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ON SOME REMARKABLE AUSTRALIAN *CORDU-
LIINÆ*, WITH DESCRIPTIONS OF NEW SPECIES.

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(Plates xxi.-xxii.)

In comparison with their rarity in other parts of the world, one is struck with the number and remarkable variety of the Australian *Corduliinæ*. In his work on the *Corduliinæ* of the de Selys' Collection,* René Martin gives 136 species as the total number so far discovered in the whole world. If we add to these three new species of *Synthemis*† which I have since described, and the five new species described in this paper, we obtain a total of 144 species, of which 28, or approximately one fifth, are Australian. But of the total number of species of Odonata known to inhabit the world (roughly 2,500), Australia possesses only 160, or approximately one-sixteenth of the total.

During my last visit to North Queensland I was very fortunate in obtaining the remarkable species described in this paper. Owing to the continuous tropical rains, my material is but scanty; in two cases I have only the unique male type; in one the female only, in another two males; and in another two males and a female. The species are, however, so remarkable and distinct that I hasten to put them on record, and hope to add further specimens and to supply the missing sexes on a future occasion. Besides the five new species, I was fortunate in obtain-

* Coll. Zool. du baron Ed. de Selys-Longchamps, Fasc. xvii., *Cordulines*, Brussels, Hayez, 1906.

† *S. nigra* ("New Australian Species of the Family Libellulidæ," these Proceedings, 1906, xxxi., p.488); *S. Martini*, *S. cyanitincta* ("Dragonflies of S.W. Australia," these Proceedings, 1907, xxxii. pp.724, 726).

ing the hitherto unknown male of the beautiful *Macromia Tillyardi* Martin, and two males of the exceedingly rare *Hemicordulia intermedia* Selys, of which only one other specimen, the type-male, is known to exist. These are also described in this paper.

AUSTROPHYA, n.g.

Allied to *Neophya* Selys, and to *Cordulephya* Selys. Upper side of triangle of forewings broken, so as to form a quadrilateral, the proximal segment of the upper side being about twice as long as the distal. All the triangles free; forewings with a quadrilateral subtriangle, free. Arculus of hindwing arising very close to the internal angle of the triangle. Triangle of hindwing rather broad. Basilar spaces free; one cross-nervule in submedian space of forewing, two in that of hindwing, the second being placed directly under the arculus, so as to form a small subtriangle. Sectors of arculus united at base. One row of cells in the discoidal area following the triangle of the forewings. Forewings narrow; hindwings very broad. Nodus of forewings placed twice as far from base as from pterostigma. Head rather small; thorax remarkably small, the distance from the interalar ridge to the prothorax, measured dorsally, being under 3 mm. Tibiæ with long slender spines.

Type *Austrophya mystica*, n.sp.*

The differences in venation between the three allied genera *Neophya*, *Cordulephya* and *Austrophya* are best seen by the following comparative summary:—

NEOPHYA Selys (*N. Rutherfordi* Selys, type).

Triangle of forewings with the upper side broken, forming a quadrilateral, the two segments being approximately equal. All

* I have elsewhere condemned the practice of proposing new genera from female characters only, and am still of opinion that it is extremely undesirable. In the present instance, however, the new species is far removed from any known species, and the female possesses all the necessary characters for the formation of the genus, so that I hasten to put it upon record and to assign to it its proper, if somewhat isolated, position in the subfamily of *Cordulinae*.

triangles very small. Hindwing very broad at base, narrowing rapidly to tip. Inner angle of triangle of hindwings at level of arculus. One cross-nervule (and hence no subtriangle), in submedian space of hindwings. One discontinuous postnodal in forewings, two in hindwings. Discoidal area of forewings narrowed at tip of wing.

CORDULEPHYA Selys (*C. pygmaea* Selys, type).

Triangle of forewings with the upper side broken, forming a quadrilateral, the proximal segment twice or thrice as long as the distal. All triangles very small. Hindwing very narrow. Inner angle of triangle of hindwings well beyond level of arculus. Two cross-nervules (and hence a small simple subtriangle) in submedian space of hindwings. Only one discontinuous postnodal in all wings. Discoidal area of forewings same as in *Neophya*.

AUSTROPHYA, n.g. (*A. mystica*, n.sp., type).

