

A New Genus and Species of Mutualistic Plataspidae (Insecta: Heteroptera) from Sarawak, Malaysia

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Abstract. A mutualistic relationship between a new species of Plataspidae and an ant of the genus *Camponotus* was discovered in a tropical rain forest of Borneo. This plataspid has lamellately expanded mandibular plates and much enlarged, laterally flattened, sac-like labrum. Based on such a remarkable modification of the head structure a new genus is described to accommodate this new species; *Inflatilabrum lambirense* gen. et sp. nov. The new plataspid dwells in shelters built on the living cortex under dead peeling barks on the lower part of the trunk of large dipterocarpacean tree, *Dryobalanops aromatica*, under attendance by the mutualistic partner ant. *Inflatilabrum lambirense* also has very long stylets, which makes it possible to suck sap from living cells in the cambium through thick bark. The stylets are coiled inside enlarged sac-like labrum in repose.

Key words: Heteroptera, Plataspidae, new genus, new species, mutualism, *Camponotus*, Sarawak, Malaysia, Borneo.

Introduction

In the Heteroptera mutualistic relationship with ants is less common than in the Homoptera. In Plataspidae such relationship has been reported only for a few species of the genera *Coptosoma*, one species from Sri Lanka with a *Cremastogaster* ant (Green, 1900), *Tropidotylus*, two species from Peninsular Malaysia with an ant *Meranoplus mucronatus* Smith, 1857 (Maschwitz *et al.*, 1987), *Tetrisia*, one species from Peninsular Malaysia with a *Technomyrmex* ant (Waldkircher *et al.*, 2004), *Caternaultiella*, one species from tropical Africa with a *Camponotus* and a *Myrmecaria* ants (Dejean *et al.*, 2000), and possibly *Coptosomoides*, one species from Sumatra with a *Camponotus* ant (China, 1931). Further case of mutualism between a plataspid and an ant was found in a tropical rain forest of Borneo. This plataspid exhibits a remarkable modification of its head structure. I here describe it as a new species and propose a new genus to accommodate this new species, with brief notes

on its biology. Adaptive significance of the modified head structure is also discussed.

Materials and Methods

Observation of the mutualistic relationship between the plataspid and *Camponotus* ant, as well as the collection of material, was made in a lowland tropical rain forest in Lambir Hills National Park, Northeastern Sarawak, Malaysia, under the projects “Insect Inventory Project in Tropical Asia (TAIIV)” in 2002 conducted by Prof. Osamu Yata of Kyushu University, Fukuoka, Japan, and “Biodiversity Inventory in the Western Pacific Region” in 2007 organized by the National Museum of Nature and Science (NSMT), Tokyo, Japan, with the permissions for the research and specimen export from the Malaysian government. Type specimens designated herein are housed in the heteropterous collection of the NSMT excluding a pair of adult paratypes and two nymphal paratypes in the collection of the Forest Research Centre (FRC), Kuching, Sarawak,

Malaysia.

Taxonomy

Genus *Inflatilabrum* gen. nov.

[Figs. 1, 2a–c]

Type species: *Inflatilabrum lambirens* sp. nov.

Description. Body somewhat ovoid in outline, moderately convex above, less convex beneath (Fig. 1a, b, e, f). Head rectangular, more or less sexually dimorphic; mandibular plates in male lamellately expanded laterally and anteriorly, horizontal and very slightly divergent in basal two-thirds, then strongly convergent and reflected in apical third, overlapping each other at apices in front of clypeus, such modification of mandibular plates less strongly developed in female (Fig. 1c, d). Ocellus nearer to eye than to each other (Fig. 1c, d). Antennae 5-segmented, but 2nd segment very short and considerably fused with 3rd segment (Fig. 1a, b, c, d). Labrum much enlarged, laterally flattened sac-like, membranous and bellows-like, enclosing stylets inside, touching at apex to base of 1st labial segment (Fig. 1e, f, g). Stylets very long, far longer than body, coiled inside enlarged sac-like labrum in repose (Fig. 1g). Pronotum transverse, lamellately expanded anterolaterally, with anterior margin roundly concave and posterior margin slightly sinuate (Fig. 1a, b). Scutellum well developed, with no raised pseudoscutellum (basal callosity) only represented by a row of punctures (Fig. 1a, b, e, f).

