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Taxonomic Revision of the Subgenus *Icarielia* of the Genus *Ropalidia* (Vespidae) in the Philippines

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Synopsis The Philippine species of the *Ropalidia* subgenus *Icarielia* are revised. Four forms so far described as subspecies of *R. flavopicta* are raised to specific rank. *R. flavobrunnea* is divided into three subspecies: *R. f. flavobrunnea*, *R. f. lapiniga* ssp. nov., *R. f. iracunda* ssp. nov.

Introduction

In his monograph of the Indo-Australian *Ropalidia*, VAN DER VECHT (1962) described five forms of the subgenus *Icarielia* from the Philippines: *R. lepida*, *R. flavopicta bipartita*, *R. f. extrema*, *R. f. nigrescens*, and *R. f. flavobrunnea*. After that, however, no taxonomic or faunistic works on the group have appeared. Recently I had the opportunity to examine specimens from several localities in the Philippines, and have concluded that the four forms treated by VAN DER VECHT as subspecies of *R. flavopicta* are distinct species. In the present paper a taxonomic revision of the Philippine *Icarielia* is given with descriptions of two new subspecies.

Materials and Methods

Specimens used in the present study were mainly collected by myself (abbreviated as J. K.) during my stay in the Philippines in 1978 and 1980. Some specimens were kindly offered by the following persons: Mr. T. TANO (T.T.), Educational Research Institute, Fukui Pref.; Mr. T. MUROTA (T.M.), Michimori High School; Mr. H. KUROKAWA (H.K.), Koyo Junior High School; Ms. C. NOZAKA (C.N.), Meirin Junior High School; Ms. D. JOVILLANO (D.J.), the Philippines; and Ms. J. CORDOVA (J.C.), the Philippines. I could have the opportunity to examine paratypes of *R. lepida* and *R. flavopicta bipartita*, which were sent from the Leiden Museum. In addition, I examined three females of *R. flavopicta flavopicta*, which had been determined by Dr. J. VAN DER VECHT. They were labeled: E. Borneo 125 m, Tabang, Bengen River, 28. VIII. 1956, A. M. R. WEGNER; Z. O. Borneo, Berangas, 25. XI. 1930, J. v. D. VECHT; Sarawak, Lawas, VII. 1977, R. H. HAMILTON.

To show the specific and subspecific differences, the following parts were measured under a stereoscopic microscope: Head width (HW); Thoracic width (TW), measured at the widest part in dorsal view excluding tegulae; Genal width (GW), measured at the widest part in profile; Eye depth (ED), measured at the widest part in profile; Basal width of gastral tergite I (BW); Width of gastral tergite I (T₁W),

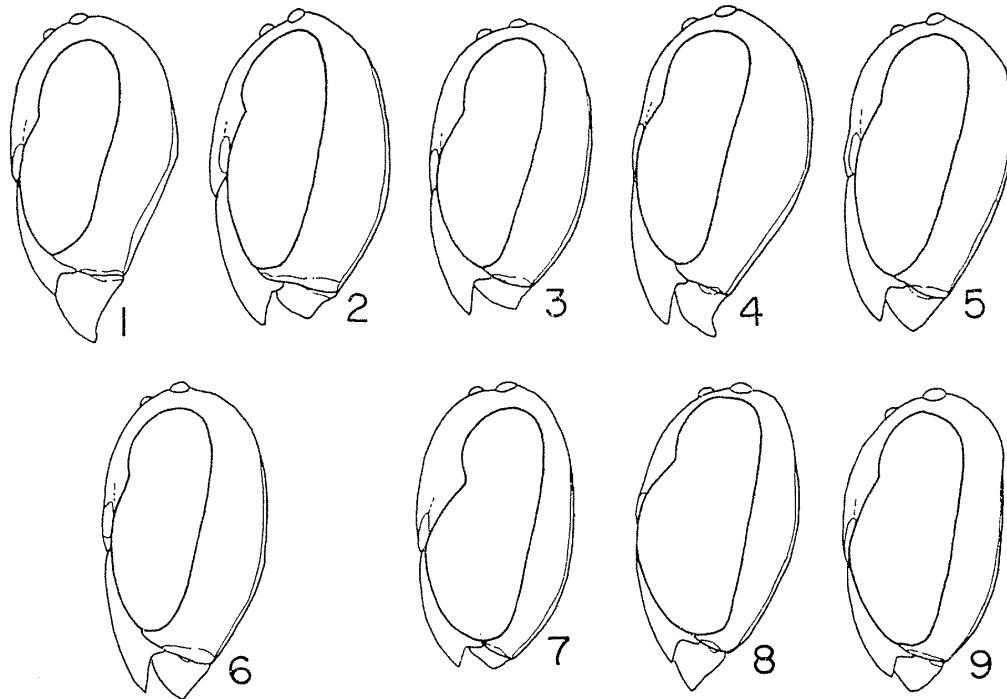
measured at the widest part in dorsal view; Length of gastral tergite I (T_1L), measured from the posterior end of the reception of propodeal muscle to the posterior margin of the tergite in profile. Some measurements used in the description are defined as follows: Clypeus width was measured as the interocular distance at the point where the eye touches the clypeus; Clypeus height was measured from the lowest point of basal margin to the apex; Length of gastral tergite II was measured from the anterior margin of the neck to the posterior margin of the tergite.

Results of measurements and specific differences in body proportions are summarized in Tables 1 and 2.

Key to the Philippine Forms of the Subgenus *Icarielia*

This key is based on the females.

1. Body slender, without distinct large punctures. Pronotal carina obliterated on the sides.....*R. lepida* VAN DER VECHT
- Body with large, flat-bottomed punctures. Pronotal carina developed, also on the sides.....2
2. Head small, about as wide as thorax including tegulae. Gastral tergite I weakly expanding posteriorly. Clypeus yellow; gastral segment II black with narrow yellow apical band.....*R. bipartita* VAN DER VECHT
- Head wider than thorax including tegulae. Gastral tergite I rather strongly expanding posteriorly. Gastral segment II often with brownish marks; if brownish marks absent, clypeus with median black spot.....3
3. Ventral half of occipital carina rather strongly thickened; gena strongly narrowed in ventral half toward mandibular base. Gastral tergite I strongly expanding posteriorly, but parallel-sided just near the apex. Clypeus with large median black mark, which extends from the base to apex.....*R. nigrescens* VAN DER VECHT
- Occipital carina smoothly curved; gena very weakly narrowed ventrally. Gastral tergite I with parallel sides on its posterior part. Clypeus entirely yellow or with median black spot, which does not reach the apex.....4
4. Gastral tergite I slender; ventral margin in profile smoothly curved. Punctures shallow. Clypeus almost without punctures, entirely yellow. Lateral bands on mesoscutum wide and distinct.....*R. extrema* VAN DER VECHT
- Gastral tergite I rather stout; ventral margin in profile nearly straight in posterior part, slightly concave near the apex. Punctures rather deep. Clypeus sparsely punctate, with median dark spot.....*R. flavobrunnea*, 5
5. Apical band on gastral segment II narrow and well defined. Frontal yellow mark separated from the base of clypeus by a wide dark area.....*R. flavobrunnea flavobrunnea* VAN DER VECHT
- Apical band on gastral segment II wide and ill defined. Frontal mark separated from the base of clypeus by a rather narrow band.....6
6. Gastral segment I with yellow spots on sides of the base of tergite and/or on



Figs. 1-9. Head in profile (1-6, female; 7-9, male). — 1, *Ropalidia flavopicta flavopicta*; 2, *R. bipartita*; 3, 7, *R. extrema*; 4, 8, *R. nigrescens*; 5, 9, *R. flavobrunnea flavobrunnea*; 6, *R. flavobrunnea lapiniga*.

