The genus *Halycaea* Cameron (Hymenoptera: Braconidae: Doryctinae) in the Oriental region

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Key words: Braconidae; Doryctinae; Hymenoptera; *Halycaea*; Oriental region; Malaysia; Sabah; Sarawak; Vietnam; China; Taiwan; new species; revision.
The Oriental species of the genus *Halycaea* Cameron are revised. Three new species of *Halycaea* are described and figured: *H. rubata* spec. nov. (Malaysia, South China (Taiwan)), *H. solo* spec. nov. (Malaysia) and *H. sonata* spec. nov. (Vietnam). *H. javana* (Fullaway) **comb. nov.** is redescribed and a key to the Oriental species of the genus *Halycaea* is added. The lectotype of *H. erythrocephala* Cameron, 1903, is designated.

Introduction

The members of the genus *Halycaea* Cameron, 1903, are rather large specimens (usually length of body 7-15 mm), which have been only recorded from the Oriental region (Shenefelt & Marsh, 1976). Up to now only two species of *Halycaea* have been known; both described from Borneo (Cameron, 1903, 1905; Shenefelt & Marsh, 1976). One additional species from Java (*H. javana* (Fullaway, 1919**) comb. nov.**) was described in the genus *Pedinotus* by Fullaway (1919). In the present study, three new species of *Halycaea* are described from Malaysia (Sabah), Vietnam and China (Taiwan). Belokobylskij et al. (2002) report a new species from Papua New Guinea. This species is similar to *H. erythrocephala* Cameron but differs by having the occipital carina complete dorsally and distinctly curved down, the second tergite with very dense and fine reticulation, the second metasomal suture angled medially, the radial vein arising before the middle of the pterostigma, the hind femur wide, and the hind tibia yellow with an almost black base.

The main diagnostic characters of the genus *Halycaea* are presence of the triangular area on 2nd tergite, the submedial cell of hind wing very short, the fore tibia without or with very small spines, the outer spur of hind tibia distinctly shortened, and fore tarsus very long. It is important to underline the distinct sexual dimorphism in *Halycaea* species. The male differs from female in the more thick antennal segments, the short fore tarsus and second segment of hind tarsus (which is almost equal to fifth one), more strong and widely distributed sculpture of metasomal tergites, and often presence of areas on third-fifth tergites.

The hosts of the genus *Halycaea* are still unknown. However, because the majority of the Doryctinae are known as ectoparasites of beetle larvae and because of the relative large size, it is likely that large beetle larvae of the families of Cerambycidae or Buprestidae are used.

The terminology for wing venation follows that of Belokobylskij & Tobias (1998). The following abbreviations are used: POL – postocellar line; OOL - ocular-ocellar line; Od - maximum diameter of lateral ocellus; BMNH - The Natural History Museum (London, England); BPBM – Bernice P. Bishop Museum (Honolulu, USA); HNHM - Hungarian Natural History Museum, (Budapest, Hungary); RMNH - Nationaal Natuurhistorisch Museum (Leiden, Netherlands); ZISP – Zoological Institute (St. Petersburg, Russia).

Halycaea Cameron, 1903

Halycaea Cameron, 1903 (type species by monotypy: *H. erythrocephala* Cameron, 1903): 127; Shenefelt & Marsh, 1976: 1375; Fischer, 1981: 128.

Cendebeus Cameron, 1905 (type species by monotypy: *C. filicornis* Cameron, 1905): 105; Shenefelt & Marsh, 1976: 1375.

Description.— Head subcubical. Ocelli in triangle with base larger than its sides. Eyes glabrous. Occipital carina present, usually reduced ventrally and not fused with hypostomal carina. Postgenal bridge narrow. Maxillary palp with 6 segments, labial palp with 4 segments; third labial palpsegment long. Scapus wide and short, without apical lobe. First flagellar segment almost straight, not shorter than second segment. Neck of promesosoma short. Pronotal keel present. Mesonotum vertically or subvertically and more or less highly raised above pronotum. Notauli present, shallow posteriorly. Sternaulus (= precoxal sulcus) distinct and long. Prepectal carina present. Postpectal carina absent. Propodeum without marginate areas; lateral tubercles and propodeal bridge absent. Fore wing (fig. 10): radial cell not shortened or weakly shortened; both radio-medial veins present; recurrent vein usually weakly postfurcal; nervulus postfurcal; parallel vein not interstitial, arising from posterior 0.20-0.25 of distal margin of brachial cell; brachial cell closed. Hind wing (fig. 11): nervellus present, short; submedial cell very short; recurrent vein present, rather short, oblique towards base of wing; medial cell wide apically; radial vein arising from costal vein; radial cell without additional transverse vein. Hind wing of male without stigma-like enlargement. Fore tibia without spines or with very short spines. Fore tarsus of female very long. Hind coxa usually angulate baso-ventrally and with small tooth. Hind tibia without spines dorsally. Hind basitarsus 0.5-0.7 times as long as second-fifth segments combined. First metasomal tergite not petiolate, usually wide and long, with distinct dorsope, rarely dorsope absent; acrosternite usually about 0.2 times as long as tergite. Second suture present, straight, angulately or roundly curved towards base of tergite. Second tergite with distinct narrow and strongly convergent furrows, fused near middle of second suture and separated triangle area. Ovipositor distinctly longer than metasoma.

Distribution.— Oriental and Australasian regions.

Key to Oriental species of the genus *Halycaea* Cameron

1. Hind coxa without basolateral corner and tubercle (fig. 30). First tergite without dorsope; length of tergite 3.3 times its apical width (figs 27, 28). Second tergite without anterolateral furrows (fig. 27). Body length 9.0 mm. – Malaysia (Sabah) ..... ***H. solo*** spec. nov.

- Hind coxa with basolateral corner and small tubercle (figs 5, 20, 40). First tergite with distinct dorsope; length of tergite 2.3-2.7 times its apical width (figs 7, 17, 18, 43-45). Second tergite with distinct anterolateral depressions (figs 7, 17, 18, 43-45) 2

2. Recurrent vein antefurcal (fig. 21). Second radiomedial cell shorter, its length 2.7-3.3 times maximum width, 0.85-0.9 times length of brachial cell (fig. 21). Body length 6.5-8.5 mm. – Malaysia (Sabah), China (Taiwan) ..... ***H. rubata*** spec. nov.

- Recurrent vein postfurcal (figs 10, 32, 38). Second radiomedial cell longer, its length 3.3-3.6 times maximum width, not less than length of brachial cell (figs 10, 38) 3

3. Head red or yellowish red. Occipital carina interrupted dorsally or dorsolaterally (fig. 35). Hind wing with 5 hamuli. All coxae black or dark reddish brown 4

- Head black or dark reddish brown mostly. Occipital carina complete dorsally (fig. 2). Hind wing with 3-4 hamuli. All coxae light brown or light reddish brown 5

4. Occipital carina of female shortly interrupted dorsally. Triangular area of second tergite sessile posteriorly, obtuse apically (fig. 45). Radial vein arising from middle of pterostigma. Body length 15.5 mm. – Malaysia ..... ***H. erythrocephala*** Cameron

- Occipital carina of female widely interrupted dorsolaterally (fig. 35). Triangular area of second tergite petiolate posteriorly, pointed apically (fig. 43). Radial vein arising distinctly before middle of pterostigma (fig. 38). Body length 8.0 mm. (♂). – Vietnam ..... ***H. sonata*** spec. nov.

