

Longicorn Beetles (Coleoptera) Boring the Seed Pods of *Afzelia xylocarpa*

Tatsuya NIISATO¹⁾ and Hiroshi MAKIHARA²⁾

¹⁾Bioindicator Co., Ltd., Nikkō-Kagurazaka Building, Iwato-chō 18, Shinjuku, Tokyo, 162–0832 Japan

²⁾2033–5, Hiari, Isumi City, Chiba, 298–0002 Japan

Abstract Five longicorn beetles are recorded with detailed collecting data as the seed pod borers of *Afzelia xylocarpa* (Fabaceae) from Laos, Cambodia, and Thailand. Amongst them, *Amamiclytus afzelivorus* sp. nov. and *Pterolophia (Hylobrotus) takakuwai* sp. nov. are described as new. *Chlorophorus coniperda* HOLZSCHUH, 1992 from Thailand, Laos and Cambodia, and *Paramimistena enterolobii* GRESSITT et RONDON, 1970 from Cambodia are new country records.

Introduction

Afzelia xylocarpa is a broadleaved tree belonging to the subfamily Caesalpinioideae of the Fabaceae and distributed in the mainland of Southeast Asia (LAFRANKIE, 2010). In dry season, it makes thick, hard and purse-like shaped seed pods about 15–20 × 7–9 cm in length and width (LAFRANKIE, 2010). The beans are usually used for the Buddhist rosary. Only *Rhaphuma motschulskyi* GANGLBAUER (= *Chlorophorus motschulskyi*) has so far been known as a pest of *A. xylocarpa* seed pods (HUTACHARERN & TUBTIM, 1995).

Recently, we had an opportunity to examine a number of longicorn specimens which were emerged from the seed pods of *A. xylocarpa* from Laos, Cambodia, and Thailand. The examined material were classified into five species, which belong to the subfamilies Cerambycinae and Lamiinae, including new country records for two species and two species new to science. In the following lines, we will record them with detailed collecting data and describe the two new species in detail.

Material and Methods

Specimens used in the present study were mainly from the collections of the Forestry and Forest Products Research Institute, Tsukuba, Japan (FFPRI) and the Kanagawa Prefectural Museum of Natural History (KPMNH), and a few from the private collection of T. NIISATO, Tokyo (TNT). All specimens were emerged from the dry seed pods of *Afzelia xylocarpa* in Laos, Cambodia, and Thailand. The holotypes of new species are preserved at the Institute for Agro-Environmental Sciences, NARO (NIAES), Tsukuba, and paratypes are in NIAES and TNT.

The specimens were observed under a stereoscopic microscope (OLYMPUS SZX16) and an optical microscope (OLYMPUS BX53M) with a microscope digital camera (OLYMPUS DP73), as well as with the aid of an image analysis software (OLYMPUS Cell Sens). SEM images were taken by a Keyence VHK-D500 Ultra Depth Multi-Angle Observation System. The whole habitus of specimens were photographed by a Canon digital camera EOS 70D with a macro photo lens EF-50mm and MP-E65mm and Life-size Converter EF. The drawings of male genitalia were made by Adobe Illustrator CC.

The abbreviations used for the ratio of the measurement for describing a new species are as follows: BL — body length measured from the apical margin of clypeus to elytral apices; HW — maximum width of head across eyes; PL — length of pronotum; PW — maximum width of pronotum near middle; PA — apical width of pronotum; PB — basal width of pronotum; EL — length of elytra; EW — humeral width of elytra; M — arithmetic mean.

Longicorn Beetles Emerged out from the Seed Pods of *Afzelia xylocarpa*

Subfamily **Cerambycinae** LATREILLE, 1804

Perissus laetus LAMEERE, 1893

(Figs. 1 & 2)

Perissus laetus LAMEERE, 1893: 283; type locality: “Pnomh Penh”.

Perissus proprius GAHAN, 1894: 21; type locality: “Thagatá in Tenasserim; and Mandalay in Upper Burma”.