Triangle of forewings with the upper side broken, forming a quadrilateral, the proximal segment twice as long as the distal. Triangles twice as large as in the other two genera, that of hindwing very wide. Hindwing very broad from base to near tip. Inner angle of triangle of hindwings only just beyond (0.2 mm.) level of arculus. Cross-nervules as in *Cordulephya*, but second placed under the arculus and not beyond it. Two discontinuous postnodals in all wings. Discoidal area of forewings widened at tip of wing.

1. AUSTROPHYA MYSTICA, n.sp. (Plate xxi., fig.1).

♂. Unknown.

♀. Unique. Total length 37 mm.; abdomen 29 mm.; forewing 26 mm., hindwing 25 mm.

Wings: *neuration* thin, black; base of forewing saffroned deeply for 6 mm. along subcostal space, and also throughout the submedian space; base of hindwing less saffroned, deeply for 2 mm. only along subcostal space. *Pterostigma* 1.4 mm., black, only moderately broad. *Membranule* very small, greyish-brown.

Nodal Indicator || 8-9 5-6 | Head: *eyes* dark brown; *vertex* small, tubercled, || 6 7 | shiny black; *front* deeply cleft medially, hairy, dark metallic greenish-black; *clypeus*, *labrum* and *labium* dark shiny brown. *Thorax* very short and stumpy (*prothorax* not visible), glaucous brown with metallic greenish reflections, dorsum darker than sides. *Legs* brown, tibiae with very long slender bristles. *Abdomen* narrow, practically cylindrical, base of abdomen *not* swollen. Colour: 1, brownish or yellowish; rest black, rather shiny, a large brownish patch on each side of 2. [The specimen is an aged one, somewhat damaged, and if there are other markings they have been obliterated.] A brown line along ventral carina from base to 6. *Appendages* wide apart, almost straight, 1 mm., tips very slightly curved, pointed; black, with brownish hairs; between them there is a distinct black projection or tubercle on seg. 10, also somewhat hairy.

Hab.—Kuranda, N.Q. (F. P. Dodd; January, 1908).

2. HEMICORDULIA INTERMEDIA Selys. (Plate xxi, fig 2).

Two males, one in very bad condition, but the other perfect, were taken by me at Cooktown, January, 1908. I have not seen the unique type-male in Hagen's collection, nor have I seen his description of it. In M. René Martin's work, cited above, he says of it—"Comme celui de *H. australica*, le mâle porte une dent inférieure aux appendices supérieurs; comme *H. tau*, il porte sur le front un τ enfoncé et bien net, ce qui le distingue de toutes les autres espèces. Il diffère par la bande médiane brune du devant du thorax, et par une bande jaune *en demi-anneau* au 2^e segment de l'abdomen. Si les accouplements utiles entre espèces différentes d'Odonates étaient prouvés, on pourrait dire que le type en question est le produit de l'accouplement des *H. tau* et *australica*."

With these words before me, I hesitate to describe my specimens as new, for they agree with M. Martin's remarks on the type *H. intermedia* in the following points:—a distinct tooth or spine on the underside of the superior appendages, a very clear

black τ on the front, and a narrow median dorsal band on the thorax. The ring of yellow on segment 2 is *almost complete*, being first divided by a fine black dorsal line, so that the expression "*en demi-anneau*" could only doubtfully be applied to it. But it is remarkable that M. Martin says nothing of the colouration of the seventh and eighth segments, which, instead of possessing the usual metallic greenish-black clepsydrate markings on an orange ground, (as in *H. tau* and *australica*) is as follows:—7, basal half entirely lemon-yellow, anal half black, the division between the two colours practically straight; 8, basal two-fifths lemon-yellow, a fine black dorsal line; rest black.

My specimens bear not the slightest resemblance to either *H. tau* or *H. australica*, being very much smaller than either, and considerably smaller even than *H. continentalis* Martin. The measurements are: total length 41 mm.; abdomen 31 mm.; forewing 28 mm.; hindwing 27 mm. The body is very slender, the broadest portion, seg. 7, being only 1.6 mm. wide, and not appreciably enlarged; whereas in the males of the two common species the abdomen is distinctly enlarged and much wider than this. Hence it appears impossible to me to think that under any circumstances the specimens I possess could have been a hybrid production of *H. tau* and *H. australica*; in fact, they appear to me to be an absolutely distinct species, as far removed from *H. tau* or *H. australica* as, if not farther than, these two species are from one another. I have, however, decided to leave them under the name of *H. intermedia*, until I have an opportunity of comparing them with the type.

