A CRITICAL REVISION OF SPECIES IN THE GENUS *ASAROPODA* BY NEW CHARACTERS

By Tarlton Rayment, F.R.Z.S.

Introduction

The several species in this genus are robust, red-haired bees up to 17 mm. in length, with largely yellow "faces", and clearly close to *Anthophora* by the mouth-parts, pygidial plates of males and females, genitalia, and the neuration of the wings. The genus is endemic to Australia and New Guinea.

The bees have not been recorded from either Tasmania or New Zealand, and *Anthophora,* too, is absent from those countries. The author (1942) has already discussed the peculiar distribution and polylectic habits of *Anthophora* as evidence of its recent arrival in Australia.

A critical study demonstrated that *Asaropoda* probably derives from *Anthophora,* and is not of primitive origin, but rather a comparatively recent branch, losing two segments of the labial palpus, leaving it with only two segments. The wings are more or less fuliginious, the legs strong and hairy; the base of the abdomen is broad, and closely adapted to the thorax, so that there is a superficial likeness to certain bumble bees.

None of the species exhibits any greenish or bluish colour, and have little relationship to the Zonata Group of *Anthophora,* but it is clear that *Asaropoda* approaches the red-haired species such as *Anthophora scymna* Grib., and *A. rhodoscymna* Ckll., and could be derived from this group. *A. dawsoni* Raym. appears to be entirely distinct. By the genitalia, *A. punctata* Raym. appears to link the *bombiformis* group with the *albiceps* group. Certain *Anthophorae* have been included in this revision because they are not close to any other Anthophorid bees.

The species are all critical, and difficult to determine without dissection. It was found that the characters employed by the author in his critical revision of the Zonata Group held good for *Asaropoda,* consequently he prepared a number of mounts of the seventh abdominal tergum, the seventh, eighth and ninth sterna, and the genitalia. It was not possible to examine the mouth-parts of every specimen surveyed in this revision.

The bees were considered by Smith to be allied to the European genus *Saropoda,* and *bombiformis* was so described, but later

Professor T. D. A. Cockerell included the species in *Anthophora*. However, microscopical examination showed them to be distinct, and he proposed the genus *Asaropoda*. It will be observed that *Asaropoda* has the "copulatory gauges" of *Anthophora* (Rayment 1942) consisting of the striated pygidial plate of the female and the bidentate plate of the male. The study of the genitalia revealed that the northern and the southern species are in two distinct groups, one possessing the genitalia of the typical Anthophorid and the other the genitalia of the Zonata Cluster.

Professor T. D. A. Cockerell (1929) had already remarked that several species have passed as *A. bombiformis* because of the strong superficial likeness, and the several collections which passed under the author's hands demonstrated the necessity for a critical revision of the species, since the insects had been labelled "*Asaropoda bombiformis*" by various workers both here and abroad. In this paper the abdominal segments are numbered morphologically.

The author is indebted to the courtesies of the authorities of the several Australian Museums for permission to study the material in their collections, and to the many correspondents who have taken specimens over a wide area of the Commonwealth, and their names are recorded under each species. The notes on the architecture of *A. rufa* were supplied by the original discoverer of the only cells known to the science.

The research was assisted by a small grant from the Trustees of the Science and Industry Endowment Fund, and the author desires to acknowledge the support accorded by the Chairman, Sir David Rivett, to his researches in the Australian APOIDEA.

References

Cockerell, T. D. A. American Museum Novitates, No. 346, p. 15, 1929.
Rayment, Tarlton. A Cluster of Bees, p. 389, 1935.
——, Ibid, p. 15, 393.
——, A Critical Revision of the Zonata Group in the Genus Anthophora, Treubia, Japanese Edition, p. 16, 1942.
——, Ibid, p. 15.
——, Victorian Naturalist, Vol. 65, p. 250, 1949.

Taxonomic Position

Saropoda Latreille

Gen. Crust. and Insect., IV, p. 177, 1809.

Sarapoda bombiformis Smith, Cat. Hym. B.M., II, p. 318, 1854.

Anthophora Latreille

Hist. Nat. Cr. et Ins., XIV, p. 45, 1808.

Anthophora bombiformis Dours, Monogr. Icon. Anthophora, p. 202, 1869.

Saropoda Latreille

Saropoda bombiformis Cockerell, Ann. Mag. Nat. Hist. (7), XVI, p. 296, 1905.
Saropoda alpha Cockerell, Ann. Mag. Nat. Hist. (7), Vol. XIV, p. 204, 1904.

Asaropoda Cockerell

Ann. Mag. Nat. Hist. (9), Vol. XVIII, p. 216, 1926.

Asaropoda Cockerell

Aust. Zool., Vol. VII, Pt. I, p. 34, August, 1931.

Asaropoda Rayment

A Cluster of Bees, p. 384, 1935.

Although Cockerell (Aust. Zool.) gives six segments for the maxillary palpus and two for the labial palpus, examination by the author of these organs in *A. anomala* Ckll. reveals only five segments in the maxillary palpus. *Anthophora* has, of course, four segments, in the labial palpus, and six in the maxillary.

The specimen examined by Cockerell was taken at Studley Park, Melbourne, Victoria, and was very probably *A. albiceps* Raym.; *Saropoda* has four segments in the maxillary, and only two in the labial palpus.