Perissus laetus var. *adhaerens* GAHAN, 1906: 255; type locality: “Assam: Patkai Mts.; Tenasserum: Thagatá; Siam; Cambodia: Pnomhpenh”.

Perissus kankauensis chungkonensis GRESSITT, 1940: 73, pl. 2, fig. 7; type locality: “between Fan-ta and Chung-konts’uen, east of Nam-fung, wesycentral Hainan Island; Taipin-ts’uen; Nam-po-ts’uen”.

Specimens examined. 1 ♂, 1 ♀ (TNT), TCCR, Kampong Cham Province, Cambodia, emerged on 18.XII.2015, M. TAKAKUWA leg.

Distribution. India, Myanmar, Thailand, Laos, Cambodia, Indonesia (Java), and China (Yunnan and Hainan).

Host plants. *Afzelia xylocarpa* (Fabaceae) (seed pod; Cambodia); *Diospyros empyropteris* (Laos), and *Millettia*, *Anogeissus*, *Derris*, *Acacia*, *Albizia*, *Cassia*, *Dalbergia*, *Dolichandrone*, *Ficus*, *Pyrus*, *Quercus* and *Xylia* species (Myanmar and India) (GRESSITT & RONDON, 1970).

Chlorophorus coniperda HOLZSCHUH, 1992

(Figs. 3 & 4)

Chlorophorus coniperda HOLZSCHUH, 1992: 27, fig. 28; type locality: “S. Vietnam, Dalat”.

Specimens examined. 1 ♀ (TNT), Meo-Village, Thailand, emerged on 29.IV–4.V.1982, A. SAKAI leg.; 1 ♀ (TNT), Tha khec (south of 42 km), Khan Muou, S. Laos, emerged on 19.V.2007, T. ENDO leg.; 10 exs. (FFPRI), Ngao, Chiang Rai Province, Thailand, emerged out on 22.II.1990, T. IKEDA & K. NAKAMUTA leg.; 13 exs. (KPMNH & TNT), TCCR, Kampong Cham Province, Cambodia, emerged on 18.XII.2015, M. TAKAKUWA leg.

Distribution. Thailand (new record), Laos (new record), Cambodia (new record), and Vietnam.