Owing to the continuous rain, I saw very few examples of *Hemicordulia* on the wing at Cooktown, not even *H. tau*, though it is certain to be abundant there in fine weather; and of *H. australica* I took only two females. This species swarms around Cairns and Atherton in fine weather, so doubtless it is also common at Cooktown; and in that case *H. intermedia* may also prove to be fairly abundant if one could be fortunate enough to find one day's sunshine there in January. Both my specimens were taken hovering high up among the eucalypts in the open forest,

AUSTROCORDULIA, n.g.

Allied to *Oxygastra* Selys (Europe), and *Syncordulia* Selys (Australia). Triangles, hypertrigonal and basilar spaces of all wings free. Inner angle of triangle of hindwing placed just beyond level of nodus. Sectors of arculus arising separately on all four wings. Two rows of discoidal cells following the triangle of the forewings. Only one cross-nervule in submedian space of all four wings; hence no small subtriangle in hindwings. Triangle of hindwings remarkably long (shaped as in the *Aeschnide*, but free). Anal triangle of hindwings of male crossed by one nervule, low down. Thorax very short. Superior appendages of male very long, inferior long and triangular.

Type: *Austrocordulia refracta*, n.sp.

This remarkable genus can be at once distinguished from both *Oxygastra* and *Syncordulia* by the following points:—the remarkable shape of the hindwing triangle, the lack of a second cross-nervule, and hence of a subtriangle, in the submedian space of the hindwing, and the possession of a small cross-nervule low down in the anal triangle of the hindwing of the male.

It resembles *Oxygastra* in possessing two rows of post-triangular cells in the forewing, while *Syncordulia* has only one row.

5. AUSTROCORDULIA REFRACTA*, n.sp. (Plate xxii, fig. 2).

♂. Total length 49 mm.; abdomen 38 mm.; forewing 30 mm., hindwing 29 mm.

Wings: *neuration* blackish, costal and subcostal spaces slightly suffused with brown, especially at base and nodus, *Pterostigma* 2.5 mm., orange-brown between black nervures. *Membranule*, fore, very small; hind, 2.2 mm., white. *Nodal Indicator*

9 6	first two or three postnodals of all wings not continuous.
6 6 7	Head: eyes and vertex dark brown; central ocellus large, transparent reddish; front and clypeus hairy, shining brown; labrum brown touched with fulvous; labium shiny brownish. Thorax: prothorax small, brown. Meso- and

* Named from the peculiarly bent or broken appearance of the appendages.

metathorax downy, shiny brownish-black above, dorsal ridge bright yellowish-brown; on each side a semi-obsolete brown ray; sides of thorax glaucous olive-brown. Legs brown, elbows and tarsi black. Abdomen cylindrical, not constricted at 3; 2 with very small dark brown spurs. Colour dark brown, glaucous. Appendages: *superior* very remarkable; long, 4 mm., separated at bases, basal two-fifths slightly divergent, rest narrower, bent suddenly inwards so as nearly to meet at tips, and tapering to a blunt point; hairy, semitransparent brown. *Inferior* 2.4 mm., narrow, subtriangular, upcurved, pale transparent brown. (See Plate xxi, figs. 7, 8).

♀. Unique (immature), similar to ♂; wings slightly larger and much more suffused with brown; abdomen flabby, cylindrical, wider than in ♂; end of 10 forming a rounded hairy tubercle separating the short (1 mm.) conical dark brown appendages.

Hab.—Endeavour River, near Cooktown, N.Q. Two males and one female; January, 1908.

I found this species invariably settled in trees, from 10 to 20 feet from the ground. When disturbed it flies off and makes for another tree. It is easily captured, unless too high up to be reached. I never saw it indulging in continuous flight, but the specimens I took were not fully matured, and the weather was unfavourable.

6. MACROMIA TILLYARDI Martin. (Plate xxii, fig. 3).

♂. Total length 69 mm.; abdomen 50 mm.; forewing 46 mm., hindwing 44 mm.