- posterolateral corners of sternite. Lateral bands on mesoscutum usually absent, but sometimes present in very reduced form. Median black band of propodeum as wide as the base of gastral tergite I.....
*R. flavobrunnea iracunda* subsp. nov.
- Gastral segment I usually with only apical yellow band. Lateral bands on mesoscutum rather wide and distinct. Median band of propodeum narrower than the base of gastral tergite I.....*R. flavobrunnea lapiniga* subsp. nov.

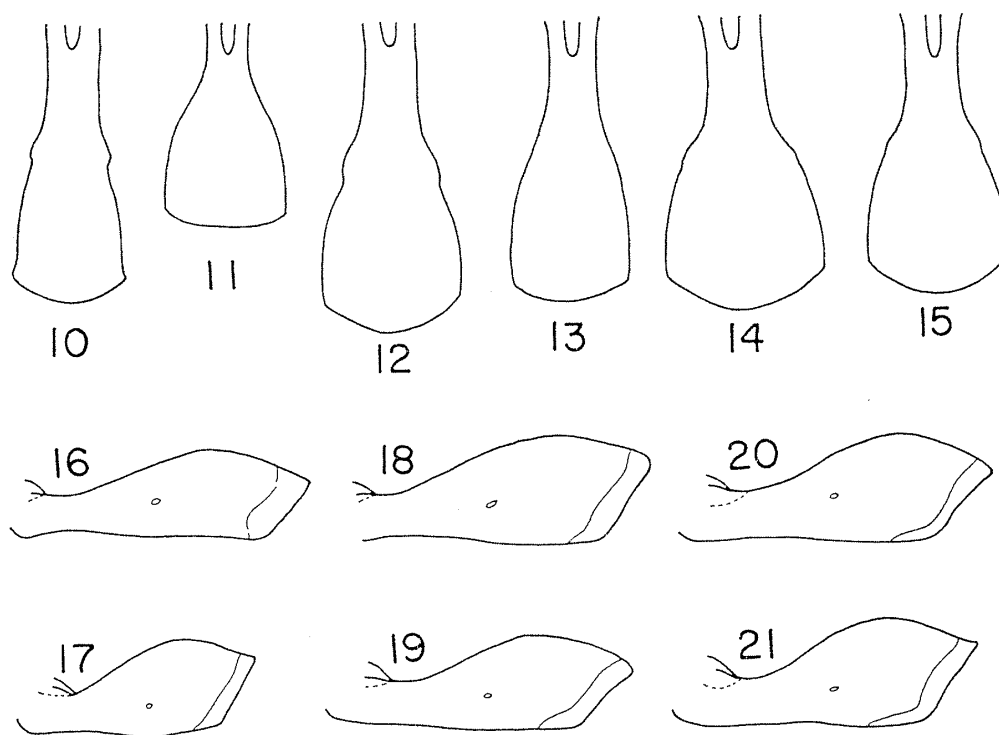
Ropalidia lepida VAN DER VECHT

Ropalidia lepida VAN DER VECHT, 1962, Zool. Verh. Rijksmus. Nat. Hist. Leiden, 57: 66-68.

Specimens examined. LUZON I. Damalon: 1 ♀ 1 ♂ (Paratypes, Leiden Museum).

Remarks. This species is easily distinguished from other Philippine *Icarielia* wasps by the absence of distinct large punctures and the absence of pronotal carina on the sides.

Gastral tergite I with parallel-sided part about twice as long as wide, widened part gradually expanding, then becoming parallel-sided again (Fig. 10); tergite in profile weakly rising beyond reception of the propodeal muscle, posteriorly depressed to the apex in a nearly straight line (Fig. 16).



Figs. 10-21. Gastral tergite I, female. — 10-15, Dorsal view at right angle to sternite; 16-21, lateral view. 10, 16, *Ropalidia lepida*; 11, 17, *R. flavopicta flavopicta*; 12, 18, *R. bipartita*; 13, 19, *R. extrema*; 14, 20, *R. nigrescens*; 15, 21, *R. flavobrunnea flavobrunnea*.

The male slightly differs from the female in color pattern. Broad band on eye emargination ending at the level distinctly lower than anterior ocellus; band on gena ending at the level slightly below the top of eye. Anterior band on scutellum rather widely interrupted medially.

Ropalidia bipartita VAN DER VECHT

Ropalidia flavopicta bipartita VAN DER VECHT, 1962, Zool. Verh. Rijksmus. Nat. Hist. Leiden, 57: 61-62.

Female. Head moderately large, as wide as thorax including tegulae, rather thick. Gena c. $4/5$ as wide as eye in profile, smoothly widened toward the middle, then somewhat narrowed ventrally; occipital carina distinct, very slightly thickened in ventral part, regularly curved (Fig. 2). Clypeus c. $13/10$ as wide as high. Posterior ocelli nearly as large as anterior one; distance between the posterior ocelli smaller than their diameter, more than three times as far from the eye as from each other. Antenna moderately thickened toward apex; third segment c. $2/5$ as wide as long, fourth as wide as long, tenth c. $3/2$ as wide as long. Eye with rather sparse, very short, erect hairs.

Sides of pronotum in dorsal view rather strongly diverging posteriorly in

nearly straight lines; pronotal carina complete and regular. Scutellum slightly convex. Dorsal face of propodeum in profile not steep, sloping at an angle of about 50° , very slightly curved; median furrow shallow and almost absent anteriorly.

Parallel-sided part of gastral tergite I about twice as long as wide, widened part gradually expanding from spiracle, then becoming parallel-sided again; widest part c. $12/5$ as wide as base, c. $2/5$ as wide as tergite II; spiracle large and projecting (Fig. 12); tergite in profile rising at an angle of about 30° beyond reception of propodeal muscle, posteriorly depressed to the apex at a weak angle (Fig. 18). Segment II slightly longer than wide, distinctly wider than high; apical lamella distinct and narrow.

Body with moderately sparse, flat-bottomed punctures, which possess distinct central pustules. Head moderately shiny; frons and vertex rather dull and moderately punctate; dorsal half of gena slightly dull with very sparse punctures. Thorax dull excepting posterior shining part of metanotum; pronotum, mesoscutum, scutellum and anterior part of metanotum moderately punctate; posterodorsal area of mesepisternum punctate, punctures becoming sparse anteroventrally; dorsal face of propodeum very finely striate. Gastral segments dull; segment II sparsely punctate.

