REVISION OF SOME ORIENTAL ANTHOPHORINE BEES OF THE GENUS AMEGILLA FRIESE (HYMENOPTERA, APOIDEA)

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SUMMARY OF CONTENTS

Anticipating a revision of the genera and subgenera of the tribe Anthophorini, a number of south-east Asiatic species previously included in *Anthophora* Latreille, are transferred by the author to *Amegilla* Friese. The types were studied of *Anthophora villosula* F. Smith, and of 19 valid and 3 invalid species of *Amegilla* (i.e., of all species discussed, except that of *himalajensis* Radoszkowski), and a key to their identification is included. The following new species are described: *A. proboscidea,* ♀ (Simalur I.), *sumatrana,* ♂ ♀ (Sumatra), *pagdeni,* ♂ ♀ (Malaya), and *leptocoma,* ♂ ♀ (Siam & Malaya). Re-descriptions of both sexes and figures are given of *A. insularis* (F. Smith), *himalajensis* (Radoszkowski), *florea* (F. Smith), and *urens* (Cockerell). Apart from the specific descriptions, notes and records are provided concerning geographical distribution, new localities, and the identity of plants visited. The following cases of synonymy are established:

A. fulvohirta Meade-Waldo, 1914 (= *insularis* F. Smith, 1858)
A. proserpina Gribodo, 1893 (= *himalajensis* Radoszkowski, 1882)
A. pahangensis Meade-Waldo, 1914 (= *himalajensis* Radoszkowski, 1882)
A. pahangensis Cockerell, 1927 (= *pendleburyi* Cockerell, 1929)
A. anthreptes Lieftinck, 1944 (= *pendleburyi* Cockerell, 1929)
Anthophora villosula auct., nec F. Smith, 1854 (= *Amegilla* spec. diff.)
Anthophora soror J. Pérez, 1905 (= *Anthophora villosula* F. Smith, 1854)
Anthophora pingshiangensis Strand, 1913 (= *Anthophora villosula* F. Smith, 1854)

As an incentive to further work I have, in 1944, published an article entitled "Some Malaysian bees of the family Anthophoridae", which was presented mainly in order to facilitate the identification of a number of previously unknown or imperfectly described bees of the genera *Anthophora* Latr. (sens.lat.), *Habropoda* F. Smith, and the Melectine parasite of the latter, *Callomelecta* Ckll. Since then, more material of these genera has come to hand, including many palaearctic and south-east Asiatic forms; and, after an examination of a number of types in the British Museum collection, it became evident that all regional species formerly assigned to *Habropoda* and *Anthophora* can no longer be included in these genera. The result has been that a new genus will be necessary for the reception of the regional members of *Habropoda,* whilst all forms previously included in *Anthophora* should be transferred to *Amegilla* Friese, 1897 (genotype: *Apis quadrifas-*

ciata Villers, 1789). Anticipating an analysis of the very heterogeneous complex of genera still amalgamated in *Anthophora* by most writers, I have merely taken the present opportunity to transfer all species just mentioned, as well as all others discussed in this paper, to *Amegilla*. This genus proved only too poorly characterized and therefore will be re-defined, it is hoped, along with some allied genera and subgenera, in a forthcoming article to be published in the near future.

Amegilla can be split up into a number of groups, or subgenera, and these again into several sections. Very little is yet known of the affinities and the geographical distribution of these subgenera, and less still of their sectional units. The discovery of more species will probably prove that several subgroups can be recognized, as is suggested already by the material dealt with here; but in the present state of our knowledge it seems hardly possible to establish well-defined "alliances" as the characters exhibited have been so differently allotted and are often shared in such a haphazard way, that one is forced to the conclusion that any divisional treatment must wait until many more Old World species can be investigated in the same way. The mutual relationship of the species discussed in this paper is reflected by the sequence chosen of the specific treatments rather than by the preceding key, which is a purely artificial one and is based mainly on secondary characters, such as colour and pubescence.

The present paper deals essentially with the fauna of the Malaysian subregion, species from other parts of eastern Asia being discussed only when necessary. It follows that the entire region east of "Wallace's Line" has been left out of consideration, chiefly for lack of sufficient material. All members of *Amegilla* are included which do not belong to the so-called "blue-banded bees" of the *zonata* L. alliance. This is an assemblage of highly specialized bees which contains also the nearly related group of brown-banded species, of which *flammeozonata* Dours appears to be one of the first described species. I have also excluded *Anthophora cingulifera* Ckll. and a few allied forms, whose resemblance to the *zonata* alliance is only superficial. It is my hope to deal with these groups separately on a later occasion, along with other species-groups of more remote affinity.

The present descriptions and notes should be read side by side with my previous article, for although the existing literature and synonymy have been quoted in every instance, I have not repeated the descriptions of several species discussed earlier. As in my former paper I have used Ridgway's nomenclature in denominating colours. Except for the key, which comprises all species known to me at present, descriptions are confined to the fresh material before me.

Leaving aside the two Chinese members, *florea* and *urens*, all species are purely Malaysian and are not likely to occur outside their known range, except of course the Malayan species *himalajensis* and its smaller replica *leptocoma*, which are probably both of them spread over the southern parts of the Asiatic mainland as well. Assuming that many species still await discovery, we may look forward to a greater number of endemic forms than we know at present. As was to be expected, the highest number of endemic species is found in Java (including Bali), all three known species being peculiar to this island, indicating its long isolation. The paucity of the Javan fauna as compared with that of Sumatra is also decidedly striking. Of the eight Sumatran species, four occur in the Malay Peninsula as well, but only two of these have reached Borneo, these being the only species yet known from this large island. We may safely assume that expert collecting especially in the mountain districts of Borneo will result in the discovery of at least as many species as are now known from Sumatra.

We are much better informed about the altitudinal range of our species as most collectors have taken pains to notify the elevation above the sea when making their captures. A summary of our knowledge of the zonal distribution is given in the last column of the accompanying table:

Species	Siam	Malaya	Sumatra	Simalur	Borneo	Bangka	Anambas	Java	Bali	China	Formosa	altitude in metres
hanitschi		+	+									600-1500
amymone			+									1400
bouwmani			+									2100
insularis		+	+		+	+	+					0-900
himalajensis	+	+										0-1100
pendleburyi	+	+	+		+							0-1100
elephas		+	+									0-900
proboscidea				+								sea-level
feronia								+				0-800
cyrtandrae								+	+			700-1900
jacobi								+				0-900
sumatrana			+									950-1400
cinnyris			+									450-600
pagdeni	+											0-1100
leptocoma	+	+										1000-2000
florea										+		250-1500
urens											+	unknown
Total	4	6	8	1	2	1	1	3	1	—	—	

It was considered advisable to record the names of plants visited by the species obtained, and whenever available I have added field notes on their

behaviour. For an enumeration of the various flowering plants frequented by species of *Amegilla* collected in Java and Sumatra, the reader is referred to my survey appended to the first part of T. Rayment's article "A critical revision of species in the *zonata* group of *Anthophora* by new characters", published in Treubia, hors serie, 1944, p. 19-20. This list includes the names of 51 plant genera belonging to 22 families (about 70 species).

In addition to the collections of the Selangor Museum, the Museum Zoologicum at Bogor, and of myself, I have been able to examine also valuable material from other sources. I am especially indebted to Mr. H. T. Pagden, now in Penang, for the privilege of studying his own Malayan collection of these bees, which proved without exception of outstanding quality and of great interest on account of the flower records attached to them. My best thanks are also due to Prof. Tsing-chao Maa, of Taipeh (Formosa), for his kindness so send me on loan, many years ago, the whole of his pre-war collection of Anthophorini obtained by him in Fukien, China.

Unless stated otherwise, the following abbreviations have been used in citing museum specimens studied:

BM	British Museum (Natural History), London
MCG	Museo Civico di Storia Naturale, Genoa
ML	Rijksmuseum van Natuurlijke Historie, Leiden
MZB	Museum Zoologicum Bogoriense, Bogor (Java)
OUM	Oxford University Museum, Oxford
SM	Sarawak Museum, Kuching (Sarawak)

KEY TO THE SPECIES

1. Males 2
— Females 14
2. Body-length 19 mm or more. First three metasomal terga basally clothed with black tomentum and carrying well-defined fulvous pubescent fasciae along posterior margin. Face strongly protuberant . . . . . *elephas*
— Body-length not exceeding 18 mm 3
3. Legs mainly pale-coloured, at least the tibiae ochraceous-tawny to orange-rufous. Posterior border of abdominal terga broadly orangish or light brown, accentuating the pubescence. Hair on the outside of basitarsus III not black. Face strongly protuberant; dark clypeal marks dark reddish-brown to black 4
— Legs darker, brown or black (except *insularis*: tibae I and II orangish exteriorly). Posterior border of abdominal terga darker, hardly showing through the pubescence. Hair on the outside of basitarsus III at least partly black. Face less strongly protuberant; dark clypeal marks usually deep black 5
4. Surface of metasomal terga 1-5 shiny, clothed with short black tomentum and with more or less interrupted, transverse, brown hair-bands along posterior margin, the anterior limit of these bands indistinct. Basitarsus III dark brown, with the hairs on the inside also dark brown . . . . . *feronia*
— Surface of metasomal terga 1-5 dull, evenly and densely clothed with short, ochra-

ceous-tawny or orange-brown tomentum. Legs entirely pale-coloured, basitarsus III but slightly darker brown, including the hairs on the inside of it . . *pendleburyi*

5. First four metasomal terga lacking complete, contrasting, pale pubescent fasciae along posterior margin 6

— First three or four metasomal terga at least basally covered with dark pubescence and usually carrying complete and well-defined pale pubescent fasciae, variable in width, along posterior margin 12

6. Abdomen above evenly clothed with short emerald- or biscay-green tomentum *hanitschi*

— Pubescence of abdomen not green 7

7. Hair on first two metasomal terga predominantly black or very dark brown. 8

— Hair on first two metasomal terga at least partly fulvous 9

8. Clypeus yellow, carrying a pair of approximated, sub-rectangular black basal patches. Pubescence of thorax rich orange-rufous. Abdomen mainly black-haired, terga 2-4 with narrow interrupted white hair-bands along posterior margin . *jacobi*

— Clypeus ivory-white with a black basal stripe, but lacking approximated sub-rectangular marks of that colour. Pubescence of thorax black or very dark brown. First three metasomal terga black-haired, the pubescence on apical segments apricot-orange. . . . . *amymone*

9. Dark marks on clypeus orangish or chestnut-coloured, usually not very sharply defined and never deep black. At least the three basal antennal segments orange or red brown anteriorly, the scape yellow in front. Dorsal pubescence of thorax bright orange-rufous, without admixture of black hairs. First two metasomal terga (occasionally also the sides of the third) partly or wholly covered with fulvous tomentum, the remaining terga black-haired. Outer surface of basitarsus III black-haired *himalajensis*

— Dark marks on clypeus sharply defined black. Light-coloured dorsal pubescence of thorax with black hairs intermixed 10

10. Dorsal tomentum of abdomen brighter than in the next two species, deep mars yellow to xanthine orange, covering metasomal terga 1-5, hair on remaining terga deep black. Face less protuberant, facial depth shorter than diameter of eye. Tarsus III black-haired save a small tuft of fulvous on the outside at base of basitarsus. Apex of ninth sternum tapering to a point (fig. 9) . . . . *insularis*

— Dorsal tomentum of abdomen zinc orange. Face a little more protuberant, facial depth about equal to diameter of eye. Apex of ninth sternum emarginate . 11

11. Light face marks maize yellow or buff yellow. Third and fourth metasomal terga partly, the succeeding terga entirely, covered with black tomentum. Apex of ninth sternum with a deep U-shaped incision (fig. 25) . . . . . *pagdeni*

— Light face marks ivory yellow. Metasomal terga 1-5 entirely clothed with orangish pubescence, the sixth and seventh (occasionally also part of the fifth) black-haired. Apex of ninth sternum shallowly emarginate . . . . . *cinnyris*

12. Dorsal pubescence of thorax mostly ochraceous-orange, long and rather tufty, with numerous black hairs intermixed. Light tomentum on disk of first two metasomal terga long and not silky; at least the first four terga with pale-coloured hair-bands along posterior margin 13

— Dorsal pubescence of thorax deeper in tint, tending to xanthine-orange, shorter, denser, and rather velvety, with a scanty admixture of black hairs. Light tomentum on disk of first two metasomal terga very short and silky, on the succeeding segments mainly black; at least the first two terga with traces of narrow pale brown or yellowish hair-lines along posterior margin, those on 1-2 ill-defined anteriorly. (For further characters see p. 40) . . . . . *florea, leptocoma* and *urens*

13. Only the basal portions of first three or four metasomal terga clothed with short black tomentum: these segments carrying complete, broad apical bands of longer

ochraceous-orange pubescence, which are ill-defined anteriorly. Outer surface of basitarsus III with many fulvous hairs intermixed . . . . . *cyrtandrae*

— All metasomal terga clothed with short black tomentum, the first moreover with lateral tufts of longish brown hairs and a narrow marginal fringe of white, second to fourth with scarcely wider but clear-cut whitish hair-bands along posterior margin of each. Outer surface of basitarsus III black-haired. *sumatrana*

14. Body-length 21 mm or more 15

— Body-length not exceeding 19 mm. 16

15. Pale face-marks cinnamon-rufous; dark clypeal marks brown, not clearly defined anteriorly. Black tomentum on abdomen covering almost the entire surface of metasomal terga 1-5, except complete and very narrow ochraceous-orange hair-bands along posterior border of 1-4 and an apical fringe of ferruginous hairs on 5 . *proboscidea*

— Pale face-marks lemon-chrome; dark clypeal marks sharply defined brownish-black or black. Black tomentum on abdominal terga more restricted, 1-4 carrying very conspicuous, transverse apical fasciae of light orange-yellow tomentum, terga 5 and 6 entirely of that colour . . . . . *elephas*

16. Abdomen above evenly clothed with short emerald- or golden-green tomentum. Labrum black basally and down the centre. Clypeus black with T-shaped yellow mark on the middle. Pubescence on outer surface of tibia. III black anteriorly, orange posteriorly . . . . . *hanitschi*

— Pubescence of abdomen not green 17

17. Face for the most part black, clypeus with pale-coloured mark down the centre, which is widest anteriorly. Scopal hairs bright orange-rufous. Pubescence of abdomen rather long and at least partly erect and tufty 18

— Face not black: either orangish, yellow, or ivory-white; clypeus marked with a pair of closely approximated, sub-rectangular, reddish to black patches on either side of the light median line. Pubescence of abdomen short and recumbent 19

18. Head, thorax, and abdomen clothed with fuscous-black pubescence. First four metasomal terga black, their posterior margins thickly fringed with fuscous-black pubescence, that on the terminal segments bright ferruginous. Body-length 17, expanse 30 mm . . . . . *amymone*