Wings: *neuration* open but thick and strong, costa dull brown, rest black. *Pterostigma* 2.7 mm., black; *membranule*, fore 2 mm., broad; hind 4 mm., very broad, dull greyish; *anal angle* much incurved, *anal triangle* two-celled; *hypertrigonal space* with three cross-nervules in forewing, one in hindwing; *triangle* free, that of forewing followed by two rows of discoidal cells. *Nodal Indicator*

13-14 7-8	Head: eyes brown, occipital triangle small, <table border="0" style="display: inline-table; vertical-align: middle;"><tr><td style="border-right: 1px solid black; padding-right: 5px;">9 8-9</td><td>black; vertex tubercled, black, hairy; front hairy, large, wide and flat above, slightly hollowed out</td></tr></table>	9 8-9	black; vertex tubercled, black, hairy; front hairy, large, wide and flat above, slightly hollowed out
9 8-9	black; vertex tubercled, black, hairy; front hairy, large, wide and flat above, slightly hollowed out		

medially, steely black, with a pair of large round yellow spots above, separated by a broad black band in the median depression; *postclypeus* overlapping *anteclypeus* at sides and fringed with stiff brown hairs; *anteclypeus* jet black; *labrum* jet black with an irregular yellow basal band widest in the middle, bordering the *anteclypeus*; *labium* huge, yellow, with a very large central semicircular area of dull blackish; *genæ* small, yellow. Thorax: *prothorax* small, hairy, brown. *Meso-* and *metathorax* metallic steely black, with long brown hairs above, a broad straight humeral yellow band on each side, and lower down another broad lateral yellow band, crossing notum between wing-joints. *Legs* long and thick, black; *tibiæ* carrying both long and short bristles. *Abdomen*: 1-2 swollen, 3 pinched, 4-6 gradually widening, 7-10 nearly as wide as 2. Colour black, beautifully marked with yellow as follows: 1, black; 2, basal four-sevenths yellow, rest black, the two colours meeting in a very irregular line, spurs very small, pointed backwards, yellow; 3, basal half yellow except a fine transverse basal black band enlarged dorsally into a triangular black patch, and prolonged along dorsum into a fine black line, anal half black; 4, black, with two large conjoined yellow spots taking up the second quarter of the segment, rounded in front but cut off square behind; 5-6 black, with the same spots smaller, flatter, and separated by a narrow black dorsal band; 7, basal three-fifths yellow crossed by a transverse black line about 1 mm. long on each side, in the supplementary carina, rest black; 8, basal two-fifths yellow with two slanting brown lines in the carina, rest black, the yellow shading insensibly into the black; 9-10 black, a small yellow spot at base of 9, hidden away under the projecting anal end of 8; 9 also projecting similarly over 10; 10 with a large vertical black spike 1 mm. high. *Appendages*: *superior* rather short, scarcely 3 mm., wide apart, thick, wavy, pointed, black, some hairs on inner margin. *Inferior* large, nearly 3 mm. long, very thick, much upcurved, very hollow above, black with a very dark brown centre. (See Plate xxi., figs. 9-10).

♀. Already described (Martin, "Cordulines," 1906, p. 72; see also these Proceedings, 1906, xxxi., p. 491).

Hab.—Kuranda, N.Q.

The type-male above described was taken by Mr. F. P. Dodd, December, 1907, and is the only one that has so far been captured. Several females have also been taken, and are now in my collection together with the type-male. I also saw a fine male near Cooktown last January, and my friend, Mr. Allen, of Cairns, has seen the insect at the Barron Falls.

This exceedingly fine and handsome insect is by far the largest of our Australian *Corduliinae*. It has a swift straight flight and it is not easy to capture. It inhabits densely wooded streams and creeks. It appears to be very closely allied to the rare European *M. splendens* Pictet, both in markings and in the form of the appendages, but it can be immediately separated from that species by the conspicuous black spine on segment 10 of the male, which is not found in the male of *M. splendens*.

7. SYNTHEMIS OLIVEI,* n.sp. (Plate xxii, fig. 4).

♂. Total length 39 mm.; abdomen 30 mm.; forewing 28.5 mm., hindwing 27 mm.

Wings: rather slack; *neuration* fine, black; two, or sometimes three, cross-nervules in basilar space, four in submedian; *pleurostigma* short, 1.7 mm., black; *membranule* nil, outer side of anal triangle convex, a tiny cross-nervule very low down; one row of discoidal cells following triangle of forewings; one cross-nervule in hypertrigonal spaces of all wings; first two or three postnodals of all wings not continuous. *Nodal Indicator* || 10-11 6-7 |
Head: *eyes* brown behind, black in front; *occipital* || 8 7 |
triangle very small, black; *vertex* small, hairy, tubercled, black, the black extending on to the base of the front; *antennæ* small, fine, black, central *ocellus* transparent, larger than the other two, which are black; *front* dull white; a black mark in the clypeal suture; *postclypeus* dull white, *anteclypeus* grey; *labrum* white,