Remarks. According to Jessop's concept (1983), this new genus belongs to the *Coptosoma*-group. The diagnostic features of *Inflatilabrum* are the lamellately expanded mandibular plates and the greatly modified labrum as described above. By these character states in the mandibular plates and the labrum,

Inflatilabrum may easily be distinguished from any other genera of Plataspidae.

Etymology. The generic name is a Latin noun in neuter compounded of *inflatus* (inflated) and *labrum* (upper lip).

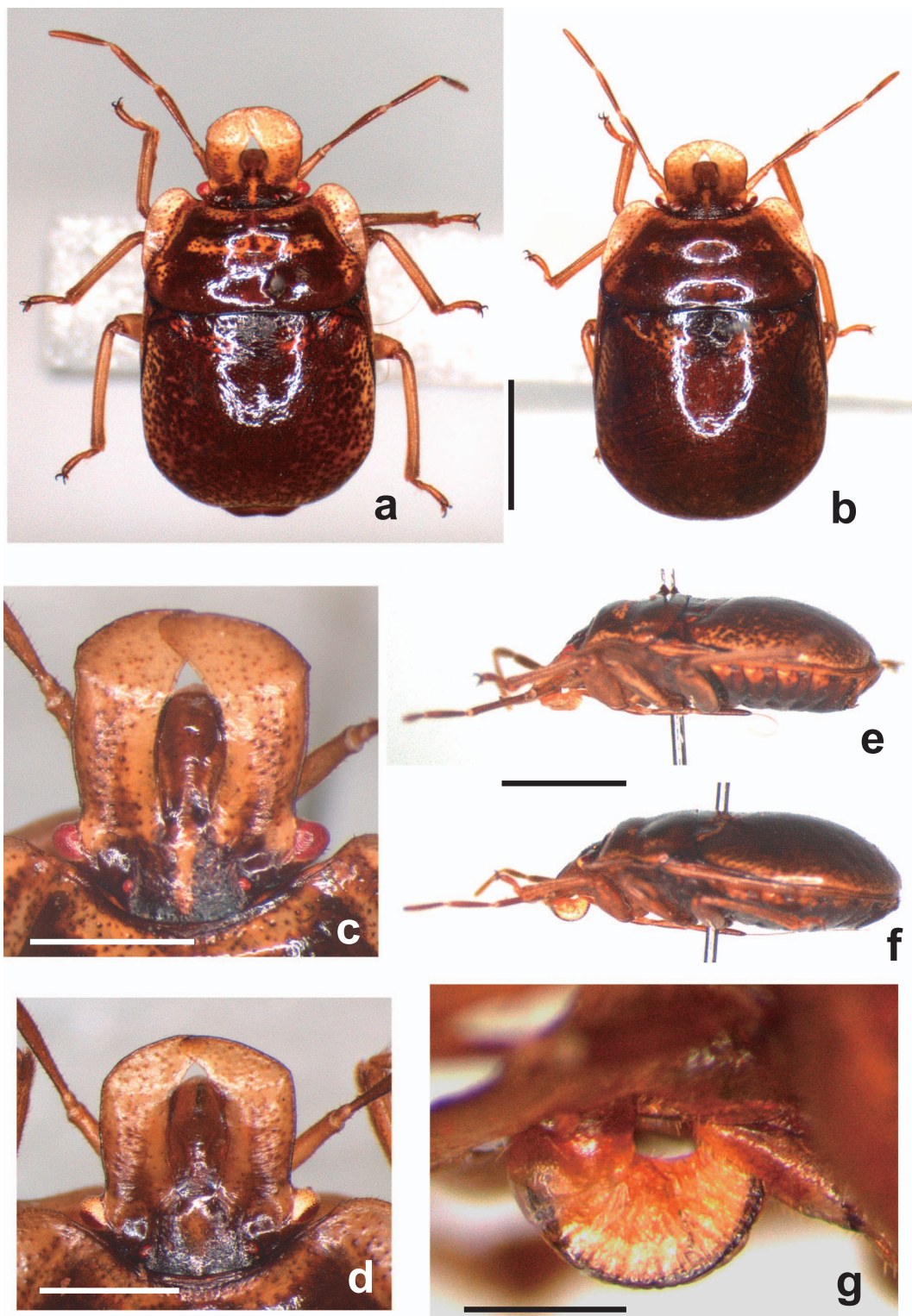
Inflatilabrum lambirens sp. nov.