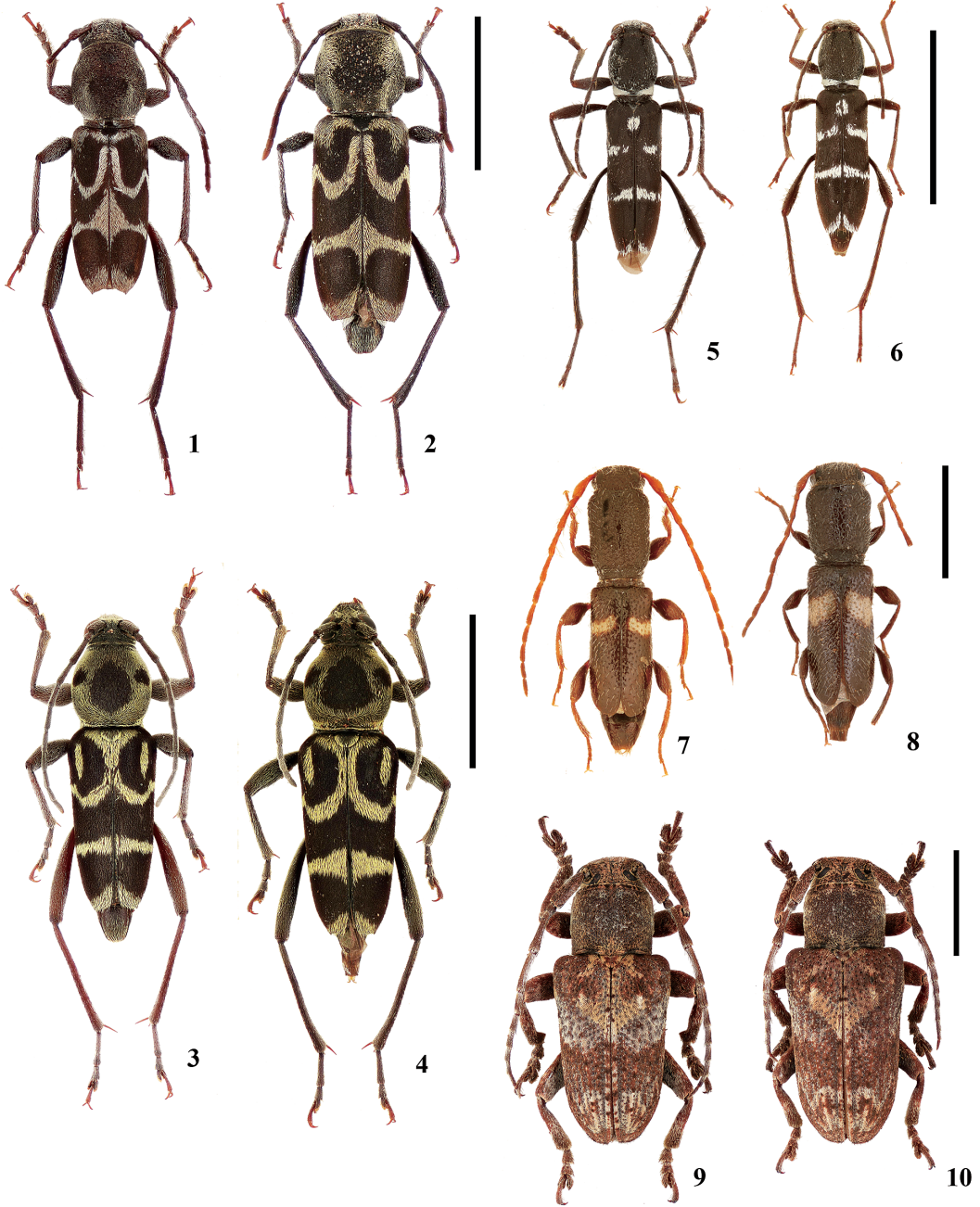
Host plants. *Pinus* sp. (Pinaceae) (Vietnam) (HOLZSCHUH, 1991); *Afzelia xylocarpa* (Fabaceae) (seed pod and seed coat; Thailand and Cambodia). The larvae of *C. coniperda* almost always feed on the seed pods in our observation, with a few exceptions bored into the seed coats.

Amamiclytus afzelivorus NIISATO et MAKIHARA, sp. nov.

(Figs. 5, 6 & 11–17)

Description. Male. Colour black, chestnut brown in antennae and legs, dark yellowish brown in palpi, mat in general. Body entirely clothed with fine pale gray pubescence, which becomes longer and denser on frons and ventral side, partly with a few erect pale yellow hairs on head and ventral

Figs. 1–10. Longicorn beetles emerged out from the seed pods of *Afzelia xylocarpa*. — 1, *Perissus laetus* LAMEERE, 1893, ♂; 2, ditto, ♀; 3, *Chlorophorus coniperda* HOLZSCHUH, 1992, ♂; 4, ditto, ♀; 5, *Amamiclytus afzelivorus* NIISATO et MAKIHARA, sp. nov., holotype, ♂; 6, ditto, paratype, ♀; 7, *Paramimistena enterolobii* GRESSITT et RONDON, 1970, ♂; 8, ditto, ♀; 9, *Pterolophia (Hylobrotus) takakuwai* MAKIHARA et NIISATO, sp. nov., holotype, ♂; 10, ditto, paratype, ♀. Scale: 4.00 mm for Figs. 1–4, 9 & 10; 2.00 mm for Figs. 5–8.



side; pronotum with thick white pubescence along basal margin except for narrow median part; elytron with four maculations of white pubescence: 1) a small semicircular spot along suture just before basal fifth, 2) a transverse or more or less oblique narrow band on basal 3/10, 3) a semi-oblique narrow band on apical 2/5, and 4) a narrow band along apical margin; ventral side with maculation of white pubescence on sides of mesosternum, on metepisternum, along apical margin of metepisternum, and on apical half or so of abdominal ventrites I and II (though interrupted with narrow median parts), supplemented with same coloured pubescence on most of prosternum; femora and tibiae sparsely with erect brownish hairs, the hairs are denser and thicker on hind legs especially on tibiae.

