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NEW AUSTRALIAN SPECIES OF THE FAMILY
LIBELLULIDÆ.

[NEUROPTERA: *Odonata.*]

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(Plate xlv.)

In this paper eleven new species are added to the list of Australian *Libellulidae*, bringing the total up from 50 to 61. All the new species were taken in the Cairns district of North Queensland during the summer of 1904-5. Of these, three only are new to science. The remainder are species already known in other parts of the world, but so far unobserved in Australia. Of the new species, one, represented by a single female, belongs to the beautiful genus *Rhyothemis*. A second is a *Synthemis*, and closely allied to several common southern Australian forms already described. A third adds a new genus (*Macromia*) to the Australian list. Of the eight remaining species, one is common in South Europe, Africa and East Indies; four others occur in the East Indies, India and Ceylon; two in New Guinea; and one, hitherto known from the male only, in Borneo. Altogether six new genera are added to the Australian list, viz., *Zyxomma*, *Erythemis*, *Macrodiplax*, *Agrionoptera*, *Tetrathemis* and *Macromia*. In two of the new species the males are yet to be discovered.

I am much indebted to M. René Martin of Le Blanc, France, for his kindness in verifying the species sent him.

i.—Subfamily LIBELLULINÆ.

1. ZYXOMMA PETIOLATUM Ramb.

This insect belongs to a remarkable genus whose affinities have been the subject of much speculation. Originally included amongst the Libellulinae, it was later on separated out and

formed by Karsch into a separate subfamily, Zyxomminæ. A first examination of the insect would suggest that it belongs to the *Corduliinae*, since it has the general *facies* of that subfamily. But the eyes, both in shape and in their extreme contiguity, as well as the wing-neuration, demand that it should be placed somewhere at the head of the Libellulinae, close to *Tholymis* and *Pantala*. This seems to me its proper position; nor is there any need for a new subfamily to contain it, unless we are to split up the Libellulinae altogether into half-a-dozen or more subfamilies.

Four species of this genus are known, one from West Africa, and three from India and East Indies. *Z. petiolatum* is found in India, Ceylon, and the East Indies. In Australia it is evidently extremely rare. I found it in only one spot, some ten miles out of Cairns, flying swiftly up and down a creek in the guava scrub, at dusk. It often hovers quite motionless in the air for a long time, and when flying, almost skims the surface of the water. I took about half-a-dozen males and two or three females.

The following is a description of this remarkable insect, made from the freshly killed specimens:—♂. Total length, 49 mm.; abdomen, 37 mm.; wings, fore 32 mm., hind 32.5 mm. Wings completely shaded (in the mature insect) with dull yellowish-brown; tips from pterostigma outwards, fuscous; bases of hind wings very slightly saffroned; hindwings slightly longer than forewings, anal border rounded. *Pterostigma* 3 mm., brown. *Membranule*, fore, small, brown; hind, 2.5 mm., rather broad, dull brown on a black nervure. *Nodal Indicator* | 11 7-8 | last antenodal of forewings, and first two or three post | 8 8-9 | nodals of all wing not continuous. *Head*: *Vertex* small, hairy, tubercled, black; *ocelli* central, brilliant; other two smaller, brown; *antennae* 2 mm., brown; eyes dark green in the living insect, dark brown in the dried specimen. Front cleft medially, dark brown above with greyish hairs, dull dirty yellowish-grey on sides and below; *clypeus* dull dirty yellowish-grey; *labrum* brown; *labium* and *mandibles* pale dirty yellowish-grey. *Thorax*: *Prothorax* pale brown. *Meso-* and *metathorax* dark brown, almost black on shoulders; sides dirty brown shading to dirty greyish-brown

below. *Legs* light brown. *Abdomen*: 1-3 enormously swollen, rest very slender, subcylindrical, slightly thickest in the middle. Colour, black shaded with deep maroon in parts; 10 carries a hairy tuft below the inferior appendage. *Appendages*: *Superior* 2.5 mm., rather close together, parallel, curving slightly downwards; black, bases brown. *Inferior* 1.7 mm., broadly triangular-lanceolate, pointed upwards; light brown.