— Pubescence lighter, that on dorsum of head and thorax ochraceous-buff with many black hairs intermixed. First four metasomal terga for the greater part black, but the first russet in distal half and the next three terga with broad ochraceous posterior borders distinctly showing through the pubescence; this blackish-brown mixed with light brown on the disk of first two terga, yellow-ocher and band-like along posterior borders of 2-4; pubescence of terminal segments dense, gradually changing to orange-chrome. Body-length 15, expanse 27 mm . . . *bouwmani*

19. Dark areas on clypeus reddish-brown (or even orange-rufous) on a lighter background, these colours not strongly contrasting. Legs dark red-brown to almost black, except tibia I and II, which are lighter in colour. Dorsal pubescence of thorax bright orange-rufous without admixture of black hairs. First two metasomal terga (occasionally also the third) partly or wholly covered with fulvous tomentum, the remaining terga black-haired. Outer surface of basitarsus III almost entirely black-haired . . . . . *himalajensis*

— Dark areas on clypeus deep brown or black on a yellow or ivory-white background, hence clearly discernible and contrasting. Light-coloured pubescence on dorsum of thorax at least sparsely intermixed with black hairs 20

20. Legs mainly pale-coloured, at least the tibiae ochraceous-tawny to orange-rufous. Posterior border of abdominal terga broadly orangish or light brown, accentuating the pubescence. Hair on the outside of basitarsus III not black. Face strongly protuberant; dark clypeal marks occasionally ill-limited anteriorly; paraocular area,

almost as far upwards as fronto-clypeal suture, yellow, and only a fine orbital line black 21

— Legs black or very dark brown, at most the tibiae I and II orangish exteriorly. Posterior border of abdominal terga darker, hardly showing through the pubescence. Hair on the outside of basitarsus III at least partly black. Face less strongly protuberant; dark clypeal marks sharply defined deep black; paraocular area for the greater part black, light colour reduced to a yellow streak along epistomal suture 22

21. Disk of metasomal terga 2 and 3 mainly clothed with short black tomentum, the rest of the surface covered with fulvous pubescence, densest and most conspicuous laterally and towards posterior margin so as to form apical hair-bands, ill-defined anteriorly. Dorsal pubescence of thorax bright orange-rufous, sparsely intermixed with black. Legs mainly salmon-orange to orange-rufous, basitarsus III dark brown; pubescence throughout ochraceous-orange, except here and there along inner surface of posterior leg . . . . . *feronia*

— Disk of first five metasomal terga lacking dark tomentum, the whole surface evenly clothed with short ochraceous-tawny hairs, densest and most conspicuous laterally and towards posterior margin, but not forming transverse apical bands. Dorsal pubescence of thorax ochraceous-buff with numerous black hairs intermixed. Legs paler, mainly ochraceous-tawny, the pubescence likewise less brightly coloured. *pendleburyi*

22. At least the first three metasomal terga uniformly clothed with light-coloured tomentum almost completely concealing the surface, this coating not or only sparsely intermixed with few erect black hairs 23

— At most the first two metasomal terga entirely clothed with light-coloured tomentum, usually the disk of 2 in the centre, and at least the basal portions of all succeeding terga covered with black hairs; first four terga often with pale-coloured hair-bands along posterior margin 25

23. Size larger, body 15.0-17.5 mm. Face less protuberant, facial depth less than diameter of eye. Light face-marks ivory-yellow. Scape of antenna often with orangish anterior spot. Dorsal pubescence of thorax less bright than that of abdomen, mesoscutum with rather abundant admixture of black hairs. Posterior border of first four metasomal terga brown, these terga entirely clothed with bright xanthine-orange tomentum, longest and densest along posterior border; remaining terga black-haired . . . . . *insularis*

— Size smaller, body 14.0-15.0 mm. Face slightly more protuberant, facial depth about equal to diameter of eye. Scape of antenna never orangish anteriorly. Dorsal pubescence of thorax and abdomen ochraceous-orange to zinc orange, that on mesoscutum with scanty admixture of black hairs. Posterior border of first four metasomal terga black; pubescence on first three or four terga light-coloured, the succeeding terga at least partly black-haired 24

24. Light face marks maize yellow or buff yellow. Basal 2/3 or 3/5 of fourth metasomal tergum black-haired, posterior part with broadly interrupted apical fascia of dense ochraceous-buff tomentum; remaining terga black-haired . . *pagdeni*

— Light face marks ivory-yellow. First four metasomal terga evenly clothed with ochraceous-orange tomentum, densest and longest along posterior border; remaining terga black-haired . . . . . *cinnyris*

25. First four metasomal terga carrying complete, broad apical bands of ochraceous-orange tomentum, which are not very sharply defined anteriorly, only the basal portions of these segments black-haired above. Dorsal pubescence of thorax ochraceous-orange, with many black hairs intermixed. Hair on the outside of basitarsus III mainly ochraceous-orange . . . . . *cyrtandrae*

— No complete pubescent apical bands on all four basal abdominal terga, or, if at all complete, then very narrow and abdomen predominantly black-haired . . 26

26. Abdomen, including the first two metasomal terga, covered with short, deep black tomentum, 1-4 or only 3-4 with narrow, complete or interrupted, but sharply defined, whitish hair-bands along posterior margin. Dorsal pubescence of thorax with many black hairs intermixed 27

— Abdomen at least with the first two metasomal terga partly clothed with short, appressed and silky, ochraceous tomentum, and in addition with narrow pale brown or yellowish hair-lines along posterior margin, widest laterally but ill-defined anteriorly. Dorsal pubescence of thorax either with scanty admixture of black hairs or throughout xanthine-orange.
(For further characters, see p. 40) . . . . . *florea, leptocoma,* and ***urens***

27. First four metasomal terga with complete, though narrow, whitish hair-bands along posterior margin. Basitarsus III on the outside black-haired, except a small tuft of cinnamon hairs along dorsal ridge at base . . . . . ***sumatrana***

— Only metasomal terga 2-4 with interrupted white hair-bands along posterior margin, those on 2 and 3 very narrow and restricted to the sides, that on 4 wider than the preceding ones and narrowly interrupted in the middle. Basitarsus III on the outside orange-rufous in basal half, black in distal half, the boundary-line diagonal and well-marked . . . . . *jacobi*

Amegilla hanitschi (Meade-Waldo)

1914. Meade-Waldo, Ann. Mag. Nat. Hist., ser. 8, vol. 13, p. 45 (key ♀), 52. — ♀ Perak (*Anthophora*).

1929. Dover, Bull. Raffles Mus., vol. 2, p. 56: Malay records (*Anthophora*).

1944. Lieftinck, Treubia, hors série, p. 96 & 100 (key ♂ ♀), 105-109, figs. 32-37 (♂ structures). — ♂ ♀ S. Sumatra (*Anthophora*).

I have recently compared some specimens which I had captured in South Sumatra with the type of *hanitschi* in the British Museum, along with other Malayan individuals, formerly belonging to the F.M.S. Museum at Kuala Lumpur. No differences were found between the females from these widely separated localities, and there can be no doubt that all belong to the same species.

Curiously enough, the sternal plates and genitalia of the male strongly recall those of *amymone* (Bingham), discussed hereafter; though, in other respects, structurally as well as in regard to the pubescence, the two species are so very different that I can hardly believe that they are at all related. Both are extremely swift-flying and wary insects which are difficult to secure, but their behaviour is very different. Whereas *hanitschi* is decidedly a sun-loving insect, favouring jungle verges and visiting the highest flowers during bright sunshine, *amymone* was found only in dense forest, visiting the flowers of low hygrophilous plants.

Amegilla bouwmani (Lieftinck)

1944. Lieftinck, Treubia, hors série, p. 100 (key ♀), 103-105. — ♀ S. Sumatra (*Anthophora*).

A mountain species, like the next probably confined to the island Sumatra.

The female and only specimen known resembles that of *amymone* fairly closely in texture and colour of the body, but the pubescence is much lighter. The male of *bouwmani* is unknown.

Amegilla amymone (Bingham) (figs. 1-5)

1896. Bingham, J. Bombay Nat. Hist. Soc., vol. 10, p. 196, pl. 1 fig. 2 (♀ insect). — ♀ N. E. Sumatra (*Anthophora*).

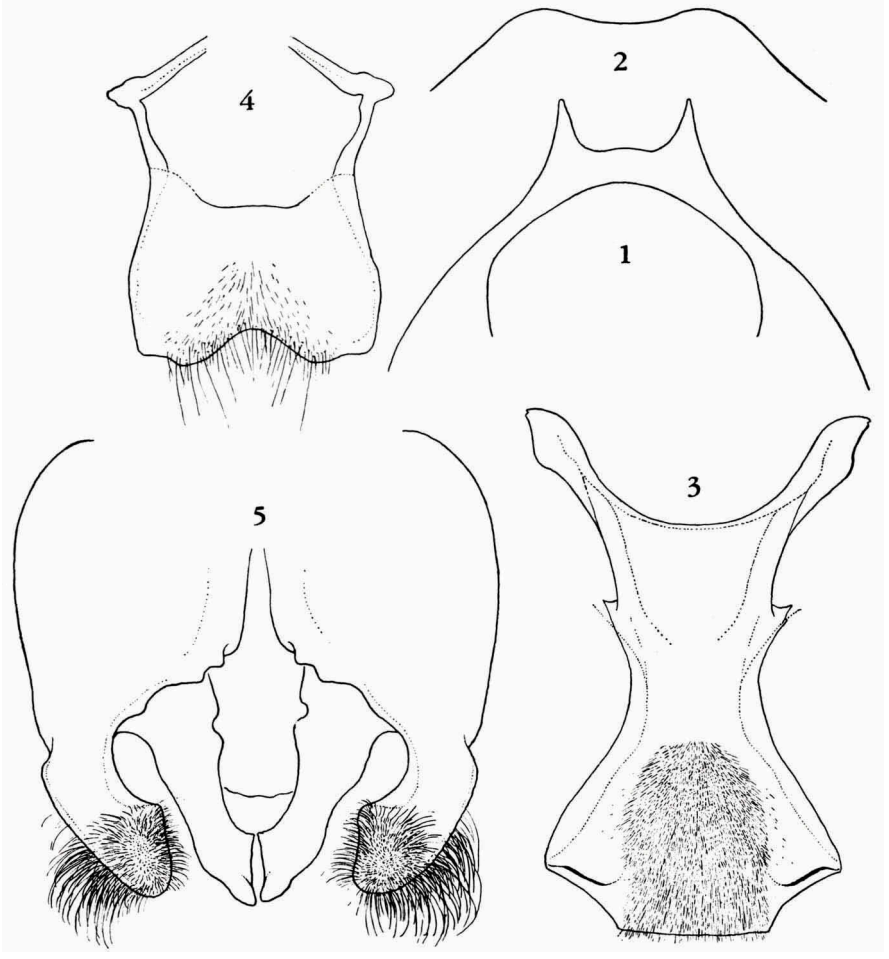
Type material. — 1 ♀, N. E. Sumatra, Deli, leg. L. Martin, "*martini* Bingham", holotype *amymone* Bingham (BM, type coll., no. 17B. 643). Further specimens studied. — 4 ♂, N. E. Sumatra, Deli, Berastagi, 1400 m, 7-14.xi.1950, on flowers of *Impatiens* cf. *oncidioides* in virgin forest, M. A. Lieftinck (MZB).

A very darkly coloured, rather long-haired species, the male with thin slender legs, large wings, and a short, strongly pointed abdomen.

Male. — Structure. Labrum equal in length to clypeus, of the ordinary sub-rectangular shape, a little wider than long, its lateral angles rounded, anterior border gently convex; surface finely reticulate, rather densely but superficially punctate, the basal tubercles and a narrow area along apical margin without punctures. Mandibles smooth on the outside, with a few scattered punctures half-way their length. Malar space well-developed, impunctate. Clypeus protuberant, facial depth a trifle greater than diameter of eye; surface finely reticulate and very superficially and sparsely punctate except along base, where the punctures are deeper and larger than the interspaces; usually no distinct longitudinal carina, but the median area smooth and hairless. Paraocular and supraclypeal surface similarly punctate as basal area of clypeus. Frontal line distinct. Vertex and supra-antennal area rather shiny, densely punctate, the punctures smaller than the interspaces. Antennae rather long, reaching tegulae; third segment strongly clavate, its width at apex twice as much as a little beyond the base, as long as the next two segments and the basal half of sixth united; fourth segment only little shorter than fifth. Thorax evenly and densely punctate, integument rather shiny, especially on middle of mesoscutum where the surface shows through the pubescence and where the interspaces are wider than the punctures; no smooth areas on either side of the median carina of scutellum; tegulae dull, impunctate. Wings large, costal side of second submarginal cell exceptionally short, only one-third or less of the anal side; first *m-cu* entering anal side of second submarginal cell a little beyond its middle. Membrane greyish-yellow, veins dark brown. Legs comparatively thin and slender, posterior basitarsus parallel-sided, its upper border slightly convex; no further peculiarities.

Abdomen small, widest across apical border of 2nd metasomal segment,

and from here strongly tapered towards apex. All segments finely, densely, but superficially punctate, the punctures smaller than the interspaces and the integument distinctly showing through the pubescence. Apex of 8th tergum (fig. 1). Sternal plates not modified; apical margin of 6th sternum



Figs. 1-5. *Amegilla amymone* (Bingham), ♂ allotype, N.E. Sumatra. Fig. 1, eighth tergum. Fig. 2, apex of seventh sternum. Fig. 3, eighth sternum. Fig. 4, ninth sternum. Fig. 5, genitalia. All structures in ventral aspect.

very slightly concave on middle, the 7th more distinctly emarginate (fig. 2); apex of 8th sternum with a tiny, prominent, transverse submarginal ridge on each side of the middle, the surface of the median area densely clothed with minute appressed pale-coloured hairs, the apical margin invisible under the pubescence (fig. 3); 9th sternum deeply emarginate (fig. 4).

Ground-colour of head and mesosoma deep black. Labrum and clypeus for the greater part ivory-yellow. Labrum with a dark line along anterior margin and a thick basal stripe which is produced on each side to include also the tubercles. Mandibles bright yellow exteriorly, the apices reddish-brown. Clypeus with a thick black stripe on either side along full length of epistomal suture, the inner borders of these stripes ordinarily meeting at one point at base just anterior to the fronto-clypeal suture and carrying a pair of short black forward prolongations, parallel to one another and extending anterad to about two-fifths the length of clypeus. Frons carrying a small, triangular, median supra-clypeal spot of yellow. Paraocular area black with a more or less L-shaped yellow mark along the eye-margin, the apex of this spot hooked inwards and swollen, touching epistomal suture. Antennae with the first four segments black, or very dark brown, scape ivory-yellow anteriorly; flagellar segments with their anterior faces brown, posteriorly almost black. Legs very dark reddish-brown to almost black; tarsi I and sometimes also II reddish-brown; tibial spurs, and claws apically, black. Abdomen with the first three metasomal terga jet-black, the downfolded portions brownish-black; fourth tergum with the basal one-third black, the remainder rufous (apricot-orange); exposed portions of succeeding terga apricot-orange, except the fifth which is sometimes indistinctly blackish along base. Sterna generally a little lighter in colour, dark brown growing to orange-brown apically.