Head wider than the apical width or slightly narrower than the maximum width of pronotum, densely provided with small shallow punctures; frons about 1.3 times as long as the basal width, distinctly emarginate at sides, flattened, with a fine vestigial median line in apical third; genae half the depth of lower eye-lobes in frontal view; eyes well prominent, with upper-lobes separated each other by about 1/3 the width of head. Antennae relatively long, attaining apical 2/5 of elytra, slender; scape slightly depressed dorsally, gently arcuate, 3/5 the length of antennomere III or almost same length to IV; antennomeres III and IV thickened at each apex, with a very weak inner angle; antennomere XI bluntly pointed at apex.

Pronotum moderately longer than wide, weakly rounded on sides, widest just behind middle, not so strongly contracted to apex and base though the latter slightly wider than the former; disc moderately convex, though almost flattened above in lateral view, suddenly declivous before basal margin, moderately provided with relatively small punctures, the punctures close and partly confluent near middle. Scutellum right-angled triangular.

Elytra rather short and broad, 2.60–2.80 times as long as the humeral width; sided with humeri weakly rounded, gradually narrowed in a very weak sinuate line to apices, which are oblique and slightly arcuate on each margin, with minute dent at both inner and external angles; disc wholly convex, slightly depressed near suture in basal fifth, finely densely punctured throughout.

Ventral surface coarsely shagreened. Abdomen with anal ventrite truncate at apex.

Legs thin and markedly long, with hind femora extending elytra apices in apical 2/5; hind tarsomere I about 2.2 times as long as tarsomeres II and III combined.

Male genitalia as shown in Figs. 14–17. Median lobe relatively broad, slightly arcuate in profile; dorsal plate rounded on apical margin, exposing the sharply pointed apex of ventral plate in dorsal view; median struts broad, about half the whole length of median lobe. Tegmen slightly longer than median lobe; parameres bifurcate at apical 5/13 and moderately separated apically, with lobe gently narrowed apicad on external margin, rounded at apex which is provided with 5–6 long setae. Eighth tergite subovate, subtruncate on apical margin, sparsely provided with setae on sides near apical margin. Eighth sternite transversely quadrate.

F e m a l e. Body broader than in male; antennae attaining behind middle of elytra; abdomen with anal ventrite moderately arcuate at apex.

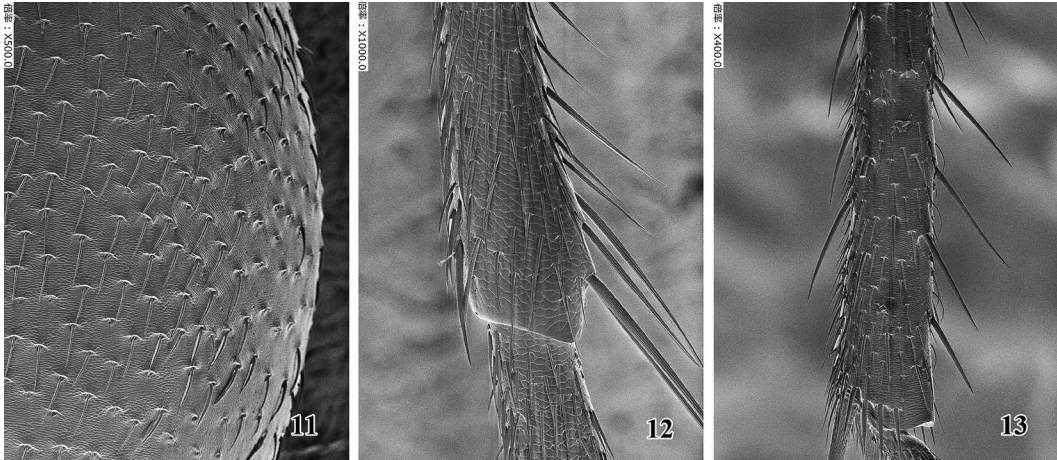
Measurements. Male (n = 5): BL 4.40–5.30 mm; HW/PA 1.09–1.21 (M 1.14); HW/PW 0.82–0.92 (M 0.86); PL/PW 1.19–1.22 (M 1.20); PL/PA 1.53–1.63 (M 1.58); PA/PB 0.91–0.98 (M 0.93); EL/EW 2.60–2.80 (M 2.77). Female (n = 1): BL 5.60 mm; HW/PA 1.09; HW/PW 0.77; PL/PW 1.15; PL/PA 1.62; PA/PB 0.94; EL/EW 2.75.