♀. Differs very slightly from male, as follows:—Total length, 52 mm.; abdomen, 38 mm. *Wings*: 6-7 postnodals; *pterostigma* nearly 3 mm. *Head*: *Vertex* and *antennæ* brown; *front* pale brown above. *Thorax* pale dirty brown. *Abdomen*: 1-3 enormously swollen, rest not quite as slender as in male. Colour, brown, sutures black. Segment 9 carries a small pointed tubercle underneath; 10 has a large swelling underneath, between and below the appendages. Between 9 and 10, below, is a small ridge carrying a few bristles bent downwards and backwards. *Appendages* wide apart, pointed, curving outwards, 1.5 mm. Colour brown, shading to dull black at tips.

Hab.—Kamerunga, near Cairns, N.Q.; rare; January.

2. RHYTHEMIS ALCESTIS, n.sp.

♀. Unique. Total length 27 mm.; abdomen 17 mm.; wings, fore 27.5 mm., hind 26.5 mm.

Wings: *Pterostigma* short, 1.8 mm., black. *Membranule* narrow, rather long, about 2.5 mm., pale dirty greyish-brown. *Nodal Indicator*

9	10-11
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 Basal half of all wings coloured black, with metallic

6	10-11
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 reflections, as follows: in the forewings the colour-line runs *from the nodus exactly* across the wings to the postcostal margin, ending at a point nearly 4 mm. from the bottom of the wing-triangle, and is *slightly* irregular in shape; in the hindwing the colour-line starts *from the first postnodal* and proceeds, bending slightly *outwards*, to about the middle of the wing; it then takes an irregular semicircular curve inwards, and ends up somewhere about half-way along the postcostal margin. *Head*: *Vertex* shiny metallic black, small, hairy, tubercled; *eyes* brown; *antennæ* black, 1.7 mm. *Front* hairy, cleft medially, very deep metallic green above, shading to brown next the clypeus.

Clypeus brown; *labrum* dark brown; *labium* and *mandibles* paler brown. *Thorax*: *Prothorax* narrow, shiny black. *Meso-* and *metathorax* hairy, shining metallic black, with bronze reflections. *Abdomen* short, subcylindrical; seen from above, almost the same width from end to end; seen sideways, tapering gradually from 3 to end. Colour dull black. Segment 10 carries a small hairy projection between the appendages. *Appendages* short, 0.7 mm., wide apart, pointed, subconical, black (Plate xlv., fig. 1).

Hab.—Kuranda, near Cairns, N.Q. A single female was captured by Mr. F. P. Dodd of Kuranda, in December, 1904, about 12 miles up the river Barron above that township.

This unique specimen is closely related to *R. bipartita* from Borneo. The latter has the wings less coloured with black. It also comes somewhat near to *R. resplendens* (♀), from which it may be at once distinguished by its greater size and by the black colouration of the wings being continuous, whereas in *resplendens* (♀) it is broken by an oval hyaline spot 4.5 mm. long. It would be interesting to obtain the male, which might be either a black insect like the female, or a brilliantly coloured insect like *resplendens* (♂).

3. CROCOTHEMIS ERYTHRÆA Brullé.

This species is very widely distributed, being found commonly over the South of Europe, the Continent of Africa, Ceylon, and the East Indies. A single pair was taken by me on Carrington Marsh, near Atherton, N.Q., flying like *O. villosovittatum*, around the edges of the marsh, and often settling high upon the branches of overhanging trees, with wings depressed. *C. servilia* Drury, already recorded from Australia, is a larger insect, with wings totally shaded with yellow. *C. nigrifrons* Kirby, is the only other Australian species of the genus, and is blue, with black head and thorax.

4. ERYTHEMIS RUFA Ramb.

At first sight this insect is almost exactly like *C. erythræa*. There is a difference, however, in the neuration of the discoidal

area of the forewings. In *Crocothemis* there are three ranks of cells in the discoidal area all the way; in *Erythemis* there are three cells, followed by two ranks afterwards (Plate xlv. figs. 2-3).

One male and two females of this insect were taken by me on the Carrington Marsh, near Atherton, N.Q., in company with the preceding species. Its flight and habits are also similar. One female also from Cairns, N.Q. (E. Allen).

This insect is already recorded from New Guinea.

5. MACRODIPLAX LYCORIS Selys.

An insect of similar size and shape to the last two, but easily distinguished by the broad irregular jet black dorsal band on the red abdomen, the portions of which on each segment from 2-8 are clepsydrate in form, and on 9 form a large segment of a circle.