5. First flagellar segment 5.5 times as long as apical width. Hind wing with 3 hamuli. Hind femur 3.5 times as long as width. Second tergite 1.4 times as long as third tergite (fig. 44). Metasoma black, with large light brown spots in posterior half. Body length 11.0 mm. – Indonesia (Borneo) ..... ***H. filicornis*** (Cameron)

- First flagellar segment 4.3 times as long as apical width (fig. 3). Hind wing with 4 hamuli. Hind femur 2.8 times as long as width (fig. 4). Second tergite slightly shorter than third tergite (fig. 7). Metasoma entirely black. Body length 4.5 mm. (♂.) – Indonesia (Java) ..... ***H. javana*** (Fullaway)

Halycaea erythrocephala Cameron, 1903
(fig. 45)

Halycaea erythrocephala Cameron, 1903: 127; Shenefelt & Marsh, 1976: 1375; Fischer, 1981: 129 (redescription, figures).

Material.— Lectotype (here designated) ♀ (BMNH), "Type", "B.M. Type Hym. 3.c.200", "*Halycaea erythrocephala* Cam., type, **Borneo**" (handwriting by Cameron), "[**Malaysia**, **Sarawak**], Kuching, Mar. 25, 1902", "Cameron Coll. 1903-121" (examined).

Distribution.— Malaysia (Sarawak).

Remark.— The reported presence of this species (♂) in Taiwan by Belokobylskij (1996) is erroneous. Most likely this specimen belongs to *H. rubata* spec. nov.

Halycaea filicornis (Cameron, 1905)
(fig. 44)

Cendebeus filicornis Cameron, 1905: 105.

Halycaea filicornis: Baltazar, 1961: 393; Shenefelt & Marsh, 1976: 1375; Fischer, 1981: 132 (lectotype designation, redescription, figures).

Material.— Lectotype ♀ (BMNH), "Type", "B.M. Type Hym. 3.c.197", "*Cendebeus filicornis* Cam., type, Borneo" (handwriting by Cameron), "Cameron Coll. 1906-138" , "*Cendebeus filicornis* Cam., Lectotype, det. Fischer, 1980" (examined).

Distribution.— Indonesia (Borneo).

Halycaea javana (Fullaway, 1919), comb. nov.
(figs 1-11)

Pedinotus javanus Fullaway, 1919: 40; Shenefelt & Marsh, 1976: 1327.

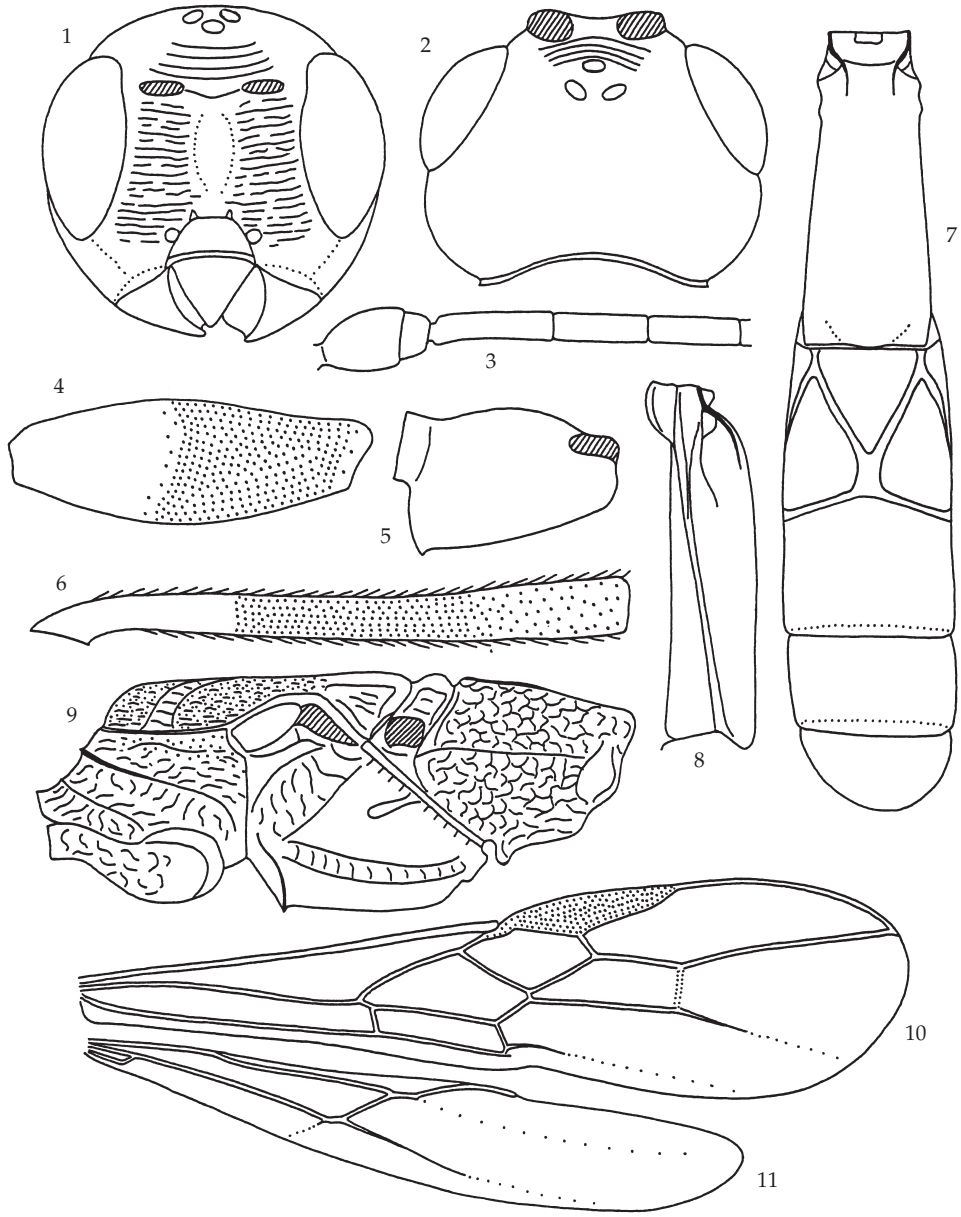
Material.— Holotype ♂ (BPBM), "Java, Roban, F. Muir", "Type *Pedinotus javanus* 202", "*Pedinotus javanus*".

Description.— Male. Body length 4.5 mm; fore wing length 3.5 mm.

