



Additional knowledge respecting taxonomy of the social wasp genus *Ropalidia* (Hymenoptera: Vespidae: Polistinae) from Vietnam, with new records of three species and an updated key to species

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Abstract

Species composition of social wasps of the genus *Ropalidia* from Vietnam is reported, with 24 species having been recorded. Of those, three species are newly recorded for the Vietnamese fauna, namely *Ropalidia binghami* van der Vecht, 1941, *R. parartifex* Tan & van Achterberg, 2014 and *R. variegata* (Smith, 1852). The presence of *R. sumatrae* (Weber, 1801) in Vietnam is confirmed. An updated key to all recorded species of the genus *Ropalidia* from Vietnam is also provided.

Key words: Vespidae, Polistinae, *Ropalidia*, new records, key, Vietnam

Introduction

The social wasps comprise the following three subfamilies in the family Vespidae: Stenogastrinae, Polistinae and Vespinae (Piekarski, 2018), and all three subfamilies occur in Southeast Asia. In the paper-wasps, *Ropalidia*, in the tribe Ropalidiini, with 20 species recorded from Vietnam, is the genus with most abundant species (Nguyen & Kojima, 2013; Nguyen *et al.*, 2006). One species, *Ropalidia sumatrae* (Weber, 1801) was mentioned to occur in Vietnam (Kojima and Carpenter, 1997) but the local name from where species recorded was not in Vietnam. Later, Pham & Li (2015) listed the species as occurring in Vietnam, but give no information about specimens examined (probably, the authors followed the information given in Kojima & Carpenter (1997).

In this study, based on material deposited in Institute of Ecology and Biological Resources (IEBR), three species of the genus are newly recorded from Vietnam, and the record of *Ropalidia sumatrae* from Vietnam is confirmed. An updated key to all known species of the genus is also provided.

Material and methods

The materials examined in the present study are those deposited in the collections of the Institute of Ecology and Biological Resources (IEBR), Hanoi, Vietnam. Observations of morphological and color characters was made on the pinned and dried specimens under a Nikon SMZ 745 stereoscopic dissecting microscope. Terminology follows Nguyen *et al.* (2006). Photographic images were made with a Nikon SMZ 800N, using HeloconFocus 7 software; the plates were edited with Photoshop CS6.

Results

Ropalidia binghami van der Vecht, 1941

(Figs 1–2)

Icaria sumatrae (Weber); Bingham, 1897. Fauna Br. India, Hym. 1: 387 (key), 389 [misidentification; not *Vespa sumatrae* Weber].

Ropalidia binghami van der Vecht, 1941, Treubia 18: 109 (key), 113, male—“Luang Prabang, Hat Thoun” [Laos] (London).

Ropalidia binghami binghami; van der Vecht, 1962, Zool. Verh., Leiden 57: 8 (in subgenus *Anthreneida*; distr.).

Ropalidia sumatrae sumatrae; Lee, 1982, Hornets from Agric. Regions China: 83 (key), 88, pl. 3 fig. 5 (in subgenus *Anthreneida*) [misidentification].

There are two subspecies in *Ropalidia binghami*, the nominate subspecies occurred in Myanmar, Laos, Thailand and China, and *R.b. wegneri* van der Vecht, 1962 occurred only in Borneo. The specimens from Vietnam is fit with description of the nominotypical subspecies, *R. b. binghami*.

It was van der Vecht’s error as he gave the locality as Siam: 1 male, Luang Prabang, Hat Thoun [Laos]. Tan *et al.* (2014) mentioned that the type locality of the species was Thailand (Siam). This species was recorded from southern provinces in Tay Nguyen highland, and is newly recorded from Vietnam.

Material examined: Kon Tum: 6 females, Sa Thay, Chu Mom Ray NP, 19°47’24.5’’N, 104°59’46.5’’E, 729 m, 25.IV.2016, LTP Nguyen, DD Nguyen & NT Tran. **Dak Lak:** Krong Bong, Krong Kmar, Chu Yang Sin NP [1 females 12°27’05.3’’N, 108°20’24.3’’E, 744 m, 5.V.2016, LTP Nguyen, DD Nguyen & NT Tran; 1 female, 12°24’56.8’’N, 108°21’02’’E, 772 m, 9.V.2018, LTP Nguyen, LX Truong & TV Luong]; 1 female, Eaphe, Krong Pak, 8.V.2019, HTQ Bui, HT Nguyen & PT Tran.