Gross Morphology

Head is small in comparison with the bulk of the body, the "face" with much yellow hair; compound eyes large and bulging in both sexes; ocelli in a low curve; scape short, somewhat dilated, and often yellow, flagellum long and sub-moniliform; glossa attenuated, and bearing a number of spatulate setae as in *Anthophora*. The generic character is found in the labial palpus, which has but two segments, the basal one excessively long and slender; maxillary palpus of five or six segments, the basal one excessively short, the second long and slender, the others short; labrum large, pale-yellow and quadrangular; mandibles bidentate, mostly yellow in colour; the maxillary combs are well developed, as in *Anthophora*.

Thorax large and strong, with a punctate sculpture but, like the scutella, hidden under the dense foxy-red fleece, so that characters of any value cannot be investigated without removing the hair; the metathorax is similarly masked, but even after the hair is removed, there is no sculpture or other characters of specific value; tegulae large, but typical of the Family.

Abdomen strong, ovate, and broadly adapted to the thorax; tegument reddish or blackish, with the hind margins of the abdominal segments somewhat paler, the whole body covered with dense reddish hair (on the southern species the hair of the head is usually white); there is a blackish band on tergum three; critical specific characters lie in the apical segments of the abdomen, but these can be studied only after dissection.

Legs stout and strong, the hind pair carrying dense scopae of harvesting-hair, which is usually black on the inner surface; basitarsi broad and powerful and, like those of *Anthophora* have no "pad" or empodium between the claws. The antennal cleaner, the strigilis, of the anterior legs has a large convex velum; there is a broad patella, or knee-plate, on the median legs; the calcariae of the posterior legs are finely serrated, and very strong, but without the coarse teeth of other earth-digging bees.

Wings are large and strong, subhyaline, or infuscated, with large areas naked, but apically there are many short papillae, and along the costal region a few long black hairs; pterostigma inconspicuous; radial cell somewhat truncated at the end; the three cubitals sub-equal, the second receiving the first recurrent nervure at about the middle, the third intercubitus nervure usually meeting the second recurrent; the twenty or more hamuli are strongly developed, and indicate a long range of flight.

Architecture

The only cells hitherto described are in the collection of the author, and were found in February, 1932, in heavy black soil at Earlwood; in hard yellowish clay at Clovelly; in fine sand among grass-roots at Thompson's Bay. Some of these at least were built by *Asaropoda rufa* Raym. All the localities are in New South Wales.

The entrance ranges about 9 mm. in diameter, and leads to a shaft about 10 cm. in length and which gives access to some ten or twelve oval "mud" cells, none of which is connected. The material is not actually mud, for the "dross" has all been removed, and the refined residue of minute pebbles is incorporated with a secretion of the salivary glands. The cells measure 23 mm. at the long axis, and 16 mm. at the short axis, and are considerably lighter in weight than a similar volume of earth. (Rayment, 1935.)

Each cell has four walls, the outer rough one, the third of a smooth brown material of unknown composition, a thinner brown one like paper, and the interior one of a pale creamy nature, but the author could not determine conclusively whether or not a primitive wax had been used for the innermost lining. He has proved that such a material is used by *Anthophora,* and suspects that *Asaropoda* has a similar habit. The total thickness of the wall is about 4 mm.

The bees seem to prefer to "nest" in the shade afforded by a ledge of rock, or even the root of a tree, and often in the vicinity of shafts of *Anthophorae,* although the "blue-bands" choose a sunny position nearby. Tests of the cell-material made with diluted nitric acid produced no ebulition, and there does not appear to be any lime or mortar in its composition. The cells of *Anthophora,* when subjected to a similar test, produced a strong ebulition, for they contain considerable lime in their composition.

Early in March, 1949, Rica Erickson, of Bolgart, Western Australia, a valued correspondent who has contributed much to our knowledge of the bees of the West, discovered a fine large female searching for her "nest" in loose sand. After a survey of the locality, the bee dived down into a shaft in a small tussock of dry reeds.

This observer investigated the shaft and found that the entrance was a short turret built of the tougher bright-red subsoil, the diameter of the shaft being about 10 mm.; the particles appeared to be cemented together with a biological secretion, probably from the salivary glands, but whether from the thoracic or the cephalic systems could not be determined. Such a firm structure appeared to be essential, for the strengthening of the shaft, owing to the friable nature of the soil. The bee had not commenced to build the cells at that date, and the rather large shaft went down in a slightly winding curve for 12½ cm. and terminated on a concave base. This is the first observation on these bees recorded for the far western State.

Behaviour of the Individual

These large robust bees are capable of excavating tough clayey ground, but they dig successfully in several other types of soil. Rica Erickson sends the following note on the behaviour of the female:

"She flew low over the ground in a swift but peculiar flight, now hovering, now darting, obviously searching for her nesting hole; after some hesitation she discovered it about a foot farther on, amid a similar tussock of reeds. All the time she maintained an exceedingly high buzzing obligato."

The egg of *Asaropoda* is large, measuring about 4·5 mm. at the long axis, with a diameter of 2 mm. approx. Like most eggs of bees they increase in size just before hatching, and the larvae of both host and a parasite feed on the store of a rather dry batter of honey and pollen, plus a little biological secretion.

Philip Whitely, another of the author's correspondents, has observed certain habits of the bees. The males assemble at night, often in the company of blue-banded *Anthophorae,* and arrange themselves along a dry stalk of grass, bending it with their weight. The bees grasp the stem with their mandibles, and rest throughout the night with the body held out almost at right angles to the support. This remarkable attitude is characteristic of other Anthophorid bees in America.