Head.— Antenna filiform, with more than 36 segments (apical segments missing). Scapus 1.4 times as long as its maximum width. First flagellar segment 4.3 times as long as its apical width, 1.4-1.5 times as long as second segment. Subapical segments 2.5 times as long as wide. Head width 1.3 times its median length. Temple roundly narrowed behind eye, transverse diameter of eye 1.2 times length of temple. Ocelli medium-sized, in almost equilateral triangle; POL 0.5 times Od, and 0.25 times OOL. Eye 1.3 times as high as broad. Malar space height 0.25 times height of eye, and 0.5 times basal width of mandible. Face width 0.8 times height of eye and almost equal to height of face and clypeus combined. Subocular suture very fine. Clypeus with very narrow lower flange. Clypeal suture distinct. Hypoclypeal depression round, its width almost equal to distance from edge of depression to eye. Occipital carina complete dorsally, below fused with hypostomal carina. Palpi long, length of maxillary palp 1.25 times height of head (without mandible).

Mesosoma.— Mesosoma weakly depressed, dorsally almost flat and its length 2.5 times its height. Posterior third of pronotum with weakly convex lobe dorsally and with distinct pronotal keel, which is situated close to mesonotum, but not fused with it medially. Median lobe of mesoscutum weakly convex. Notauli deep anteriorly, shallow posteriorly, crenulate. Prescutellar depression shallow, with distinct median carina, sparsely striate-rugulose, 0.3 times as long as scutellum. Subalar depression deep, rather wide, rugose. Sternaulus distinct, shallow, crenulate, connected with prepectal carina anteriorly, running ventrally along almost entire length of mesopleura, curved in posterior half. Propodeum without lateral tubercles.

Wings.— Fore wing 3.8 times as long as its maximum width. Pterostigma 4.7 times as long as wide. Radial vein arising before middle of pterostigma; (distance from apex of pterostigma to radial vein 1.5 times distance from radial vein to base of pterostigma). Radial cell not shortened. Metacarpus 1.2 times as long as pterostigma. Second radial abscissa 3.8 times first abscissa, 0.4 times the straight third abscissa, and 1.3 times first radiomedial vein. Second radio-medial cell rather long, 3.6 times as long as its maximum width, 1.1 times as long as brachial cell. Recurrent vein slightly postfurcal. Distance from nervulus to basal vein 0.5 times nervulus length. Hind wing 5.8 times as long as wide, with 4 hamuli. First abscissa of medio-cubital vein 0.2 times as long as second abscissa. Recurrent vein straight, weakly curved distally, slightly antefurcal.



Figs 1-11. *Halycaea javana* (Fullaway). 1, head, frontal view; 2, head, dorsal view; 3, 5 basal segments of antenna; 4, hind femur; 5, hind coxa; 6, hind tibia; 7, metasoma, dorsal view; 8, first metasomal tergite, lateral view; 9, mesosoma, lateral view; 10, fore wing; 11, hind wing.

Legs.— Fore tarsus very long. Fore tibia with very small indistinct spines. Hind femur 2.8 times as long as wide. Outer side of hind tibia with 3-4 spines apically. Hind tarsus almost as long as hind tibia. Basitarsus 0.55 times as long as second-fifth segments combined. Second tarsal segment about 0.5 times as long as basitarsus, almost as long as fifth segment (without pretarsus).

Metasoma.— Metasoma 1.3 times as long as head and mesosoma combined. First tergite with large dorsope, with small spiracular tubercles in basal quarter, weakly and almost linearly widened from base to apex. Acrosternite with large basomedian keel. Maximum width of first tergite 1.5 times its minimum width; length 2.4 times its maximum width. Second tergite with distinct anterolateral furrows in basal half, with triangular area in basal 0.8; length of tergite equal to its basal width, slightly less than length of third tergite. Second suture deep, roundly concave. Remainder of tergites without basal areas.

Sculpture and pubescence.— Vertex smooth; frons semicircularly striate; face and malar space rugulose-striate, face smooth medially. Side of pronotum coarsely rugose. Mesoscutum densely rugulose-reticulate, widely rugose medio-posteriorly. Scutellum punctulate. Mesopleuron finely and sparsely punctulate. Propodeum entirely coarsely reticulate-rugose, with fine dorsal carina in basal third. Hind coxae smooth, sparsely punctulate laterally. First tergite rugose-reticulate; second-fifth tergites almost entirely (except smooth apices) with very small and dense reticulation. Vertex sparsely setose, temple and face with dense semi-erect white setae. Mesosoma entirely shortly and densely setose. Hind tibia with short dense and semi-erect setae dorsally, length of these setae significantly less than maximum width of hind tibia.

Colour.— Body black, but head ventrally reddish. Antenna black, two basal segments light reddish brown. Palpi pale yellow. Legs light brown, apical halves of all femora (especially hind femur), all tibiae submedially and hind tarsus dark reddish brown; all tibiae pale basally. Fore wing almost hyaline. Pterostigma entirely dark brown.

Female unknown.

Discussion.— This species is similar to *H. filicornis* (Cameron) and differs by the longer temple, the shorter malar space, the short first flagellar segment, the longer mesosoma, the four hamuli, the wider hind femur, the second segment of hind tarsus almost equal to fifth segment, the second tergite slightly shorter than third, the mesoscutum with dense and small reticulation with rugulosity, and the entirely black metasoma.