Distribution: Myanmar; Thailand; China (Guangdong); Vietnam (new record).

Ropalidia parartifex Tan & van Achterberg, 2014

(Figs 3–4)

Ropalidia parartifex Tan & van Achterberg, 2014, Zookeys 391: 23, female –“Longmen, Shangyong, Yunnan” [China] (Zoological Collection of School of Life Sciences, Northwest University, Xi’an).

This species was recorded from one province in the northwest and is newly recorded from Vietnam.

Material examined: Son La: 1 female, Phu Yen, Gia Phu, Vo Nguyen Giap forest, 350 m. 17.VI.2015, DT Nguyen.

Distribution: Thailand; China (Yunnan); Vietnam (new record).

Ropalidia sumatrae (Weber, 1801)

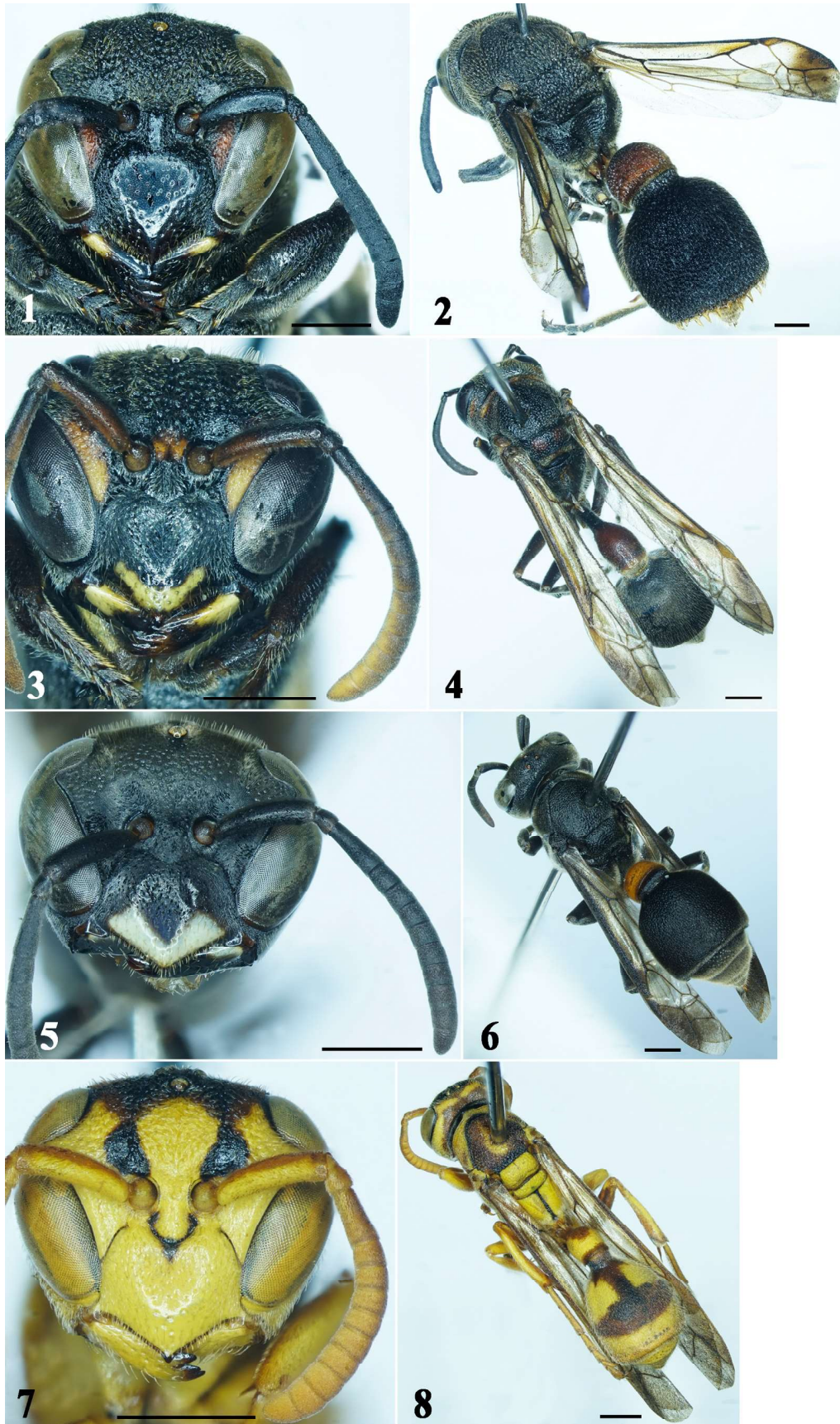
(Figs 5–6)

Vespa Sumatrae Weber, 1801, Observ. Entomol. Kiliae: 103—“Sumatra” (type depository unknown).