Whitely said that one night a violent hailstorm swept the district of Marrickville, N.S.W., and next morning he found that the hailstones had decapitated many Anthophorid bees assembled, the heads being still attached to the stalk; the headless bodies scattered over the ground. Some of these were *A. rufa* Raym., and others were probably *A. bombiformis* (Sm.).

F. E. Wilson, the well known Melbourne coleopterist, once observed a number of *Asaropodae* flying in company about the

flowers of mistletoe, *Loranthus* sp., at Melton, Victoria, but there is reason to believe that the bees visit a wide range of other plants, including the Antignon vine; Begonia sp., an introduction to Queensland; and Wandoo, *Eucalyptus redunca,* in West Australia. Pollens from many species have been recovered by the author from the fleece of the bees.

Commensals and Parasites

At Bolgart, Rica Erickson observed a large fly in close attendance on the bee digging its shaft. "In flight the fly certainly had a superficial resemblance to the bee, for it had a long dense fleece of similar golden hair." The fly proved to be a handsome specimen of *Bombylius,* and there is little doubt it is parasitic in the nests of the red-haired bees.

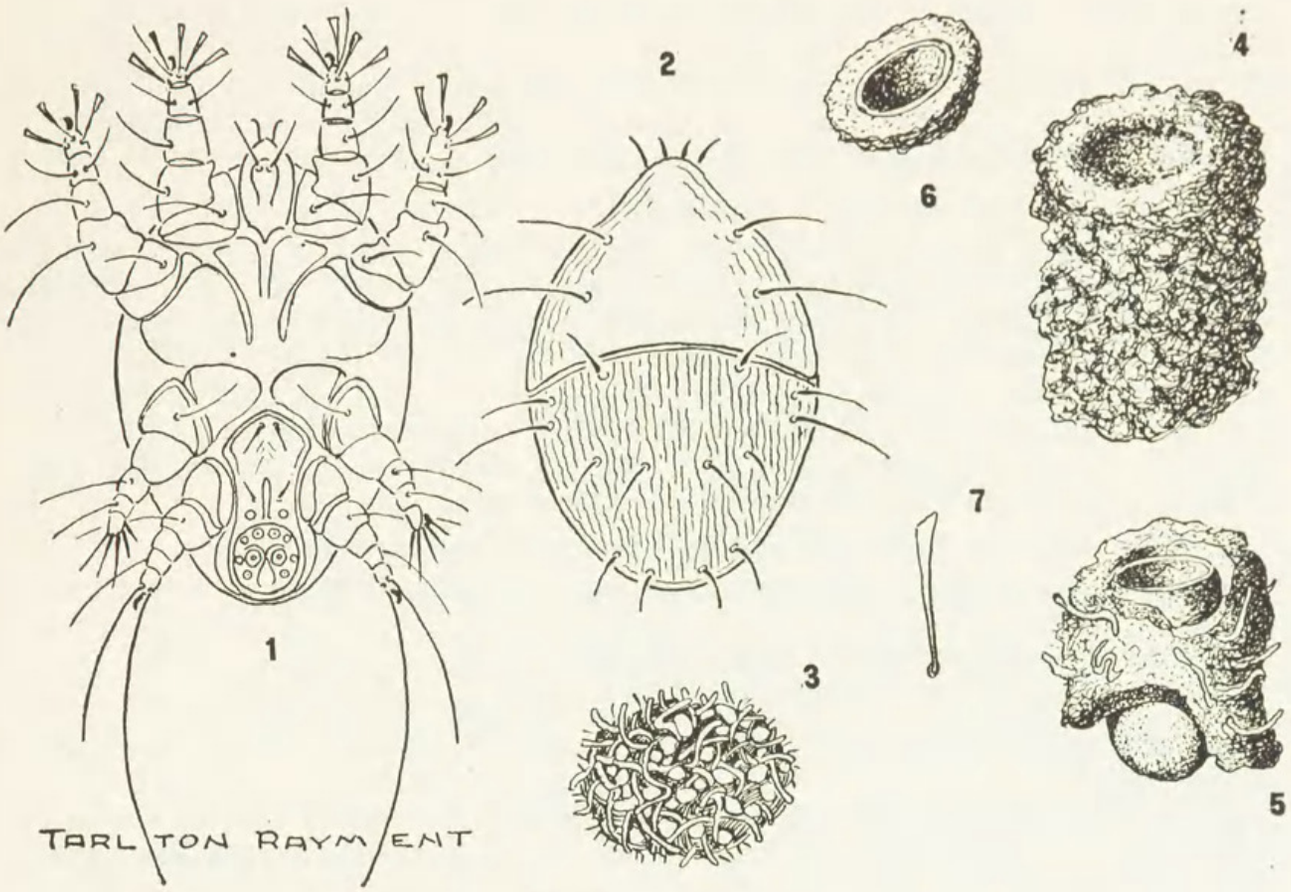
The complete literature on the genus is not available to the author, and he is unable to determine the species, but the following brief description will assist in the identification of the fly.