* Dedicated to my friend, Mr. E. A. C. Olive, of Cooktown.

crossed medially by a black line; *labium* pale dirty brownish white, large; *genæ* black; *mouth* strongly edged with black. *Thorax*: *prothorax* hairy, brown, a white mark on the collar, and two pale dorsal spots not very distinct. *Meso-* and *metathorax* rich black, a creamy line along dorsal ridge; on each side of it a humeral line, cream-coloured, about 1.5 mm. long, followed behind by a creamy spot; sides marked with a large dull irregular creamy blotch something like the letter "n" slightly flattened; lower parts of sides and underside marked irregularly with dull grey; *notum* brownish-black, a conspicuous white spot on mesoscutellum. *Legs* brownish, underside of femora black, tibiæ black. *Abdomen* very slender, cylindrical, black, marked with straw-colour as follows:—2, a pair of dorsal marks, slightly slanting, nearly touching; spurs very small, a tiny white point on each; genital appendages dirty brownish with a grey basal lateral spot touching them on each side; 3-6, a pair of basal marks nearly touching above, and running down on the underside, also a pair of rounder central spots, very narrow on 5-6, separated by the dorsal carina; 7 with very small basal marks, and flat central spots placed one-third from base of segment; 8, a pair of spots one-third from base; 9-10 black. *Appendages*: *superior* short, 1.8 mm., well separated, straight, pointed, carrying a number of long stiff black hairs, two or three of which protrude from the tips. *Inferior* nearly as long, narrow, upcurved, hairy, black. (See Plate xxi., figs. 13, 14).

♀. Unknown.

Hab.—Cooktown, N.Q.; January, 1908. Very rare.

Two males taken in a sequestered spot on the mountains, where it inhabits a small boggy stream. It has an easy soaring flight, usually keeping high up round the trees, and often settling on them.

This species is by far the smallest member of the genus *Synthemis* yet discovered, and exhibits some striking differences from the more typical members of this large and complicated genus. In its thin cylindrical abdomen and in the form of its appendages it shows a close relationship to *S. flavoterminalis* Martin. One

should also notice the peculiar anal triangle of the male, in which all signs of a supplementary membranule have disappeared; the outer side, forming the anal margin of the wing, has been strengthened by assuming a convex shape, making the triangle itself small but comparatively broad, while the cross-nervule usually present in this genus here appears as a tiny veinlet quite close up to the lower angle of the triangle.

8. *SYNTHEMIS CLAVICULATA*,* n.sp. (Plate xxii., fig. 5).

♂. (Unique). Total length 48 mm.; abdomen 37 mm.; forewing 31.5 mm.; hindwing 30 mm.

Wings: *neuration* fine, black, costa pale brown at base; bases of all wings slightly saffroned; *pterostigma* short, 2 mm., black; *membranule*, fore, very small; hind, narrow, 2 mm., pale greyish touched with brown; one cross-nervule in basilar space, three or four in submedian; a conspicuous yellow spot on each wing-base; first two or three postnodals of all wings not continuous; one cross-nervule in hypertrigonal space of forewings, those of hindwings free. *Nodal Indicator* $\left\{ \begin{array}{l} 11 \\ 7-8 \end{array} \right\}$ Head: *eyes* brown; *occiput* small, black; *vertex* steely $\left\{ \begin{array}{l} 7-8 \\ 8 \end{array} \right\}$ black with a round yellow spot; *front* hairy, deeply cleft medially, steely-black, with two very large yellow spots reaching to the eyes and separated by a narrow black band in the median cleft; *clypeus* steely-black; *labrum* with two large yellow spots separated and surrounded by a narrow black band; *labium* black. *Thorax*: *prothorax* very small, dull brownish. *Meso-* and *metathorax* with long brown hairs in front; colour black above with a broad short humeral yellow band on each side, placed well forward, and cut short suddenly behind at a distance of nearly 2 mm. from the fore wing-join; a tiny yellow spot near latter; dorsal ridge with a yellow line, enlarged on meeting the interalar ridge, on each side a very broad steel-coloured band, then a complete lateral

* Named from the peculiar form of the appendages.