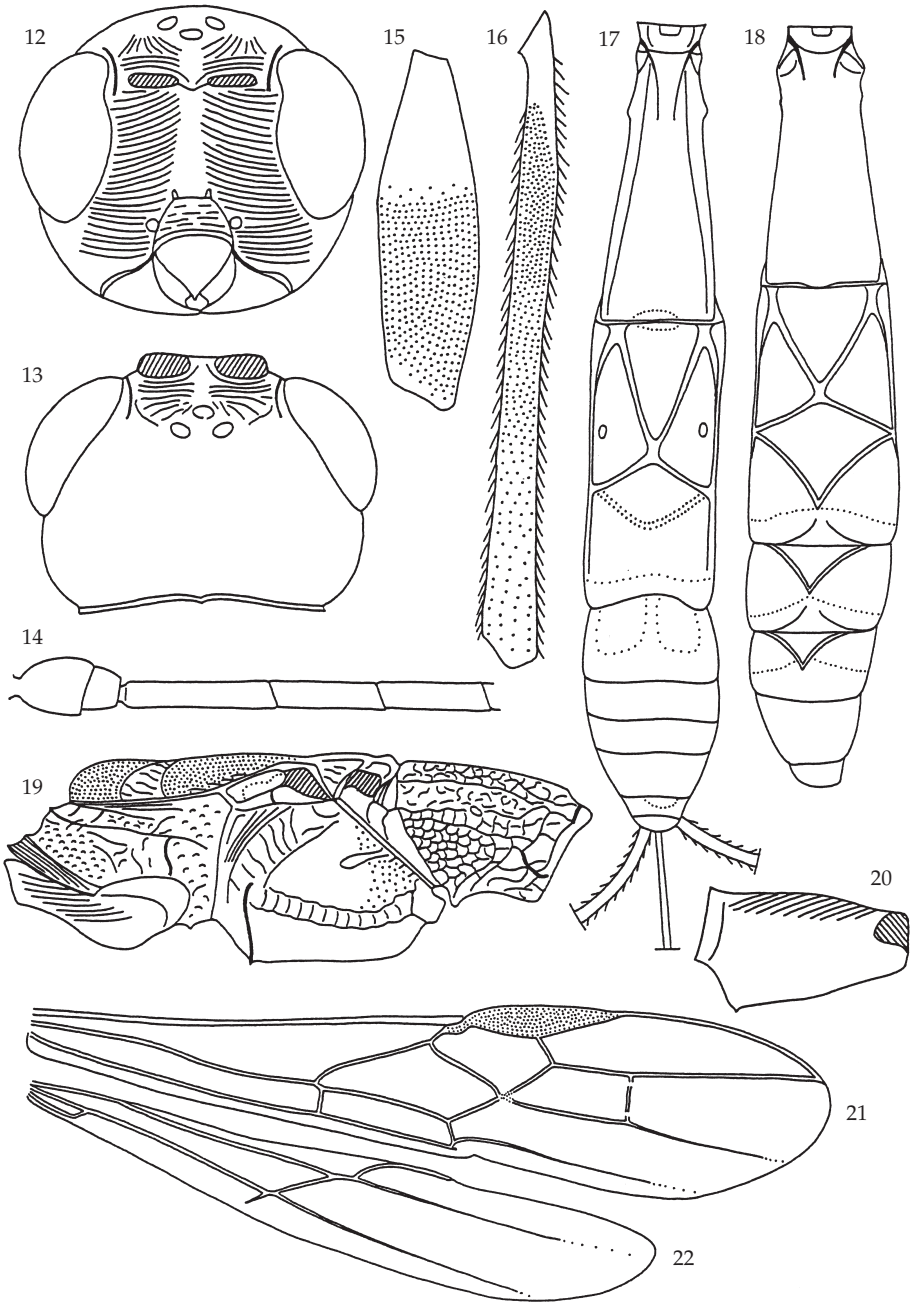
Distribution. – Indonesia (Java).

Halycaea rubata spec. nov.
(figs 12-22)

Material.— Holotype, ♀ (RMNH), "**Malaysia** – SW. **Sabah**, n[ea]r Long Pa Sia (West), c. 1200 m, 2-14.iv.1987, Mal. Trap 7, RMNH'87, C. v. Achterberg". Paratypes: 3 ♂♂ (HNHM, ZISP), "**Formosa**, Sauter", "Fuhosho, 1909.iii.".

Description.— Female. Body length 8.5 mm; fore wing length 5.7 mm.

Head.— Antennae slender, filiform, more than 39 segments (apical segments miss-



Figs 12-22. *Halycaea rubata* spec. nov. 12, head, frontal view; 13, head, dorsal view; 14, 5 basal segments of antenna; 15, hind femur; 16, hind tibia; 17, 18, metasoma, dorsal view (17, female, 18, male); 19, mesosoma, lateral view; 20, hind coxa; 21, fore wing; 22, hind wing.

ing). Scapus 1.3 times as long as its maximum width. First flagellar segment 6 times as long as its apical width, 1.4 times as long as second segment. Subapical segments almost 4 times as long as wide.

Head width 1.4 times its median length. Frons weakly concave. Temple roundly narrowed behind eye, transverse diameter of eye 1.3 times length of temple. Ocelli medium-sized, basal side of ocellar triangle 1.25 times lateral sides; POL 1.1 times Od, 0.4 times OOL. Eye glabrous, 1.3 times as high as broad. Malar space height 0.35 times height of eye, 0.7 times basal width of mandible. Face width 0.8 times height of eye and equal to height of face and clypeus combined. Subocular suture absent. Clypeus with very narrow lower flange. Clypeal suture distinct. Hypoclypeal depression round, its width almost equal to distance from edge of depression to eye, and half as wide as face. Occipital carina dorsally complete and weakly curved medially, below widely separated from hypostomal carina. Hypostomal flange narrow. Head below eyes distinctly roundly narrowed. Palpi long, length of maxillary palp 1.6 times height of head (without mandible).

Mesosoma.— Mesosoma weakly depressed, its dorsal side almost flat. Length 2.7 times height. Posterior half of pronotum with distinctly convex lobe dorsally and with distinct pronotal keel, which is situated rather close to mesonotum, but not fused with it medially. Median lobe of mesoscutum weakly roundly convex, with shallow and wide longitudinal furrow. Notauli complete, deep anteriorly, shallow posteriorly, crenulate. Prescutellar depression rather deep, with distinct median carina, rugulose, 0.4 times as long as scutellum. Metanotum without median tooth. Subalar depression shallow, wide, rugose-crenulate. Sternaulus distinct, deep, rather narrow, but weakly widened posteriorly, coarsely crenulate, connected with prepectal carina anteriorly, running ventrally along entire length of mesopleura, curved in posterior half. Propodeum without lateral tubercles.

Wings.— Fore wing 4.5 times as long as its maximum width. Pterostigma 4.5 times as long as wide. Radial vein arising almost from middle of pterostigma. Radial cell not shortened. Metacarpus 1.4 times as long as pterostigma. Second radial abscissa 2.2 times first abscissa, 0.4 times weakly curved third abscissa, 1.4 times first radiomedial vein. Second radiomedial cell rather short, 2.7 times as long as its maximum width, 0.85 times as long as brachial cell. First abscissa of medial vein weakly S-shape. Recurrent vein slightly antefurcal. Distance from nervulus to basal vein 0.2 times nervulus length. Hind wing 6 times as long as wide, with 3 hamuli. First abscissa of mediocubital vein 0.3 times as long as second abscissa. First costal abscissa 0.5 times second abscissa. Recurrent vein straight, rather short, entirely pigmented, antefurcal.

Legs.— Fore tarsus very long and slender, 2.2 times as long as fore tibia. Fore tibia with very small spines arranged in narrow band. Fore and middle trochantelli dorsally with short and high keel, and latero-apically with long lobe. Hind trochantellus distinctly convex dorso-apically. Baso-ventrally hind coxa angled and with small tubercle. Hind femur 3.5 times as long as wide. Hind tibia straight, with 7 spines on apical outer margin. Outer spur of hind tibia short, 0.45 times as long as inner spur; inner spur 0.2 times as long as hind basitarsus. Hind tarsus slender, 1.15 times as long as hind tibia. Basitarsus 0.7 times as long as second-fifth segments combined. Second tarsal segment 0.6 times as long as basitarsus, twice as long as fifth segment (without pretarsus).

Metasoma.— Metasoma 1.4 times as long as head and mesosoma combined. First tergite with distinct dorsope, with very small spiracular tubercles in basal quarter, almost linearly widened from base to apex. Acrosternite with large median keel basally. Maximum width of first tergite almost twice its minimum width; length 2.7 times its maximum width, 2.3 times length of propodeum. Second tergite with distinct narrow antero-lateral furrows in its basal third, with triangular area in basal 0.8; length of tergite 1.1 times its basal width, slightly larger than length of third tergite. Triangular area petiolate posteriorly, its length 1.4 times basal width. Second suture deep, narrow, angulately curved medially towards base of tergite. Hypopygium obtuse apically. Ovipositor sheath 1.2 times as long as body, 1.8 times as long as fore wing.

