

THE DRAGONFLIES OF SOUTH-WESTERN AUSTRALIA.

BY R. J. TILLYARD, M.A., F.E.S.

(Plates xxxiv.-xxxvi.)

Few parts of Australia have been more neglected, from an entomological point of view, as the West. The fact that enormous tracts of land there are practically without a useful rainfall, and carry but an insignificant insect fauna, seems to have deterred collectors from working this portion of the continent as carefully as they might have done. Probably a very large portion of the west would not repay the trouble and expense of visiting it; but it must nevertheless be borne in mind that the State of Western Australia in itself contains between one-third and two-fifths of of the whole continent, and that in this vast area there are many rich districts, blessed with an abundant rainfall, and exceedingly rich in insect life.

One of these rich districts is the South-Western District, lying roughly between Perth on the north-west and Albany on the south-east, and in particular that portion of it which has a regular annual rainfall of from 30-50 inches. Here are found immense forests of jarrah and karri timber, covering vast areas of rich soil which will be capable of great possibilities when the district is opened up. As no systematic collecting of Odonata has so far been carried out in Western Australia, I did not attempt to cover a vast area superficially in the three weeks I had at my disposal, but rather to take a well-defined and not too large district and work it thoroughly. In deciding on the South-Western District, I was mainly guided by the rainfall. This is very regular, and falls in the winter months. The summer is dry and fairly hot; and after the last rains have fallen the rivers

begin to dry up rapidly. In less favoured localities the river-beds become quite dry in the summer, with possibly a pool of water here and there; and even in the best localities I found very few of the creeks actually running.

A glance at the map (Plate xxxiv.) shews that a fair number of rivers drain the South-Western District. Taking them in order from north to south, we have the Swan, Serpentine, Murray, Collie, Preston, Margaret, Blackwood, Warren, and Frankland. These may all be classed as mountain streams; for they all drain the plateau of the Darling Ranges, which extends from north to south at a distance of twenty to forty miles from the coast, except at Cape Naturaliste, where a spur runs out right to the Cape itself. The sources of the longer rivers would therefore be at elevations of from twelve to fifteen hundred feet, and in the winter they bring down a big volume of flood-water. However, the river channels are narrow and deep, and the only stream that has any pretensions to being a really fine river is the Blackwood. At Bridgetown, a hundred miles from its mouth, it carries all through the year a large volume of water and is in many places over one hundred yards wide.

Besides these running mountain-streams, all of which carry nearly the same Odonate fauna, we have the coastal lagoons, some of which are fresh, like Mungar's Lake, near Perth. These carry a somewhat different Odonate fauna. A third class, the marshes and swamps, usually very rich in Odonata, is practically absent, except in the Warren River district and around Lake Muir, where there are some fine tracts of swampy country. These are very inaccessible, but I was able to work the fringe of them at Wilgarrup, where there is a small brook running through some splendid marshy tracts. This is one of the best collecting places I found in Western Australia.

Taking as my base the South-Western railway line (that is the line from Perth to Busselton and Bridgetown, running almost due south) I was able to work from Perth down to Cape Leeuwin, and inland to Bridgetown and beyond, with care and thoroughness. I was unable to get farther eastward to Albany, but the

collection in the Macleay Museum, Sydney, contains a number of Odonata from this latter locality; and as these are all species which I obtained myself further to the west, I propose to include Albany in the South-Western District. The following localities were worked carefully and thoroughly:—Perth and Fremantle (Mungar's Lake and Swan River), Armadale (Canning), Busselton (Vasse), Bridgetown (Blackwood), Wilgarrup (Warren district), and the Margaret River and Karri-dale district. Besides these, I am much indebted to Mr. G. F. Berthoud, of the State Farm, Hamel, for sending me a large number of specimens from Waroona (Murray district), thus linking together the northern and southern localities which I myself worked.

Considering that the district worked was practically new ground, the final result of twenty-six species is perhaps somewhat disappointing. Six new and extremely interesting species were found; three or four more may be considered as exceedingly rare and local. The rest are insects found more or less commonly in similar latitudes in the Eastern States. Hence we are enabled to extend the range of many of our eastern species, and to notice their variation under different climatic conditions. The following is a complete list of all the species taken or observed, with notes on all points of interest, and complete descriptions of new species:

Family LIBELLULIDÆ.