Type series. Holotype ♂ (NIAES), Ngao, Chiang Rai Province, Thailand, emerged on 22. II.1990, T. IKEDA & K. NAKAMUTA leg. Paratypes: 4 ♂♂, 1 ♀ (NIAES & TNT), same data as the holotype.

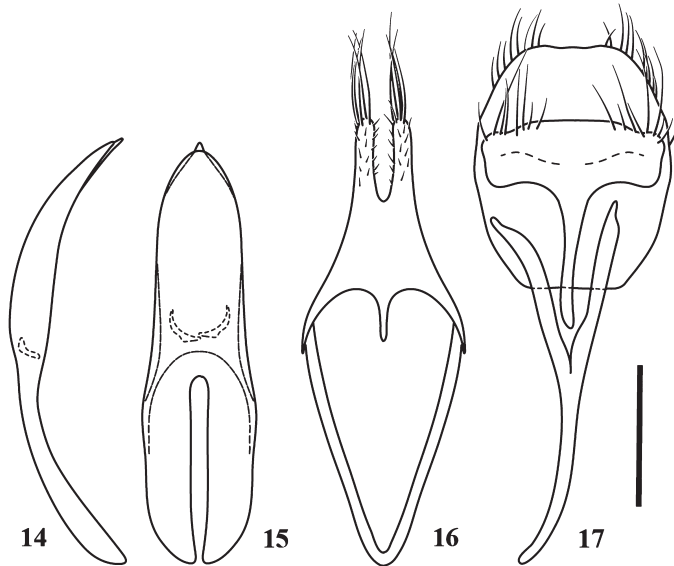
Distribution. Thailand.

Etymology. The specific name is derived from the host plant of this new species, *Azelia xylocarpa*.

Host plant. *Azelia xylocarpa* (Fabaceae) (seed pod; Thailand).



Figs. 11–13. Body parts of *Amamiclytus afzelivorus* NIISATO et MAKIHARA, sp. nov. (SEM images). — 11, Pronotum, showing the structure of disc; 12, apical part of antennomere III, showing the blunt apical angle; 13, apical part of hind tibia, showing the erect hairs.



Figs. 14–17. Male genitalia of *Amamiclytus afzelivorus* NIISATO et MAKIHARA, sp. nov. — 14, Median lobe, lateral view; 15, ditto, dorsal view; 16, tegmen, dorsal view; 17, 8th abdominal segment, ventral view. Scale: 0.25 mm.

Diagnosis. *Amamiclytus afzelivorus* sp. nov. is characterised by the maculations of white pubescence on pronotum, elytron, and abdominal ventrites as follows: a thick transverse band along the basal margin of pronotum; a small semicircular spot along suture near basal fifth, and two transverse or semi-oblique narrow bands on basal 3/10 and apical 2/5 of elytron; apical bands on basal half or so of abdominal ventrites I and II. In the arrangement of maculation of white pubescence maculation and the male genitalia, this new species may have some relationship with *A. nubilus* NIISATO et HAN, 2011 from Taiwan (NIISATO & HAN, 2011). This clytine beetle may be also similar to *A. squamifer* HOLZSCHUH, 1991 and *A. comis* HOLZSCHUH, 2017, both from northwestern Thailand. However, it is clearly

distinguished from the latter two species by the mat body surface in general, and fairly short elytra which are about 2.8 times as long as the humeral width, while about 3.3 times or 3.2 times respectively in the latter two (HOLZSCHUH, 1991, 2017).