Sculpture and pubescence.— Vertex smooth; frons coarsely rugose-striate; temple densely punctulate, face densely striate and sometimes striae curved, with fine rugulosity between striae. Sides of pronotum rugulose-punctulate at most part. Mesoscutum densely punctulate, with fine and dense granulation, narrow medio-posterior area rugose. Scutellum finely and densely punctulate. Mesopleura smooth at most part, punctulate posteriorly. Propodeum entirely rugose-areolate, with undulate median carina in basal third. Hind coxae densely striate dorsally, almost smooth laterally. First tergite densely rugose-areolate, more densely in apical half. Second tergite entirely, third tergite largely (except smooth apical part) and medio-basal 0.75 of fourth tergite with very densely and fine, almost regular reticulation. Vertex mostly glabrous, with very sparse erect and rather short setae laterally, temple with very dense semi-erect and rather long setae. Mesoscutum entirely shortly and very densely setose. Mesopleuron densely and shortly setose at most part, glabrous at rather wide and round median area. Hind tibia with short, very dense and semi-erect setae dorsally, length of these setae significantly less than maximum width of hind tibia.

Colour.— Head and mesosoma dark reddish brown. Metasoma reddish brown dorsally, brownish yellow or yellow ventrally. Antenna dark reddish brown to black, two basal segments entirely and basal half of third segment yellow with brownish tint. Palpi pale yellow. Tegulae brownish yellow. Legs yellow, hind coxa brownish yellow, infuscate in apical half; all femora yellowish brown or brown; all tibia submedially rather widely brown; apical 0.5-0.8 of all tarsi brownish, third and fourth segments of middle and hind tibiae brownish yellow. Ovipositor sheath dark brown, paler basally. Fore wing faintly infuscate. Pterostigma entirely dark brown.

Male.— Body length 6.5-7.8 mm; fore wing length 4.5-5.7 mm. Antenna with 48-55 segments. First flagellar segment almost 4 times as long as its apical width, 1.4-1.6 times as long as second segment. Penultimate segment 2.8-3 times as long as wide, 0.4-0.45 times as long as first flagellar segment, 0.85 times as long as apical segment; the latter pointed apically. Ocelli slightly enlargened; POL 0.8 times Od. Fore wing 4 times as long as wide. Radial cell weakly shortened. Metacarpus 1.2 times as long as pterostigma. Second radial abscissa about 3 times first abscissa, 1.3-1.4 times first radio-medial vein. Second radio-medial cell longer, 3.1-3.3 times as long as wide, and 0.9 times as long as brachial cell. Hind wing 5.5 times as long as wide, with 4 hamuli. First abscissa of medio-cubital vein 0.2 times second abscissa. Fore tarsus shorter, 1.4-1.5 times as long as fore tibia. Hind femur about 3 times as long as wide. Outer margin of hind tibia with 3 spines apically. Outer spur of hind tibia 0.4 times as long as inner spur. Hind tarsus almost as long as hind tibia. Basitarsus 0.75 times as long as

second-fifth segments combined. Second tarsal segment 0.45 times as long as basitarsus, almost as long as fifth segment (without pretarsus). Maximum width of first tergite 1.6 times its minimum width; length 2.2-2.4 times its maximum width. Length of second tergite 0.9-1.0 times its basal width, and 0.8-0.9 times length of third tergite. Length of triangular area almost equal or slightly larger than its basal width. Second suture strongly roundly curved medially towards base of tergite. Basal 0.3-0.5 of third-fifth tergites with pointed medio-posteriorly areas, bordered by deep grooves. Frons striate. Sides of pronotum entirely rugose-punctulate. Mesopleura widely rugulose-punctulate posteriorly. Dorso-anterior half of hind coxa rugose, its dorso-posterior half striate and laterally punctulate. First tergite entirely rugose-areolate. Basal 0.7 of fourth tergite and basal half of fifth tergite with very small, very dense and rather regular reticulation. Anterior half of vertex glabrous and sometimes also its posterior quarter, rest part with long, rather dense semi-erect setae, directed towards median line. Head below lighter. Meso- and metasoma black or dark reddish brown almost entirely. Hind coxa almost entirely dark reddish brown. Otherwise similar to female.

Discussion.— This species is similar to *H. filicornis* (Cameron) and differs by the antefurcal recurrent vein, the forwardly angled second suture of metasoma, the radial vein arising from middle of pterostigma, the first flagellar segment and fifth segment of hind tarsus short, the mesosoma and the first tergite long, metasoma dorsally evenly reddish brown.

Distribution.— Malaysia (Sabah).

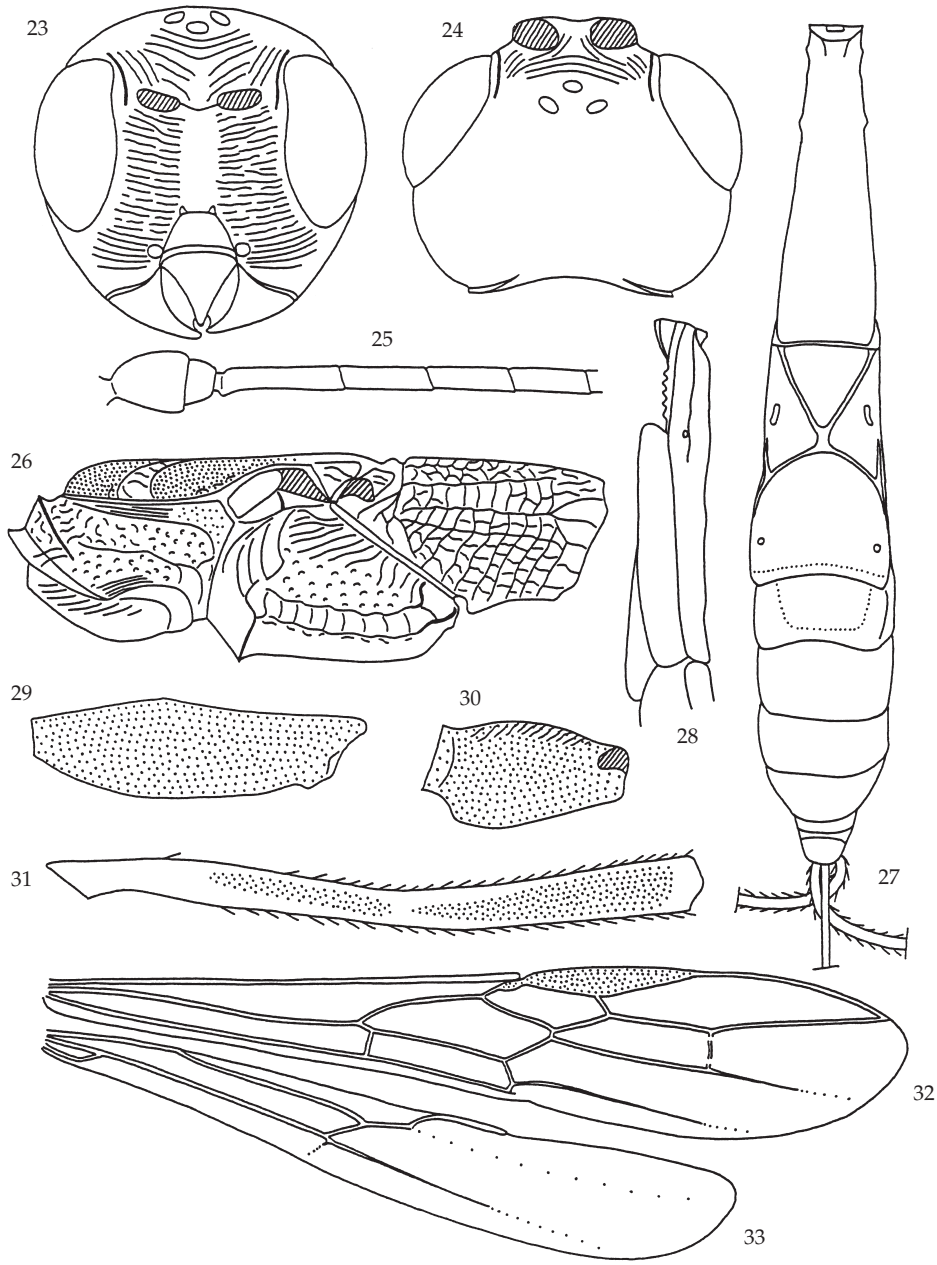
Halycaea solo spec. nov.
(figs 23-33)