Kirby gives Madagascar(?) as the habitat of this insect. Selys obtained his specimens from New Guinea. I believe the female is unknown. The male flies swiftly over creeks and rivers, often wandering into the bush, like *Pantala flavescens*. It is rare and local, and only occurs singly. About half-a-dozen males were taken by me at Kuranda and Cairns, N.Q.

6. DIPLACODES TRIVIALIS Ramb.

This common insect is exceedingly abundant in India, Ceylon, and the East Indies. It has never been recorded before for Australia. In the summer it is very rare in the Cairns district. I took several males and two females at Redlynch, near Cairns, N.Q., flying around the edges of billabongs of still water. In the winter it is exceedingly common. I have received great numbers of it, together with *Brachydiplax australis*, a somewhat similar insect, from Mr. E. Allen of Cairns.

The male and female are both, for many weeks after emergence, of a dull brown colour, with black markings. Later on, when quite matured, the thorax and abdomen of the male, and more rarely of the female also, become covered with a bluish bloom, except on the last segment or two, which are jet black. So different does the insect then appear from the described brown type,

that I was led to give it a new name; and it was not until I received an abundant supply from Mr. E. Allen that I was able to connect the two forms by intermediate specimens. At Cairns this species appears at the end of July, and in August the brown form swarms. At the end of that month the males begin to assume the bluish bloom, and throughout September they are still common. From then up to December the species rapidly decreases in number, and in January-February only a few tattered individuals are left. The old females which are left over to the end of the season are, like the males, almost entirely covered with bluish bloom.

7. DIPLACODES NEBULOSA Fabr.

This pretty little species is common in the East Indies. It may be easily recognised by its diminutive size, and by the fuscous tips to all four wings. In Australia, I took seven males flying over the Carrington Marsh, near Atherton, N.Q., in January, 1905. It flies about ten yards out from the edge of the swamp and keeps very close to the surface of the water. It can only be captured by wading. The motion of the wings is so quick that it is exceedingly difficult to see this insect when flying, though its actual progress is slow and very zigzag. It is fond of sitting on the very tips of grass and reed-stems sticking out of the water, with its wings depressed. I do not know the female.

8. AGRIONOPTERA INSIGNIS Ramb.(?).

During the months of February-April, 1905, Mr. E. Allen of Cairns, forwarded me a number of exceedingly beautiful dragonflies referable to the genus *Agrionoptera*. I forwarded a number of these to M. René Martin, who is of opinion that they are "probably *insignis*." *A. insignis* is a Javan insect. No species of this genus has ever been recorded for Australia. As there appears to be a possibility that this is a new species, and as no description of *A. insignis* is accessible to Australian collectors, I propose to give a careful description of my species and thus put it permanently on record; when it is to be hoped that any collector possessing specimens of *A. insignis* will at once compare his insects with this published description.

♂. Total length 34-35 mm., abdomen 24 mm.; wings, fore 28-29 mm., hind 26 mm.

Wings long, narrow, especially at bases; neuration black; bases generally slightly saffroned, sometimes not at all. Basilar space free; one cross-nervure in submedian space; triangles of all wings free. *Pterostigma* 2.5 mm., black. *Membranule* minute, nearly black. *Nodal Indicator* $\left\| \begin{array}{cc} 14 & 10-11 \\ 10-11 & 10-11 \end{array} \right\|$

Head: *Occipital triangle* very small, black; *eyes* dark brown; *vertex* tubercled, hairy, brilliant deep steely metallic blue; *antennae* 2 mm., black; *ocelli*, central one large, all three transparent, pinkish; *front* hairy above, very square, brilliant steely metallic blue, sides yellow; *clypeus* yellow, anteclypeus somewhat recessed under postclypeal ridge; *labrum* dirty brown, shiny; *labium* broad, square and large, pale yellow, crossed from top to bottom by a broad black band; *genae* and *mandibles* black or very dark brown, a yellowish spot on each side.

