forest	Smith <i>et al.</i> (2020), Sittichaya (unpublished)
<i>Arixyleborus sittichayai</i> Smith, Beaver & Cognato	S: Nakhon Sri Thammarat	Tropical rainforest	Smith <i>et al.</i> (2021), Sittichaya (unpublished)
<i>Arixyleborus suturalis</i> (Eggers)	N: Chiang Mai; S: Nakhon Sri Thammarat	Tropical rain forest	Beaver <i>et al.</i> (2014) Sittichaya (unpublished)
<i>Arixyleborus tuberculatus</i> (Eggers)	S: Chumphon, Nakhon Sri Thammarat, Songkhla	Durian plantation, tropical rainforest	Beaver <i>et al.</i> (2014), Sittichaya (unpublished)
<i>Arixyleborus vellus</i> sp. nov.	N: Nan	Montane forest	This publication
<i>Arixyleborus yakushimanus</i> (Murayama)	N: Chiang Mai (Beaver <i>et al.</i> (2014) recorded as <i>A. malayensis</i>); N-E: Loei; C: Kanchanaburi.	Montane forest, mixed deciduous forest	Smith <i>et al.</i> (2020), Sittichaya (unpublished)

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