Material.– Holotype, ♀ (RMNH), "**Malaysia** – SW. **Sabah**, n[ea]r Long Pa Sia (East), c. 1000 m, 1-13.iv.1987, Mal. trap 4, C. v. Achterberg, RMNH'87".

Description.— Female. Body length 9.0 mm; fore wing length 6.4 mm.

Head.— Antenna slender, filiform, with more than 42 segments (apical segments missing). Scapus 1.2 times as long as its maximum width. First flagellar segment 5.3 times as long as its apical width, 1.4 times as long as second segment. Subapical segments 3.3 times as long as wide. Head width 1.3 times its median length. Frons very weakly concave. Temple roundly narrowed behind eye, transverse diameter of eye 1.3 times length of temple. Ocelli medium-sized, basal side of ocellar triangle 1.3 times lateral sides; POL 1.2 times Od, 0.4 times OOL. Eye glabrous, 1.2 times as high as broad. Malar space height 0.3 times height of eye, 0.7 times basal width of mandible. Face width 0.9 times height of eye and almost equal to height of face and clypeus combined. Subocular suture absent. Clypeus with very narrow lower flange. Clypeal suture distinct. Hypoclypeal depression round, its width 0.9 times distance from edge of depression to eye, 0.4 times width of face. Occipital carina dorsally widely interrupted, below fused with hypostomal carina by additional ruga. Hypostomal flange narrow. Head below eyes distinctly roundly narrowed. Palpi long, length of maxillary palp 1.7 times height of head (without mandible).

Mesosoma.— Mesosoma weakly depressed, its dorsal side almost flat. Length 2.8 times its height. Posterior 0.7 of pronotum with high convex lobe dorsally and with



Figs 23-33. *Halycaea solo* spec. nov. 23, head, frontal view; 22, head, dorsal view; 25, 6 basal segments of antenna; 26, mesosoma, lateral view; 27, metasoma, dorsal view; 28, first metasomal tergite, lateral view; 29, hind femur; 30, hind coxa; 31, hind tibia; 32, fore wing; 33, hind wing.

distinct pronotal keel, situated rather far from mesonotum and not fused with it medially. Median lobe of mesoscutum weakly and obliquely-roundly raised above pronotum, with very fine, partly indistinct longitudinal furrow. Notauli complete, deep anteriorly, posterior 0.7 shallow, crenulate. Prescutellar depression rather shallow, with distinct median carina, sparsely rugose, 0.3 times as long as flat scutellum. Metanotum without median tooth. Subalar depression shallow, rather wide, rugose. Sternaulus distinct, shallow, rather wide, crenulate, connected with prepectal carina anteriorly, running ventrally along entire length of mesopleuron, weakly curved in posterior half. Propodeum without lateral tubercles.

Wings.— Fore wing 5 times as long as its maximum width. Pterostigma 5.3 times as long as wide. Radial vein arising weakly before middle of pterostigma (distance from apex of pterostigma to radial vein 1.2 times distance from radial vein to base of pterostigma). Radial cell not shortened. Metacarpus 1.3 times as long as pterostigma. Second radial abscissa 4.6 times first abscissa, 0.6 times weakly curved third abscissa, 1.6 times first radiomedial vein. Second radiomedial cell long, 4.2 times as long as its maximum width, 1.15 times as long as brachial cell. First abscissa of medial vein very weakly S-shape. Recurrent vein slightly postfurcal. Distance from nervulus to basal vein 0.4 times nervulus length. Hind wing 7 times as long as wide, with 4 hamuli. First abscissa of mediocubital vein 0.2 times as long as second abscissa. First costal abscissa 0.65 times second abscissa. Recurrent vein straight, short, entirely pigmented, postfurcal.

Legs.— Fore tarsus very long and slender, 2.2 times as long as fore tibia. Fore tibia with small spines arranged almost in a single row. Dorsally fore and middle trochantelli with distinct pointed tooth, latero-apically with distinct lobe. Hind trochantellus distinctly convex dorso-apically. Hind coxa rounded baso-ventrally, without tubercle. Hind femur 3.4 times as long as wide. Hind tibia curved medially, without spines on apical outer margin. Outer spur of hind tibia short, 0.45 times as long as inner spur; inner spur 0.25 times as long as hind basitarsus. Hind tarsus slender, almost as long as hind tibia. Basitarsus 0.6 times as long as second-fifth segments combined. Second tarsal segment 0.65 times as long as basitarsus, almost twice as long as fifth segment (without pretarsus).

Metasoma.— Metasoma 1.5 times as long as head and mesosoma combined. First tergite without dorsope, with small subbasal lateral processes and small spiracular tubercles in basal quarter, linearly widened from base to apex. Acrosternite elongate, 0.27 times as long as first tergite, with large baso-median keel. Maximum width of first tergite 1.6 times its minimum width; length 3.3 times its maximum width, almost twice length of propodeum. Second tergite without antero-lateral furrows, basal 0.7 with triangular area; length of tergite equal to its basal width, 0.7 times length of third tergite. Triangular area petiolate posteriorly, its length almost equal to basal width. Second suture deep, narrow, deeply roundly curved towards base of tergite. Hypopygium obtuse apically. Ovipositor sheath 1.2 times as long as body, 1.7 times as long as fore wing.