Color as in VAN DER VECHT's (1962) description, slightly different in the following details: yellow band on the frons separated from the base of clypeus by a narrow dark band; metanotum yellow except for blackish posterior portion.

Male. Unknown.

Length ($H+Th+T_1+T_2$). 9 mm in the female.

Specimen examined. LUZON I. Babalasang, Kalinga, Mountain Province: 1 ♀, 3. III. 1953, M. C. TOWNES (Paratype, Leiden Museum).

Remarks. This species is distinctly separated from *R. flavopicta flavopicta* by the smoothly curved occipital carina (in *R. flavopicta* it rather strongly curves at the level of one third from top, then becomes nearly straight (Fig. 1)). Shape of gastral tergite I is also distinctly different; in *R. flavopicta* the parallel-sided part is about $3/2$ as long as wide, and the widened part expanding rather strongly (Fig. 11); in profile the tergite rises from posterior end of reception of propodeal muscle (Fig. 17).

Ropalidia extrema VAN DER VECHT

Ropalidia flavopicta extrema VAN DER VECHT, 1962, Zool. Verh. Rijksmus. Nat. Hist. Leiden, 57: 60-61.

Female. Head fairly large, distinctly wider than thorax including tegulae, moderately thick. Gena c. $2/3$ as wide as eye in profile, smoothly widened toward the middle, then slightly narrowed ventrally; occipital carina distinct, smoothly curved, very slightly thickened ventrally (Fig. 3). Clypeus c. $6/5$ as wide as high. Size of posterior ocelli nearly equal to that of anterior one; distance between the posterior ocelli equal to their diameter and c. $1/3$ of distance from eye. Antennal

segment III about twice as long as wide, equal to the length of segments IV and V together; segment IV as long as wide, segment X c. $3/2$ as wide as long. Eye with very sparse, erect, very short hairs.

Pronotum in dorsal view nearly straight laterally, not strongly expanding posteriorly; pronotal carina distinct and regularly curved. Scutellum slightly convex. Dorsal face of propodeum in profile nearly straight, sloping rather steeply at an angle of about 60° ; median furrow distinct, not widened anteriorly.

In dorsal view gastral segment I slender, with parallel-sided part c. $3/2$ as long as wide; widened part expanding gradually, then becoming parallel-sided again, slightly constricted at the apex; widest part c. $8/3$ as wide as base (Fig. 13), and c. $3/8$ as wide as tergite II; tergite in ventral view with sides bearing rather sparse outstanding hairs; triangular area of sternite as long as wide, posteriorly rather deeply emarginate, and slightly rugose (Fig. 22); tergite in profile rising beyond reception of propodeal muscle, regularly curved toward apex, posteriorly depressed at a weak angle (Fig. 19); apical lamella weak. Gastral segment II slightly longer than wide, distinctly longer than high; tergite with its articulation weakly separated from the short neck (Fig. 25); apical lamella distinct but narrow.

Body with sparse, weakly defined punctures, which are shallow, flat-bottomed, with weak central pustules. Head shining; frons, vertex and ocular sinus duller; sparse punctures in the dorsal half of frons spreading to the vertex; antennae dull. Thorax generally dull; pronotum, mesoscutum, scutellum and anterior third of metanotum moderately punctate; mesepisternum sparsely punctate on postero-dorsal area, punctures becoming sparse anteroventrally; scutellum and metanotum shining; propodeum less shining, very finely striate; legs rather dull. Gastral segments dull; segment II very sparsely punctate.

Color as in VAN DER VECHT's description (1962). In some specimens, band on frons separated from the base of clypeus by a very narrow black band; gastral tergite I with small, yellow spot on each side of the base; sternite I with spots on postero-lateral corners.

Male. Similar to the female, but head smaller; clypeus smaller, more rounded, c. $9/8$ as wide as high, covered with dense silvery hairs except for ventral part; eye strongly swollen, gena narrower, c. $2/5$ as wide as eye in profile (Fig. 7); antennal segments III–XIII with tyloids; yellow band on frons wider. Structure of gastral sternites VII+VIII as in Figs. 26 and 27; sternite VII with diagonal braces (Fig. 26), but sometimes with only single anterior ridge (Fig. 27). Genitalia see Figs. 28–30; ventral teeth of aedeagus very small (Fig. 30).

Length ($H+Th+T_1+T_2$). 6.5–7.5 mm in the female and 6.0–7.5 mm in the male.

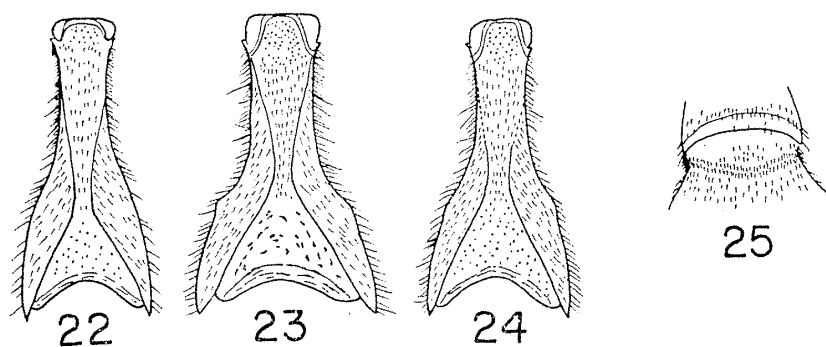
Specimens examined. LUZON I. Hidden Valley Spring, Alaminos, Laguna: 2 ♀♀, 3–4. IV. 1978, T. T.; 1 ♀, 3–4. IV. 1978, T.M. Botanical Garden, Los Baños, Laguna: 1 ♀, 30. III. 1978, C.N. Pagsanjan, Laguna: 2 ♀♀, 2. IV. 1978, T.T. St. Dominago, Albay: 1 ♀, 17. VIII. 1978, C.N. Monito, Albay: 2 ♀♀,

18. VIII. 1978, T.M. University of the Philippines at Los Baños (UPLB), Laguna: 1 ♀, 17. III. 1980, J. K.; 1 ♀, 22. IV. 1980, J. K.; 4 ♂♂, 22. IV. 1980, J. K., from a nest; 1 ♀, 1. V. 1980, J. K.; 2 ♀♀, 2. V. 1980, J. K.; 1 ♀, 5. V. 1980, J. K.; 3 ♀♀, 6. V. 1980, J. K.; 1 ♀, 7. V. 1980, J. K.; 2 ♀♀, 8. V. 1980, J. K.; 1 ♀, 9. V. 1980, J. K.; 3 ♀♀, 10. V. 1980, J. K.; 7 ♀♀, 11. V. 1980, J. K.; 2 ♀♀, 12. V. 1980, J. K.; 2 ♂♂, 12. V. 1980, J. K., from a nest. Banao, Guinobatan, Albay: 1 ♀, 2. IV. 1980, J.C. Balesteros, Cagayan: 1 ♀, 17. V. 1980, J.K. NEGROS I. Mambucal: 1 ♀, 2-3. IV. 1979, T. T.; 1 ♂, 2-3. IV. 1979, C. N.