Paramimistena enterobii GRESSITT et RONDON, 1970

(Figs. 7 & 8)

Paramimistena enterobii GRESSITT & RONDON, 1970: 308, figs. 48 c, d; type locality: "Laos: Nong Tevada, Vientiane Province; km 17, Paksane".

Specimens examined. 3 ♂♂, 2 ♀♀ (KPMNH & TNT), TCCR, Kampong Cham Province, Cambodia, emerged on 18.XII.2015, M. TAKAKUWA leg.

Distribution. Laos, Thailand, and Cambodia (new record).

Host plants. *Enterolobium saman* (Fabaceae) (seed pod; Laos) (GRESSITT & RONDON, 1970); *Azelia xylocarpa* (Fabaceae) (seed pod; Cambodia). According to the original description, the type series of *Paramimistena enterobii* were emerged from *Enterolobium saman* during November to December in 1962 and November in 1963 (GRESSITT & RONDON, 1970).

Subfamily **Lamiinae** LATREILLE, 1825

Pterolophia (Hylobrotus) takakuwai sp. nov.

(Figs. 9, 10 & 18–22)

Description. Male. Colour black in dorsum, yellowish brown in elytra and venter though partly infuscate in anal ventrite of abdomen. Body densely clothed with brown to yellowish brown pubescence and scattered white short hairs; pronotum densely with dark olive green pubescence, the pubescence become paler in a large median rhombic area and on sides; elytron densely with brown pubescence, usually with scattered small spots of blackish pubescence, partly with yellowish brown pubescence near scutellum, around basal swellings, at apical 3/10 and 1/10, these yellowish brown areas usually enlarged as a large basal maculation near suture or an undefined transverse band near the posterior area, provided with an oblique broad band of mingled dull white and yellowish brown pubescence from humerus to just behind middle of suture.

Head slightly narrower than pronotum, shagreened, sparsely punctured; frons as long as the basal width, moderately raised; genae almost as deep as lower eye-lobes. Antennae stout, attaining apical fifth of elytra; scape slightly arched and swollen, almost same length to antennomere III or IV, both of which are weakly arched and thicken at each apex, and twice the length of V; antennomere XI strongly flattened.

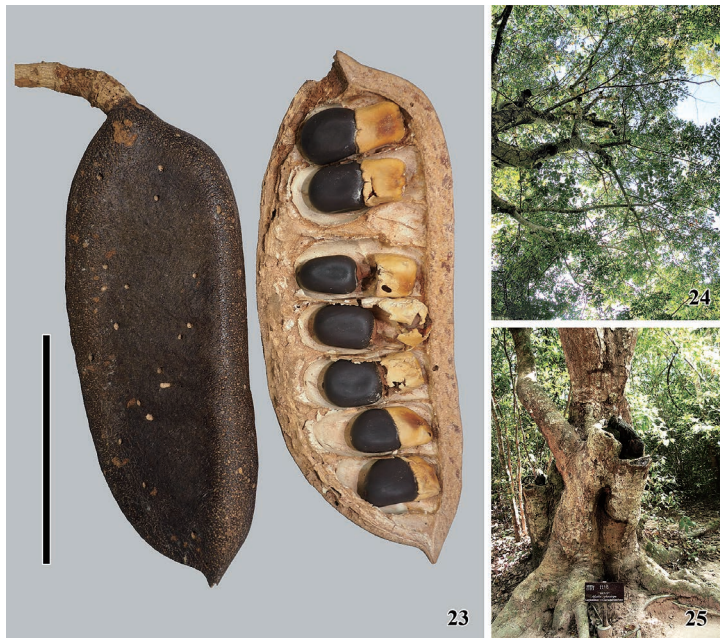
Pronotum distinctly wider than long, almost parallel-sided though widest near middle, rather densely provided with medium-sized punctures; disc weakly convex, faintly raised on sides near middle. Scutellum semicircular.