[Figs. 1, 2a–c]

Type series. Holotype: male (NSMT-I-He 66018), Inoue Trail, Lambir Hills National Park, Sarawak, Malaysia, on *Dryobalanops aromatica* (tree no. AA00267) with its mutualistic partner ant, *Camponotus* sp. (Fig. 2d, e), 3 March 2007, M. Tomokuni leg. Allotype: female (NSMT-I-He 66019), same data as for holotype. Paratypes: two males (NSMT-I-He 66020 and FRC), one female (FRC), and five nymphs (all 5th instar; NSMT-I-He 66022–66024 and FRC), same data as for holotype; one male (NSMT-I-He 66021), Pantu Trail, Lambir Hills National Park, Sarawak, Malaysia, 11 March 2002, M. Tomokuni leg.

Description. *Measurements* (HT, AT, and 3 PTs; in mm): total body length 6.3–6.4 (HT 6.3); head length along meson 1.8–2.0 (HT 1.9); head width including eyes 1.7–1.8 (HT 1.7); pronotal length along meson 1.5–1.7 (HT 1.6); pronotal width across humeri 3.3–3.6 (HT 3.4); scutellum length along meson 2.9–3.0 in male (HT 2.9), 3.4 in female; greatest scutellum width 3.6–3.7 in male (HT 3.6), 3.9 in female; antennal lengths from 1st to 5th segments 0.7–0.9, 0.1–0.2, 1.0–1.1, 1.0–1.1, 0.9–1.0 (HT 0.8, 0.2, 1.1, 1.0, 1.0), total antennal length 3.8–4.2 (HT 4.1); labial lengths from 1st to 4th segments 0.5–0.6, 0.8–0.9, 0.6–0.7, 0.9–1.0 (HT 0.5, 0.9, 0.6, 1.0), total labial length 2.9–3.0 (HT 3.0); lengths from femur to tarsus of foreleg 1.4–1.6, 1.3–1.4, 0.6 (HT 1.5, 1.3, 0.6), of midleg 1.5–1.7, 1.4–1.6, 0.6 (HT

Fig. 1. *Inflatilabrum lambirens* gen. et sp. nov. from Sarawak, Borneo. a, holotype, male; b, allotype, female; c, head of holotype; d, head of allotype; e, profile of holotype; f, profile of allotype; g, close-up of labrum of allotype. Scales: 2 mm for a and b; 1 mm for c and d; 2 mm for e and f; 0.5 mm for g.



1.7, 1.6, 0.6), of hindleg 1.6–1.8, 1.7–2.0, 0.6–0.7 (HT 1.8, 2.0, 0.7).

Coloration. Body strongly lustrous, pale yellowish brown, but chestnut brown on clypeus, basal part of head above, most part of pronotal disc except for a pair of pale transverse markings, scutellum except for pale lateral parts, and abdominal sternites (Fig. 1a, b). Eyes and ocelli red. Labium (rostrum) and legs also pale yellowish brown, but antennae slightly darkened. Punctures on head, pronotum, and scutellum chestnut brown.