Ropalidia sumatrae; van der Vecht, 1941, Treubia 18: 104 (syn.: *Icaria marangensis* Gribodo, *Vespa mutillata* Illiger, *Polistes pubescens* Fabricius, *I. rufinoda* Cameron, *Eumenes formicaria* Fabricius, *Anthreneida coronata* White, *I. speciosa* de Saussure), 113 (key), 181 (taxonomy; female, male; fig.; distr.).

Ropalidia sumatrae sumatrae; van der Vecht, 1962, Zool. Verh., Leiden 57: 35, pls. 1 and 3 (in subgenus *Anthreneida*; ethology).

Kojima and Carpenter (1997) in their catalog of species in the polistine tribe Ropalidiini stated that *Ropalidia sumatrae* occurring in Vietnam as they cited van der Vecht (1941: 181): Indo China: 1 female, Haut Mekong, Vien Ponkha, May, 18, R. V. DE SALVAZA {British Museum}, but that local name was not Vietnamese name, probably it was a local name in Laos. Pham and Li (2015) also listed the species as occurring in Vietnam, but give no more information; maybe they followed Kojima and Carpenter (1997). In our study, the species was recorded in one province in the central high land of Vietnam (Tay Nguyen), which confirmed the occurrence of the species in Vietnam after 20 years of doubtful information.



FIGURES 1–8. **Figs. 1–2.** *Ropalidia binghami*, female. 1. Head, frontal view. 2. Habitus. **Figs. 3–4.** *Ropalidia parartifex*, female. 1. Head, frontal view. 2. Habitus. **Figs. 5–6.** *Ropalidia sumatrae*, female. 1. Head, frontal view. 2. Habitus. **Figs. 7–8.** *Ropalidia variegata*, female. 1. Head, frontal view. 2. Habitus. Scale: 1mm

Material examined: **Gia Lai:** 2 females, Ka Bang, Konpne, Kon Ka Kinh NP, 14°23'22.9"N, 108°20'27.5"E, 847 m, 16.VII.2012, LTP Nguyen.

Distribution: India: West Bengal; Myanmar; Thailand; Vietnam; China: Yunnan; Malaysia; Singapore; Indonesia: Kalimantan, Bangka, Sumatra.

***Ropalidia variegata* (Smith, 1852)**

(Figs 7–8)

Epipona variegata Smith, 1852, Ann. Mag. Nat. Hist. (2) 9: 48, female—"Poona" [India] (London).

Icaria variegata; de Saussure, 1854, Ét. Fam. Vesp. 2: 237, pl. 4, fig. 3a (nest) [error: "La China"].

Icaria pendula Smith, 1857, Cat. Hym. Br. Mus. 5: 98, female—"India (Bareilly)" (London).

Ropalidia variegata; Bequaert, 1918, Bull. Am. Mus. Nat. Hist. 39: 247.

Ropalidia variegata variegata; van der Vecht, 1941, Treubia 18: 112 (key), 154 (distr.).

This species was recorded from two provinces in the northwest and is newly recorded from Vietnam.

Material examined: **Dien Bien:** 2 females, Muong Nhe NR, 22°18'21.1"N, 102°23'47.0"E, 23.VII.2009, LTP Nguyen, PH Pham & J Kojima; **Son La:** 1 female, Co Ma, Thuan Chau, 1200 m, 5.VI.2008, LTP Nguyen & PH Pham.

Distribution: Pakistan; India: Kashmir, Rajasthan, Punjab, Haryana, Delhi, Uttar Pradesh, Uttarakhand, Bihar, West Bengal, Gujarat, Madhya Pradesh, Maharashtra, Chhattisgarh, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala; Nepal; Myanmar; Malaysia; Indonesia: Sulawesi; Vietnam (new record); China.