Sculpture and pubescence.— Vertex and temple smooth; frons rugulose-striate partly, with fine granulation; face densely reticulate-punctulate, smooth medially. Sides of pronotum rugulose-striate, finely punctulate medially. Mesoscutum densely punctulate-granulate entirely, with two weakly convergent carinae and fine rugulosi-

ty between their. Scutellum finely granulate. Mesopleuron densely punctulate, its upper third rugose. Propodeum coarsely entirely rugose-areolate, with 5 complete and rather fine longitudinal carinae. Hind coxae finely striate-granulate dorsally, almost smooth at most part. Basal half of first tergite rugulose-areolate, its apical half with small and very dense almost regular reticulation. Second and third tergites entirely with very dense and fine almost regular reticulation; medio-basal half of fourth tergite very densely and finely areolate-punctulate. Vertex with sparse semi-erect and rather short setae, temple with rather dense, long and posterodorsally directed semi-erect setae. Mesoscutum entirely shortly and very densely setose. Mesopleura densely and shortly setose at most part, with wide glabrous areas below sternaulus. Hind tibia with short, dense and semi-erect setae dorsally, length of these setae significantly less than maximum width of hind tibia.

Colour.— Head yellowish-red. Mesosoma and three basal metasomal tergites black, metasoma behind third tergite and ventrally reddish brown. Antenna black, two basal segments brownish yellow. Palpi pale yellow. Tegulae dark reddish brown. Legs dark reddish brown, fore and middle coxae, trochanters and trochantelli, fore tarsus, middle tibia and tarsus reddish brown or yellowish brown with dark spots; middle tibia basally, hind tibia basally, but laterally narrowly on all its length white or whitish yellow. Ovipositor sheath dark brown, paler basally. Fore wing faintly infuscate. Pterostigma entirely dark brown.

Male.— Unknown.

Distribution.— Malaysia (Sabah).

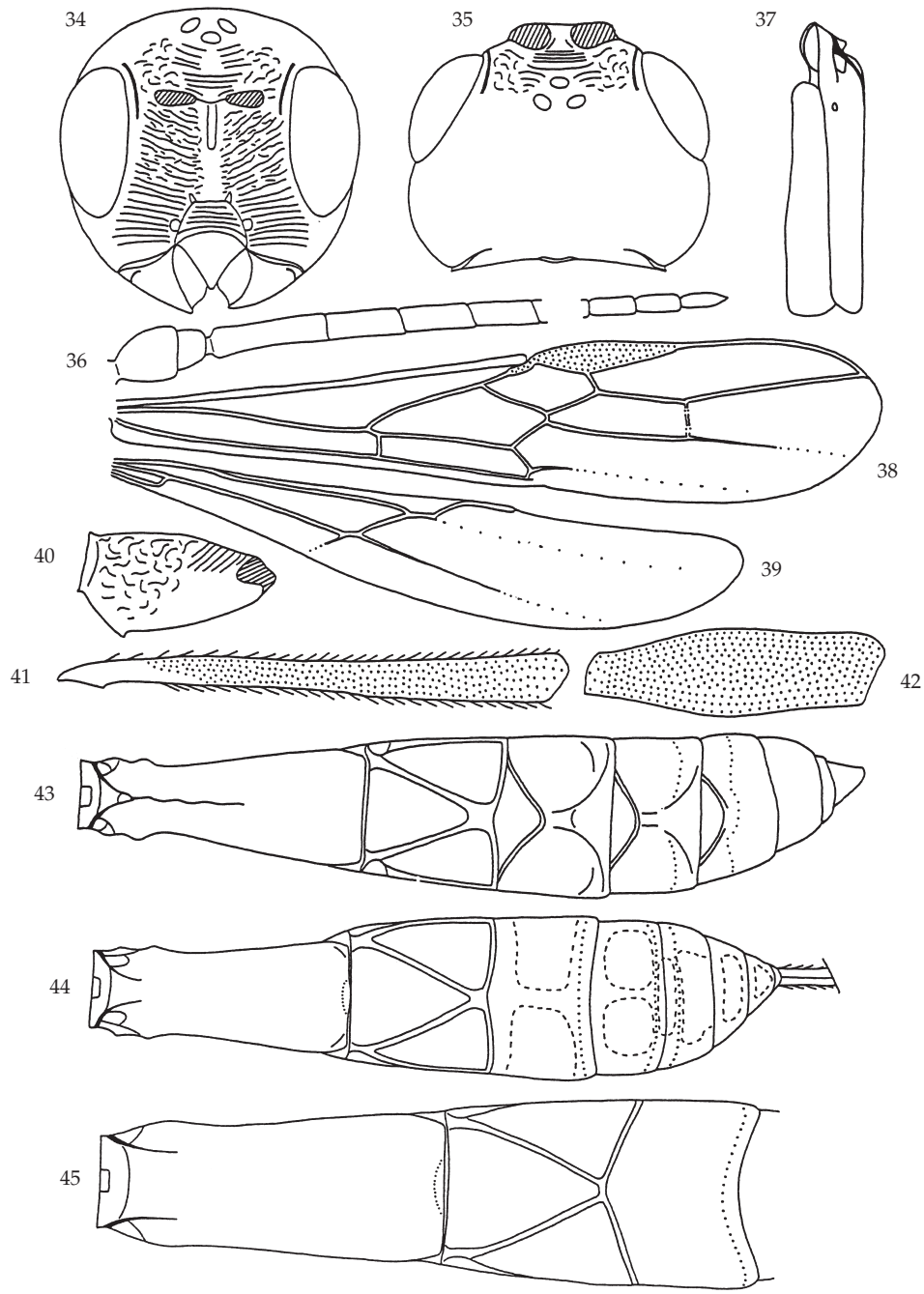
Discussion.— This species is similar to *H. erythrocephala* Cameron and differs by having the occipital carina widely interrupted dorsally, the ocelli not in an equilateral triangle, the mesoscutum weakly and roundly raised above the pronotum, the four hamuli, the hind coxa without baso-ventral tooth, the dorsope of the first tergite absent, and the first tergite long.

Halycaea sonata spec. nov.
(figs 34-43)

Material.— Holotype, ♂ (HNHM), "**Vietnam**, Da Lat, Cam Ly area", "1994.xii.6, leg. Mahunka, Sziraki, Zombori".

Description.— Male. Body length 8.0 mm; fore wing length 5.5 mm.