Structure. Body finely and coarsely punctate on dorsum, covered with fine pubescence. Head a little longer than wide including eyes, about half as wide as pronotum, convex in vertex, frons, and clypeus; clypeus clavate, thick and long, attaining level of tip of 1st antennal segment; mandibular plates longitudinally concave, a little wider than clypeus seen from above (Fig. 1c, d). Eyes small, prominent laterad, nearly touching anterior margin of pronotum. Ocelli lying near to anterior margin of pronotum; distance between ocellus and eye about half as long as interocellar distance (Fig. 1c, d). Antennae distinctly longer than pronotal width, densely covered with short suberect pubescence, with 3rd to 5th segments flattened. Labrum and stylets as in generic description. Labium 4-segmented, normal in shape, with no special modification in each segment, extending beyond 3rd abdominal sternite in male, reaching posterior margin of 3rd abdominal sternite in female, with 2nd segment slightly curved.

Pronotum a little more than twice as wide as long (about 2.1 : 1.0), distinctly inflated around humeral angles, medially with weak, transverse constriction; anterolateral lamellate expansion a little wider in male than in female, gradually narrowing posteriad (Fig. 1a, b). Scutellum gradually widening posteriad, then rounding posterolaterally, slightly concave along posterior margin (Fig. 1a, b). Most part of thoracic sterna shagreened. Ostiolar peritreme slightly expanded apicad and gently

curved forward, ended well before anterolateral margin of evaporative area. Evaporative area wide and long, almost extending to lateral margin of metapleuron. Legs moderate in size and thickness; femora a little flattened; tibiae each with distinct longitudinal groove dorsally; tarsi 2-segmented, each with stout 2nd tarsomere about twice as long as 1st one.

Abdomen evenly convex beneath; transverse sulcus distinct on each side of 3rd to 6th sterna; posterior margin of 6th sternite widely emarginate sharply in male and more gently in female. Genital segments as in Fig. 2a, b.

Fifth instar nymph ($n=5$) (Fig. 2c). Body ovoid, 5.0–6.0 mm long, 3.5–4.0 mm wide, moderately convex above, less convex beneath, light brown with strong luster and furnished with fine pubescence throughout. Head as long as wide including eyes; clypeus clavate; mandibular plates as in adults. Eyes prominent laterad, touching anterior margin of pronotum. Ocelli present but not fully developed as in adult, nearly touching anterior margin of pronotum; distance between ocellus and eye about half of interocellar distance. Antennae 4-segmented, a little shorter than pronotal width; relative lengths of 1st to 4th segments 1 : 1.4 : 1.2 : 1.5. Labrum enlarged as in adults. Labium 4-segmented, extending to middle of 3rd abdominal sternite; relative lengths of 1st to 4th segments 1 : 1.5 : 1.2 : 1.8. Stylets at least twice as long as body. Pronotum three times as wide as long, with lamellar expansion laterally. Scutellum semicircular or inverted triangular, nearly three times as wide as long (2.8 : 1). Wing pads extending to posterior margin of 4th abdominal tergite. Legs moderate in size and thickness; tibiae as long as or slightly longer than respective femora; tarsi 2-segmented, each with stout 2nd tarsomere about twice as long as 1st one. Abdomen with connexiva and scent-gland plates obviously darkened.

Remarks. This new species seemingly resembles *Neocratoplatys salvazai* Miller, 1955 known from Laos, and *Cratoplatys gestroi* Montandon, 1894 from Burma, particularly in the shape of