Elytra about 1.5 times as long as the humeral width, straightly narrowed to apical third, then arcuate to apices; disc well convex, provided with a pair of weak ridges behind bases, distinctly costate though intermittent in basal halves, rather densely with medium-sized punctures on intervals; apices narrowly rounded.

Legs stout, relatively long; mid tibiae with a dense tuft of brown hairs near each apex.



Figs. 18–22. Male genitalia of *Pterolophia* (*Hylobrotus*) *takakuwai* MAKIHARA et NIISATO, sp. nov. — 18, Median lobe, dorsal view; 19, ditto, lateral view; 20, tegmen, dorsal view; 21, ditto, lateral view; 22, 8th and 9th abdominal segments, ventral view. Scale: 0.50 mm.



Figs. 23–25. *Afzelia xylocarpa* (Fabaceae). — 23, Dry seed pod, showing the emergence holes of longicorn beetles (*Chlorophorus coniperda* HOLZSCHUH, 1992) (Thailand). Scale: 10 cm; 24, live tree, tree crown seen from the ground (Cambodia); 25, ditto, trunk near the ground. Figs. 24 & 25 taken by K. TANAKA.

Male genitalia as shown in Figs. 18–22. Median lobe moderately arcuate in profile; dorsal plate narrowly rounded at apex, almost reaching the apex of ventral plate; ventral plate almost parallel-sided, strongly narrowed from apical fifth to obtusely pointed apex; median struts a little less than half the whole length of median lobe. Tegmen a little shorter than median lobe; parameres large and broad, with lobes approximated each other, densely provided with waved long setae along whole margins. Eighth tergite trapezoidal, gently emarginate on apical margin.

F e m a l e. Body slightly broader than in male. Antennae barely attaining apical third of elytra. Mid tibiae without a dense tuft of brown hairs near each apex.

Measurements. Male (n = 10): BL 10.05–12.50 mm; HW/PA 0.89–0.98 (M 0.93); HW/PW 0.81–0.91 (M 0.85); PL/PW 0.80–0.86 (M 0.83); PL/PA 0.87–1.00 (M 0.93); PA/PB 0.92–1.00 (M 0.95); EL/EW 1.47–1.79 (M 1.65). Female (n = 5): BL 10.60–12.60 mm; HW/PA 0.97–0.98 (M 0.98); HW/PW 0.84–0.86 (M 0.85); PL/PW 0.77–0.80 (M 0.79); PL/PA 0.86–0.93 (M 0.91); PA/PB 0.91–0.92 (M 0.91); EL/EW 1.58–1.64 (M 1.61).

Type series. Holotype: ♂ (NIAES), TCCR, Kampong Cham Province, Cambodia, emerged on 18.XII.2015, M. TAKAKUWA leg. Paratypes: 7 ♂♂, 3 ♀♀ (KPMNH & TNT), same data as the holotype; 1 ♂ (NIAES), Ngao, Chiang Rai Province, Thailand, emerged on 22.II.1990, T. IKEDA & K. NAKAMUTA leg.; 1 ♂, 2 ♀♀ (NIAES), Tha Phra, Khon Khen, NE. Thailand, emerged on 3.VII.1997, S. OHMOMO leg.

Distribution. Thailand and Cambodia.

Etymology. The new specific name is dedicated to our good fellow, the late Dr. Masatoshi TAKAKUWA who collected most of the type series. It was expected to publish this paper with him, but could not be accomplished because of his sudden death from terminal cancer in the summer of 2016.

Host plant. *Afzelia xylocarpa* (Fabaceae) (seed pod; Thailand and Cambodia).

Diagnosis. Nineteen members of the subgenus *Hylobrotus* have so far been recorded from Indochina including southwestern China (PIC, 1934; BREUNING, 1968; BEZARK, 2018; TAVAKILIAN & CHEVILLOTTE, 2018). Amongst them, *Pterolophia* (*H.*) *takakuwai* sp. nov. is similar to *P. (H.) minoconsularis* BREUNING, 1968 from Laos and Thailand, as well as to *P. (H.) postfasciculata* PIC, 1934 from Vietnam. However, this new species is easily distinguished from the two relatives by the broader body particularly in the elytra and different pattern of elytral maculation. This new species is characterised by an oblique broad band of mingled dull white and yellowish brown pubescence from humerus to just behind middle of suture on each elytron, whereas *P. (H.) minoconsularis* and *P. (H.) postfasciculata* possess three or four pale brown spots on each elytron, respectively.