Key to species of the genus *Ropalidia* from Vietnam

(Modified from the key by Nguyen *et al.*, 2006)

1. Propodeum with paired, longitudinal, basal carinae; propodeal orifice very narrow, slit like, pointed above. Inner orbit below level of ocular sinus and supraclypeal area smooth; antennal sockets further from eye than from each other; length of lateral margin of clypeus that lies along the inner eye margin equal to length of malar space; gena wide, in profile wider than eye; distance between posterior ocelli longer than their diameter; male antennal flagellum with distinct tyloids. Scutellum rather strongly convex, with median depression anteriorly; metanotum convex on each lateral side of median triangular flattened area; median groove of propodeum obsolete in anterior half; propodeal valvula large, broadly rounded. Metasomal tergum I strongly swollen in posterior half both in lateral and anterodorsal views, but moderately narrowed near apex in dorsal view, dorsal face in profile depressed near apex; segment II obliquely cut off posteriorly, tergum longer than sternum, suture between tergum and sternum inconspicuous 2. *R. marginata* species group
- Propodeum without such carinae; propodeal orifice broader, rounded above. 4
2. Propodeum with weak striation between basal carinae; striations lateral to carinae weak. Tergum II reddish-brown, with wide, yellow, apical band. *R. marginata* (Lepeletier)
- Propodeum with strong punctures between basal carinae; striations lateral to carinae strong. Tergum II usually completely black or mainly black with very narrow, yellow, apical band 3
3. Female clypeus slightly higher than wide, with sparse medium punctures, space between puncture about two to three times larger than puncture diameter. Gena narrow, in profile narrower than eye. Metasomal segment II normal, not obliquely cut off posteriorly, tergum slightly longer than sternum; Tergum II with very coarse punctures and apical margin normal, with a row of spines Metasomal segment I almost reddish brown, segment II black. *R. binghami* van der Vecht
- Female clypeus distinctly wider than high, with denser medium punctures, space between punctures equal or smaller than puncture diameter. Gena wide, in profile wider than eye. Metasomal segment II obliquely cut off posteriorly, tergum much longer than sternum; Tergum II with punctures less coarse and apical margin without a row of spines. Metasomal segment I and II dark brown with yellow apical band *R. magnanima* van der Vecht
4. Propodeal valvula large, in lateral view covering most part of propodeal teeth forming orifice. 5
- Propodeal valvula small, in lateral view most part of propodeal teeth visible. 15
5. Posterior ocelli approximately or less than twice as far from inner eye margin as from each other; female flagellomere I less than three-fold as long as its apical width. Basal angle of second submarginal cell larger than 90°. Propodeal orifice broadly rounded above. Ventral margins of tergum I in ventral view closely approaching each other before posterior divergence. . . . 6
- Posterior ocelli more than 2.5-fold as far from inner eye margin as from each other; female flagellomere I more than three-fold as long as its apical width. Basal angle of second submarginal cell distinctly less than 90°. Propodeal orifice weakly narrowed in anterior one-third to half. Ventral margins of tergum I in ventral view nearly parallel before posterior divergence. 7. *R. stigma* species group
6. Female clypeus with shallow and sparse punctures, space between punctures two to three times larger than puncture diameter.