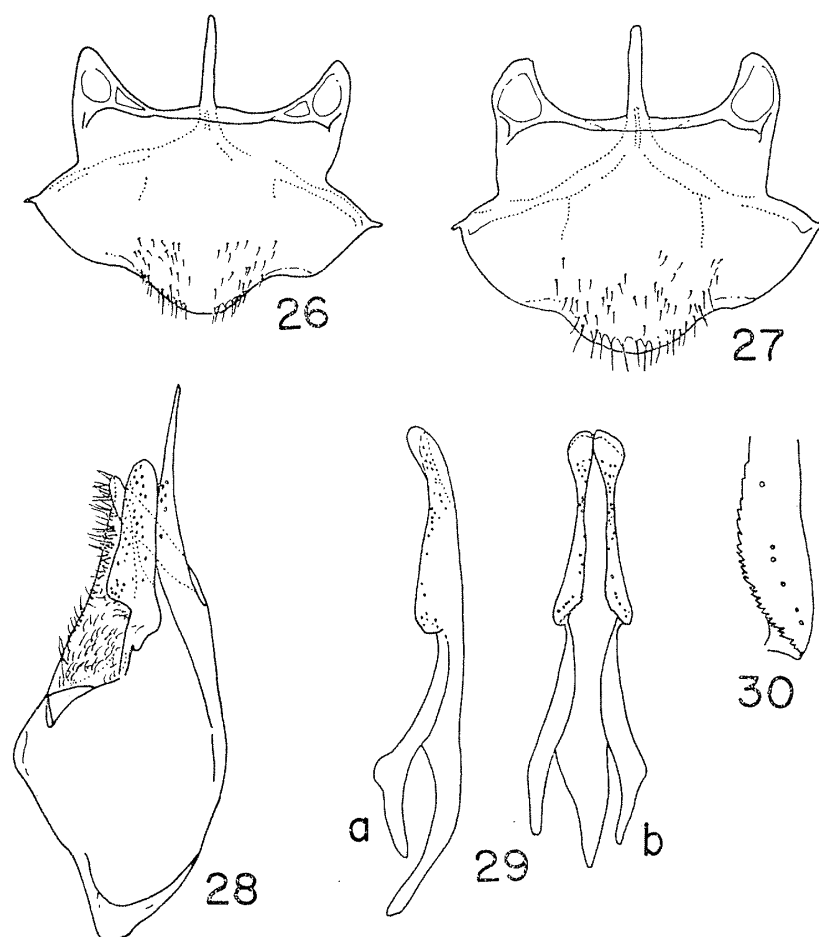
Larval stage. Third to final instar larvae were available for the study.

Final instar larva. Head: Cranium colored whitish yellow, nearly circular in frontal view (Fig. 31a), posteriorly concave at the level of antennae in profile (Fig. 31b). Integument weakly sclerotized, with fine granules but without visible setae except for the clypeus which has very sparse setae. Midcranial sulcus present in reduced form in upper half, wide but very shallow. Frons not separated from the epicranium and clypeus by distinct lines. Temporal band distinct and wide, outer half reticulate (Fig. 34). Antenna moderate in size, with three very minute sensilla (Fig. 36). Dorsal tentorial pit invisible; anterior tentorial pit distinct, located on epistoma and ventral to antenna. Postoccipital and hypostomal sulci moderately developed; pleurostomal sulcus not so developed; epistomal sulcus developed, but lacking in upper portion. Clypeus with nearly parallel lateral sides; mid-point of the ventral margin being at the level of mandibular base. Labro-clypeal suture rather distinct; labrum ventrally emarginate medially, with several setae; palate with several conical sensilla on ventral side but the number is variable. Mandible weak, circular in cross section, moderately curved, with weak constriction at the middle, bearing two apically pointed teeth (outer one weak and short), with small denticles around the middle; adductor apodeme long, with a short branch at some distance from base; abductor apodeme short (Fig. 37 a). Maxilla nearly spherical, weakly narrowed toward apex; stipes not distinctly separated from cardo, with maxillary palp and galea; maxillary palp with four small sensilla; galea divided into two lobes (Fig. 38). Salivary lips not conspicuous; prelabium nearly circular, with sparse setae; labial palp with four small sensilla; sensory bristle behind palp not bifid, with raised socket (Fig. 39). Postlabium not developed, weakly emarginate ventrally. Body: Integument not granulate, with sparse setae and dense microscopic denticles (Fig. 40). Setae on thoracic sternites II-III and abdominal sternite I longer than those on other segments; setae on abdominal sternites II-IX and on abdominal tergites restricted to each anterior portion. Denticles on thoracic sternites and abdominal sternite I larger and seldom connected; those on thoracic tergites and abdominal tergites I-VI often connected into a row. Posterior half of abdominal tergites IX and X almost without denticles. Paired oval areas on thoracic sternites distinct; meso- and metathoracic lobes with also oval areas (Fig. 42). First spiracle about twice as wide as the others; atrium without visible spines.

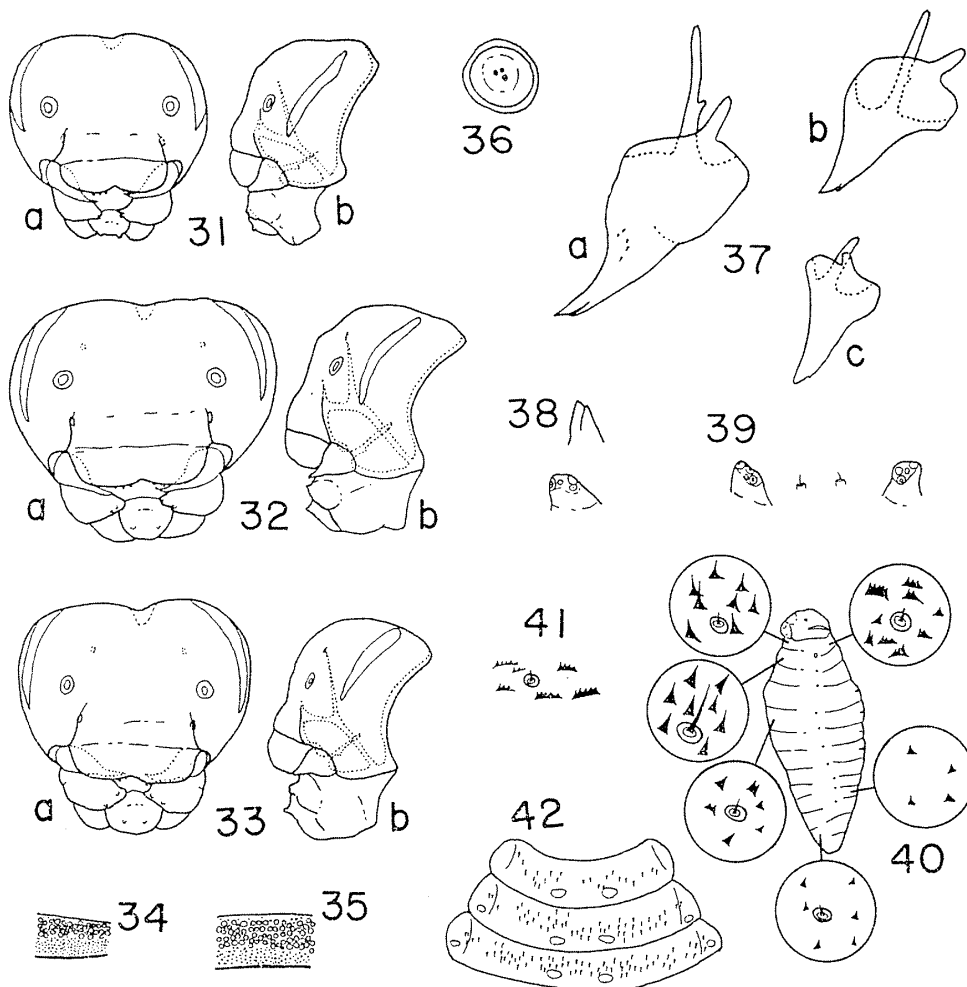
Fourth and third instar larvae. Cranium less sclerotized; mandible weaker,