Head.— Antennae slender, setiform, with 55 segments. Scapus 1.3 times as long as its maximum width. First flagellar segment 4.2 times as long as its apical width, 1.5 times as long as second segment. Penultimate segment 3.3 times as long as wide, 0.4 times as long as first flagellar segment, 0.85 times as long as apical segment; the latter pointed apically. Head width 1.3 times its median length. Frons weakly concave. Temple weakly convexly narrowed behind eye, transverse diameter of eye 1.1 times length of temple. Ocelli medium-size, basal side of ocellar triangle 1.3 times lateral sides; POL 0.7 times Od, 0.3 times OOL. Eye glabrous, 1.2 times as high as broad. Malar space height 0.4 times height of eye, 0.6 times basal width of mandible. Face width 1.1 times height of eye and 1.2 times height of face and clypeus combined. Subocular suture absent. Clypeus with very narrow lower flange. Clypeal suture distinct, but



Figs 34-43, *Halycaea sonata* spec. nov.; fig 44, *H. filicornis* (Cameron); fig 45, *H. erythrocephala* Cameron. 34, head, frontal view; 35, head, dorsal view; 36, basal and apical segments of antenna; 37, first metasomal tergite, lateral view; 38, fore wing; 39, hind wing; 40, hind coxa; 41, hind tibia; 42, hind femur; 43, 44, metasoma, dorsal view (43, male, 44, female); 45, 3 basal tergites of metasoma.

shallow upper. Hypoclypeal depression round, its width almost equal to distance from edge of depression to eye, 0.5 times as wide as face. Occipital carina widely interrupted latero-dorsally, with a short and fine part of carina medially, below not fused with hypostomal carina. Hypostomal flange narrow. Head below eyes distinctly and almost linearly narrowed. Palpi long, length of maxillary palps 1.5 times height of head (without mandible).

Mesosoma.— Mesosoma weakly depressed, its dorsal side almost flat. Length 2.8 times its height. Posterior half of pronotum with high convex lobe dorsally and with distinct pronotal keel, close to mesonotum, but not fused with it medially. Median lobe of mesoscutum weakly and almost perpendicularly raised above pronotum, with shallow and wide longitudinal depression. Notauli complete, deep anteriorly, its posterior 0.7 shallow, rugose. Prescutellar depression rather shallow, with distinct 3 carinae, rugose, 0.3 times as long as scutellum, scutellum flat. Metanotum with small and wide median tooth. Subalar depression shallow, rather wide, rugose. Sternaulus distinct, shallow, rather narrow, coarsely crenulate, connected to prepectal carina anteriorly, running ventrally along entire length of mesopleuron, weakly S-shaped. Propodeum without lateral tubercles.

Wings.— Fore wing 4.6 times as long as its maximum width. Pterostigma 4.6 times as long as wide. Radial vein arising distinctly before middle of pterostigma (distance from apex of pterostigma to radial vein 1.5 times distance from radial vein to base of pterostigma). Radial cell slightly shortened. Metacarpus 1.2 times as long as pterostigma. Second radial abscissa 4.2 times first abscissa, 0.5 times its straight third abscissa, and 1.5 times first radiomedial vein. Second radio-medial cell rather long, 3.4 times as long as its maximum width, 0.9 times as long as brachial cell. First abscissa of medial vein weakly S-shaped. Recurrent vein postfurcal. Distance from nervulus to basal vein 0.3 times nervulus length. Hind wing 5.6 times as long as wide, with 5 hamuli. First abscissa of medio-cubital vein 0.2 times as long as second abscissa. First costal abscissa 0.5 times second abscissa. Recurrent vein straight, short, entirely pigmented, antefurcal.

Legs.— Fore tarsus very long and slender, 1.6 times as long as fore tibia. Fore tibia with very small spines arranged in single row. Fore and middle trochantelli dorsally with short and high keel, latero-apically with long lobe. Hind trochantellus with wide dorso-apical tooth. Hind coxa with baso-ventral corner and small tubercle. Hind femur 3.2 times as long as wide. Hind tibia almost straight, outer side with two small spines apically. Outer spur of hind tibia short, 0.4 times as long as inner spur; inner spur 0.3 times as long as hind basitarsus. Hind tarsus slender, almost as long as hind tibia. Basitarsus 0.6 times as long as second-fifth segments combined. Second tarsal segment 0.5 times as long as basitarsus, almost as long as fifth segment (without pretarsus). Fifth tarsal segment weakly enlarged

Metasoma.— Metasoma 1.5 times as long as head and mesosoma combined. First tergite with distinct dorsope, with small spiracular tubercles in basal 0.2, almost linearly widened from base to apex. Acrosternite short, 0.15 times as long as first tergite, with large baso-median keel basally. Maximum width of first tergite 1.8 times its minimum width; length 2.3 times its maximum width, and twice length of propodeum. Second tergite with weak, but distinct anterolateral furrows, and basal 0.8 with triangular area; length of tergite almost equal to its basal width, 1.1 times length of third

tergite. Triangular area petiolate posteriorly, its length 1.25 times basal width. Second suture shallow, narrow, weakly curved towards base of tergite. Third-fifth tergites in basal third with semi-oval areas. Third and fourth tergites with roundly divergent medio-lateral furrows in posterior 0.25-0.35.

Sculpture and pubescence.— Vertex smooth; frons widely medially rugose-striate; upper half of face densely punctulate-rugose, and remainder with transverse curved striae, narrowly almost smooth medially; temple smooth in anterior third, and remainder sparsely and distinctly punctulate. Sides of pronotum entirely rugose. Mesoscutum densely rugulose-punctulate with very dense and fine granulation, and posterior half widely reticulate-rugose. Scutellum punctulate and partly finely granulate. Mesopleuron rugose anteriorly and posteriorly, and remainder mostly punctulate, but small median part smooth. Propodeum coarsely rugose-reticulate, almost smooth at small basolateral areas, with almost complete median carina. Hind coxa transversely striate in dorsoapical half, coarsely rugose-reticulate dorsally and laterally in basal half, but its latero-apical half almost smooth. First tergite densely rugose-areolate. Second-fourth tergites (except smooth posterior fifth of third and fourth tergites), and basal half of fifth tergite with very dense and very fine, almost regular reticulation. Fifth tergite striate medially, and remainder of tergite and other tergites smooth. Anterior half of vertex glabrous, its posterior half with long and rather dense semi-erect setae directed medio-posteriorly. Temple with long dense semi-erect setae and directed towards posterior 0.7. Mesoscutum entirely shortly and very densely setose. Mesopleuron almost entirely densely setose. Hind tibia with short, dense and semi-erect setae dorsally, length of these setae significantly less than maximum width of hind tibia.

Colour.— Head red. Meso- and metasoma black. Antenna black, two basal segments reddish yellow. Palpi pale yellow. Tegulae dark reddish brown, but brown yellow in outer lateral half. Legs dark reddish brown, fore tarsus reddish brown, middle and hind tarsi and distal half of middle tibia brownish yellow; middle and hind tibiae basally whitish yellow; hind coxa, trochanter, trochantellus and femur almost black. Fore wing infuscate. Pterostigma entirely dark brown.

Female.— Unknown.

Distribution.— Vietnam.

Discussion.— This species is similar to *H. erythrocephala* Cameron and differs by having the occipital carina widely interrupted dorso-laterally, the radial vein arising distinctly before middle of pterostigma, the fore tibia with rather distinct spines, the triangular area of the second tergite petiolate posteriorly, the mesopleuron largely densely punctulate, the second tergite with very dense and very small almost regular reticulation.

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