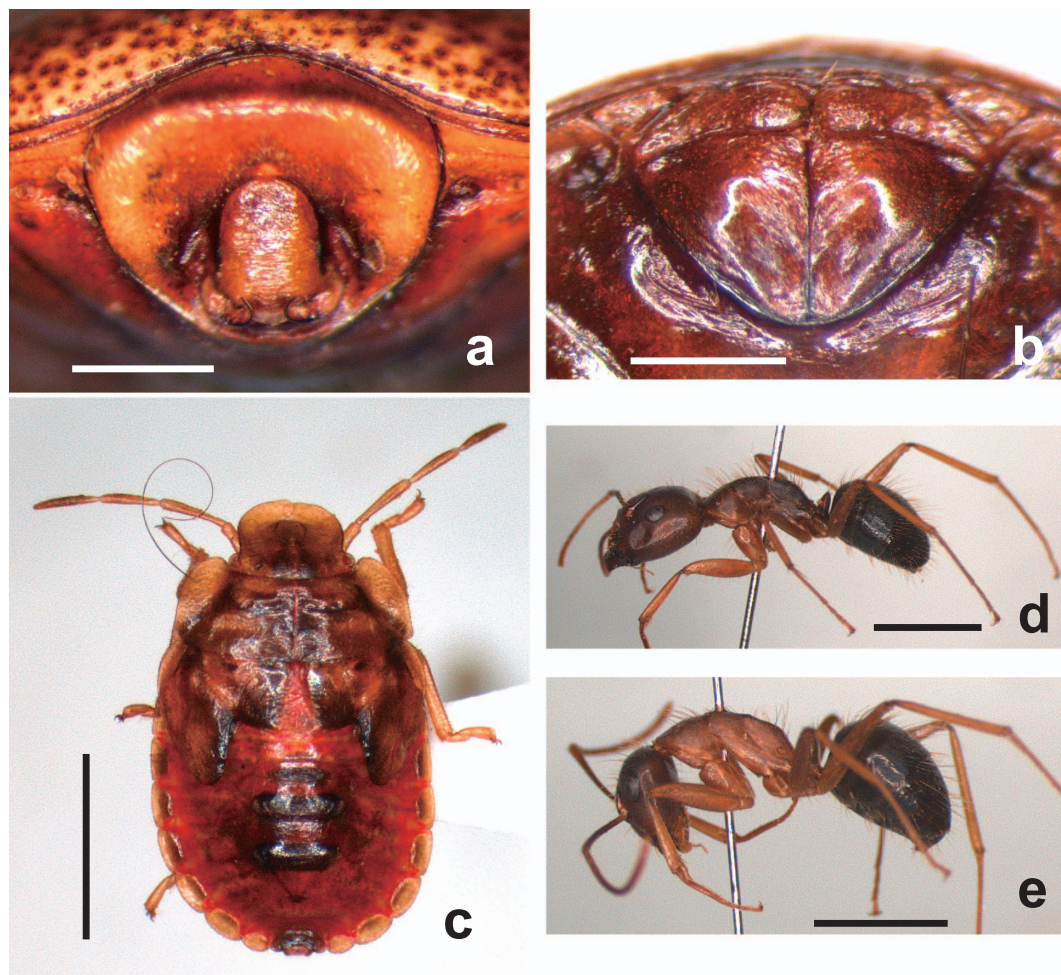


Fig. 2. *Inflatilabrum lambirensis* gen. et sp. nov. and its mutualistic partner ant, *Camponotus* sp. a, genital segments of holotype, male; b, genital segments of allotype, female; c, 5th instar nymph; d, larger worker of *Camponotus* sp.; e, smaller worker of *Camponotus* sp. Scales: 0.5 mm for a and b; 2 mm for c; 2 mm for d and e.

mandibular plates, but the former is much smaller than the latter two, and has longer labium and different coloration of the body. Placement of eyes and ocelli is also different between these species. The ocellus is placed nearer to the eye than to each other in *Inflatilabrum lambirensis*, but it is placed nearer to each other than to the eye in *N. salvazai* and *C. gestroi*.

Etymology. The specific epithet comes from the type locality of this new species.

Biology. Colonies of *Inflatilabrum lambirensis* were found on a large dipterocarpacean

tree, *Dryobalanops aromatica* (for specimens collected in 2007), and an unidentified large tree (in 2002) with its mutualistic partner ant, *Camponotus* sp. (Fig. 2d, e). The plataspid, both adults and nymphs (mostly fifth instar), dwelt in shelters built on the living cortex under dead peeling barks on the lower part of the trunk around a height of less than 1 m. Besides the dead barks the shelters were covered with small pieces of wood and dead leaves that had unquestionably been collected by the ants. No eggs were found in these shelters at that time. When I opened the shelters the

adults and nymphs were keeping still for a while besides vibration of their antennae, but many workers of the ant moved about the shelters in confusion. Many of the bugs inserted their stylets deep into the trunk and they were unable to be removed easily when I took them by a forceps. They hung from the trunk with their stylets when I released them from the forceps. Due to the limitation of time for observation neither excretion of honeydew from the bugs nor imbibing behavior of the ants was detected directly, but circumstantial evidence mentioned above clearly showed their relationship to be trophobiotic.