Pubescence. Labrum and mandibles covered with few recumbent silvery yellow or white hairs, the marginal hairs on mandibles very long and beard-like. Pubescence on underside of head and lower part of genal area long and dense, almost pure white, further upwards gradually replaced by long brownish-black hairs which cover the entire upper surface of the head, hiding most of the surface. Clypeus with few, paraocular area with numerous long, sub-erect, arcuate black hairs. Dorsal pubescence of thorax long and dense, blackish-brown or black, concealing most of the surface except on middle of mesoscutum, longest and tufty behind tegulae, on postscutellum and propodeum; pleurae dark grey-brown, sometimes more yellowish-brown, the hairs on the lower surface longest and palest. Pubescence of anterior legs, especially on coxae, trochanters, and underside of femora, long, greyish-yellow, that on the remaining parts short and scanty, pinkish-cinnamon; hairs on femora II much shorter and also darker, appressed hairs on tibiae and tarsi short and dark on the inside, orange-cinnamon on the outer surface; pubescence of posterior legs not very dense and also shorter than usual, very dark brown on the inside, throughout orange-cinnamon to apricot-orange exteriorly, this colour most conspicuous along dorsal ridge of tibia and basitarsus. Dorsal pubescence of abdomen sub-erect, rather long

and scanty, the surface showing through on all segments except at sides of first metasomal tergum; colour black, or very dark brownish-black on first three segments and basal third of fourth tergum, apricot-orange on the succeeding segments on which the hairs are longest. Venter with short and sparse appressed marginal pubescence on basal sterna, the appressed apricot-orange hairs on succeeding segments longer and more crowded together, forming fairly distinct marginal bands, exposed portions of seventh and eighth sterna entirely of that colour.

Body-length 12.5-13.0, expanse 23.0-23.8, greatest width of abdomen 5.0, anterior wing 9.6-10.2 mm.

Except *bouwmani,* this remarkable species has no near allies in the Malaysian subregion. Both species are characterized by their longer pubescence, suggesting some members of *Anthophora* more closely than do the other species of *Amegilla.* Also the dimorphism of the sexes is a noteworthy feature.

The male produces a high shrill note during flight, somewhat reminiscent of that of *Habropoda impatiens* Lieft., with which it occurred together in the deep forest. It is the swiftest species I have ever encountered.

Amegilla insularis (F. Smith) (figs. 6-10)

1858. Smith, J. Proc. Linn. Soc. London, Zool., vol. 2, p. 48-49. — ♀ N. W. Borneo, Sarawak (*Anthophora*).
1914. Meade-Waldo, Ann. Mag. Nat. Hist., ser. 8, vol. 13, p. 46 (key), 51-52. — ♀ ♂ Singapore; Johore; N. Borneo (*Anthophora fulvohirta*).
1925. Cockerell, Ann. Mag. Nat. Hist., ser. 9, vol. 15, p. 490 (key) (*Anthophora).*
1925. Cockerell, Ibid., ser. 9, vol. 16, p. 421 (note on type) (*Anthophora*).
1927. Cockerell, Ibid., ser. 9, vol. 20, p. 531-532 (comparative notes, ♀ Singapore; *fulvohirta* probably the same as *insularis*) (*Anthophora*).
1929. Dover, Bull. Raffles Mus., vol. 2, p. 56 (locality records) (*Anthophora fulvohirta*).
1944. Lieftinck, Treubia, hors série, p. 126 (notes) (*Anthophora*).

Type material. — 1 ♀, with round white label "SAR" [awak], and "*Anthophora insularis* Smith", in F. Smith's hand, holotype *insularis* F. Smith (OUM, type collection). 1 ♀, Singapore, leg. H. N. Ridley, holotype *fulvohirta* Meade-Waldo (BM, type collection, no. 17B.649). Further specimens examined. — Malaya (both sexes): Negri Sembilan, Gunong Angsi, 2000-2790 ft., iv.1918; Kuala Lumpur, near Gardens, 29.ix.1923 and 3.x.1933, leg. H. M. Pendlebury; Johore, Kota Tinggi, viii.1917 (BM and MZB). 1 ♀, Pahang, Ginting Simpah, 2000 ft., 21.ix.1947, leg. H. T. Pagden, no. 01073 (coll. Pagden). Sumatra: 3 ♂, N. E. Sumatra, Deli, Sibolangit, 450 m, 16-17. xi. 1950, on flowers of *Donax canniformis,* leg. M. A. Lieftinck (MZB). 1 ♀, W. Sumatra, Benkulen, 19-21.v.1935, leg. M. E. Walsh (coll. v.d. Vecht). Anambas Is. (South China Sea): 1 ♀, Anambas

Is., Pulu Lemaja, Lebong, leg. F. N. Chasen (ex F. M. S. Mus., MZB). Bangka I.: Banca, leg. van den Bossche (ML). Borneo: 2 ♀, N. W. Borneo, Sarawak, Trusan, viii.1900; 1 ♀, id., Kuching, 27.ii.1897, *A. insularis* Sm., det. P. Cameron; 1 ♀, id., Ulu Lawas, ix.1909 (SM and MZB). 1 ♂, 1 ♀, E. Borneo, Sangkulirang distr., Sampajan, 1937, leg. Mrs. M. E. Walsh (coll. v.d. Vecht). A series of both sexes, E. Borneo, 50 m, Balikpapan, Mentawir River, x.1950, leg. A. M. R. Wegner (MZB). 4 ♀, S. Borneo, Sampit distr., Pemantan, 50-100 m, ult.vii.1953, on flowers of *Alpinia romburghiana* Val., leg. M. A. Lieftinck (MZB).

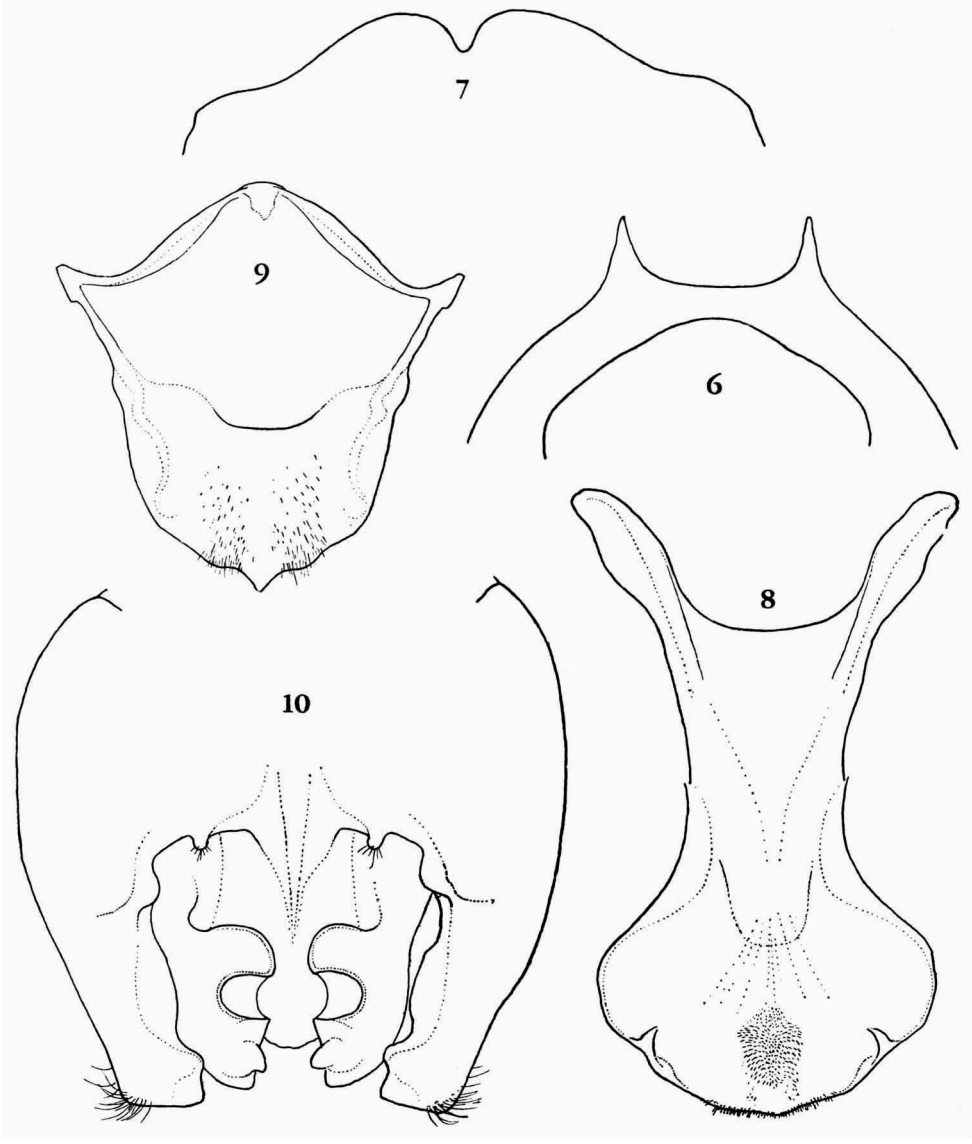
Superficially very similar to *cinnyris* Lieft. and *pagdeni*, sp.n., but averages larger in size and has a wider head; it is also more compactly built and more vividly coloured than these species.

Male. — Structurally not different from *cinnyris* and allies, labrum and clypeus of approximately the same shape but face less protuberant, facial depth distinctly less than diameter of eye. Third antennal segment a trifle longer than in *cinnyris*, but shorter than the next three segments united. Sculpture of body, shape of legs, and neuration of wings without peculiarities. Abdomen shaped similarly to the allied species, except that the basal terga are more strongly convex. Apical margin of 6th sternum very shallowly emarginate on middle; outline of posterior border of 7th sternum more characteristic: apex more or less bilobate and deeply notched (fig. 7), distal two-thirds of the exposed portion swollen and impunctate on middle without forming a distinct longitudinal keel. Eighth and 9th sterna also somewhat deviating from the normal shape; apex of 8th with strong outward convexity on the middle, the surface of which is closely beset with minute denticles, the marginal ridge on each side of it short but well pronounced (fig. 8); 9th sternum relatively broad, evenly and strongly narrowed towards the end, with pointed apex (fig. 9). Apex of 8th tergum with two widely separated short stout spines (fig. 6). Genitalia of characteristic shape, penis valves each deeply and roundly excavated interiorly, the emargination for the greater part filled out with a thin membrane; apex of gonocoxite bluntly angular and carrying a tuft of recurved stiff bristles exteriorly (fig. 10).

Integument of body very dark, black or almost so, the posterior borders of abdominal terga brown and accentuating the pubescence. Pale face-marks ivory yellow, shaped as described for *cinnyris*.

Pubescence similar to *cinnyris*, but generally somewhat longer and denser, the hairs on dorsum of thorax not so bright and with more dark hairs intermixed. Scopal hairs of posterior tibia mars yellow, the apical fringe paler; posterior tarsus black-haired, except an oblique triangular tuft of fulvous

hair, variable in size, on the outside at base of basitarsus. Appressed dorsal tomentum of abdomen deeper in tint than in *cinnyris,* xanthine orange in fresh examples, very short and evenly distributed, densest along apical margin, covering the entire surface of metasomal terga 1-5; first tergum with



Figs. 6-10. *Amegilla insularis* (F. Smith), ♂ allotype, S. Borneo. Fig. 6, eighth tergum. Fig. 7, apex of seventh sternum. Fig. 8, eighth sternum. Fig. 9, ninth sternum. Fig. 10, genitalia (interior bristles of gonocoxite omitted). All structures in ventral aspect.

longer erect pubescence on basal half and at the sides, and a scanty admixture of black hairs on middle; usually also a few long black hairs on the middle at extreme base of 4 and 5; remaining terga entirely black-haired. Venter smooth and shiny, except the three apical sterna which are finely punctate and rather densely clothed with short black tomentum.

Female. — Resembles the male in most respects, but more robust and much larger, the head especially being short, broad and of large size. Black clypeal marks slightly more divergent than in female *cinnyris*, the pale median line separating them reaches the fronto-clypeal suture, but, apically, thickens more markedly than in that species.

Third antennal segment as long as or a trifle longer than the next three segments united. Scape usually with distinct yellowish or orange anterior spot (absent in the allied species) and flagellar segments 4-12 also orange or brown anteriorly. Legs usually dark blackish brown, anterior two pairs of tibiae lighter brown exteriorly, the pubescence brighter than in the male. Posterior tibia slightly more curved and also somewhat more flattened and expanded than in the allied species; pubescence on the outside of posterior basitarsus mars yellow in basal half or two-fifths, for the rest deep black, the boundary diagonal; penicillus liver brown to almost black.

Abdomen broadly oval, terga strongly arched. Pubescence of first four terga entirely xanthine orange, with few long black hairs intermixed on first and very few on the succeeding terga; remaining terga black-haired. Penultimate tergum laterally with a tuft of erect pale orange hairs most conspicuous and longest at side-margin; apical fringe black. Pygidial tergum also black-haired, the plate itself tongue-shaped, black, its sides somewhat upturned; surface smooth and rather shiny, transversely, extremely finely reticulate and carrying a very distinct longitudinal carina from base to apex.

Size variable. Body length ♂ 11.0-15.0, greatest width of abdomen 4.5-6.0, anterior wing 8.7-11.0; ♀ body length 15.0-17.5, greatest width of abdomen 6.5-7.5, anterior wing 11.0-12.0 mm.

A re-examination of Smith's type of *insularis* has given conclusive evidence that Cockerell was right in supposing that this species might be the same as Meade-Waldo's *fulvohirta*. The descriptions of both species are quite insignificant, but on directly comparing the females it was at once evident that the two are identical. In the field, also, the vividly coloured and robustly built female of *insularis* is more easily recognized than the male, worn individuals of the latter being liable to be mistaken for *cinnyris*.

A. insularis is a shy, swift-flying species and has habits similar to those described for *himalajensis*.

Amegilla himalajensis (Radoszkowski) (figs. 11-15)

1882. Radoszkowski, Wiadomosci z. nauk. przyrodz. Warszowa, vol. 2, p. 75. — ♀ Himalaja (*Anthophora*).
1893. Gribodo, Bull. Soc. Ent. Ital., vol. 25, p. 286. — ♀ Malacca (*Anthophora proserpina*).
1894. Gribodo, Ibid., vol. 26, p. 275 (addit. notes). — ♀ Birmania (Bhamo) (*A. proserpina*).
1897. Friese, Die Bienen Europa's, vol. 3, Anhang, p. 297 (orig. Latin diagnosis; not seen) (*Podalirius*).
1897. Bingham, Fauna Brit. India, Hym., vol. 1, p. 525 (key), 532. — ♂ ♀ "The Himalayas, from Simla to Sikhim, at low elevations; the hills of Burma and Tenasserim. Common." (*A. himalayensis*).
1914. Meade-Waldo, Ann. Mag. Nat. Hist., ser. 8, vol. 13, p. 57 (♀ Malacca, as *A. himalayensis* = *proserpina*), p. 58 (♀ Pahang and Johore, as *A. himalayensis* var. *pahangensis*, var. nov.).
1925. Cockerell, Ann. Mag. Nat. Hist., ser. 9, vol. 15, p. 490 (key) (*A. himalayensis*).
1929. Dover, Bull. Raffles Mus., vol. 2, p. 56 (locality records) (*A. himalayensis* + var. *pahangensis* partim).