Length 10 mm. approx.; width of abdomen 5·5 mm., overall length of expanded wings 24 mm.; the insect is covered with dense long reddish-gold hair; arista black; with much long black hair; vertex with long hair about the ocelli; a long-oval depression on a dull-black almost naked area of the mesonotum; abdomen with black integument, but terga with a lateral broad reddish-amber band, and conspicuous long black hair among the golden fleece; on the ventral surface the hair is pale lemon; the very long slender legs are of a golden colour; tarsi black with black hair; wings sub-hyaline, the nervures typical of the genus; halteres clavate, golden-yellow; squamae golden-amber.

The author has reared Tachinid flies, *Miltogramma,* from cells of the blue-banded *Anthophorae,* and as many as five red pupal-cases have been present in one cell; there is no doubt that Anthophorid bees suffer from a heavy infestation of Dipterous parasites.

The most common parasite is probably the blue-spotted bee in the genus *Crocisa,* and specimens taken by Whiteley, at nests in Marrickville, near Sydney, proved to be *C. lugubris* Sm., and a new subspecies. The parasites loiter about the vicinity with a soft noiseless flight and, when the *Asaropoda* departs, descends to the cells to deposit the egg, which measures about 2·8 mm. at the long axis, with a diameter of 1·5 mm. at the short. The two eggs were present on one pudding. *Anthophora,* too, is pestered by these spotted parasites, and the young bees which emerge from such cells are mere dwarfs, owing to the depleted supply of food.

The author has taken only a few acarine mites from the fleece of certain *Asaropodae,* and of the many hundreds of Anthophorid bees studied by him, only about 1 per cent harbour these universal parasites. It would appear then that, in Australia at least, Anthophorid bees enjoy a remarkable freedom from these small pests,



1. Ventral view of a new Tyroglyphid mite.
2. Dorsal view showing the striations.
3. A parasite of *Asaropoda rufa* that had woven the hairs and indigestible portions of the chitinous plates of the bee into a strange cocoon.
4. Portion of the shaft built by *Asaropoda rickae* sp. nov.
5. The rough mud broken away from a cell of *Asaropoda rufa* to show the smooth inner cell.
6. The cap of the cell.
7. A long spatulate seta from the mite.

and the reason for this is not known. It is interesting to learn that the very different reed-dwelling simple social bee, *Exoneura,* enjoys a similar freedom from mites. (Rayment, 1949.)

I am indebted to Mr. H. Womersley, South Australian Museum, Adelaide, for his determination of the mite. It is a new species of *Tyroglyphus,* near to the ubiquitous *T. farinae* L., but may be separated by the striated hysterosoma (it is pitted in *farinae*), and the outer spatulate setae being longer than the inner. Womersley will later publish a full specific description.

Descriptions of New Species

Asaropoda albiceps, sp. nov.

Type, Male. Length 13 mm. approx.

Head covered with white hair; clypeus yellow, with two black lines laterally, the wide lateral yellow marks slightly higher than clypeus; a very large supra-

clypeal mark; antennae missing; mesothorax with buff hair lightly tipped with black; terga black, wide amber margins, much buff-red hair; sterna black and amber; legs reddish with buff-red hair; the black hair of the inner surface of basitarsi visible laterally as a black fringe; second cubital cell almost quadrate. The black band on abdomen more defined than on a female which seems to agree.

Allotype, Female. Length 15 mm. approx.

Head covered with deep-buff hair; clypeus yellow, with two wide bars of suffused amber; no supraclypeal or lateral marks; antennae dark above, reddish beneath; mesothorax with buff-coloured hair tipped with black; terga black with wide red margin, the dense hair redder than thoracic fleece; sterna black with wide ferruginous margins; some black hair above the pygidial plate, which has a narrow rim and striae persisting throughout; tegument of legs dark-brown, hair red. Wings sub-hyaline, second cubital cell narrow, much contracted at top.

There is some doubt of this association with the male.

Locality. Studley Park, Melbourne, Victoria. Chas French, Junr.

Allies. Approaches *dentiventris* Raym. and *victoriensis* Raym.

Asaropoda albigena Raym. stat. nov.

Jour. Roy. Soc. West. Aust., Vol. XVII, p. 182, 1930-1931.

Male. Length 12 mm. approx. The whole insect covered with a fleece of reddish-yellow hair.

Head small, scape yellow in front, flagellum black, obscurely red beneath; third segment of antennae long and slender; genae with conspicuous long white hair; mesothorax with some black hair intermixed; margins of abdominal terga broadly red; large contiguous punctures on mesothorax; pygidial plate short, dentate.

Locality. Lander Station, West Australia. H. Newman?

Allies. Clearly close to *albiceps* and *rickae.*

Asaropoda alpha Ckll., stat. nov.

(Smith's *var. A.* of *bombiformis*)

Ann. Mag. Nat. Hist., Ser. 7, Vol. XIV, p. 204, 1904.

Male. Length 10-11 mm. approx.

Head small, clypeus laterally with a broad black band on the yellow; flagellum ferruginous beneath; legs blackish, with much orange hair, except on posterior tarsi, where hair is entirely black; some black hair adjacent to pygidial plate, which is dentate.

Female not known.

Locality. Toowoomba and Mackay, Queensland. Coll. not known.

Asaropoda anomala Ckll., stat. nov.

American Museum Novitates, No. 346, p. 14, 1929.

Male. Length 12 mm. approx. The largest and reddest species of the group.