Figs. 22-24. Ventral view of gastral sternite I and sides of tergite I, female. — 22, *Ropalidia extrema*; 23, *R. nigrescens*; 24, *R. flavobrunnea flavobrunnea*. Fig. 25. Articulation of gastral tergite II of female *Ropalidia extrema*.



Figs. 26-30. Terminal sternites and genitalia of male *Ropalidia extrema*. — 26-27, Gastral sternites VII+VIII; 28, inner aspect of left paramere with volsella; 29, aedeagus (a, lateral view; b, ventral view); 30, ventral teeth of aedeagus, in ventral view.



Figs. 31-42. Larva. — 31-33, Head of final instar larva (a, frontal view; b, lateral view); 34-35, temporal band (part); 36, antenna; 37, left mandible (a, final instar larva; b, fourth instar larva; c, third instar larva); 38, maxillary palp and galea; 39, labial palpi and sensory bristles; 40-41, setae and microscopic denticles on body integument; 42, thoracic sternites, microscopic denticles not drawn. 31, 34, 36-40, 42, *Ropalidia extrema*; 32, 35, 41, *R. nigrescens*; 33, *R. flavobrunnea lapiniga*.

supplemental tooth weaker in fourth instar larva (Fig. 37 b), and nearly absent in third instar larva (Fig. 37 c).

Remarks. This species is distinguishable from *R. flavopicta flavopicta* in the regularly curved occipital carina and slender gastral tergite I.

Ropalidia nigrescens VAN DER VECHT

Ropalidia flavopicta nigrescens VAN DER VECHT, 1962, Zool. Verh. Rijksmus. Nat. Hist. Leiden, 57: 59-60.

Female. Head distinctly wider than thorax including tegulae, somewhat thick.

Gena c. $3/4$ as wide as eye in profile smoothly widened toward the middle, then narrowed ventrally (Fig. 4); occipital carina distinct, moderately thickened in ventral part, rather strongly curved near the middle of gena then becoming nearly straight. Clypeus c. $6/5$ as wide as high. Posterior ocelli slightly smaller than anterior one, c. $5/2$ as far from the eye as from each other; distance between the posterior ocelli equal to their diameter. Antennal segment III $7/3$ as long as wide, somewhat longer than the length of segments IV and V together, segment X c. $5/3$ as wide as long. Eye with very sparse, erect, short hairs.

Pronotum in dorsal view slightly convex laterally, somewhat strongly expanding posteriorly; pronotal carina distinct, regularly curved. Scutellum moderately convex. Dorsal surface of propodeum in profile slightly convex, sloping rather steeply at an angle of about 75° ; median furrow distinct but almost disappearing near anterior end.

Gastral segment I stout; its parallel-sided part c. $3/2$ as long as wide; widened part rather strongly expanding, then becoming parallel-sided again near the apex; the widest part about three times as wide as the base (Fig. 14), and c. $2/5$ as wide as gastral tergite II; tergite in ventral view with sides bearing many outstanding hairs; triangular area of sternite c. $3/4$ as long as wide, somewhat granulate, weakly emarginate posteriorly (Fig. 23); tergite in profile rising at an angle of about 30° beyond reception of propodeal muscle, posteriorly depressed at a weak angle to the apex in a nearly straight line (Fig. 20). Gastral segment II nearly as wide as long, and as long as high; apical lamella distinct, very narrow.

Body with rather deep punctures, which are flat-bottomed and have distinct central pustules. Head generally dull, except for shining ventral half of clypeus; clypeus very sparsely punctate; frons, dorsal half of eye emargination and vertex rather densely punctate; gena sparsely punctate in dorsal half. Thorax dull; pronotum and mesoscutum coarsely punctate; mesepisternum moderately punctate on posterodorsal area; scutellum and anterior half of metanotum punctate; posterior half of metanotum shining; dorsal face of propodeum slightly shining, finely striate. Gaster dull; widened part of tergite I very sparsely punctate; segment II more closely punctate.

Color basically as in VAN DER VECHT's description (1962), but somewhat variable even in the same local population; interantennal spot butterfly-like, but often reduced and sometimes completely absent; trace of postocellar line often absent; tegulae sometimes extensively marked with yellow.

Male. Like the female, but head smaller; clypeus smaller, more rounded, c. $7/6$ as wide as high, densely covered with silvery hairs except for apex; eye strongly swollen; gena narrower, c. $3/8$ as wide as eye in profile; occipital carina rather regularly curved (Fig. 8); antennal segments III–XIII with tyloids. Head more extensively marked with yellow; clypeus yellow with obscure median dark line; yellow band on frons separated from the base of clypeus by a narrow line, strongly narrowed at the level of dorsal margin of antennal socket, reaching quite near the

anterior ocellus; band along inner orbit nearly filling the eye emargination; band on gena wider and longer. Gastral sternite II with obscure yellow spot on each side.

Structure of gastral sternites VII+VIII and genitalia very similar to that of *R. extrema*.

Length ($H+Th+T_1+T_2$). 6.5–8.0 mm in the female and 7.5–7.5 mm in the male.