Type material. — 1 ♀, "Malacca, Coll. Gribodo, *Anthophora Proserpina* Grib., Tipo, coll. Gribodo", holotype *proserpina* Grib. (MCG). 1 ♀, Malaya, Pahang, Gunong Tahan, 2500-3500 ft., v-vii.1905, leg. H. C. Robinson, holotype *pahangensis* M. Waldo (BM, type coll., no. 17B.642). Further specimens studied. — A series of both sexes, ex coll. C. T. Bingham, from the Rangit Valley in Sikkim, the Khasia Hills, 1 ♀ "Himalayas", and from Middle Tenasserim (BM, general coll., over *"himalayensis = proserpina"*). A series of both sexes, ex F. M. S. Mus., from various localities in Peninsular Siam and Malaya, collected by F. N. Chasen, H. C. Abraham, and (mostly) by H. M. Pendlebury: Nakron Sri Tamarat, Khao Kao, 300 ft.; Gunong Angsi, Negri Sembilan, 2000-2790 ft.; Pahang, Kuala Tahan and Ulu Sungai Iriang; Kedah, near Jitra, Catchment Area; Selangor, Ulu Langkat; Westcoast, Langkawi Is.; Johore, Mt. Ophir and Lubuk Kedondong (BM and MZB). 2 ♂, without locality (from the Malay Peninsula or N. E. Sumatra), leg. B. Hagen (ML). 1 ♂, Penang I., Waterfall Gardens, 20.vii. 1955, on flowers of *Thunbergia affinis;* 2 ♂, idem, Sungei Batu Feringgi, 7.viii.1955, on flowers of *Clerodendron deflexum;* all leg. H. T. Pagden (coll. Pagden).

A robust stocky species with a short and broad head, short antennae, and a comparatively long, rather parallel-sided abdomen.

Male. — Structure. Mouth-parts very little prominent; labrum relatively of small size, as long as clypeus, of the ordinary sub-rectangular shape, slightly shorter than wide with rounded side-angles, its anterior border almost straight; entire surface coarsely superficially punctate, the basal punctures somewhat finer and deeper. Mandibles distinctly striate on the outside.

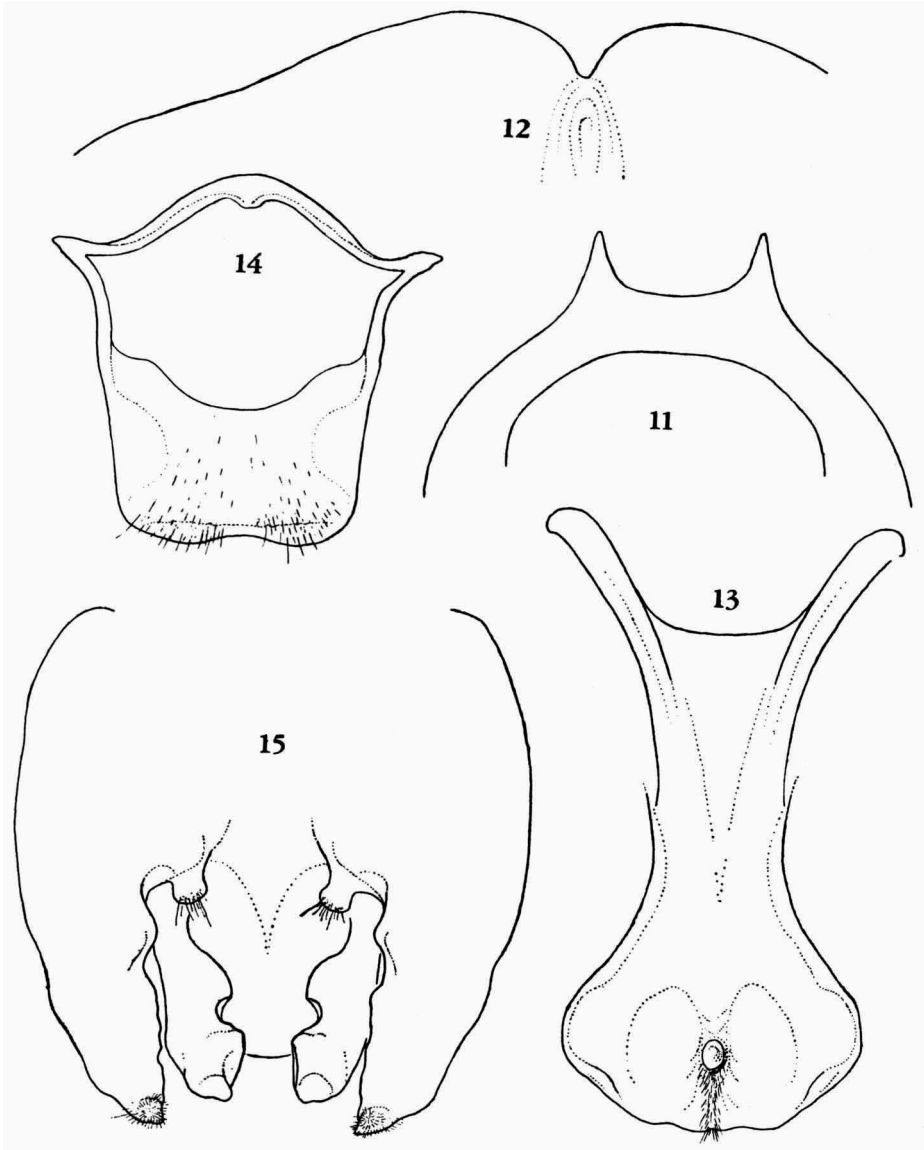
Malar space linear. Clypeus short and broad, facial depth much less than diameter of eye; surface finely reticulate and coarsely not very deeply punctate; a distinct, low, longitudinal median impunctate ridge, narrowed and evanescent basally. Paraocular and supraclypeal areas densely, more finely punctate, as are also the vertex and occiput. Antennae short and thick, almost reaching tegulae; third segment somewhat longer than next two segments united, fourth segment about 2/5 the length of fifth.

Thorax evenly densely punctate, the surface concealed almost everywhere under the dense pubescence; tegulae dull, impunctate. Wings normal, neuration without peculiarities; membrane strongly tinged orange-yellow, the veins ochraceous-orange; tegulae orange-rufous. Legs long, moderately robust, shape normal, posterior tibia and basitarsus rather flattened, the latter slightly downcurved.

Abdomen elongate-oval, widest across 2nd metasomal segment, thence very gradually tapering. Integument evenly, very finely and densely punctate, except a narrow area along posterior border of last three terga, the surface slightly showing through the pubescence, except under the appressed light tomentum of metasomal terga 1 and 2. Apex of 8th tergum (fig. 11). Sternal plates not modified, surface rather smooth and shiny, laterally finely and sparsely punctate; apical margin of 5th sternum very weakly concave on middle, that of 6th more markedly so, the 7th still more strongly emarginate, the incision preceded by a smooth, short and low, median convexity (fig. 12); apex of 8th sternum with the distal portion of the side-margins slightly swollen, the median area rather strongly raised, forming a blunt knob-like tubercle which runs out into a low median ridge carrying short pale bristle-like hairs (fig. 13); 9th sternum broad and squarish, apex very slightly emarginate with broadly rounded side-angles (fig. 14). Genitalia (fig. 15).

Integument of body mainly deep black. Labrum, mandibles, and clypeus pale yellow-orange, the labrum narrowly brownish-black anteriorly, the mandibles with a narrow blackish line roundabout and with the apex reddish-brown; labrum moreover with orange-rufous basal stripe, variable in width, and a similarly coloured, indistinctly comma-shaped spot attached to it on each side on the basal tubercles. Clypeus with the apical margin orange-rufous, the epistomal suture finely black, marked with a pair of broad, not very sharply defined, closely approximated orange-rufous to Sanford's brown patches occupying most of the surface; these marks fused for a short distance at base, then slightly divaricate and separated by the yellow-orange median ridge, its anterior margin and the side-edges having also that colour. Frons with low, broad, triangular, median supra-clypeal spot of yellow-orange. Paraocular area black with a triangular yellow-orange mark filling out its

anterior half. Antennae with the first three or four segments orange-rufous, the remaining segments burnt sienna to dark brown; scape of antenna with its anterior surface yellow-orange.



Figs. 11-15. *Amegilla himalajensis* (Rad.), ♂ paratype, Malaya. Fig. 11, eighth tergum. Fig. 12, apex of seventh sternum. Fig. 13, eighth sternum. Fig. 14, ninth sternum. Fig. 15, genitalia (interior bristles of gonocoxite omitted). All structures in ventral aspect.

Thorax black. Legs, including the spines, Sanford's brown to auburn; tarsi II and III nearly always darker, occasionally deep black.

Abdomen black, the downfolded portions of the first two metasomal terga, and the sterna as well, chestnut-coloured; remaining segments all black.

Pubescence. Labrum and mandibles covered with short golden yellow hairs, the long marginal bristles of mandibles white. Clypeus with few short brown hairs. Long and dense pubescence on underside of head and lower part of genal area palest yellowish-white, further upwards gradually replaced by dense orange-rufous (fox red) hairs covering the entire upper surface, but leaving three hairless areas on vertex: one in front of the median ocellus, and one inside to the upper end of compound eye. Practically no admixture of black hairs. Dorsal pubescence of thorax rather short, very dense and velvety, bright orange-rufous without admixture of black; hair on propodeum longer and rather tufty on both sides, scanty on the middle; lateral thoracic pubescence only little lighter than on dorsum. Anterior two pairs of legs with short and very scanty light-coloured hairs; appressed hairs on tibiae and tarsi denser, ochraceous-orange on the outside, short and purplish brown on the inner surface; femur III with short and inconspicuous dark brown or black hair, but with well defined exterior patch of rufous pubescence at the knee; tibia III almost black on the inside, bright orange-rufous with apical tuft of light orange on outer surface; posterior basitarsus deep purplish black or black, occasionally a few rufous hairs on the outside near base, the apical segments black. Abdomen ochraceous-orange to orange-rufous on first two metasomal terga, for the rest deep black. First tergum with some long erect hairs on the vertical surface, denser tufts on basal half (especially at the sides) and a more or less distinct apical band of shorter appressed pubescence that covers either the entire surface or only part thereof, but at least its apical half; second tergum either entirely covered with similar appressed tomentum or with a median subtriangular area of variable size replaced by black, but at least carrying a broadly interrupted light apical band, widest on both sides of the middle; third tergum entirely black-haired save a narrow fringe of light-coloured marginal hairs aside.

Female. — Greatly resembling the male but differing by its much larger size, more expanded hind legs and details of colouring. Third antennal segment slightly longer than in male, a little shorter than the next three segments united. Ground-colour of mouth-parts and face deeper in tint, often almost ochraceous-orange, only the labrum and supraclypeal triangle distinctly orange-yellow; dark clypeal patches more enlarged and usually more reddish so as to become still more evanescent, but occasionally more sharply delimited, dark brown, towards base. Paraocular area with the orangish an-

terior spot reduced to a streak along epistomal suture. Antennae lighter, usually bright reddish-brown, the flagellar segments obscured posteriorly, rarely dark brown with basal segments orange-rufous; scape invariably with orange-yellow anterior spot. No black hairs intermixed on dorsal surface of head and thorax. Legs as in the male, but tibia and basitarsus III much more expanded and more densely pubescent; tuft of rufous hair at apex of femur III sharply defined and larger; long pubescence on the outside of basitarsus III bright rufous in basal half or two-thirds, for the rest black, the boundary diagonal; penicillus glistening dark brown.

Abdomen straighter than usual, with the first two segments almost parallel-sided, thence gradually diminishing in width. Colour and pubescence very similar to the male and showing the same variation. In the majority of specimens, including the types of *proserpina* and *pahangensis*, the fine brown tomentum on first and second terga is more or less interrupted on middle so as to save a broad, rather triangular, area of black, widest basally, which on second tergum occupies the median one-fifth to one-third of the surface. In several other females, however, the short black tomentum has disappeared completely, or almost so, the whole surface being ochraceous-tawny in colour. Specimens exhibiting this pattern predominate among Bingham's series from Sikkim and Tenasserim, but are also known from more southerly localities in Malaya (i.e., Kuala Tahan and Ulu Sungai Iniang in Pahang; G. Angsi in Negri Sembilan; Selangor; and Mt. Ophir). The third and following segments are entirely black-haired. Pygidial plate dull black, whether or not keeled, its surface finely transversely striate from base to apex.

Body-length ♂ 14.0-17.2, width of abdomen 5.2-6.0, anterior wing 10.5-11.4; ♀ body-length 15.8-18.7, width of abdomen 6.5-6.8, anterior wing 12.2-12.5 mm. (Type *proserpina:* body ca. 18.0, width of abdomen 6.7, anterior wing 12.0 mm; type *pahangensis:* body 16.8, width of abdomen 6.5, expanse 29.5, anterior wing 12.0 mm).

The type of *proserpina* is remarkable in that the rufous pubescence on the outer surface of tibia III, along almost the distal half of its length, is replaced along ventral margin by an elongate streak of black hairs, the light hairs at the base of the basitarsus having also disappeared but for a few rufous hairs along upper margin.

The pubescent colour-pattern of this species is strongly reminiscent of that of *leptocoma*, sp.n., and this resemblance is especially striking on account of the fact that they exhibit the same variation in the extent of the first two metasomal terga. On the other hand, it is interesting to note that although the two insects are evidenly widely distributed in the Malay Peninsula,

leptocoma is chiefly found in the hills and lower mountain zone, whereas *himalajensis* seems to frequent the lowland forests, Mt. Ophir (altitude not stated) being perhaps the only locality where they occur together.

I am satisfied that the type of *pahangensis* Meade-Waldo is in no way different from a number of other females in which the rufous pubescence on the basal abdominal terga is interrupted and restricted to band-like apical patches, the species showing much variation in this respect, all intergradations being known. As has been pointed out by Meade-Waldo, *proserpina* is undoubtedly synonymous with *himalajensis,* as this species is understood by the authors; but since neither Bingham nor subsequent writers have seen the type of Radoszkowski's insect, it is just possible that it is yet another closely similar species. In the last case the name *proserpina* should be used as a substitute for the present species.