Clypeus yellow, with a marginal black dot laterally; lateral marks suffused with orange and not quite so high as clypeus; supraclypeal mark ivory-yellow; third antennal segment short and thick; scape yellow, flagellum blackish; a few black hairs among the very red ones of the mesothorax; terga with much dark-red hair and a conspicuous black band on second tergum; legs largely red, with some black hair on the inner surface; pygidial plate obtusely bilobed (not

distinctly angled as in *bombiformis*, for which it would be taken on casual inspection: Cockerell).

Locality. Brisbane, Queensland. H. Hacker?
Lismore, New South Wales. Dudley Townley.

Female. Length 17 mm. approx.; larger than *bombiformis.*

Head small; clypeus suffused with reddish, no lateral or supraclypeal mark; the dark antennae long, third antennal segment long and slender; scape ferruginous; red hair of mesothorax with a few black hairs intermixed; the hairs on the abdominal terga are lighter on the anterior half; sterna black; considerable black hair about the pygidial plate, which has a fine rim and striae persisting throughout.

Locality. Lismore, New South Wales. Dudley Townley.

Asaropoda bombiformis (Sm.), stat. nov.

Cat. Hym. B.M., II, p. 318, 1854.

Male. Length 12 mm. approx. Smaller, and not so rufous as *anomala.*

Clypeus yellow, two suffused amber bars laterally, and a black dot; yellow lateral face-marks as high as clypeus, a large yellow supraclypeal mark; scape yellow, flagellum dark; mesothorax with much black hair among the buff-coloured hair; terga black, margins obscurely lighter, with much golden hair, a conspicuous black band on tergum three; sterna ferruginous, with a black dot; pygidial plate dentate, no black hair about the pygidial plate. Legs very light ferruginous in certain lights; wings sub-hyaline, the large second cubital cell almost quadrate.

Female. Length 16 mm. approx.

Head small; clypeus suffused with reddish; no lateral or supraclypeal marks; scapes and flagellum beneath ferruginous; disc of mesothorax with less hair, so that the sculpture is evident; the black band of the terga is very conspicuous; no black hair about the pygidial plate, which has the striae failing over a large area. Legs dark-red, with much black hair on inner surface. Wings sub-hyaline, the large second cubital cell contracted at top.

Locality. Sydney, New South Wales, Feb., 1942. Rayment.
Hunters Hill, Sydney, 20th March, 1940. L. Robertson.
Lismore, New South Wales, 13th March, 1940. Dudley Townley.
Sydney, New South Wales. Owen Dawson.
Richmond River, New South Wales?
Magnetic Island, Queensland. J. Stewart.
Toowoomba, Queensland? } Recorded by H. Hacker.
Brisbane, Queensland? } Recorded by H. Hacker.
Buderim Mountain, Queensland? } Recorded by H. Hacker.
Montville, Queensland? C. Borch.
Binaturi River, New Guinea? Included by Cockerell.

This last recorded by Cockerell, but all the six must be doubtful, since both authors had more than one species.

Allies. A. anomala Ckll., *A. rufa* Raym., and *A. rubricata* Raym.

Asaropoda dentiventris, sp. nov.

Type, Male. Length 7 mm. approx. The smallest male in the group.

Hair of head white; clypeus ivory-yellow, lateral marks a trifle below apex of clypeus, a large supraclypeal mark of similar colour; antennae dark-brown above,

flagellum reddish beneath; scapes yellow beneath; mesothorax with reddish hair, a few black-tipped; terga black, obscurely lighter on margins, much foxy-red hair; sterna black with wider amber margins; sixth sternum with a pair of lateral teeth (see Fig. 2, Pl. 5); legs red, with much foxy-red hair; the dark hair of the inner surface visible laterally as a black fringe; the fifth sternum has a sharp tooth laterally. Second cubital small and much contracted at top.

Female not known.

Locality. Broadmeadows, Victoria, 5th October, 1922. F. P. Spry.

Allies. Closely allied to *albiceps* Raym. and *victoriensis* Raym.

Asaropoda imitata, sp. nov.

Type, Female. Length 15 mm. approx.

Head covered with foxy-red hair; clypeus yellow, suffused with amber; not any lateral or supraclypeal marks; stout scapes reddish-amber, flagellum reddish beneath, darker above; mesothorax with buff-red hair and many black ones intermixed; about the tegulae the hair is bright-orange; terga black, margins obscurely reddened, much appressed red hair, among which is a few long black ones; a black spot of hair above the pygidial plate which has the striae absent on a narrow median line; sterna brownish-black; the black band and hair on the abdomen is very distinct; legs reddish with much red hair, blackish on inner surface; wings very pale; large second cubital cell almost quadrate.

Male not known.

Locality. New South Wales. Rayment Coll.

Allies. Plainly very close to *rufa* Raym., *rubricata* Raym., and *bombiformis* (Sm.).

Asaropoda meltonensis, sp. nov.

Type, Female. Length 16 mm. approx.

Hair of head white; clypeus yellow, suffused with amber; a wide thin supraclypeal mark; obscure lateral marks; scape excessively short, flagellum brownish-black; mesothorax covered with foxy-red hair, not any black; abdomen with reddish-brown terga and sterna, and much red hair; copious black hair about the apical segments; pygidial plate with striae persisting throughout; legs with similar red hair on red tegument; wings sub-hyaline, second cubital cell large, almost quadrate, slightly contracted at top. Mouth-parts could not be examined.