Subfamily LIBELLULINÆ.

1. *PANTALA FLAVESCENS* Fabr.

Rare; several taken at Waroona by Mr. Berthoud. It is an exceedingly common tropical species, extending to India and North America. In the Eastern States it is common from Cape York down to Clarence River, N.S.W.; and it is met with occasionally round Sydney. A large brownish-orange insect, with very broad hindwings.

2. *TRAMEA LOEWII* Brauer.

Mungar's Lake, Perth. A beautiful large red insect, with a graceful soaring flight. The hindwings have a peculiar black

network at the bases, which are broad as in the preceding species. Common in the Eastern States, from Clarence River, N.S.W., northwards.

3. DIPLACODES NIGRESCENS Martin.

Very rare and local. Two males at Mungar's Lake, Perth; one at Armadale; one at Margaret River; one seen on the wharf at Fremantle. There are several females in the Macleay Museum Sydney, *loc.* Albany. It is also very rare in New South Wales and Victoria (R. Martin). The male is an insect of great beauty, having a very broad and flattened abdomen, brilliant red with large black spots. Female brownish.

4. DIPLACODES HÆMATODES Burm.

Fairly common, but somewhat local. Armadale, Waroona, Margaret River; also Albany. Found all over Australia; very common in the central and tropical parts. The male has the abdomen somewhat broad and flattened, brilliant red *without spot*. Female brown, tips of wings saffroned.

[*D. rubra* Kirby, is synonymous with this species.]

5. DIPLACODES BIPUNCTATA Brauer.

Fairly common. Perth, Armadale, Waroona; rare at Bridgetown and in the southern localities. Found all over Australia; swarms in Victoria, New South Wales and Queensland. The male has the abdomen narrow and rounded; colour brick-red, with small black spots. Female brown.

6. ORTHETRUM CALEDONICUM Brauer.

Exceedingly abundant around Perth; rarer further south. Round the sandy shores of Mungar's Lake these beautiful dragonflies may be seen in thousands. The male is a large pale blue insect, female olive-brown. It is one of the commonest of Australian Odonata, swarming all over the Eastern States, and also in Central Australia in very arid regions. It seems particularly fond of dry, hot sand.

7. *NANNODYTHEMIS AUSTRALIS* Brauer.

Wilgarrup, common. Absent elsewhere. It is widely diffused, but very local, in the Eastern States, especially New South Wales. The western form is larger and handsomer than the eastern form. It is a small stumpy-looking insect, appearing at first sight like some wasp-like creature armed with a formidable sting. The male has the abdomen very short and constricted, the end being enlarged into a thick club, brilliant red. It sits about on the grass and reed-stems in marshes, with wings much depressed. Female brownish.

Subfamily **CORDULINÆ**.

8. *HEMICORDULIA AUSTRALIÆ* Rambur.

Fairly common on the mountain streams in the south, especially the Blackwood. Common all over the Eastern States. A beautiful insect, with deep orange abdomen carrying a broad and very irregular dorsal band, the portions on each segment being more or less clepsydrate. The front of the head carries a pair of brilliant metallic-blue spots, rather square and close together. Female duller. Hindwings of both sexes rounded at the anal margin.

9. *HEMICORDULIA TAU* Selys.

Common everywhere; found throughout Australia, even in the dry central regions. It is larger than the preceding, and far less beautiful. Markings of abdomen similar but duller. The front of the head carries a thick black **τ** on a pale yellow ground; hence the name.

10. *PROCORDULIA (SOMATOCHLORA) AFFINIS* Selys.