Specimens examined. LUZON I. Pagsanjan, Laguna: 3 ♀♀, 2. IV. 1978, T. T.; 2 ♀♀, 2. IV. 1978, T. M.; 1 ♀ 1 ♂, 7–9. VIII. 1979, H.K. Hidden Valley, Alaminos, Laguna: 1 ♀, 3–4. IV. 1978, T. T.; 1 ♀, 6. VIII. 1978, H.K. Botanical Garden, Los Baños, Laguna: 1 ♀, 30. III. 1978, C.N. San Fernando, Launion: 1 ♀, 11. VIII. 1978, C.N. Naga, Camarines Sur: 2 ♀♀ 1 ♂, 14. VIII. 1978, C. N. St. Domingo, Albay: 1 ♀, 17. VIII. 1978, T.M. UPLB, Laguna: 10 ♂♂, 12. III. 1980, J. K., from a nest; 1 ♀, 16. III. 1980, J. K.; 1 ♀, 18. III. 1980, J. K.; 1 ♀, 21. III. 1980, D. J.; 1 ♀, 21. III. 1980, J. K.; 17 ♀♀, 22. IV. 1980, J. K.; 1 ♀, 4. V. 1980, J. K.; 4 ♀♀, 6. V. 1980, J. K.; 2 ♀♀, 7. V. 1980, J. K.; 3 ♀♀, 8. V. 1980, J. K.; 6 ♀♀, 9. V. 1980, J. K.; 2 ♀♀, 10. V. 1980, J. K.; 1 ♀, 11. V. 1980, J. K.; 1 ♀, 13. V. 1980, J.K. Banao, Guinobatan, Albay: 6 ♀♀, 30. III. 1980, J. K.; 22 ♀♀, 2. IV. 1980, J. K.

Larval stage. Final instar larva like that of *R. extrema*, but cranium more transverse in frontal view (Fig. 32 a), posteriorly rather strongly concave in profile (Fig. 32 b); dorsal tentorial pit very weak but visible; outer two thirds of temporal band reticulate (Fig. 35); antenna sometimes with four very minute sensilla; post-labium without ventral emargination. Denticles on abdominal sternites II and III more often connected; those on thoracic tergites and abdominal tergites I–VI nearly always connected into a row (Fig. 41).

Remarks. This species is distinguishable from *R. flavopicta flavopicta* by the more weakly curved occipital carina; and the shape of gastral tergite I, which in this species has longer parallel-sided part and does not rise from the posterior end of the reception of propodeal muscle.

Ropalidia flavobrunnea VAN DER VECHT

VAN DER VECHT (1962) recorded this species from several localities throughout the Philippines. He noted that the specimens showed rather variable color patterns. However, in the present study, three subspecies are recognized based on differences in color pattern, which are apparently correlated with the geographic distribution.

Ropalidia flavobrunnea flavobrunnea VAN DER VECHT

Ropalidia flavopicta flavobrunnea VAN DER VECHT, 1962, Zool. Verh. Rijksmus. Nat. Hist. Leiden, 57: 58–59.

Female. Head distinctly wider than thorax including tegulae, somewhat thick. Gena c. $2/3$ as wide as eye in profile, smoothly widened toward the middle, then slightly narrowed ventrally; occipital carina distinct, slightly thickened ventrally, regularly curved (Fig. 5) Clypeus c. $6/5$ as wide as high. Posterior ocelli smaller than anterior one; distance between the posterior ocelli longer than their diameter, about three times as far from the eye as from each other. Antennal segment III c. $3/7$ as wide as long, IV as wide as long, X c. $3/2$ as wide as long. Eye with fairly sparse, very short, erect hairs.

Pronotum in dorsal view slightly concave laterally, rather strongly expanding posteriorly; pronotal carina complete, regularly curved. Scutellum slightly convex. Dorsal face of propodeum in profile slightly convex, sloping at an angle of about 60° ; median furrow shallow and evanescent in anterior one fourth.

Parallel-sided part of gastral segment I c. $9/5$ as long as wide, widened part somewhat strongly expanding, then becoming parallel-sided again; widest part c. $11/4$ as wide as the base (Fig. 15), and c. $2/5$ as wide as gastral tergite II; tergite in ventral view with sides bearing many outstanding hairs; triangular area of sternite c. $6/5$ as long as wide, posteriorly moderately emarginate, weakly granulate (Fig. 24); tergite in profile rising beyond reception of propodeal muscle, posteriorly depressed toward apex in a nearly straight line, very slightly concave near the apex (Fig. 21). Gastral segment II slightly longer than wide, longer than high; apical lamella distinct but narrow.

Body moderately punctate; punctures flat-bottomed with distinct central pustules. Head generally shiny; frons, eye emargination and vertex slightly duller and moderately punctate; clypeus very sparsely punctate; gena with sparse punctures in dorsal one third. Thorax dull; pronotum, mesoscutum, scutellum and anterior half of metanotum punctate; scutellum and metanotum shining; postero-dorsal area of mesepisternum moderately punctate; propodeum slightly shining, finely striate on dorsal face. Gaster dull, posterior part of tergite I sparsely punctate; segment II moderately punctate.

Color pattern generally agrees with VAN DER VECHT's (1962) description of the type specimen. Clypeus with dark median spot which connected with the base; frontal mark separated from the base of clypeus by a wide dark area; broad band on eye emargination narrowly extending to curved postocellar line, which is intercepted in the middle; occipital carina entirely black, rarely yellow in ventral part. Mesoscutum with reduced lateral yellow band, which is often absent; propodeum yellow with median, rather wide black band from stigma to apical valvule, which is as wide as the base of gastral tergite I, and with lateral band separating yellow markings of propodeum from spots on metapleuron. Gastral tergite I with rather wide apical band, which is incised medially, sometimes narrowly but completely interrupted by a black line, rarely with small spot on each side of the base; sternite I sometimes with small spots on posterolateral corners; apical band on gastral tergite II narrow and well defined, with small subquadrate lobe on each side; sternite with

two large, ill-defined brownish spots near the base and with well-defined narrow apical yellow band.

Male. Like the female, but clypeus entirely yellow, smaller and more rounded, c. 7/6 as wide as high, covered with dense silvery hairs. Eye strongly swollen; gena narrower, c. 2/5 as wide as eye in profile (Fig. 9). Antennal segments III–XIII with tyloids. Frontal mark separated from the base of clypeus by a narrow dark band.

Structure of gastral sternites VII+VIII and genitalia closely resembles that of *R. extrema*.

Length ($H+Th+T_1+T_2$). 7.0–7.5 mm in the female and 7.0 mm in the male.

Specimens examined. LUZON I. Naguilian, Launion: 2 ♀♀, 28. III. 1978, T. T.; 3 ♀♀, 28. III. 1978, C. N.; 3 ♀♀, 28. III. 1978, T.M. Botanical Garden, Los Baños, Laguna: 7 ♀♀, 30. III. 1978, T.T. Bacnotan, Launion: 1 ♀, 15. V. 1980, J.K. NEGROS I. Mambucal: 1 ♀, 2–3. IV. 1979, T. T.; 1 ♂, 2–3. IV. 1979, C. N.

Remarks. Though I have not seen the holotype, all the above specimens well agree with VAN DER VECHT's (1962) description of the darker specimens (holotype and paratypes) from Mindoro I. This species is distinguishable from *R. flavopicta flavopicta* by the regularly curved occipital carina and the shape of gastral tergite I.

***Ropalidia flavobrunnea lapiniga* subsp. nov.**

Female. General morphology as in the nominate subspecies, but slightly different in details: head larger, gena wider in profile, c. 3/4 as wide as eye (Fig. 6); punctures rather shallow; pronotal carina complete but weaker.