Discussion

Generally, longicorn beetles feed as larvae on tree xylems, however, a small number of species are known to grow exceptionally in seed pods (LINSLEY, 1959; OHBAYASHI & NIISATO, 2007; IWATA, 2015). The examples of seed pod borers are unusual for longicorn beetles, and only several observations on members of the subfamilies Cerambycinae and Lamiinae have so far been reported from Mexico, Brazil, Thailand, and Japan (CRAIGHEAD, 1923; HUTACHARERN & TUBTIM, 1995; MARINONI *et al.*, 2002; YAMAZAKI & TAKAKURA, 2003).

Based on our observation, we reported five longicorn beetles belonging to the two subfamilies as the seed pod borers of *Afzelia xylocarpa* (Fabaceae). The longicorn beetles mainly feed on the seed pods, except that a few individuals of *Chlorophorus coniperda* HOLZSCHUH were observed boring into the seed coats. Even referring to the above-mentioned studies, it had never been observed until the present study that five cerambycid species belonging to two subfamilies bore as larvae into the seed

Pods of the same plant. It is most probable that the seed pod of *Afzelia xylocarpa* is a prosperous food resource for the cerambycid larvae, probably due to the large pod size ranging from 15 to 20 cm, as well as to the abundance and nutrient richness. A similar observation was reported by YAMAZAKI and TAKAKURA (2003) that a lamiine species, *Pterolophia (Pterolophia) granulatus* (MOTSCHULSKY, 1866), is a pod borer of *Gleditsia japonica* MIQUEL (Fabaceae) in Japan.

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要 約

新里達也・楨原 寛：メンガ(マメ科)の豆鞘に穿孔するカミキリムシ(鞘翅目)。——メンガ *Afzelia xylocarpa* はマメ科の高木で、東南アジアの大陸部に比較的広く分布している。乾期に厚く硬い大きな豆鞘を実らせ、その豆はしばしば祭事の数珠に用いられたりする。タイ、ラオスおよびカンボジア産の本種の豆鞘から羽化脱出したカミキリムシ類を調べたところ、下記の5種に同定された。このうち、ケズネチビトラカミキリ属 *Amamiclytus* の一種とサビカミキリ属 *Pterolophia* の一種はそれぞれ未記載種であったため、本論文で新種として命名記載した。

- 1) *Perissus laetus* LAMEERE, 1893 (カンボジア)
- 2) *Chlorophorus coniperda* HOLZSCHUH, 1992 (タイ, ラオス, カンボジア)
- 3) *Amamiclytus afzelivorus* NIISATO et MAKIHARA, sp. nov. (タイ)
- 4) *Paramimistena enterobii* GRESSITT et RONDON, 1970 (タイ)
- 5) *Pterolophia (Hylobrotus) takakuwai* MAKIHARA et NIISATO, sp. nov. (タイ, カンボジア)

カミキリムシ類の幼虫は通常、主に樹木の木部などの組織を食べて成長するが、少数ながら例外的に食餌資源として種子を利用するものが知られている。これら種子やそれを内包する鞘に穿孔するカミキリムシは、ブラジルやメキシコ、タイ、日本からカミキリ亜科とフトカミキリ亜科に属するいくつかの種において観察例が知られているが、本例のように複数種(2亜科にわたる5種)の幼虫が、ほぼ同時に同じ植物種の鞘や種子を幼虫期の食餌とした事例の報告は今回が初めてとなる。メンガは、長さ15–20 cmにも及ぶ巨大な、肥厚した硬い豆鞘をたくさん実らせるために、比較的多くのカミキリムシが餌資源として利用できるであろう。

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