- Pronotal carina develop, slightly lamellate at dorsal part. Male antennal flagellum without tyloids, last flagellomere normal. Tergum I and II also yellow with brown mark *R. variegata* (Smith)
- Female clypeus with deeper and denser punctures, space between punctures equal or slightly larger than puncture diameter. Male antennal flagellum with distinct tyloids; last flagellomere excavated, curved in apical two thirds, with tyloid strongly sinuate. Tergum I reddish brown; tergum II blackish brown, with paired, anterolateral, orange-yellow spots, and wide, apical, orange-yellow band. *R. fasciata* (Fabricius)
7. Occipital carina strongly widened in ventral half, its maximum width nearly half the genal width. Gena narrower than eye. Pronotal carina weak, obsolete laterally; median groove of propodeum obsolete, only present at posterior margin. Mandible, clypeus, inner orbit below level of ocular sinus, supraclypeal area, vertex, gena smooth; frons and area around ocelli with small, scattered punctures; pronotum, mesoscutum and mesepisternum with shallow, sparse punctures; metapleuron, scutellum, metanotum and propodeum smooth; tergum I, smooth; metasomal segment II with scattered punctures. Terga II–V blackish brown, with apical yellow bands; tergum VI wholly yellow. *R. thailandia* Gusenleitner
- Occipital carina not prominently widened 8
8. Suture between second tergum and sternum indistinct except in posterior margin. Posterior ocelli approximately 2.5-fold as far from inner eye margin as from each other; distance between posterior ocelli slightly longer than their diameter. Metasomal segment II obliquely cut off at posterior margin, its sternum distinctly shorter and more convex than the tergum; depressed apical lamella narrow. Basal part of clypeus rather strongly punctate; gena distinctly punctate; metanotum except polished posteromedian area strongly punctured; propodeum with strong striations; basal half of tergum I smooth; punctuation at base of metasomal segment II coarse. Clypeus reddish-brown, with triangular, yellow spot at apex; tergum I with lateral, yellow lines at base; tergum II with paired, small, yellow spots near base *R. hongkongensis* (de Saussure)
- Suture between second tergum and sternum distinct throughout the segment. 9
9. Preapical part of tergum II swollen mediodorsally 10
- Preapical part of tergum II not swollen dorsally. 11
10. Female clypeus nearly as wide as high. Tergum II with preapical part distinctly swollen. Body ground color brown or dark brown. Female clypeus yellow with a black mark in the middle. *R. artifex* (de Saussure)
- Female clypeus much wider than high (1.1 times wider than high). Tergum II with preapical part slightly swollen. Body ground color black. Female clypeus largely black with yellow apical portion *R. parartifex* Tan & van Achterberg
11. Propodeum coarsely punctate, with median groove deep and wide. Metasomal segment I relatively short, less than twice as long as wide, and less than threefold as long as high, gradually but strongly swollen dorsally; segment II in lateral view obliquely cut off apically, tergum distinctly shorter than sternum; sternum II strongly swollen posteriorly in anterior one-third. Width of gena less than eye width. Male antennae very characteristic: flagellomeres III–VII slightly curved, VIII–XI with strong, dentiform tyloids. Body brown; tergum II with a narrow yellow apical band *R. taiwana* Sonan
- Propodeum with striations but no distinct punctures; median groove not deep, obsolete anteriorly. Metasomal segment I longer, more than twice as long as wide, more than threefold as long as high, gradually and weakly swollen posteriorly; segment II in lateral view nearly vertically cut off apically, tergum as long as or slightly longer than sternum; sternum II swollen posteriorly in anterior two-thirds. 12
12. Female gena as wide as eye. Tergum II in dorsal view swollen posteriorly in anterior one-third. Tergum I brown, except black basal half; basal part of tergum II with paired, yellow spots laterally. . *R. nigrita* Das and Gupta
- Female gena narrower than eye. Tergum II in dorsal view gradually swollen posteriorly in anterior two thirds 13
13. Female antenna slender; flagellomere I more than three-fold as long as its apical width; flagellomere II longer than wide; terminal flagellomere longer than its basal width. Metasomal segment I more than 2.6-fold as long as wide. Clypeus black with yellow, triangular spot at apex; metasomal segment I black in basal half; sternum II wholly black . . *R. rufocollaris* (Cameron)
- Female antenna thicker; flagellomere I nearly threefold as long as its apical width; II as long as wide; terminal slightly longer than its basal width. Metasomal segment I less than 2.4-fold as long as wide. 14
14. Ventral metapleuron smooth, without punctures. Clypeus yellow, with dorsal margin black; tergum I brown or blackish brown, with two yellow lines at basal half; second tergum and sternum usually brown, with paired, large, lateral, yellow spots at base *R. stigma* (Smith)
- Ventral metapleuron punctured. Clypeus yellow, dorsal margin black; tergum I brown or blackish-brown, often with short, lateral, yellow lines in basal half; second tergum and sternum brown or blackish-brown, often with paired, small, lateral, yellow spots at base *R. mathematica* (Smith)
15. Metasomal segment I less than twice as long as wide 16
- Metasomal segment I at least twice as long as wide 20
16. Female flagellomere I at least threefold as long as its apical width. Ventral corner of pronotum truncate. Tergum I abruptly swollen dorsally near posterior margin of basal slit to receive propodeal suspensory ligament. Gena approximately 0.9-fold as wide as eye; distance between posterior ocelli slightly more than twice as long as their diameter and approximately 0.65-fold as long as distance between posterior ocellus and inner eye margin. Border between punctured posterodorsal area and unpunctured anteroventral area of mesepisternum distinct; disc of metanotum broadly produced posteromedially; concavity on posterior face of propodeum rather deep and wide. Posterior margin of articulation of tergum II weakly truncate medially, sharp-edged or slightly overhanging laterally. Metasomal segments I and II blackish-brown, with narrow, apical, yellow bands. *R. rufoplagiata* (Cameron)
- Female flagellomere I less than three-fold as long as its apical width. Ventral corner of pronotum gradually tapering ventrally. Tergum I in profile gradually swollen posteriorly 17
17. Forewing with two submarginal cells. Posterior ocelli approximately twice as far from inner eye margin as from each other. Head and mesosoma with dense punctures, but median concavity of propodeum nearly impunctate. Metasomal segment II with