Color pattern similar to that of the nominate subspecies, but distinctly different in the following points: dark spot on clypeus usually separated from the base, sometimes narrowly extending to the base; frontal mark separated from the base of clypeus only by a narrow band; band on eye emargination seldom separated from the curved postocellar band, both often completely joined to form a wide band; ventral part of occipital carina yellow. Lateral yellow lines of mesoscutum always present, very often rather wide and distinct; yellow marks on scutellum and metanotum larger; median black line of propodeum narrower, distinctly narrower than the base of gastral tergite I; legs more extensively marked with yellow. Apical band of gastral tergite I wider and only weakly incised medially; basal brown spots on tergite II often connected to form a broad band; apical yellow band wider and ill defined, anterior margin irregular; black part between anterior brown band and apical yellow band sometimes absent; sternite II extensively marked with brownish orange, apical yellow band wider and ill defined.

Male. Much as in the nominate subspecies, but propodeum extensively marked with yellow, median black band narrower; apical band of gastral tergite I wider; legs extensively marked with yellow.

Table 1. Comparison of some measurements among the Philippine forms of *Ropalidia* subgenus *Icarielia*.

Species	Sex	N	HW (mm)	TW (mm)	GW (mm)	ED (mm)	BW (mm)	T ₁ W (mm)	T ₁ L (mm)
<i>leptida</i>	♀	1	2.20	1.85	0.38	0.53	—	0.78	1.72
	♂	1	2.04	1.69	0.25	0.55	—	0.65	1.65
<i>bipartita</i>	♀	1	2.34	2.12	0.46	0.55	0.35	0.85	1.94
	♀	37	2.13	1.74	0.37	0.56	0.27	0.72	1.56
<i>extrema</i>	♀		(2.01-2.23)	(1.56-1.84)	(0.35-0.40)	(0.51-0.59)	(0.25-0.30)	(0.63-0.82)	(1.37-1.85)
	♂	7	2.13	1.82	0.27	0.63	0.28	0.77	1.63
<i>nigrescens</i>	♀		(1.89-2.27)	(1.69-1.88)	(0.24-0.30)	(0.56-0.68)	(0.25-0.32)	(0.68-0.84)	(1.50-1.80)
	♀	82	2.42	2.00	0.48	0.61	0.31	0.92	1.59
<i>flavobrunnea</i>	♂		(2.29-2.55)	(1.85-2.13)	(0.45-0.51)	(0.58-0.66)	(0.28-0.35)	(0.85-1.03)	(1.49-1.70)
	♂	12	2.32	2.02	0.27	0.72	0.31	0.90	1.56
<i>f. lapiniga</i>	♀		(2.23-2.39)	(1.85-2.15)	(0.25-0.30)	(0.68-0.74)	(0.30-0.33)	(0.80-0.96)	(1.43-1.63)
	♀	16	2.28	1.88	0.38	0.60	0.29	0.81	1.49
<i>f. iracunda</i>	♂		(2.00-2.35)	(1.82-1.95)	(0.36-0.40)	(0.56-0.63)	(0.28-0.32)	(0.78-0.85)	(1.41-1.57)
	♂	2	2.15 & 2.23	1.85 & 1.84	0.25 & 0.26	0.63 & 0.68	0.27 & 0.30	0.78 & 0.80	1.35 & 1.49
<i>f. iracunda</i>	♀		2.28	1.78	0.44	0.58	0.29	0.82	1.57
	♀	66	(2.15-2.40)	(1.64-1.94)	(0.40-0.48)	(0.55-0.60)	(0.25-0.32)	(0.74-0.90)	(1.42-1.68)
<i>f. iracunda</i>	♂		2.14	1.66	0.25	0.66	0.27	0.78	1.49
	♂	40	(2.04-2.32)	(1.53-1.82)	(0.23-0.28)	(0.60-0.70)	(0.25-0.30)	(0.70-0.85)	(1.35-1.56)
<i>f. iracunda</i>	♀		2.34	1.85	0.44	0.60	0.29	0.83	1.61
	♀	46	(2.15-2.43)	(1.65-2.00)	(0.38-0.48)	(0.55-0.65)	(0.25-0.30)	(0.75-0.96)	(1.43-1.78)
<i>f. iracunda</i>	♂		2.23	1.79	0.27	0.68	0.29	0.82	1.57
	♂	24	(2.12-2.39)	(1.61-1.96)	(0.25-0.30)	(0.63-0.75)	(0.27-0.33)	(0.70-0.90)	(1.49-1.70)

Values are provided as means, with ranges in parentheses. HW: Head width; TW: thoracic width; GW: gastral width; ED: eye depth; BW: basal width of gastral tergite I; T₁W: width of gastral tergite I; T₁L: length of gastral tergite I (as to the measured parts, see text).

Length ($H+Th+T_1+T_2$). 7.0–7.5 mm in the female and 6.0–7.0 mm in the male.

Holotype: ♀, Palo, Leyte I., 20. III. 1978, J. K. leg. Deposited in the Entomological Institute, Hokkaido University.

Paratypes: Same locality, 1 ♂, 6. III. 1978, J. K.; 1 ♀, 9. III. 1978, J. K.; 2 ♀♀, 25. III. 1978, J. K.; 1 ♀, 27. III. 1978, J. K.; 4 ♂♂, 29. III. 1978, J. K.; 1 ♀, 31. III. 1978, J. K.; 2 ♀♀, 3. IV. 1978, J. K.; 2 ♂♂, 16. VI. 1980, J. K.; 2 ♀♀, 2 ♂♂, 17. VI. 1980, J. K.; 1 ♂, 18. VI. 1980, J. K. Deposited in the Entomological Institute, Hokkaido University; Leiden Museum; Department of Entomology, University of the Philippines; Department of Biology, Ibaraki University.

Other specimens examined. LEYTE I. Palo: 1 ♀ 2 ♂♂, 6. III. 1978, J. K.; 3 ♀♀, 10. III. 1978, J. K.; 2 ♀♀, 20. III. 1978, J. K.; 1 ♀, 22. III. 1978, J. K.; 3 ♀♀, 25. III. 1978, J. K.; 2 ♀♀, 26. III. 1978, J. K.; 3 ♀♀, 27. III. 1978, J. K.; 4 ♂♂, 29. III. 1978, J. K.; 2 ♀♀, 30. III. 1978, J. K.; 1 ♀, 3. IV. 1978, J. K.; 2 ♀♀, 13. VI. 1980, J. K.; 9 ♂♂, 16. VI. 1980, J. K.; 1 ♂, 16. VI. 1980, J. K., from a nest; 2 ♀♀ 10 ♂♂, 17. VI. 1980, J. K.; 2 ♂♂, 18. VI. 1980, J. K.; 2 ♂♂, 23. VI. 1980, J. K. Burauen: 2 ♀♀, 5. III. 1978, J. K. Dulag: 8 ♀♀, 28. III. 1978, J. K. SAMAR I. Mondragon: 50 ♀♀, 6. VI. 1980, J. K., from a nest.