Discussion

Conspicuous modification of the mandibular plates has been known in several species of the Plataspidae. Tropical African species of the genera *Arefbea*, *Ceratocoris*, *Glarocoris*, *Severiniella*, *Teuthocoris*, and so on, show noticeable sexual dimorphism and only males have extremely produced mandibular plates (cf. Jessop, 1983; Miller, 1955). Unlike these "horn-like" mandibular plates, those of *Inflatilabrum* are transformed to long, thin, lamellar plates both in the male and female with weak sexual dimorphism. Similar condition of the mandibular plates exists in some Asian genera, *Cratoplatys* and *Neocratoplatys*, for example, but the modification has progressed much higher in *Inflatilabrum* than in these genera. Although the adaptive significance of the lamellate mandibular plates of *Inflatilabrum lambirensis* was still unknown, the plates are perhaps functional in the mutualistic life-style of this species.

Modification of mouthparts is also unique in *Inflatilabrum lambirensis*. In some species of the genera *Coptosomoides* and *Bozius* the second labial (rostral) segment is remarkably swollen out into a laterally flattened, circular, membranous chamber as an enclosure of long stylets (China, 1931), while the labial segments are normal in *Inflatilabrum*, but the labrum is

enormously swollen similarly to the labial chamber of the former. China (1931) mentioned that the labrum is swollen into a small membranous chamber in some species of the genera *Tiarocoris* and *Coptosomoides*. Although I have not yet examined any specimens of these genera, the labrum of *Inflatilabrum* seems much more enlarged than those of these genera so far as can be judged with China's (1931, fig. 2b) semi-diagrammatic illustration. *Inflatilabrum lambirensis* has long stylets as described above and this unquestionably makes it possible to suck sap from living cells in the cambium through thick bark, and the labrum has evolved into a swollen chamber to enclose the long stylets similarly to the labial chamber of the genera *Coptosomoides* and *Bozius*.

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アリと共生するサラワク産の新属・新種のマルカメムシ
(昆虫綱: 異翅目: マルカメムシ科)

友国雅章

マレーシアサラワク州のランビルヒルズ国立公園の熱帯雨林で、アリと共生するマルカメムシの一種が発見された。アリとの共生の例は、姉妹群である同翅目には多くみられるものの、異翅目ではきわめて稀である。このマルカメムシは、頭部側葉が薄い板状となって前方に伸展するほか、上唇が扁平な袋状となり、その中に少なくとも体長の2倍に達するきわめて長い口針をコイル状に巻いて収納している。このような特異な形態を併せもつマルカメムシは他に知られていないので、これを新属、新種 *Inflatilabrum lambirens* として記載した。

Inflatilabrum lambirens は、フタバガキ科のリュウノウジュ *Dryobalanops aromatica* の樹幹下部の剥がれかけた樹皮の下に“住居”に棲息し、その周辺は共生者のアリが集められたと思われる木片や落葉の破片で覆われていた。住居には複数のマルカメムシの成虫と幼虫が同居し、常時 *Camponotus* 属のアリが随伴していた。いくつかの成虫と幼虫は長い口針を樹幹深くに挿入していたため、容易に引きはがすことができなかった。時間的制約から、両者間の栄養の授受やアリの天敵に対する防御行動など両者の共生関係の詳細は観察できなかったが、これらの状況証拠から両者が栄養共生の関係にあると推察できる。

Inflatilabrum lambirens の長い口針とそれを収納するための上唇の特異な発達、樹幹の厚い樹皮を通して師部もしくは形成層から汁液を吸収するための適応形態であると考えられるが、頭部側葉の発達の意義については、今回の観察からはそれを類推する手がかりが得られなかった。