As to the habits of this beautiful species, Mr. H. T. Pagden, who recently discovered *himalajensis* in Penang, wrote to me the following: "They are very wary and the slightest movement seems to scare them, after which they may not come back for an hour or so, and they seem to favour visiting flowers situated almost in the heart of the plant (i.e. *Clerodendron),* rarely going to those on the periphery". This observation is more or less in accordance with a dramatic story told by the collector B. Hagen, which I found written on a label attached by him to one of the two males in the Leiden Museum (both unfortunately lacking a locality-label), and which reads as follows: "Sehr selten. Flug colossal schnell, wie ein Feuerfunke, und, da es ungemein scheu ist, nur mit unendlicher Mühe und Fertigkeit zu erhaschen. Ich habe trotz aller Mühe nur diese beiden Exempl. erhaschen können. Das Thier lässt sich beim Saugen nicht nieder, sondern schwebt nur ein Moment vor der Blüthe. Das Auge kann dem rasend schnellen Flug kaum folgen. In lichten Wäldern an blühenden Sträuchern."

Amegilla pendleburyi (Cockerell)

1927. Cockerell, Ann. Mag. Nat. Hist., ser. 9, vol. 20, p. 531-532. — ♂ (type) ♀ Pahang; ♀ Peninsular Siam (*Anthophora insularis pahangensis*).
1929. Cockerell, Entomologist, vol. 62, p. 285 (*A. insularis pendleburyi,* nom. nov. for *pahangensis* Ckll., nec Meade-Waldo).
1944. Lieftinck, Treubia, hors série, p. 97 & 102 (key ♂ ♀), 135-138, figs. 73-79 (♂ structures). — ♂ ♀ S. Sumatra (*A. anthreptes*).

Type material. — 1 ♂, Malay Peninsula, Pahang, Kuala Nipis, 29.v., leg. H. M. Pendlebury, holotype *pahangensis* Ckll. = *pendleburyi* Ckll. (BM, type collection). Further specimens studied. — Siam: 1 ♀, Peninsular Siam, Nakan Sri Tamarat, Khao Luang, 2000 ft., 26.iii.1922, leg. H. M. Pendlebury, with label in T.D.A. Cockerell's hand "*A. insularis pahang-*

ensis (corrected into) *pendleburyi* Ckll., cotype ♀" (ex F. M. S. Mus., BM). Malaya: 2 ♀, Penang, v.1917, 1500-2428 ft.; both sexes from Selangor, Bukit Kutu, 3300 ft., 24-28.ix.1932, and Ampang, 1.ix.1926, leg. H. M. Pendlebury; Pahang, near Karak, Chintamani, jungle, 17.viii.1935, and Kedah Peak, 3000 ft., 8.iii.1928, leg. H. M. Pendlebury (BM and MZB). 1 ♂, Selangor, Kuala Sleh, 24.viii.1947, no. 01044, leg. H. T. Pagden (coll. Pagden). Sumatra: 1 ♂, W. Sumatra, Sibolga, viii.1913, *Podalirius brookiae* Bingham, det. F. Maidl (ML). 1 ♀, W. Sumatra, Benkulen, Muara Tenam, 250 m, vii.1935, leg. Mrs. M. E. Walsh (coll. v. d. Vecht). 1 ♂, N. E. Sumatra, Deli, Bandar Baru, 950 m, 12.xi.1950, M. A. Lieftinck (MZB). Borneo: 1 ♀, N. W. Borneo, Sarawak, Lundu, iv.1913 (ex F. M. S. Mus., BM). 2 ♀, N.W. Borneo, Sarawak, Matang, xii.1897 and Matang Road, 25.ii.1916 (SM). 1 ♂, E. Borneo, 50 m, Balikpapan, Mentawir River, x. 1950, A. M. R. Wegner (MZB). 1 ♀, S. Borneo, Sampit distr., Pemantan, 50-100 m, ult. vii.1953, Sampit River, on *Alpinia romburghiana* Val., M. A. Lieftinck (MZB).

Cockerell's characterization of the two sexes of his *A. insularis pahangensis* is not only extremely fragmentary and confusing, but is evidently based on two different species. The author himself admits that the insect "caused him some perplexity", and this is probably the reason why he merely compared the type with *A. subinsularis* (Strand) and *insularis* (F. Smith) — two species of very remote affinity —, adding instead a minute description of its labial and maxillary palpi and including even the measurements in microns of the separate palpal joints!

I have not seen all Cockerell's specimens, but a re-examination of the type male and some females has proved beyond doubt that *pendleburyi* is the same species as *anthreptes* (Lieft.), the first-mentioned name thus taking precedence over the last. For a full characterization of male and female *anthreptes* the reader is therefore invited to consult the published descripions of that species (loc. cit.).

A. pendleburyi had not before been recorded from Borneo, where it is apparently widely distributed in low country. From the same island I have examined not less than two closely allied, yet quite different, species, which can be held apart by the dissimilarity of the facial and antennal segments, and also by the pubescence of the body. Since only the females of these species are known, I prefer to hold over their description, pending the discovery of the males.

I met with this species first in the hill-forests of South Sumatra, where it flew in company of *A. cinnyris*, both visiting the flowers of *Cyrtandra* and

Impatiens; also singly, gathering nectar from the tubular flowers of a wild ginger. In the lowlands of Borneo, it was associated with *A. insularis* and two blue-banded species of the *zonata* group, all frequenting the white-and-pink flowers of a tall ginger, *Alpinia romburghiana,* fringing the river banks. The bees were most abundant during dull weather and still active on rainy days, but they soon disappeared with the rising temperature as the sun came out. Lastly, at Bandar Baru (N.E. Sumatra), I captured a specimen at flowers of a *Lantana* bush, along with a male of *A. sumatrana,* sp. n.

Amegilla feronia (Lieftinck)

1944. Lieftinck, Treubia, hors série, p. 97 & 101 (key ♂ ♀), 130-135, figs. 66-72 (♂ structures). — ♂ ♀ Java (*Anthophora*).

This is a scarce lowland species, apparently confined to the island Java.

Amegilla elephas (Lieftinck)

1944. Lieftinck, Treubia, hors série, p. 96 & 100 (key ♂ ♀), 109-116, figs. 45-51 (♂ structures). — ♂ ♀ S. Sumatra (*Anthophora*).

Additional specimens studied. — 1 ♀, Malaya, Selangor, Ulu Langkat, 2.ix.1934, leg. H. M. Pendlebury (ex F.M.S. Mus., MZB). 1 ♂, W. Sumatra, Sibolga, viii.1913, leg. E. Jacobson (ML). 1 ♀, W. Central Sumatra, Pajakumbuh, Kota Alam, iv.1915, leg. E. Jacobson (ML). 1 ♀, id., Bukit Tinggi (Fort de Kock), 920 m, vi.1954, leg. Miss Wa. Vergeest (coll. P. Benno).

This conspicuous and large species has been described already in great detail in my previous account of these bees. The present individuals agree closely in every respect with the typical series and they are of the same size.

In one of his numerous papers on Oriental bees, Friese (Konowia, 1922, vol. 1, p. 91) has included a brief characterization of an *Anthophora gigas,* from the island Wetar (Lesser Sunda islands), and the same species was said to occur in "O. Sumatra, Deli". I have not been able to examine Friese's two specimens and all I can say is that they are very probably not conspecific.

Amegilla proboscidea, sp.n.

Material. — 1 ♀ (holotype, ML), Simalur I., off the west coast of Sumatra, Lasikin, iv.1913, leg. E. Jacobson, with collector's note: "Burrows in the soil, nest site at entrance of a cave".

Allied to *A. elephas* (Lieft.), and of the same stature and robust size. Here follows a description in comparison with that of *elephas* (loc. cit.).

Structure. — Labrum of the ordinary squarish shape, equal in length to

clypeus, width across basal tubercles equal to its length, its lateral portions strongly downfolded; anterior border distinctly more convex, but sculpture similar. Face strongly protuberant, facial depth about equal to the diameter of the eye. Clypeus with median carina still more sharply pronounced and supraclypeal area also with indication of a smooth longitudinal ridge. Antennae, with the exception of the scape, missing. Tongue of great length, measuring 34 mm from tip of labrum to apex.

Thorax, legs, and wings without peculiarities, wing-membrane slightly more brownish.

Abdomen oval, all terga distinctly more convex than in *elephas,* and in dorsal view also more expanded about half-way their length, greatest width at apex of second metasomal segment and from here more rapidly tapering; sculpture not different. Pygidial plate as in *elephas,* but the lateral margins more distinctly upcurved and median convexity on surface of disk also better pronounced; sculpture identical.

Body dark brown, though generally more reddish. Dark areas on clypeus and supraclypeal area liver brown instead of black, the dark patches on clypeus similar in principle to those of *elephas* but ill-limited on all sides, their border evanescent in front and merging into the ground-colour, which is best described as cinnamon-rufous, instead of yellow. Labrum also darker, between antimony yellow and ochraceous-orange, the anterior border and basal tubercles only slightly deeper in tint. Spot on paraocular area bright yellow. Legs deeper in tint, more reddish-brown. Abdomen dull, unicolorous very dark brown, except first tergum, which is dark reddish-brown in distal half, and the downfolded portions of remaining terga, which are also lighter. Sterna verona brown, the basal and apical areas turning to amber brown.

Pubescence. Hair on galeae, labrum, and mandibles glistening ochraceous-orange, on clypeus dark brown; light hair on dorsal surface of head and occiput deeper in tint, long pubescence on lower part of genal area cinnamon-buff, not whitish. Thoracic pubescence ochraceous-orange, the plumose tufts behind tegulae and on metanotal area still more brightly coloured. Legs conspicuously coloured, glistening capucine orange, the posterior tibial and basitarsal hairs more densely crowded than in *elephas,* but like that species without intermixture of black hairs; penicillus kaiser brown. Abdomen with the same short appressed black tomentum as *elephas* and with some longer pale-coloured hair-tufts on either side on first tergum, the black coating, however, a little longer on all segments, though not concealing the integument and covering almost the entire surface of metasomal terga 1-5; no conspicuous transverse apical fasciae of longer appressed pale hairs, the terga instead fringed with short ochraceous-orange marginal hairs so as to form complete

linear pale hair-bands, progressively a little wider from before backwards, that on fourth tergum hardly 0.2 mm wide, only the fifth tergum carrying an apical fringe of somewhat longer ferruginous hairs. Sterna with the same very fine appressed dark sub-apical tomentum as in *elephas*, but the dense patches of sub-erect hairs near the apex of fifth and sixth sterna are much darker, chestnut-coloured; seventh sternum nude, carrying only a fringe of apical bristles.

Total length 21.0, greatest width of abdomen 7.0, anterior wing 13.0 mm.

Immediately distinguished from *elephas* by the more reddish-brown colour of the body, the less defined head-markings, and the reduction of the pale hair-bands on the abdominal terga. The male has unfortunately remained unknown.

Amegilla jacobi (Lieftinck)

1944. Lieftinck, Treubia, hors série, p. 95 & 99 (key ♂ ♀), 116-120, figs. 38-44 (♂ structures). — ♂ ♀ Java (*Anthophora*).

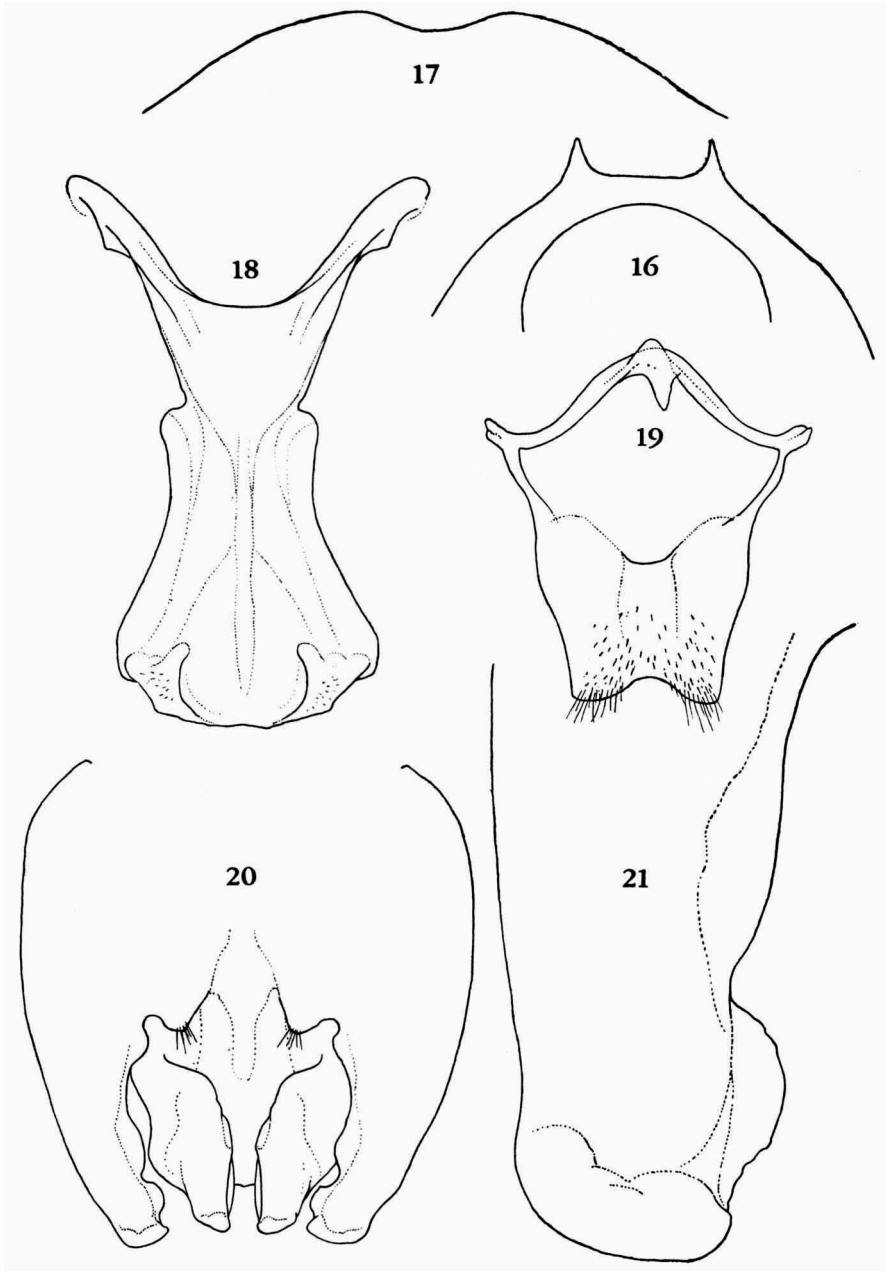
This bee is essentially a species of uncultivated country, restricted to the forests of the plains and foot-hills of Java. Caught in company of *feronia* on the flowers of *Globba marantina, Donax canniformis, Costus speciosus,* and *Coleus galeatus,* in West Java, *jacobi* being always the scarcest of the two species.