Male not known.

Locality. Melton, Victoria. F. E. Wilson.

Allies. Approaches *albiceps* Raym., but not very close.

On flowers of mistletoe (*Loranthus* sp.).

Asaropoda punctata Raym., stat. nov.

Jour. Roy. Soc. West Aust., XVII, 1930-1931.

Type, Male. Length 13 mm. approx.

Head small, with much long buff hair; clypeus butter-yellow, white hair; lateral yellow marks higher than clypeus; large yellow supraclypeal mark; scapes yellow in front, flagellum dark above, reddish beneath; hair of genae and pleura white; mesothorax with sparse buff-coloured and black hair; terga black, margins amber, much dull ferruginous hair, a few long black ones; sterna dark-amber; black band of abdomen but little evident; legs red, hair red, only a few

black hairs on inner surface. Wings almost clear, second cubital cell narrow, higher than wide, and contracted at top. Mouth-parts could not be studied.

Female not known.

This and *albiceps* are the lightest-coloured of all the group.

Locality. Brisbane, Queensland, 2nd March, 1923. Cedric Deane.

Allies. By the genitalia, *punctata* appears to link the two groups, *albiceps* and *bombiformis*.

Asaropoda rickae, sp. nov.

Allotype, Female. Length 14 mm. approx.

Hair of head ivory and pale-buff, with many long black hairs intermixed; clypeus yellow, with a wide black bar laterally, and which, taken with a nude area above, form a horse-shoe design; no lateral or supraclypeal marks; the silvery hair of the genae is very conspicuous; scape and flagellum all black, the third segment of the antennae exceedingly long and slender; mesothorax with dense straw-coloured, buff, and black hair, so that the disc appears to be grey in colour; about the tegulae the hair is bright-orange; terga black, obscurely lighter on margins, and covered with a dense fleece of buff-coloured hair; sterna black, with amber margins; much black hair about the pygidial plate which has no rim and striae persisting throughout; legs brownish-red and black, with much deep-buff hair, tarsi reddish. Wings sub-hyaline, the small second cubital cell greatly narrowed at top; there is an enclosed deeply infuscated appendicular cell.

This may prove to be the other sex of *albigena*.

Locality. Bolgart, West Australia, 26th March, 1949. Rica Erickson.

Allies. The yellowest in colour of all the group.

Taken at "nest." (See notes under headings Architecture and Behaviour.)

[A female, *Anthophora flava*, was described by Friese (Deutsch. Ent. Zeitschr., p. 448, 1911) from Fremantle, Western Australia. From the description, this species apparently approaches the *albigena* group of *Asaropoda*; the tegument of the abdomen is black, and the dense fleece yellowish in colour; legs, clypeus, mandibles, labrum, and tegulae yellow. The author has no bee conforming to the description, and since Friese does not include any critical characters (he said it resembled *Anthophora bombiformis*), only this brief reference can be included.

The same author also described *Anthophora rufescens* Fr., which is said to be related to *A. bombiformis* Sm., but Cockerell (Australian Zoologist, Vol. VII, Part I, p. 35, 1931) suggests that it "is evidently very close to *A. rhodoscymna* Ckll. *A. scymna* Grib. has the abdominal terga black.

Neither of Friese's types was available for study; no dissections appear to have been made, and in the absence of figures of critical characters the author is unable to determine their true relationships. These bees have been mentioned here because they could not be included in the author's critical revision of the Zonata group of *Anthophora*.]

Asaropoda rubricata, sp. nov.

Type, Male. Length 11 mm. approx.

Head small, with pale ferruginous hair; clypeus and supraclypeal mark yellowish-ivory, a suffused area laterally on the former; lateral face-marks paler, and higher than clypeus on orbital margin; scape yellow, flagellum blackish, reddish beneath; clypeus with much black hair; mesothorax with sparse buff-coloured hair intermixed with many black ones; abdominal terga with the black band marked with much long black hair, and margins lighter; sterna clear-ferruginous, with much red hair. Legs ferruginous, with copious red hair; only a few black hairs on the inner surface. Wings reddish, the small second cubital cell contracted at top, higher than wide.

The general aspect is redder than *bombiformis* but not so red as *anomala.*

Female. Length 14 mm. approx.

Hair of head reddish-yellow to pale-buff, no lateral face-marks; the supra-clypeal mark almost obsolete; clypeus deeply suffused with amber, copious black hair; scape black, flagellum black above and reddish beneath; mesothorax with many black hairs among the pale ferruginous ones; the black hair conspicuous about the tegulae; terga of abdomen black, with red hair, but two black bands are clearly defined; not any black hair about the pygidial plate; sterna black and ferruginous; pygidial plate with a narrow rim and striae persisting through-out; legs ferruginous, with red hair; wings reddish, the small second cubital cell higher than wide, contracted at top. This association of the sexes may not be correct.

Locality. Lismore, New South Wales, 9th March, 1940. Dudley Townley.
Lismore, New South Wales, 20th May, 1940. Dudley Townley.
Parramatta, New South Wales, February, 1933. N. A. Hall.
Taken on flowers of *Antignon* vine.

Asaropoda rubricata dentata, subsp. nov.

A male from Sydney is not typical. Hair of frons white; the black fringe of the posterior legs, especially the basitarsi, is very conspicuous; pygidial plate with a small tubercle between the two short stout teeth; wings distinctly yellowish, the small second cubital cell almost quadrate, a small enclosed appendiculate cell; mesothorax has much black hair among the yellowish hair.