A very rare species, confined to a few localities in South-West Australia. I took a dozen or so at Wilgarrup, all in a damaged condition, which shews that this insect is out on the wing early, probably in September or October. Also one male at Margaret River. At first sight it is very similar to *Hemicordulia australiæ*, but the following points will distinguish it:—the abdomen is not so slender, and the whole form less graceful than that of

H. australiae. The frontal spots are possibly less brilliant, and more greenish than blue, but this may be due to the age of the specimens I took. The males can be distinguished at once by the superior appendages. Those of *H. australiae* are fairly long, somewhat curved, tips pointed, and carry underneath, about their middle, a sharp black spine, easily seen with the naked eye. Those of *P. affinis* are, however, very short, much arched, almost forcipate, but with the tips slightly recurved; they carry *no spine* underneath, and are only half the length of those of *H. australiae*. Besides this, the males of the genus *Hemicordulia* have the anal margin of the hindwings rounded, while *Procordulia* has it *very slightly*, but distinctly, angulated. The females of both species have rounded anal margins to their hindwings, and are exceedingly difficult to distinguish. *P. affinis* female has a slightly longer membranule and appendages.

11. SYNTHESIS MACROSTIGMA Selys.

Sparingly at Bridgetown; abundant at Wilgarrup. The males outnumber the females by twenty to one. I was fortunate in obtaining two mature females at Wilgarrup, where the males were so common in marshy places that two could be caught with one sweep of the net. This insect is rather rare and local. It was first recorded from Fiji, but I have since taken it in New South Wales on the Blue Mountains, and have received one male from Mount Macedon, Victoria. The Western Australian form is considerably smaller than the eastern form. It is a beautiful insect, very slender and graceful, of a rich cinnamon-brown colour, profusely marked with beautiful cream-coloured spots in pairs. There are no bands on the upper part of the thorax, but on each side there is a round spot and a short band, both cream-coloured.

12. SYNTHESIS CYANITINCTA, n.sp.

(Plate xxxv. figs. 3-4; Plate xxxvi. fig. 1).

This beautiful little species is exceedingly rare. I took it sparingly in one locality at Margaret River, and I also found one very damaged female at Armadale. It is easy to capture,

shewing no fear, and often hovering or flying slowly and gracefully to and fro within a yard or two of the net.

♂. Total length 41 mm., abdomen 31 mm.; forewing 27 mm., hindwing 26 mm. Wings very slightly suffused with pale brown. *Neuration* black, bases slightly saffroned; the space between the subcostal and median nervures black for nearly 2 mm. at the base. *Pterostigma* 2 mm., brown. *Membranule*, fore very narrow, 2 mm.; hind narrow, 3 mm., dull whitish. One cross-nervule in basilar space, 2-3 in submedian; a conspicuous white spot at the base of each wing. *Nodal Indicator* || 10-11 6-7 |
 Head: *Eyes* bordered with white beneath. *Occiput* || 6-7 6-7 |
 very small, hairy, brown, with a cream-coloured triangle behind. *Vertex* dark brown. *Front* deeply cleft, with a creamy oval spot above on each side, extending downwards along the side of the front. *Clypeus* and *labrum* brown, *labium* dull brownish. *Thorax*: *Prothorax* very small, brown, touched with cream on the collar. *Meso-* and *metathorax* hairy, dark chocolate-brown, a pair of short straight humeral bars, cream-coloured, and less than 2 mm. in length; on each side a longer lateral bar of the same colour; and lower down, near abdomen, a triangular cream-coloured patch. *Interalar* ridge touched with white. *Notum* brown, a creamy spot on meso- and metascutum. *Legs* black, bases of femora brown. *Abdomen* slender, 1-2 slightly enlarged, 7-10 somewhat clubbed. *Colour*: 1, brown; 2, brown with a pair of semicircular creamy spots. Rest of abdomen dark brown shading to black, each of the segments 3-7 carrying a pair of central dorsal spots, oval or suboval, of a beautiful very pale greyish-blue colour; those of 3-5 touching along the dorsal ridge; each spot crossed by a transverse black line in the supplementary carina; 8, a pair of large oval spots similar to those on 3-7, but more than half the length of the segment; 9, a pair of small round basal spots of the same colour; 10 sometimes carries a more or less distinct basal band of cream marked with two very small brown spots. The underside of 8 carries a conspicuous patch of hairs; 9 with the testes whitish. *Appendages*: *Superior* rather long, 3 mm., wavy, narrow sub lanceolate, black,

pointed. *Inferior* 1.8 mm., concave above, tip upcurved; brown, subtriangular.