Amegilla sumatrana, sp.n. (figs. 16-21)

Material. — 2 ♂, N.E. Sumatra, Deli, Bandar Baru, 950 m, 12.xi.1950, on flowers of *Saurauia* cf. *pendula* and *Lantana camara;* 1 ♀, same area, Berastagi, 1400 m, 7-14.xi.1950, on flower of *Impatiens* cf. *oncidioides* in dense virgin forest; all leg. M. A. Lieftinck. Holotype ♂ and allotype ♀ in the Leiden Museum.

Allied to *A. jacobi* (Lieft.), but with the abdomen longer, the dorsal pubescence of thorax less bright, with more black hairs intermixed, and with complete, though narrow, white hair-bands along posterior margin of first four metasomal terga.

Male. — Structurally very similar to *jacobi* and, apart from slight differences in the configuration of the apical abdominal segments and genital organs, differing from that species chiefly in details of colouring and pubescence. Apex of eighth tergum less deeply notched, with the processes distinctly shorter and finer (fig. 16). Apex of sixth sternum shallowly excavated on the middle, the excavation of the seventh wider than in *jacobi,* the side-angles less convex (fig. 17); eighth and ninth sterna (figs. 18-19)



Figs. 16-21. *Amegilla sumatrana,* sp.n., ♂ holotype, N.E. Sumatra. Fig. 16, eighth tergum. Fig. 17, apex of seventh sternum. Fig. 18, eighth sternum. Fig. 19, ninth sternum. Fig. 20, genitalia. Fig. 21, right gonocoxite, more highly magnified (interior bristles omitted). All structures in ventral aspect.

almost identical in the two species, but the edges of both slightly better pronounced in the new species. Genitalia similar to *jacobi,* but penis valves not closely approximated apically, and with the sub-apical interior projection of the distal part of each gonocoxite much larger and at the same time situated more apicad (figs. 20-21).

Colour. Face-marks exactly as described for *jacobi,* but black patches on clypeus in both species often a little longer than in fig. 38 of the original description (loc. cit., p. 110). Ground-colour lighter, almost white (ivory-yellow) instead of apricot-yellow. Antennae black, scape in front ivory-yellow; anterior faces of flagellar segments (third segment only in its distal half), auburn. Tegulae orange-rufous. Wings with the neuration and membrane as described for *jacobi.* Legs also similarly coloured, but all femora (and sometimes also the tibiae) dark reddish-brown instead of black. Abdomen black, first two and ultimate metasomal sterna reddish-brown in the paratype.

Pubescence on head and thorax rather similar to *jacobi,* with the following differences. Hair on labrum almost white, that on frons and vertex less bright, warm buff, the admixture of long erect black hairs more dominating; pubescence along occipital border, as well as on dorsum of thorax and upper parts of pleurae, paler, ochraceous-buff, and with more black hairs intermixed; no admixture of black on both sides of postscutellum and propodeum. Pubescence of legs similar to *jacobi* but less dense and also much paler in colour: cinnamon-buff or clay colour on outer faces of tibiae; apical tuft of long hairs on posterior tibia palest yellow. Dorsal pubescence of abdomen black, sparser and a little longer than in *jacobi,* but fifth and sixth terga with more numerous longish erect black hairs intermixed. Complete, narrow, whitish hair-bands along margin of first four metasomal terga sharply defined, consisting of appressed hairs, not interrupted mesially and of almost equal width, that on first preceded on each side of the middle by longer, sub-erect, cinnamon hair-tufts which cover most of the surface. Remaining segments black-haired. Venter with very short and sparse blackish tomentum most conspicuous on fifth and sixth sterna.

Female. — Very similar to the male, but much larger and more robust. Differences between the sexes as in *jacobi.* Pubescence on upper surface of head and thorax less bright than in *jacobi,* the thoracic coating definitely longer, with more and longer black hairs intermixed. Legs shaped and coloured as in that species, but the hairs on posterior two pairs of tibiae, though brighter than in the male, coloured less conspicuously than in *jacobi.* Tibia and tarsus III entirely black-haired on the inside; scopal hairs of

tibia mainly vinaceous-cinnamon, but on the lower (inner) one-third or two-fifths of the outer surface replaced by dark brown, especially towards the apex, and with a tiny extero-apical tuft of pale yellowish hairs; basitarsus III black-haired except a small tuft of longish cinnamon hairs rising from the dorsal ridge, near its base; penicillus glistening blackish-brown.

Abdomen elongate-oval, decidedly longer than in *jacobi,* greatest width at base of third metasomal segment. Upper surface dull, sculpture superficial, not differing from that of *jacobi.* Pubescence similar to the male, the fasciae a little narrower, those on first two terga somewhat more yellowish laterally. Pygidial plate longer and more strongly tapered; surface dull, finely, superficially, transversely striated on basal half, apical portion irregularly rugose, the tip fringed with golden brown, the tergal surface on both sides of the plate also covered with glistening golden-brown hairs.

Body-length ♂ 13.0-14.0, expanse 22.0, greatest width of abdomen 5.0, anterior wing 8.9-9.1; ♀ body-length 15.5, greatest width of abdomen 6.0, anterior wing 11.0 mm.

Amegilla cinnyris (Lieftinck)

1944. Lieftinck, Treubia, hors série, p. 98 & 103 (key ♂ ♀), 126-130, figs. 59-65 (♂ structures). — ♂ ♀ S. and N.E. Sumatra (*Anthophora*).

Additional specimens studied. — 8 ♂, 7 ♀, N.E. Sumatra, Deli, Sibolangit, 450 m, 16-17. xi.1950, on flowers of *Donax canniformis,* leg. M. A. Lieftinck (MZB).

The present fine series confirms my previous identification of the allotype, from Tinggi Radja (Deli), which was the only female so far known. The fresh examples agree with this specimen in every respect, all having the fifth metasomal tergum black-haired. The males look somewhat different, as in them ordinarily only the last visible (sixth) tergum is black; however, the present series includes one specimen in which also the fifth is covered with black tomentum, this tergum carrying only a pair of transverse orangish hair-tufts along posterior margin.

At Sibolangit this species was a regular visitor of the Marantacea, *Donax canniformis,* the nectar being obtained by hovering in front of the flowers, hence quite different from the way by which food is procured from flowers with a tubular corolla and deep-lying nectar, such as the yellow Balsam, *Impatiens oncidioides,* in which the bees disappear completely. Occasionally, individuals of *cinnyris* were disturbed by the erratic males of *A. insularis,* which, though swifter and very wary, could be recognized even on the wing by their large size and brighter colouring.

Thus far, *cinnyris* is only known from Sumatra.

Amegilla cyrtandrae (Lieftinck)

1944. Lieftinck, Treubia, hors série, p. 98 & 102 (key ♂ ♀), 120-126, figs. 52-58 (♂ structures). — ♂ ♀ Java (*Anthophora*).

Additional material. — 2 ♀, E. Java, Idjen Highlands, Ongop-ongop, 1850 m, vi.1916, leg. H. C. Robinson (ex F. M. S. Mus., BM). 2 ♂, 2 ♀, South Bali I., Baturiti, 1000 m, vii.1941, leg. J. P. A. Kalis (coll. J. v. d. Vecht).

Previously known only from the mountains of Java, where it is universally distributed in forested regions, though not occurring below 700 metres altitude. The present specimens from Bali are the first to be reported from that island. They do not differ in any way from Javan individuals.

Amegilla pagdeni, sp.n. (figs. 22-27)

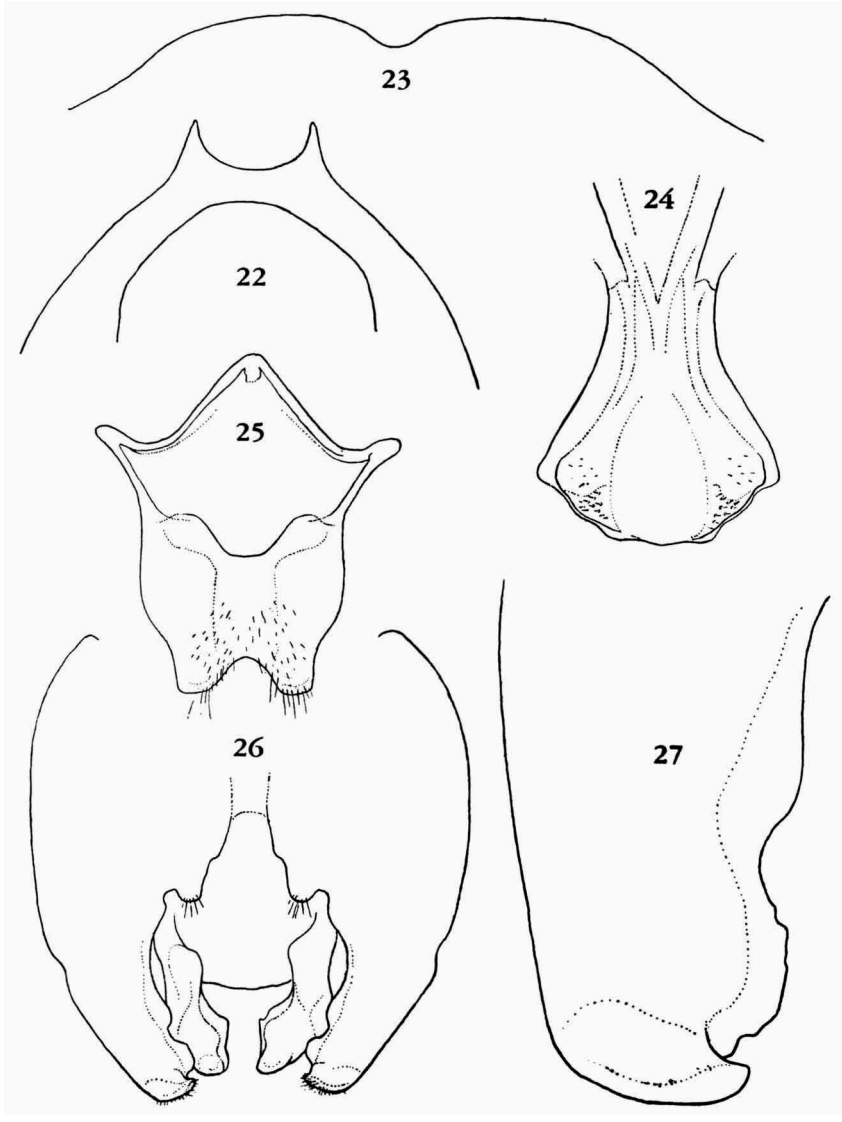
Material. — 1 ♂ (holotype), Malay Peninsula, Selangor, Ampang Reservoir, 24.vi.1947, no. 0954, leg. H. T. Pagden; 1 ♀ (allotype), Pahang, Ginting Simpah, 2000 ft., 15.vi.1947, no. 0906, leg. H. T. Pagden; 1 ♀ (paratype), Bukit Kutu, 3500 ft., 9.ix.1929, leg. H. M. Pendlebury (ex F. M. S. Mus., MZB). Types in the British Museum.

Stature and colouring of *cinnyris* Lieft., and also resembling *insularis* F. Sm. very closely in general appearance, but differing from both in details of pubescence and genital organs. The following notes may serve to its recognition, in comparison with the best described species, *cinnyris*.

Male. — Structurally practically identical, including form of antennae and legs. Labrum a little longer, only very slightly wider than long (in *cinnyris* more distinctly so). Median carina of clypeus not different. Neuration without peculiarities. Apical margin of 6th sternum slightly excavated on the middle, but more so than in *cinnyris*, the excavation of the 7th also wider and deeper (fig. 23); 8th sternum with the lateral margins of the apex a little undulated, the marginal tubercles very weakly indicated, less developed and lower than in *cinnyris*, lateral angles across greatest width better pronounced (fig. 24); 9th sternum with the apical portion strongly upcurved, the lateral angles noticeably more convex mesially and with the apical lobes more strongly protuberant, separated by a deep U-shaped notch (fig. 25). Genitalia, penis valves more hollowed out interiorly before apex, and with the sub-apical interior projection much larger and removed apicad, the whole structure resembling in shape that of *deliensis* more closely (figs. 20 & 26).

Light face marks sharply pronounced, but occupying less of the whole surface: the black patches longer and more approximated in the median

line so as to save a narrow stripe, incomplete basally; ground-colour maize yellow or buff yellow, not ivory-white. Supraclypeal yellow mark also a little smaller. Integument of body very dark brownish-black, the femora a little lighter than in *cinnyris*.



Figs. 22-27. *Amegilla pagdeni*, sp.n., ♂ holotype, Selangor, Malaya. Fig. 22, eighth tergum. Fig. 23, apex of seventh sternum. Fig. 24, eighth sternum, apical portion. Fig. 25, ninth sternum. Fig. 26, genitalia. Fig. 27, right gonocoxite, more highly magnified (interior bristles omitted). All structures in ventral aspect.

Pubescence generally similar. Short tomentum on labrum pale yellow, long hairs on clypeus black. Colour on head predominantly orange-buff, many longer black hairs intermixed on vertex and a fewer number on each side on occiput; behind the eyes as in *cinnyris*. Hair of legs not different, the orangish tuft near upper margin at base of posterior basitarsus rather more conspicuous. Thoracic pubescence zinc orange, somewhat denser and brighter than in *cinnyris,* there being much fewer black hairs intermixed and these only on mesoscutum and scutellum; hair on lower parts of pleurae light ochraceous-buff, not white. Dorsal tomentum on first three metasomal terga much as in *cinnyris,* though growing slightly paler towards apical margin of 2 and 3, and the hairs covering a small triangular median area at base of third tergum sparser and black instead of orangish; basal half of exposed portion of fourth tergum entirely, and distal half for its median one-third, sharply defined black-haired, this segment thus carrying an interrupted apical fascia of orange hairs; fifth to seventh terga entirely black-haired. Venter with the first three metasomal sterna smooth and shiny, the finely punctate remaining sterna covered w'th a very short and dense dark tomentum, only the sides fringed with pale hairs.

Female (allotype). — Agreeing with the male in most respects, ground-colour of face likewise deeper in tint than in *cinnyris*. Black clypeal marks more enlarged but scarcely differing in shape from those of female *cinnyris,* the median yellow streak also abbreviated basally. Pubescence on labrum darker, glistening brown, hair of clypeus likewise brown, with golden reflections in certain lights, not black. Frons and vertex with tufts of deep ochraceous-orange hair and with long black hairs intermixed; pubescence on occiput and behind the eyes longer and also more fulvous, fading to palest yellowish-white on lower part of temples. Thoracic pubescence somewhat longer, denser and deeper in tint and with much fewer black hairs intermixed on dorsum, ochraceous-buff instead of white on lower part of mesopleurae. Pubescence of legs not differing from *cinnyris;* scopal hairs on the outside of posterior basitarsus diagonally divided into an upper ochraceous-orange and a lower black portion; penicillus glistening black.