Location. Sydney, New South Wales, 7th February, 1943. Owen Dawson.

Asaropoda rufa Raym., stat. nov.

Jour. Roy. Soc. West Aust., Vol. XVII, p. 181, 1930-1931.

Male. Length 13 mm. approx.

Hair of head with a large amount of black among the orange-red hair; yellow of face suffused with reddish; supraclypeal mark deeply so; lateral face-marks as high as clypeus, which has much long black hair, and two longitudinal bars suffused with reddish; scape yellow, flagellum reddish beneath; mesothorax with bright ferruginous hair, many long black ones intermixed; terga black, broadly lighter margins, much appressed ferruginous hair with a few long black ones; venter clear-ferruginous; legs red, basitarsi long, the black hair of the inner surface shows laterally as a fringe against the ubiquitous red hair; wings yellow, second cubital cell slightly higher than wide.

This species is redder than *bombiformis* but not so red as *anomala.*

The type, male, was taken at Enoggera, Queensland—not Sydney, New South Wales, as given in the original description. Specimens from the latter locality are not quite typical.

Female. Length 16 mm. approx.

Head very small, and covered with bright-ferruginous hair, among which is a number of black ones; clypeus yellow, suffused with amber; not any lateral marks; supraclypeal mark so deeply suffused as to be almost obsolete; antennae reddish beneath, slightly darker above; mesothorax with many black hairs among the foxy-red fleece; terga black, with wide golden margins; sterna similar, much orange-red hair; in a certain light each of the terga show a blackish band; no black hair about the pygidial plate, on which the striae fail over a large area; wings yellowish, second cubital cell large and almost quadrate.

The pattern of the pygidial plate is after the manner of *Anthophora longmani* Raym.

The sexes may not be correctly associated.

Locality. Lismore, New South Wales, 1st January, 1940. Dudley Townley.
Hunters Hill, Sydney, 20th March, 1940. L. Robertson.
Ennogera, Queensland, 27th December, 1912. Coll. not known.
Marrickville, Sydney, 6th January, 1931. Phillip Whiteley.

Allies. Plainly close to *bombiformis.*

Taken at "nest" in the ground. (See description of the Architecture.)

Asaropoda victoriensis, sp. nov.

Type, Male. Length 8 mm. approx.

Head covered with white hair; clypeus ivory-yellow; two wide short black bars laterally, lateral face-marks wide, and a trifle lower than the clypeus; antennae dark-brown, but scape yellow in front; mesothorax with foxy-red hair and a few black ones intermixed; terga black, margins obscurely lighter; two basal segments have copious black hair-bands, but all others covered with dense foxy-red hair; sterna brownish; legs dull-reddish, hair red, but blackish on inner surface. Wings almost clear, the second cubital cell almost quadrate.

Female not known.

Locality. Broadmeadows, Victoria, 1st January, 1918. F. P. Spry.

Allies. Clearly in the *albiceps* and *dentiventris* group.

Anthophora dawsoni, sp. nov.

Male. Length 18 mm. approx., the smallest specimens 15 mm. Red and black.

Head transverse, with pale fulvous and white hair; face-marks lemon-yellow, lateral marks separated from the clypeus by a black undulating mark like that of *Anthophora zonata*; black frons with scattered coarse punctures; clypeus lemon-yellow, with two pale-amber longitudinal lines, white hair; supraclypeal area a wide low triangle of yellow; vertex rugose, with long pale fulvous hair; compound eyes large, claret; genae with dense fulvous hair fading to white near mandibles; labrum square, yellow, very coarsely punctured, with two black nodules on anterior margins; mandibulae yellow, blackish apically; black antennae, with yellow patch on front of scape; segments well marked.

Prothorax with dense fulvous short hair; tubercles fulvous; mesothorax with numerous large shallow punctures under a dense mat of plumose reddish hair; beneath the hair is paler; scutellum and postscutellum with a like mass of fulvous hair; metathorax masked with similar red hair; ventral segments with whitish hair; abdominal dorsal segments of a rich reddish-brown tegument; 1 with a mass of fulvous hair as on mesothorax; 2-6 with lighter margins, and coarse appressed black hair; 7 like an oblong plate with two nodules laterally.

Legs dark-reddish, with amber hair on anterior and median pairs; much long black hair on posterior pair; tarsi reddish, with close fulvous hair on anterior, black on posterior; claws dark-reddish; hind calcar black, finely serrated, pale apically; tegulae reddish-amber, polished.

Wings suffused with a beautiful dark dusky-purple iridescence; nervures heavy and black; third cubital cell almost quadrate; pterostigma blackish, inconspicuous; hamuli powerful, about 24.

Locality. Onslow, North-West Australia, 2nd August, 1944. Owen Dawson.

Type in the collection of the author.

Allies. A very distinctive bee, resembling some of the *Chalicodoma* of Europe. Genitalia typical of the genus. Easily known by the dark wings and reddish-brown body.