♀. Differs from the male as follows:—*Wings* much suffused with brown; pterostigma pale brown, slightly longer than in male. A tiny cream-coloured triangular spot on the *anteclypeus*. *Abdomen* cylindrical, thicker than in male, 2-8 spotted as in male, but the spots of each segment of a more equal size, those of 8 *smaller* than the rest; 9-10 dark brown. Appendages separate, short, 1 mm., straight, pointed, black.

A very distinct species, and by far the smallest member of the genus. The pale blue colouring of the spots is remarkable, and I do not know of another species of the *Corduliinae* which possesses it.

Hab.—Small mountain-brooks; Margaret River district and Armadale; December-January.

13. SYNTHEMIS MARTINI, n.sp.

(Plate xxxv. figs. 1-2; Plate xxxvi. fig. 2).

♂. Total length 55-57 mm.; abdomen 42-44 mm.; forewing 33-34 mm.; hindwing 32-33 mm.

Wings: *Neuration* black; a very conspicuous cream-coloured spot at the base of each wing. *Pterostigma* 27-30 mm., black. *Membranule*, fore 15 mm., white; hind nearly 3 mm., pale greyish. *Nodal Indicator*

11-14	6-9
8-10	8-11

 One cross-nervule in basilar space, 3 to 4 in

8-10	8-11
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 submedian. *Head*: *Eyes* bordered behind with brown for 3 mm., followed by cream-colour for 2 mm. *Occipital tubercle* brown in front, rounded and cream-coloured behind. *Vertex* small, tubercled, hairy, brownish-black. *Front* hairy, widely cleft medially, dark brown; on each side a large round creamy spot; lower part of front dull fleshy-grey, brown in the cleft. *Clypeus* dull fleshy-grey tinged with brown; *labrum* and *labium* pale dirty flesh-colour. *Thorax*: *Prothorax* dark brown, a pale straw-colour in front. *Meso-* and *metathorax* very dark brown, in parts almost black, with a slight metallic tinge. A fine straw-coloured line for about 2.5 mm. on

the dorsal ridge, and four fair-sized creamy dorsal spots, at about equal distances apart, forming approximately the angular points of a square; of these the two front are often cleft by the intrusion of the ground-colour from behind, but the other two are more or less round. On each side of the thorax is a broad lateral band of cream-colour or pale straw, running from between the wing-joints to above the metacoxa; part of the thorax next the abdomen is dull greyish. Notum brown, except meso- and metascutum, which are cream-coloured. *Legs* black. *Abdomen* long and slender, 3 and 8-10 rather narrower than the rest. Colour: 1, brown with a creamy dorsal spot; 2, brown, on each side a creamy basal mark running up from the spur to dorsum, and nearly meeting above. Spurs small, creamy above, dull grey-brown beneath. Rest of abdomen black spotted with cream-colour as follows:—3-8, two basal triangular spots, and two central suboval or round spots crossed by a fine black line, the first two diminishing rapidly in size from 3-8, being only mere lines in 8, the last two somewhat pointed basally in 3, round in 4-7, smaller and pointed anally in 8; 9, black, sometimes with two tiny spots; 10, a rather large central diamond-shaped or oval spot, a pair of tiny lateral spots. Ventral carina black, broadly edged with dirty white, this colour being broadest at the base of each segment, and running up to join the basal spots on 3-8. *Appendages*: *Superior* very long, 3.8 mm., basal two-thirds straight, rest forcipate; black, with some very small hairs. *Inferior* 2.2 mm., narrow, subtriangular, slightly hairy below; concave above, tip slightly upcurved, colour pale brownish, darkened at tip.

♀. Differs from the male as follows:—A somewhat larger insect; forewing 36 mm., hindwing 35 mm. Bases of wings more or less shaded with rich yellowish-brown, especially between subcostal and median nervures. Pterostigma pale, 4 mm. Colours of thorax and abdomen duller. Spots on thorax larger and sometimes running into one another so as to form two very irregular antehumeral bands. *Abdomen* cylindrical, broader than in male; designs larger and bolder; 9-10 very short and narrow. Ovipositor

of 8 ending in a black hook, sharply upcurved. *Appendages* short, 0·7 mm., straight, black; separated by a projecting tubercle on 10, black and hairy and as long as the appendages; below this is a second tubercle, rounded, hairy, dark brown.