Dorsal pubescence of metasomal terga 1-3 closely resembling that of the male, but third tergum lacking the blackish basal triangle, only very few of the mid-basal pale hairs being replaced by black ones; apical pale pubescent fascia of fourth tergum less broadly interrupted by black than in the male and occupying about two-fifths of the exposed length of segment; fifth tergum entirely black-haired, the marginal bristles glistening dark and golden brown; sixth tergum golden brown on each side of the pygidial plate, which

is dark brown, its surface smooth, more shiny than in *cinnyris,* transversely reticulate-striate in basal half.

In the parallotype from Bukit Kutu the yellow stripe covering the longitudinal carina of clypeus reaches the fronto-clypeal suture; this specimen also differs in that the black pubescence on the 4th metasomal tergum is less sharply marked off from the pale apical fascia of the same segment. In other respects it agrees so closely with the allotype that I have no doubt about its identity.

Body-length ♂ 12.5, greatest width of abdomen 4.8, anterior wing 9.0; ♀ body-length 14.3, width of abdomen 5.4, anterior wing 10.0 mm. Tongue (♂) 12.5 mm approx.

I have much pleasure in naming this new species after Mr. H. T. Pagden, who has a great knowledge of Oriental wasps and bees.

Amegilla florea (F. Smith) (figs. 28-33)

1879. Smith, Descr. new spec. Hym. Brit. Mus., p. 123. — ♀ Shanghai (*Anthophora*).
1913a. Strand, Supplem. Entom., vol. 2, p. 50-51. — ♂ ♀ Kagoshima, Japan; Pingshiang, S. China (*Anthophora*).
1913b. Strand, Archiv f. Naturgesch., vol. 79, p. 106-107 (note). — ♂ ♀ Pingshiang, S. China (*Anthophora*).
1914. Meade-Waldo, Ann. Mag. Nat. Hist., ser. 8, vol. 13, p. 53-54 (notes on synonymy: *Anthophora (Amegilla) villosula).*
1915. Strand, Entom. Mitteil., vol. 4, p. 78 (comparative notes) (*Anthophora).*
1929. Hedicke, Deutsche Ent. Zeitschr., p. 65-67 (comparative notes) (*Anthophora*).

Type material. — 1 ♀, labelled "N. China, 55.21", and *florea* Smith, holotype *florea* F. Smith (BM, type collection, no. 17 B. 599). For comparison: 1 ♂, labelled "N. China, 54.8", and *villosula* Smith, holotype *villosula* F. Smith (BM, type collection). Further specimens studied. — 11 ♂, 14 ♀, S.E. China, Fukien, Shaowu City, 250-350 m, 1942 (spec. F of Prof. Maa), Shaowu, Tachulan, ca. 1500 m, 14-30.ix.1943 (spec. I of Prof. Maa), and same locality, 5-23.viii.1944 (spec. F of Prof. Maa), all leg. Tsing-chao Maa (coll. Maa).

Concerning this species, which is a true *Amegilla,* and *Podalirius villosulus* F. Smith, also described from Shanghai, the greatest possible confusion exists in the literature. This is due to the fact that Friese (Bienen Europa's, vol. 3, 1897, p. 94-96) obviously had never seen *villosula,* otherwise he should have noticed its striking resemblance to the well-known *Anthophora acervorum* (L.), of which it is probably only a subspecies. However, although quoting in full Smith's Latin diagnosis and English description of *villosula,* Friese confounded it with an entirely different Anthophorine which he had from

Yokohama [1]). This is at once evident from his exceptionally adequate description of the Japanese insect, female and male "*villosulus*", which undoubtedly applies to a species of *Amegilla*, and not to *Anthophora!*

Following Friese's unfortunate example, Meade-Waldo also thought that *Anthophora villosula* was an *Amegilla*, and not having examined Smith's type either, came to the wrong conclusion that *florea* was the female of the same species, — solely on the evidence that both species had been described from the same locality. On the other hand, Meade-Waldo correctly synonymized *A. pingshiangensis* Strand (loc. cit., 1913b), of which he had received cotypes from E. Strand, with *villosula* Smith; but it remains hard to explain why he treated these species as *Amegilla*, since *villosula* is undoubtedly a genuine *Anthophora*. Relying entirely on Friese's doctrine, Strand perpetuated the confusion the next year in an attempt to safeguard his *A. pingshiangensis*, which he stated could never be identical with *villosula* because Friese had previously declared *villosula* a member of the *quadrifasciata* Vill. group. This, of course, was wrong, for *quadrifasciata* is the genotype of *Amegilla* Friese, whereas *villosula* is the eastern representative of *acervorum* (L.), which itself is the genotype of *Anthophora* Latr.

In this connection mention should also be made of H. Hedicke's analysis of the geographical distribution and variation of *Anthophora acervorum* (L.). Here again, the correctness of Friese's and Strand's conception was taken for granted, *villosula* being left out of consideration. Hedicke therefore selected the Japanese *Anthophora soror* J. Pérez (Bull. Mus. Paris, vol. 11, 1905, p. 31) as the proper name for the eastern representative of *acervorum*. As we have seen, however, the oldest available name for the sino-japanese race of *acervorum* is *Podalirius villosulus* F. Smith, 1854, which therefore should be considered the correct name for the East Asiatic subspecies (or species).

Besides the types of *villosula* and *florea* in the British Museum collection, I have examined a pair of *villosula* in Mr. P. M. F. Verhoeff's collection from Fukuoka (Kyushu), 18.iii.1922 and 18.iv. 1931, leg. Hori & Fujino; also a good series of both sexes of the same species from S.E. China, Fukien, Chungan, Bohea Hills, iii.1940, leg. T. C. Maa. There is one male cotype of *A. pingshiangensis* Strand in the Leiden Museum, but the female from Tsingtau, iv, leg. Hoffmann, also identified by Strand as this insect, belongs to a closely allied, yet different species.

The type of *florea* is a female in rather poor condition. The pubescence on the thorax above is badly stuck and disintegrated, the specimen being also

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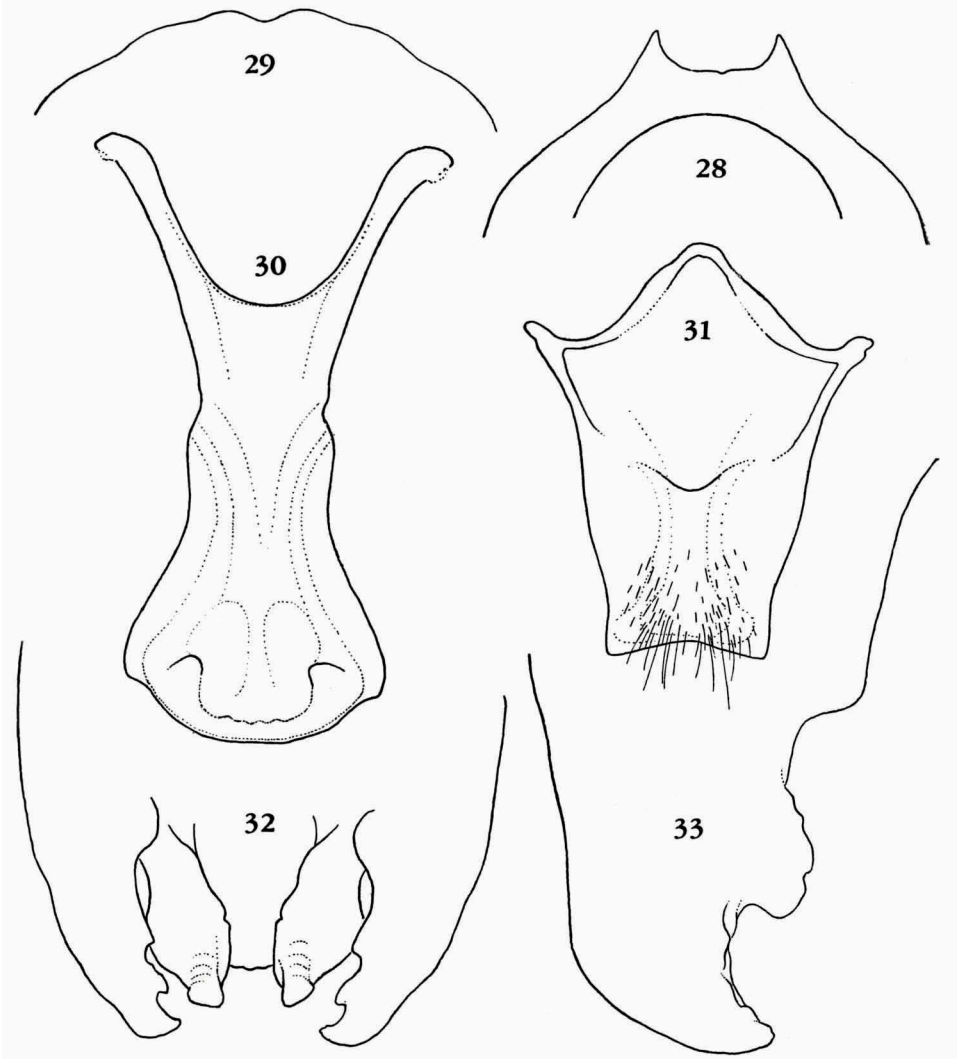
[1]). As follows from the description, this Yokohama species differs in several respects from *Amegilla florea* (F. Smith), which occurs also in Japan.

somewhat discoloured, but as far as I can make out, it matches the fine series from Fukien in every other respect.

Amegilla urens (Cockerell) (figs. 34-39)

1911. Cockerell, Entomologist, vol. 44, p. 341-342. — ♂ (type) ♀ Formosa (*Anthophora*).

1913. Strand, Supplem. Entom., vol. 2, p. 49 (no descr.). — ♀ Formosa (*Anthophora*).



Figs. 28-33. *Amegilla florea* (F. Smith), ♂ Fukien, China. Fig. 28, eighth tergum. Fig. 29, apex of seventh sternum. Fig. 30, eighth sternum. Fig. 31, ninth sternum. Fig. 32, distal portion of genitalia. Fig. 33, apical portion of right gonocoxite, more highly magnified (interior bristles omitted). All structures in ventral aspect.

1925. Cockerell, Ann. Mag. Nat. Hist., ser. 9, vol. 15, p. 490 (key) (*Anthophora*).

Material studied. — 1 ♀, Formosa, leg. H. Sauter, "*Anthophora urens* Ckll., Cotype", in Cockerell's hand (BM). 1 ♂, Formosa, Suisharyo, x.1911, leg. H. Sauter, identified with *urens* Ckll. by E. Strand (BM). 2 ♂, Formosa, Taihanroku, 19-26.iv.1908, leg. H. Sauter, acq. 1908 (ML).

Cockerell's description of this species is rather full and the few specimens in the British and Leiden Museums which I have examined apply very well to it, except in a few points. The pubescence on the underside of the thorax of the type is described as creamy-white; in the specimens before me it is rather more yellowish; the small tuft of fulvous hair on the outside at the base of the posterior basitarsus is either extremely small (few hairs only), or entirely replaced by black ones. Lastly, in Cockerell's cotype female, the pubescence on the outside of the middle tarsi is of the usual ochraceous tint, not black as stated in the original description. According to Cockerell, *urens* differs from *florea* by the ferruginous femora as well as by the narrow white hair-bands on the abdomen; but I doubt that Cockerell ever compared *urens* with authentic specimens of *florea,* since the two are very closely related.

A female of *urens* was reported by Cockerell also from Siam, but seeing how very similar this species really is to *leptocoma,* I believe that this specimen was misidentified.

Amegilla leptocoma, sp.n. (figs. 40-44)

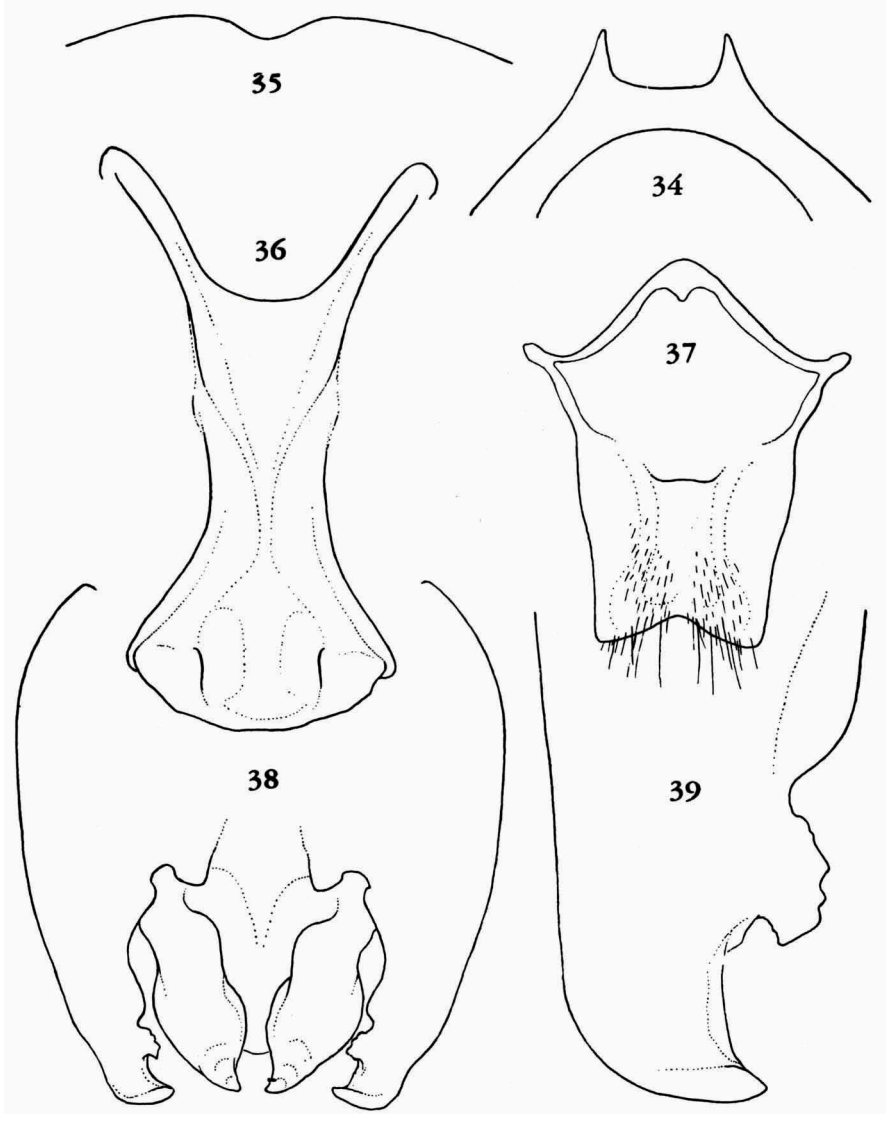
1929. Dover, Bull. Raffles Mus., vol. 2, p. 56 (localities, partim!) (*Anthophora himalayensis* var. *pahangensis*).