Thorax: *Prothorax* black, bordered with yellow in front and behind, and with a small dorsal central yellow spot. *Meso-* and *metathorax* metallic greenish-black above, including two narrow parallel dorsal yellow stripes about 1.5 mm. long, separated by a narrow black line along the dorsal ridge; in front of these is a small square yellow spot, and behind them near the wing-joints a pair of small triangular yellow spots close together. Sides bright yellow irregularly marked with metallic greenish-black bands as follows:—A continuation of the metallic groundcolour above starts from near the front wing-joints, and, isolating two yellow spots of which the lower is twice as large as the upper, is continued as a narrow irregular band across to the mesocoxa, where it becomes much enlarged, isolating a yellow spot at the base of the coxa. A similar but smaller band starts from the hind wing-joints and, isolating a triangular yellow spot, proceeds across to the metacoxa, subdividing into a pair of narrow irregular bands, the lower of which spreads out into a big smoky black patch on the underside. A shorter curved black mark connects the base of the abdomen with the middle of the last-mentioned band. On

the underside, below the black patch, is a transverse black ray separating off a triangular yellow space above and a yellow band below it. *Scutella* bright yellow. *Legs* black; *coxæ* dirty brown, two thirds of underside of fore femora bright yellow.

Abdomen slender, 1-3 swollen, 4-10 narrow. Colour: 1-2 reddish marked by transverse rays of black which coalesce somewhat above so as to make the dorsal surface of 1 nearly all black; suture between 2 and 3 lined by a black band; 3-7 bright red (in some specimens testaceous); a very fine transverse black line one-third of the way from the base of 3; at the end of each segment an irregular broad transverse black band spreading out underneath so that the underside is almost entirely black; 8-10 deep jet black; 9-10 enlarged, slightly clubbed.

Appendages: *Superior* 1.5 mm., black; narrow sublanceolate, slightly curved, pointed; apart at bases. *Inferior* almost as long as superior, triangular, black. A few pale hairs on all the appendages (Plate xlv., figs. 4-5).

♀. Generally slightly longer than male, and differing from it as follows:—Bases of wings more saffroned, generally for a space of 6-7 mm. Thorax generally somewhat paler than in male and more conspicuously marked; *scutella* pale yellow. Abdomen with the red colouring replaced by orange or fulvous; segment 2 pale yellow. Appendages short, 1 mm.; parallel, pointed, subcylindrical, black; well separated by the rounded hairy projection of segment 10. Seen sideways 8-9 appear somewhat wider than the other segments, and 9 projects underneath into a small black spine with a few fine hairs projecting from it.

Hab.—Cairns, N.Q. (E. Allen); February-April; local.

This beautiful insect has the same general shape and appearance as *Lathrecista festa*, a species which also occurs, though rarely, at Cairns. It is, however, far more brilliantly coloured than *L. festa*, and considerably smaller.

9. TETRATHEMIS FLAVESCENS Kirby.

Kirby has described the male of this rare insect, from Borneo. The female has never been described. In January, 1905, I took one

male and several females at Kuranda; the male was unfortunately destroyed by ants, but I still have the females. The following is the description:—♀. Total length 22-24 mm.; abdomen 14-15 mm.; wings, fore 22·5 mm., hind 21 mm. Wings tinged with yellow from triangle to nodus and slightly beyond; *pterostigma* rather short and thick, 1·6 mm., black. *Membranule* nil. Triangle of hindwings placed beyond the arculus. *Nodal Indicator* 8 6-7; Head somewhat hairy, dull olive-brown, paler on clypeus; 7-8 5-6; *labium* straw-colour. *Thorax*: *Prothorax* brownish. *Meso-* and *metathorax* dull olive-brown above; sides glaucous, paler yellowish-brown, crossed by two fairly broad parallel brown bands. *Abdomen* cylindrical, short, 1-2 very slightly enlarged. Colour: 1 brownish; 2 brownish, with a transverse basal black band; 3, central portion black, a narrow transverse yellowish-brown band at either end, sutures black; 4, basal two-fifths yellowish-brown, rest black; 5, basal one-fifth black, central two-fifths yellowish-brown, rest black; 6 black, crossed by a narrow irregular central transverse band of yellowish-brown; 7 dull yellow, a transverse black band at either end; 8 black, a small yellowish spot low down on each side; 9-10 black; 10 projecting below outwards beyond the appendages into a black spine carrying some longish hairs; there is also, above this, a tubercle under the appendages. *Appendages* very short, 0·6 mm., subconical, points not very sharp but ending with a short stiff hair; separated at bases, very dark brown (Plate xlv., fig. 6). †

The above description is taken from the dried specimen. If I remember aright, the dull browns of the dead insect were a dull olive-green in the living insect.