CRITICAL REVISION OF GENUS *ASAROPODA*

Explanation of Plate I

No. 1. Pygidial plate of female *Asaropoda bombiformis* (Sm.).
2. The plate of *A. anomala* Ckll. has the striae persisting throughout except over a wide rim.
3. The striae persists over the narrow rim in *A. rubricata,* sp. nov.
4. Striae fails over a wide band on *A. rufa* Raym.
5. *A. imitata* has the striae failing on a narrow median line.
6. The plate of *Anthophora grisescens* Raym. has a high median rise with striae persisting throughout.
7. There is no rim, and striae persists over plate of *Asaropoda meltonensis,* sp. nov.
8. There is a narrow rim on *Asaropoda albiceps,* sp. nov.
9. Striae persists over a low narrow rim on *Anthophora rhodoscymna* Ckll.
10. Striae fails entirely but there is an elevated area on *Anthophora calva* Raym.
11. Striae persists over a low narrow rim in *Anthophora preissi froggattii* Ckll. The plates of *Anthophorae* Nos. 6 and 10 are illustrated here because they could not be included in the blue-banded *Zonata* Group, being nearer to *A. rhodoscymna* Ckll.

12-17. There is a distinctive patch of black hair on fifth abdominal sternum of *A. anomala* Ckll. (All at the same magnification, but allowance must be made for distortion by pressure of the cover-glass.)

18. Eighth tergum of male *Asaropoda rubricata,* sp. nov.
19. Anterior wing of mutation showing stump on second intercubitus nervure.
20. Posterior wing.
21. The twenty-two hamuli indicate strong flight.
22. Much of the wing area is nude, but apically there are alar papillae; a few stiff hairs are in the costal region.

Explanation of Plate II.

Eighth Tergum and Genitalia of Males

1-2. *Asaropoda bombiformis* (Sm.)
3-4. *Asaropoda anomala* Ckll.
5-6. *Asaropoda rubricata, sp. nov.*
7-8. *Asaropoda rufa* Raym.
9-10. *Asaropoda albiceps.*

11-12. *Asaropoda victoriensis,* sp. nov.
13-14. *Asaropoda dentiventris,* sp. nov.
15-16. *Anthophora rhodoscymna* Ckll. is closer to *Asaropoda* by the genitalia pygidial plate.
17-18. *Anthophora dawsoni* Raym. is unlike other Australian species, for the pygidial plate has an almost straight margin, after the manner of certain American Anthophorid bees, such as *A. edwardsii* Cresson.

Explanation of Plate III

Eighth Abdominal Sternum of Males

1. *Asaropoda bombiformis* (Sm.)
2. *Asaropoda anomala* Ckll.
3. *Asaropoda rubricata,* sp. nov.
4. *Asaropoda rufa* Raym.
5. *Asaropoda albiceps,* sp. nov.
6. *Asaropoda victoriensis,* sp. nov.
7. *Asaropoda dentiventris,* sp. nov.
8. *Anthophora rhodoscymna* Ckll.
9. *Anthophora dawsoni* Raym.

By the genitalia of the males 2, 4, 6, 8 are definitely closely related, and approach typical *Anthophora,* but 10, 12, 14 are farthest away, and constitute a distinct group.

The eighth tergum of the males is bidentate, with 14 approaching the form of *Anthophora dawsoni*; that of *Anthophora rhodoscymna* is distinct, having an undulate margin.

Explanation of Plate IV

Seventh and Ninth Sterna of Males

1 and 2. *Asaropoda bombiformis* (Sm.)
3 and 4. *Asaropoda anomala* Ckll.
5 and 6. *Asaropoda rubricata,* sp. nov.
7 and 8. *Asaropoda rufa* Raym.
9 and 10. *Asaropoda albiceps.*
11 and 12. *Asaropoda victoriensis,* sp. nov.
13 and 14. *Asaropoda dentiventris,* sp. nov.
15 and 16. *Anthophora rhodoscymna* Ckll.
17 and 18. *Anthophora dawsoni* Raym.

By the ninth sternum 2, 4, 6, 8 are in one group, with the plate short and wide, and 10, 12, 14 are in the second group, with the plate long and narrow, as in the Zonata Group of *Anthophora.*

The gradulus of the seventh sternum also shows close affinity, except in the case of 17, where the large plate is quite distinct, and only 13 shows any approach to this form.

A. rufa is close to *A. anomala,* but *A. rubricata* is closer to *A. bombiformis.*

Explanation of Plate V

1. Front of head-capsule of female *Asaropoda rickae,* sp. nov. Note the horse-shoe pattern.
2. Sixth sternum of *A. dentiventris,* sp. nov.
3. Seventh sternum of *A. punctata* Raym.
4. Sixth sternum of *A. victoriensis,* sp. nov.
5. Pygidial plate of female *A. imitata,* sp. nov.

6. Pygidial plate of female *A. rickae,* sp. nov.
7. Bouton, or spoon, at apex of glossa of male *A. anomala* Ckll.
8. Eighth sternum of male *A. punctata* Raym.
9. Strigilis of male *A. anomala* Ckll.
10. Maxilla with comb and maxillary palpus.
11. Maxillary palpus more highly magnified.
12. Dentate pygidial plate of male *A. punctata* Raym.
13. Posterior calcar of male.
14. Ninth sternum of *A. punctata* Raym.
15. Apex of stipite of genitalia of male.
16. Four tarsal segments and claws of *A. anomala* Ckll.
17. Third antennal segment of female *A. imitata,* sp. nov.
18. Third antennal segment of male *A. anomala* Ckll.
19. Mandible of male.
20. Labrum of male.
21. One of the spatulate setae of the glossa of male.