1931. Cockerell, Ann. Mag. Nat. Hist., ser. 10, vol. 7, p. 39. — ♀ Siam (*Anthophora urens*).

Material. — A series of both sexes from the Malay Peninsula: Pahang, Fraser's Hill, 3000 ft.; Kedah Peak, 3000-3950 ft.; Larut Hills, 3700-4550 ft.; Cameron's Highlands, Mt. Berembum, 6036 ft., and Ginting Kial, 5000 ft.; Selangor, Bukit Kutu, 3300-3500 ft.; Perak, Maxwell's Hill, 3000-4076 ft.; all leg. H. M. Pendlebury, 1928-1939; Johore, Mt. Ophir, viii.1905 (2 ♀ with red label 53 & 54 (ex F.M.S. Mus., BM & MZB). 2 ♂, 11 ♀, from localities in the Malay States: Taiping Hill, 3700 ft.; Kedah Peak, 3600-3800 ft.; Cameron's Highlands, 4600 ft.; Tanah Rata, 4600 ft., nos. 2190 & 2334 (♂), and 2094, 2332, 2333, 2335, 2364-2367, 2375, 2583 & 2586 (♀), all leg. H.T. Pagden (coll. Pagden). Holotype ♂ and allotype ♀, Taiping Hill, 3700 ft., 11-13.ix.1931, nos. 2334 and 2365 of H. T. Pagden (BM).

Most closely approaching *florea* (F. Smith) and *urens* (Ckll.), by having

only part of the two basal metasomal terga covered with extremely short brown tomentum, the succeeding terga being predominantly black-haired. The present series of *leptocoma* formed part of the F.M.S. Museum collection at Kuala Lumpur; it was confounded by Pendlebury and Dover with Meade-



Figs. 34-39. *Amegilla urens* (Ckll.), ♂ Formosa. Fig. 34, eighth tergum. Fig. 35, apex of seventh sternum. Fig. 36, eighth sternum. Fig. 37, ninth sternum. Fig. 38, genitalia. Fig. 39, right gonocoxite, more highly magnified (interior bristles omitted). All structures in ventral aspect.

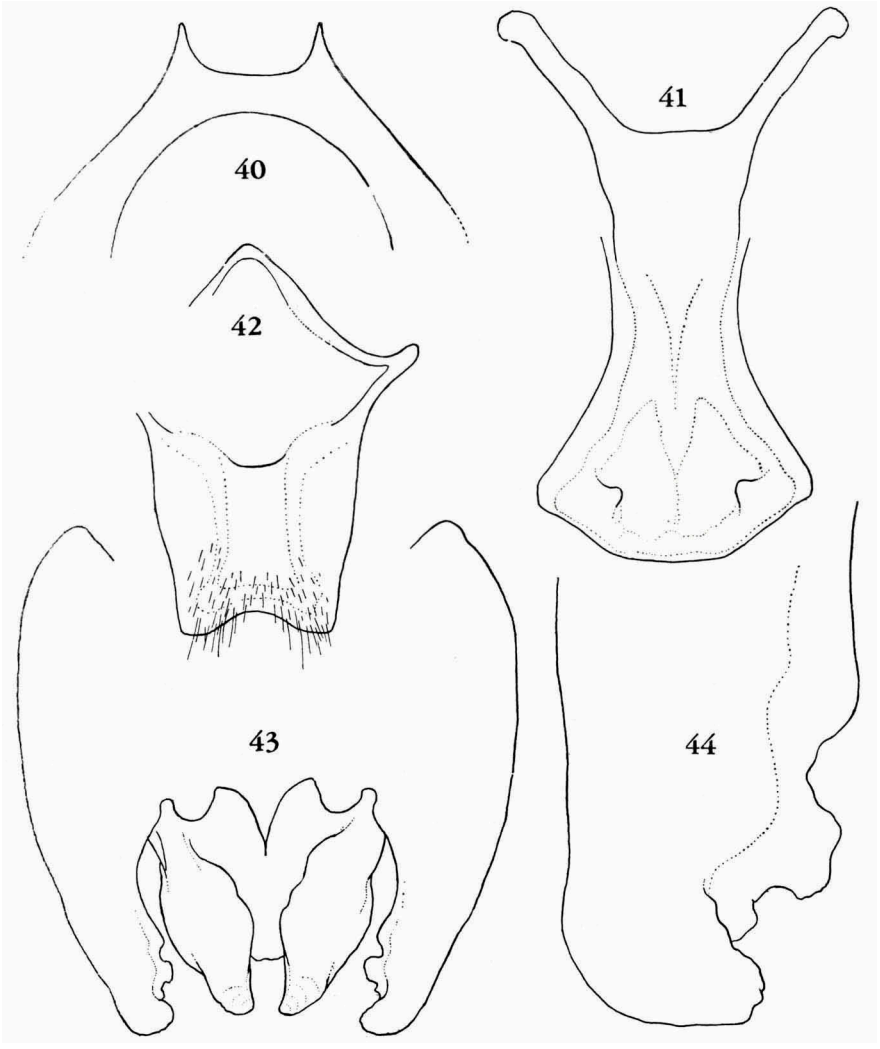
Waldo's "variety" *pahangensis* of *A. himalajensis* (Rad.), both authors having been misled by Meade-Waldo's laconic diagnosis of this variety, which runs as follows: "♀. Similar to the typical form, but tergites 1-3 with apical fasciae or rufous pubescence, that on tergite 3 widely broken medially". This characterization not only applies to the whole *florea* group but equally well to *himalajensis* and hence is quite insignificant. As I have shown before (p. 21), the name *pahangensis* should be dropped as a synonym of *himalajensis*.

Along with a number of other, mostly Chinese, species, *A. leptocoma, florea* and *urens* form a small group within the genus, which are evidently closely related to each other. Morphologically, these species are also very similar to the Malaysian *cinnyris,* described by me in 1944, and *pagdeni,* sp.n. I have, therefore, prepared a description of *leptocoma* comparable to that already given for the two species just mentioned.

Male. — Structure of mouth-parts and antennae similar to the allied species, labrum slightly wider than long, facial depth very little less than diameter of eye. Clypeus feebly keeled. Light face-marks sharply pronounced, like *pagdeni* maize yellow or buff yellow (not ivory-yellow as in *cinnyris* and *insularis),* but the black patches shaped exactly as described for *cinnyris.* Antennae short, scarcely reaching tegulae; third segment only little longer than the next two segments united; all segments unicolorous black or brownish-black, except the whole anterior surface of the scape, which is bright yellow. Apex of eighth tergum (fig. 40). Apical margin of sixth sternum hardly noticeably emarginate on middle, the excavation of the seventh but slightly deeper; eighth and ninth sterna (figs. 41 & 42), closely resembling those of *florea* and *urens* in shape, and also very similar to the same structures of such species like *cinnyris* and *pagdeni.* Legs and wings without peculiarities. Integument brownish-black, legs kaiser brown to chestnut brown; spines black. Tegulae ochraceous-buff. Abdominal terga black, sterna brownish-black.

Hair on labrum, mandibles, and paraocular area glistening yellow, that on clypeus brown; long and tufty pubescence on dorsal surface of head ochraceous-buff, with numerous black hairs intermixed on vertex, fewer on occiput; dense pubescence behind the eyes changing from light buff to palest yellowish-white on lower part of temples. Pubescence of thorax dense, not entirely concealing surface, zinc orange on dorsum and upper part of pleurae but fading to light ochraceous-buff lower down, dorsal pubescence with fewer black hairs intermixed than in *cinnyris* and *pagdeni* and hence rather more brightly coloured than in these species. Pubescence of legs similar, ochraceous-buff on the outside, dark brown interiorly, the apical tarsal

segments dark-haired; scopal hairs of tibia III with an apical tuft of light buff; basitarsus III entirely black-haired, the short tomentum in the inner surface with a light brown gloss. Abdomen dull, the terga evenly covered



Figs. 40-44. *Amegilla leptocoma*, sp.n., ♂ paratype, Kedah Peak, Malaya. Fig. 40, eighth tergum. Fig. 41, eighth sternum. Fig. 42, ninth sternum. Fig. 43, genitalia. Fig. 44, right gonocoxite, more highly magnified (interior bristles omitted). All structures in ventral aspect.

with a fine appressed pubescence, the hair on each side of the first metasomal tergum longer and more tufty, but not so dense as in *cinnyris* and *pagdeni*, longest at the side-edges. Hair on first tergum ochraceous-buff except on

the middle, where it gradually changes to black, leaving an ill-defined crescent-shaped area of black tomentum, but forming a narrow apical band of pale hairs; second tergum ochraceous-buff from base to apex, the disk largely black-haired almost as far as the posterior margin, forming a wide, rather semicircular and ill-defined area of black; remaining terga entirely black-haired, the third only with a latero-ventral tuft of ochraceous-buff, which is prolonged a short way inwards along posterior margin as a linear apical fringe, the median third of the posterior margin replaced by black. Venter sparsely covered with extremely short and mainly dark tomentum, apical border of basal sterna fringed with somewhat longer, pale brown hairs.

Female. — Very similar to the male and differing by its larger size, wider and more cordate abdomen. Black clypeal marks a little longer and broader than in the male and also somewhat more closely approximated and longer than in *cinnyris;* clypeal keel more distinct than in the male. Third antennal segment a little longer than the next three segments united; antennae black, or almost so, only the fourth segment reddish-brown anteriorly. Thoracic pubescence brighter than in male and with fewer black hairs intermixed on mesoscutum; hair on pleurae light ochraceous-orange. Legs darker brown, but pubescence similar to that of the male, basitarsus II somewhat darker than the rest, but not black; pubescence of basitarsus III as in the male, except that there is a distinct triangular patch of ochraceous-orange on the outside, covering rather less than the basal half; penicillus glistening dark brown.

Dorsal pubescence of abdomen as in male, except that the transition from light into black hairs on the disk of the first two segments is more gradual, especially on the second, where there is often a greater amount of light hairs interspersed between the black ones, the median black patch being also very variable in size, depending on the extent of pale-coloured hair invading the central area. At least the apical margin of the first two terga with a narrow fringe of light hairs, that of the third linear and usually interrupted; in rare instances the fourth also carries an extremely narrow apical hair-line. Penultimate and pygidial segments mainly black-haired, the plate broadly rounded, not distinctly keeled, surface dull, finely transversely reticulate.

Body-length ♂ 12.8-15.5, greatest width of abdomen 5.0-5.5, anterior wing 9.5-10.0; ♀ body-length 13.5-16.0, greatest width of abdomen 5.8-6.2, anterior wing 10.0-11.0 mm.

As stated before, this new species comes nearest *florea* and *urens*. Their distinguishing characters, though very slight, are apparently constant, and since no intermediary specimens have so far been found, it seems best to keep them apart as good species. As regards colour and pubescence, it is worth

noticing that the Formosan species *urens* resembles the Malayan *leptocoma* more closely than *florea,* from the opposite mainland of China; in the structure of the male genitalia, however, *leptocoma* takes a more solitary position.

They can be held apart as follows:

florea. — Black clypeal marks of male relatively short and divergent, the yellow median stripe separating them wider, distinctly broadened anteriorly where it attains almost the same width as the transverse yellow stripe along anterior border. Pubescence on lower part of thoracic pleurae pure white. Dorsal pubescence of thorax predominantly ochraceous-orange. First four metasomal terga with distinct light buff apical hair-bands, narrow and gradually passing into the ochraceous tomentum covering the disk of 1 and 2, distinctly broader and sharply contrasting against the black tomentum on 3 and 4. Apical margin of 7th sternum undulated, as shown in fig. 29. Apex of 9th sternum with side-angles sharply pronounced, the apical margin very shallowly excavated (fig. 31). Apex of gonocoxite subacute and hooked inwards, interior margin with only one distal prominency, which is situated some distance away from the apex (figs. 32-33).

urens. — Clypeal marks of male similar to *florea.* Pubescence on lower part of thoracic pleurae slightly tinged yellowish. Dorsal pubescence of thorax deeper in tint, mars yellow to xanthine orange. Only the first two metasomal terga with narrow light buff apical hair-bands, that on the third usually broadly interrupted and restricted to the sides of the tergum. Apical margin of 7h sternum shallowly excavated on middle, as shown in fig. 35. Apex of 9th sternum with side-angles less acute but more deeply notched (fig. 37). Apex of gonocoxite sub-acute and hooked inwards, interior margin with only one distal prominency very similar to that of *florea* (figs. 38-39).

leptocoma. — Black clypeal marks of male longer, hardly divergent, the yellow median stripe separating them rather narrow, very slightly widened anteriorly and narrower than the transverse yellow stripe along anterior border. Thoracic and abdominal pubescence of male very similar to *urens.* Apical margin of 7th sternum shallowly excavated in the middle (fig. 35, *urens*). Apex of 9th sternum with side-angles still more rounded, the excavation deeper and wider (fig. 42). Apex of gonocoxite blunt, not inwardly curved, interior margin in ventral view with two distal prominencies, the second (smallest) situated near apex (figs. 43-44).

A. leptocoma is apparently a widely distributed insect in Siam and the Malay Peninsula, but seems to be common only at higher elevations above the sea. It may be allied to a somewhat smaller Anthophorine from the Taiping Hills in Upper Perak, classified by H. Friese as *Anthophora*

villosula F. Smith var. *malaccensis* Friese (Zool. Jahrb., Abt. f. Syst., 1918, vol. 41, p. 511). As I have pointed out on page 32 of this paper, it is obvious that Friese misinterpreted *villosula,* considering it an *Amegilla,* which it is not. The diagnosis of *malaccensis* is hopelessly inadequate, as Friese's descriptions usually are, and his statement "Metatarsus innen lang schwarz befranst" does not at all apply to our insect. I have failed to examine the type of *malaccensis* in the Berlin Museum, and as the specimen apparently could not be traced in Friese's collection, its status must remain uncertain.

Postscript. — Since the completion of the present paper, I came across three articles dealing with Anthophorine bees of both hemispheres, all published in Russian by V.V. Popov. In one of these publications the genus *Amegilla* Friese is re-defined and two new subgenera of it are proposed, viz., *Aframegilla* Popov (genotype: *Anthophora nubica* Lepeletier, 1841), and *Zonamegilla* Popov (genotype: *Apis zonata* L., 1758).

(See: V. V. Popov, Geographical distribution of the Apidae of the genus *Habropoda* F. Smith. Dokl. Akad. Nauk S.S.S.R. Moscow, 1948, vol. 59, new series, pp. 1673-1676, 1 map; Idem, On the genus *Amegilla* Friese. Ent. Obosr., Moscow, 1950, vol. 31, pp. 257-261, 5 figs.; Idem, Geographical distribution and evolution of the Apidae of the genus *Clisodon* Patton. Zool. Zh. (formerly Revue russe Zool.), 1951, vol. 30, pp. 243-253, 2 figs.).

These papers are now being translated.