This curious dragonfly flies rather high up around small trees and bushes on the banks of densely wooded jungle creeks. It seldom descends low enough to be caught. It is very fond of sitting on leaves or twigs of trees with wings much depressed. If disturbed, it indulges in a bewildering up-and-down flight, finally rising high up into the trees.

It can be distinguished at once from *Nannophlebia Lorquini*, an insect of somewhat similar size and habits, by the position of

the triangle of the forewings. In the latter genus this triangle is normal, *i.e.*, it arises just about the arculus, and not quite beyond it as in *Tetrathemis*.

ii.—Subfamily CORDULINÆ.

10. SYNTHEMIS NIGRA, n.sp. (*S. guttata* var. *punctata* Martin).

♂. Total length 50 mm.; abdomen 38 mm.; wings, fore 34 mm., hind 33 mm.

Wings rather slack; neuration black, costa yellowish outwards for some distance; a distinct white round spot at the base of the costal nervure of all the wings. Basilar space with two or three cross-nervules; anal margin of hind wings obtusely angulated. *Pterostigma* 2·5 mm., narrow, black. *Membranule*, fore nil; hind 1·5 mm., thick, dark brown. *Nodal Indicator* 14 8; 10 10

Head: *Vertex* hairy, black; *eyes* brilliant dark green in the living insect; *ocelli* and *antennæ* black. *Front* hairy, cleft medially, minutely punctate, black, with two large pale patches separated by the median cleft. Each patch is composed of two conjunct spots; the inner being rounded, chalky white; the outer triangular, dull greyish. *Clypeus*: postclypeus black, anteclypeus brownish with a central white triangular spot; *labrum* black; *labium* very pale yellowish-brown; *mandibles* brown.

Thorax: *Prothorax* black. *Meso-* and *metathorax* black with metallic green reflections; dorsal suture rather deep, marked with a pale grey line; just behind the suture are two slanting white spots, close together. On either side a greyish band; below this, close to the underside, another shorter band; mesoscutum round, white; metascutum greyish; underside dirty greyish. *Legs* black, coxæ, trochanters and part of fore femora dirty brown.

Abdomen thin, much pinched at 3; 3-5 widening, 6-10 cylindrical. Colour deep black; 3 has a pair of small oval greyish spots, basal, close up to suture; 10 slightly swollen below, hairy. Underside deep black, 1 with a transverse grey band; genital appendages of 2 surrounded with grey.

Appendages: *Superior* 1.5 mm., wide apart at bases; narrow sublanceolate, curved downward and inclined so as to meet at tips, which are blunt and rounded; hairy, granulate, deep black. *Inferior* nearly as long as superior, thick, truncate, hairy, black.

The specimen described was a somewhat immature one. Probably in the mature insect the whites and greys become yellowish.

♀. Differs from male as follows:—A larger insect; forewing 37 mm. Wings deeply suffused all over with rich orange-brown; no spots at bases of costal nervures. *Nodal Indicator* | 14 9-10 |
Those parts of head and thorax which are white or grey | 10 11 |
in male are bright yellow in the female. Abdomen thicker than in male, subcylindrical, 2.8 tapering; 3.4 with a suspicion of a brown basal spot on either side of dorsal ridge; 2.5 with a pair of indistinct central brown spots; 10 projecting below, very hairy. Appendages thin, short, cylindrical, 1 mm.; wide apart at bases, parallel, hairy.

Hab.—Kuranda, N.Q.; January, 1905; rare (1 ♂, 2 ♀).

Taken along the railway line in the dense bush on the side of the ranges. It has an easy flight and is not difficult to capture. Male very similar at first sight to *Syncordulia atrifrons*, but easily distinguished by the basilar space being reticulate.

M. René Martin has regarded this species merely as a variety of *S. guttata*, a common southern species. A careful comparison of *S. nigra* and *S. guttata*, however, will show that the differences between the two are as great as, if not greater than, the differences between any two of the three species *guttata*, *brevistyla* and *virgula*. Perhaps they none of them deserve higher rank than that of subspecies; but while the other species stand, I am convinced that this must also take rank as a separate species.