- punctures distinctly interspaced. Body black; lateral margin of clypeus often yellow; propodeum and fore coxa usually with yellow spots; pronotum and scutellum pale orange *R. bicolorata* van der Vecht
- Forewing with three submarginal cells. 18
18. Gena distinctly narrower than eye; posterior ocelli less than 2.5-fold as far from inner eye margin as from each other. Sternum II in lateral view swollen posteriorly in anterior two-thirds. Male flagellum with tyloids; tyloids on flagellomeres I–X developed, giving flagellum serrate below; terminal flagellomere weakly curved. Propodeum with median groove distinct. Clypeus yellow, with a median dark spot; mesoscutum with paired, longitudinal, yellow bands; metanotum yellow with a median dark band; tergum II with paired, large, lateral, yellow spots at base; first and second metasomal segments with narrow, apical, yellow bands. *R. cyathiformis* (Fabricius)
- Gena nearly as wide as or wider than eye; posterior ocelli more than 2.5-fold as far from inner eye margin as from each other. Sternum II in lateral view swollen posteriorly in anterior one-third 19
19. Mandible twisted, so that all teeth are in the same plain as clypeus. Propodeum smooth; propodeal orifice broadly rounded above. Ventral margins tergum I in ventral view nearly parallel before posterior divergence; first and second metasomal segments short, wider than long; tergum II in lateral view weakly swollen dorsally near posterior margin. Female gena slightly wider than eye; posterior ocelli less than 2.5-fold as far from inner eye margin as from each other, the latter distance approximately 1.5-fold as long as the diameter of posterior ocellus; female flagellomere I slightly more than twice as long as its apical width. Pronotal carina complete, sharply raised, reaching close to the ventral corner of pronotum; propodeum in dorsal view with lateral margin broadly rounded, in profile its posterior face slightly convex; median concavity of propodeum rather deep and wide, nearly oval in outline. Apical margin of clypeus yellow; metasomal segment I black, with narrow, yellow, apical band; segments II–VI wholly black *R. malayana* (Cameron)
- Mandible not twisted. Propodeum with strong striations; propodeal orifice weakly narrowed above. Ventral margins of tergum I closely approaching each other before posterior divergence; first and second metasomal segments long, longer than wide; apical margin of tergum II not swollen dorsally. Female gena nearly as wide as eye; posterior ocelli more than 2.5-fold as far from inner eye margin as from each other, the latter distance slightly longer than their diameter; female flagellomere I approximately two-fold as long as its apical width. Pronotal carina complete, sharply raised, reaching ventral corner of pronotum; propodeum in dorsal view with lateral margins slightly rounded; median concavity deep and narrower. Body entirely black. *R. vietnama* Gusenleitner
20. Body with coarse punctures. Propodeum with wide and deep medial furrow. Body ground color black with redish-brown mark on metasomal segment I. 21
- Body with less coarse punctures. Propodeum with narrow and shallow medial furrow. Body ground color black with extensive yellow mark. 22
21. Female gena slightly wider than eye, with deep, moderately close punctures. Marginal cell of forewing yellow. Propodeum rugose, with strong punctures, interposed with reticulate punctures laterally. Clypeus black with dark brown mark *R. modesta* (Smith)
- Female gena distinctly wider than eye (1.25 times as wide as eye), with shallower and sparser punctures. Marginal cell of forewing dark brown. Propodeum with weaker punctures, punctures not reticulate laterally. Clypeus black with light yellow apical margin. *R. sumatrae* (Weber)
22. Occipital carina in lateral view weakly bent anteriorly at level near mid-height of eye (less distinct in the male), then running down in a nearly straight line. Metasomal segment I rather short; in profile dorsal face of tergum I rising from posterior end of reception of propodeal suspensory ligament, then weakly curved down towards posterior margin, but slightly concave near posterior margin. Clypeus yellow, with black, central spot. Yellow spot on each lateral side of tergum II reduced. *R. flavopicta* (Smith)
- Occipital carina in lateral view smoothly curved. Metasomal segment I proportionally longer and more slender; in profile dorsal face of tergum I slightly concave just after reception of propodeal suspensory ligament, then gradually rising. Clypeus entirely yellow; yellow spot on each lateral side of tergum II large *R. ornaticeps* (Cameron)

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