yellow band, crossing the notum also, then a narrow band of steel-colour; rest of sides and underside yellowish. *Legs* black, except underside of profemora yellowish-brown. *Abdomen*: 1-2 swollen, rest very slender, gradually widening to 10. Colour: 1, black; 2, basal half yellow with a narrow black dorsal portion, anal half black, spurs dark brownish; 3-7, black, with a pair of central oval yellow spots largest in 3, then gradually getting smaller and rounder from 4 to 6, larger again in 7, each pair crossed near anal ends by a black line in the transverse carina; 8, black with two very large yellow spots, elongate-oval and pointed anally, reaching from base to two-thirds of the length of the segment, and crossed at their middle by a fine black line; 9-10 black. *Appendages*: *superior* long, 3 mm., hairy, black, wide apart and slightly swollen at bases, then undulating and swelling out into a rather rounded and somewhat clubbed tip (see Plate xxi., figs. 11, 12). *Inferior* short, 1.2 mm., subtriangular, upcurved, black.

♀. Unknown.

Hab.—Kuranda, N Q. Very rare; January, 1908. A unique male taken by my friend, Mr. E. Allen, of Cairns.

This interesting species shows great similarity in its general markings to *S. virgula* Selys, a fairly common southern species, from which it is readily distinguished by its long and peculiarly formed appendages.

In conclusion, it may be remarked that the genus *Synthemis*, of which fifteen species are now known, stands in great need of careful revision and systematic treatment. The two species just described are widely separated, and should certainly be placed in different genera, if a clear point of separation could be found between the members of the group. But while it seems so probable that new species will continue to be found as long as new Australian localities can be visited by collectors, it is perhaps advisable to leave this typically Australian group in its present condition, and to wait until further knowledge of it is made available.

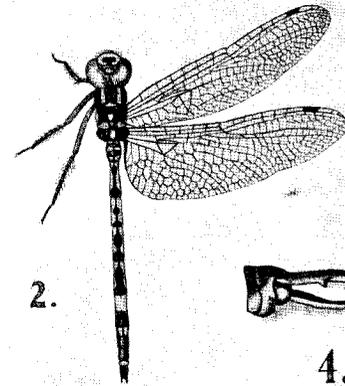
EXPLANATION OF PLATES.

Plate xxi.

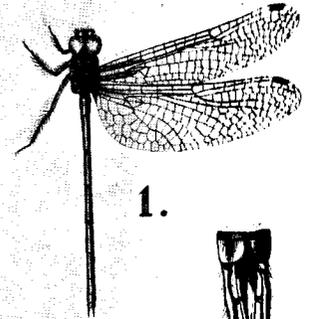
- Fig. 1.—*Austrophya mystica*, n.sp., ♀ (natural size).
 Fig. 2.—*Hemicordulia intermedia* Selys, ♂ (natural size).
 Fig. 3.— “ “ “ appendages of ♂, seen from above.
 Fig. 4.— “ “ “ “ “ seen sideways.
 Fig. 5.—*Pseudocordulia circularis*, n.sp., appendages of ♂, seen from above.
 Fig. 6.— “ “ “ “ “ “ seen sideways.
 Fig. 7.—*Austrocordulia refracta*, n.sp., “ “ “ seen from above.
 Fig. 8.— “ “ “ “ “ “ seen sideways.
 Fig. 9.—*Macromia Tillyardi* Martin “ “ “ seen from above.
 Fig. 10.— “ “ “ “ “ “ seen sideways.
 Fig. 11.—*Synthemis claviculata*, n.sp. “ “ “ seen from above.
 Fig. 12.— “ “ “ “ “ “ seen sideways.
 Fig. 13.—*Synthemis Olivei*, n.sp. “ “ “ seen from above.
 Fig. 14.— “ “ “ “ “ “ seen sideways.

Plate xxii.

- Fig. 1.—*Pseudocordulia circularis*, n.sp., ♂ (natural size).
 Fig. 2.—*Austrocordulia refracta*, n.sp., ♂ “
 Fig. 3.—*Macromia Tillyardi* Martin, ♂ “
 Fig. 4.—*Synthemis Olivei*, n.sp., ♂ “
 Fig. 5.—*Synthemis claviculata*, n.sp., ♂ “



2.



1.



4.



3.



8.



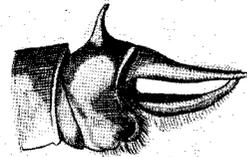
5.



6.



7.



10.



9.



11.



12.



14.



13.

R. J. T. del.