Larval stage. Final instar larva similar to that of *R. extrema*, but dorsal tentorial pit very weak but visible (Fig. 33 a); cranium rather strongly concave posteriorly in profile (Fig. 33 b); postlabium without ventral emargination; denticles on body integument as in *R. nigrescens*.

Remarks. This form slightly differs from the nominate subspecies in some structural characters as described above, but such differences may be due to geographical variation. Therefore, here, this form is treated as a subspecies of *R. flavobrunnea*. The local name of this wasp is "Lapinig."

Ropalidia flavobrunnea iracunda subsp. nov.

Female. General morphology as in the nominate subspecies. Body usually larger than in the other two subspecies. Punctures, pronotal carina and gena in profile as in *R. f. lapiniga*.

Black spot on clypeus often separated from the base; curved postocellar band reduced, often absent, and separated from a band on eye emargination; occipital carina yellow in its ventral part. Lateral bands on mesoscutum much reduced, often absent; marks on thorax as in the nominate subspecies. Gastral tergite I with basal spot on each side, which is rarely absent; apical band wider; sternite I usually with small spot on each posterolateral corner. Color pattern of gastral segment II as in *R. f. lapiniga*, but only one specimen possessed well-defined, narrow apical band.

Male. Much as in the nominate subspecies, but gastral tergite I with basal spot on each side; sternite I often with spot on each posterolateral corner.

Table 2. Comparison of some body proportions among *Ropalidia flavopicta* and related Philippine species formerly considered as belonging to *R. flavopicta*.

Species	Sex	N	HW/TW	GW/ED	T ₁ W/BW	T ₁ L/T ₁ W
<i>flavopicta flavopicta</i>	♀	3	1.26 (1.20–1.31)	0.74 (0.73–0.75)	3.02 (2.69–3.09)	1.55 (1.52–1.58)
<i>bipartita</i>	♀	1	1.10	0.84	2.43	2.28
<i>extrema</i>	♀	37	1.23 (1.17–1.30)	0.66 (0.62–0.71)	2.69 (2.50–3.00)	2.17 (1.97–2.40)
	♂	7	1.17 (1.09–1.22)	0.43 (0.39–0.44)	2.74 (2.62–2.86)	2.13 (2.02–2.35)
<i>nigrescens</i>	♀	82	1.21 (1.17–1.28)	0.78 (0.72–0.83)	2.97 (2.73–3.25)	1.73 (1.64–1.86)
	♂	12	1.15 (1.10–1.21)	0.38 (0.35–0.41)	2.95 (2.69–3.21)	1.73 (1.66–1.79)
<i>flavobrunnea</i>	♀	16	1.21 (1.18–1.26)	0.64 (0.61–0.69)	2.76 (2.58–3.01)	1.83 (1.76–1.94)
<i>flavobrunnea</i>	♂	2	1.19 (1.16–1.22)	0.39 (0.39–0.40)	2.76 (2.65–2.87)	1.80 (1.75–1.86)
<i>flavobrunnea lapiniga</i>	♀	66	1.28 (1.21–1.33)	0.77 (0.69–0.83)	2.85 (2.62–3.04)	1.91 (1.80–2.04)
	♂	40	1.29 (1.22–1.37)	0.39 (0.35–0.42)	2.83 (2.56–3.07)	1.92 (1.78–2.07)
<i>flavobrunnea iracunda</i>	♀	46	1.26 (1.21–1.33)	0.73 (0.67–0.80)	2.91 (2.70–3.27)	1.94 (1.79–2.24)
	♂	24	1.25 (1.18–1.28)	0.40 (0.36–0.42)	2.82 (2.64–3.00)	1.94 (1.76–2.16)

Values are provided as means, with ranges in parentheses. For abbreviations, see Table 1.

Length ($H+Th+T_1+T_2$). 7.0–8.5 mm in the female and 6.5–7.5 mm in the male.

Holotype: ♀, Central Mindanao University, Musuan, Bukidnon, Mindanao I., 29. V. 1980, J. K. leg. Deposited in the Entomological Institute, Hokkaido University.

Paratypes: Same locality, 5 ♂♂, 25. V. 1980, J. K.; 1 ♂, 26. V. 1980, J. K.; 8 ♀♀ 1 ♂, 29. V. 1980, J. K.; 2 ♀♀ 3 ♂♂, 30. V. 1980, J. K. Deposited in the Entomological Institute, Hokkaido University; Leiden Museum; Department of Entomology, University of the Philippines; Department of Biology, Ibaraki University.

Other specimens examined. Same locality, 32 ♀♀ 2 ♂♂, 25. V. 1980, J. K.; 6 ♀♀, 25. V. 1980, J. K., from a nest; 5 ♀♀, 26. V. 1980, J. K.; 28 ♀♀ 2 ♂♂, 29. V. 1980, J. K.; 6 ♀♀, 30. V. 1980, J. K.; 1 ♂, 30. V. 1980, J. K., from a nest.

Larval stage. Final instar larva closely resembles that of *R. f. lapiniga*, but is a little larger.

Remarks. This wasp is very aggressive and, therefore, is named "iracunda" (irascible).

Concluding Remarks

RICHARDS (1978) noted that the subgenus *Icarielia* normally builds a complex of enclosed combs. It is generally accepted that a covered nest has evolved from an uncovered simple nest. It seems likely, because of the complex structure of its covered nest, that the subgenus *Icarielia* has evolved more recently than the subgenus *Icariola* which makes uncovered simple comb(s).

The study on the geographic distribution is, in general, an effective approach to clarify the speciation process. The subgenus *Icarielia* is widely distributed in the Indo-Australian Region, while each species of the subgenus occurs within a relatively restricted area. The Philippines is the northeast boundary of its distribution, and has the *Icarielia* fauna consisting of five species, which are restricted to the Philippines. Though the present survey does not cover all the Philippine Islands, at present the following comments can be made on the distribution of the Philippine *Icarielia*: 1) Both *R. lepida* and *R. bipartita* are quite rare and probably restricted to Luzon I.; 2) *R. nigrescens* is confined to but rather abundant in the lowland of Luzon I.; 3) *R. extrema* occurs both in Luzon and Negros Is., but may not yet spread to Samar, Leyte, Mindanao and Palawan Is.; and 4) *R. flavobrunnea* occurs throughout the Philippines excepting Palawan I. The last species is much abundant and successful in Samar, Leyte and Mindanao Is., where other *Icarielia* species are probably absent. Furthermore, no species belonging to the subgenus *Icarielia* has so far been recorded from Palawan and Sulu Is. Intensive survey on these areas will provide the clue for the relationship between Philippine and other Indo-Australian species of the *Icarielia*.

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References

- RICHARDS, O. W., 1978. The Australian social wasps (Hymenoptera: Vespidae). *Aust. J. Zool.*, Suppl. Ser., **61**: 1-132.
- VECHT, J. VAN DER, 1962. The Indo-Australian species of the genus *Ropalidia* (*Icaria*) (Hymenoptera, Vespidae) (Second part). *Zool. Verh. Rijksmus. Nat. Hist. Leiden*, **57**: 1-72, 8 pls.