The following comparison will show the points of difference between *nigra* and *guttata* :—

<i>S. guttata.</i>	<i>S. nigra.</i>
Neuration close.	Neuration much more open.
A clear yellow line along the dorsal ridge.	Only the slightest touch of yellow along the dorsal ridge.

S. guttata.

Frontal spots of male 1 mm. apart.

No white spots at bases of wings in male.

A broad straw-coloured transverse band across the mesonotum.

Abdomen much spotted with yellow.

S. nigra.

Frontal spots of male close together.

Four distinct white spots at bases of wings in male.

No band at all across the mesonotum.

Abdomen almost entirely black.

Besides these differences, *S. guttata* is a smaller insect (especially the ♀); though on the other hand the pterostigma in *guttata* is slightly larger than in *nigra* (especially in ♂).

In some ways *S. nigra* shows closer affinity with *S. brevistyla* than with *S. guttata*, notably in having the four spots at the bases of the wings, and in lacking the transverse mesonotal band.

The four closely allied species, viz., *virgula*, *brevistyla*, *guttata* and *nigra*, may now be easily distinguished by the following key :—

- A. Superior appendages of ♂ short.
- B. { A pair of dorsal humeral yellow stripes on thorax..... *virgula.*
 { No dorsal humeral stripes on thorax..... *C.*
- C. { Four distinct spots at the bases of the wings in ♂..... *D.*
 { No spots at the bases of the wings in ♂..... *guttata.*
- D. { Abdomen much spotted, a large yellow spot on 7..... *brevistyla.*
 { Abdomen almost entirely black..... *nigra.*

11. MACROMIA TILLYARDI Martin.

Three females of this magnificent insect were taken by me at Kuranda, N.Q., in January, 1905. As M. René Martin is about to issue his work on the Corduliinæ, it seems fitting that the record and description of so fine a species should appear in his new work. I have therefore sent him my description of the insect together with the type-specimen. It will be sufficient in this paper to give a short description only, so that the insect may be recognised by Australian collectors :—

This is by far the largest of the Australian Corduliinæ.

♂. Unknown.

492 NEW AUSTRALIAN SPECIES OF THE FAMILY LIBELLULIDÆ.

♀. Total length 68 mm.; abdomen 50 mm.; wings, fore 50 mm., hind 46.5 mm. Wings: *Pterostigma* 3 mm., blackish. *Membranule*, fore, 3 mm. broad; hind, 5 mm., narrower, semidiaphanous, greyish-white. *Nodal Indicator* ||12-14 6-7|| Head metallic steel-coloured, with a pair of ||8-9 7-10|| frontal yellow spots, and yellow postclypeus. *Thorax* deep brown with steely blue reflections; dorsal ridge yellow, a pair of broad straight subhumeral yellow bands, below them a broader yellow band, parallel, passing transversely across the notum between the wing-joints. *Abdomen* flat, flabby, and apparently ill-nourished in all three specimens. Colour black with bright yellow bands as follows— a broad yellow band encircling 2; 3 nearly all yellow; 4 similar to 3 but with less yellow; 5-6 a narrow irregular central yellow band; 7, basal half yellow; 8, an irregular transverse basal yellow band; 9-10 black. *Appendages* 1.5 mm., wide apart, flattish, narrow subtriangular, sharply pointed, black (Plate xlv., figs. 7-8).

It flies swiftly in the dense bush and occasionally along the densely wooded creeks and rivers. Very difficult to capture.

EXPLANATION OF PLATE XLIV.

- Fig. 1.—*Rhyothemis Alcestis* n.sp. (♀); appendages.
 Fig. 2.—*Crocothemis erythraea* Brullé; triangle and part of discoidal area of forewing.
 Fig. 3.—*Erythemis rufa* Ramb. " " "
 Fig. 4.—(?)*Agrionoptera insignis* Ramb. (♂); appendages, dorsal view.
 Fig. 5.— " " " " " lateral view.
 Fig. 6.—*Tetrathemis flavescens* Kirby (♀); appendages.
 Fig. 7.—*Macromia Tillyardi* Martin, n.sp. (♀); appendages, dorsal view.
 Fig. 8.— " " " " " lateral view.