Hab.—Running streams and mountain-brooks all over the S.-W. district. A few specimens seen on Mungar's Lake, Perth. Abundant at Margaret River and Bridgetown.

The females are very rare, and, as in the preceding species, the males outnumber them by 20 to 1. In both cases this is probably accounted for by their being seldom on the wing, and retiring into the thick bush. The few females I have taken have been generally very immature, and we may perhaps see in this a wise provision by Nature for the preservation of the species. If the females only mature slowly, they are enabled to outlast the dry months at the end of summer, when many of the streams in which they breed have ceased to run, and they probably only deposit their ova late in the autumn, when the rains have commenced. There would always be plenty of males left over, even though they mature earlier, to provide for the fertilisation of the ova. This is borne out indirectly by the fact that, in the case of the three *Synthemids* which occur in S.-W. Australia, I never once took a pair in cop., even at the end of January, though all other species were frequently found so.

This exceedingly graceful insect has an easy flight, going to and fro in small clearings near the brooks, or up and down some small and shady reach. They never go far from water, and are very easy to capture. On hot summer days they sometimes hawk about swiftly over the streams, but it is the exception to see them flying at all fast.

Family *ÆSCHNIDÆ*.

Subfamily *GOMPHINÆ*.

14. *AUSTROGOMPHUS COLLARIS* Selys.

Common on most of the mountain rivers and brooks. Also recorded from South Australia and Victoria. It is fond of sitting about on trees and bushes overhanging the water, or on

hot sandy patches. It has a swift, dodging flight, and on hot summer days individuals may be seen chasing each other ceaselessly in and out of the river banks. The colours are black and yellow, which in the very mature insect turns more to olive-green, especially on the thorax. The appendages of the male are yellow, subconical, with a large cornute tubercle or branch underneath. The female carries, behind the occiput, three tubercles of nearly equal size.

15. *AUSTROGOMPHUS OCCIDENTALIS*, n.sp.

(Plate xxxv. figs. 5-6; Plate xxxvi. fig. 3).

♂. Total length 45 mm.; abdomen 34 mm.; forewing 27 mm.; hindwing 26 mm. Wings: *Neuration* black, costa pale greenish outwards; bases of wings very slightly saffroned. *Pterostigma* large, broad, nearly 3 mm. long, rich brown between black nervures. A minute yellow spot at the base of each wing. *Nodal Indicator* || 11-14 7-10 | Head: *Occipital ridge* 1 mm., yellow, suture || 9-10 8-10 | next the vertex brown and hairy. *Vertex* black, with a round yellow spot behind, next occiput. *Antennæ* black, a fine yellow line on the inner side of bases. *Front* greenish-yellow, a dull clouded brownish triangular area above in the centre, and a dark brown or dull black band (of varying width, according to the specimen) along the clypeal suture. *Clypeus* yellowish-grey, sutures tinged with brown. *Labrum* and *labium* grey; *genæ* pale greenish-yellow; mouth edged with brown. *Thorax*: *Prothorax* rather large, dark brown, a small yellow mark on the collar in front; a double small round dorsal spot, a larger spot on each side, and a small spot touching the procoxa on each side, all greenish-yellow. *Meso-* and *metathorax* rich brown above, a pair of fine slanting lines in front along the collar, behind these a pair of short antehumeral bars, somewhat slanting, and a pair of spots near the fore wing-joints; all these markings yellow more or less tinged with green. Also a very fine yellowish line along the dorsal ridge, only conspicuous for about 0.5 mm., where the ridge stands up into a small spine tipped with brown. The sides are of

various colours, as follows: firstly, the brown colour from above borders the sides in a band from forewing to mesocoxa; then comes an irregular greyish lateral band, enlarged near the wings, then suddenly constricted, and again enlarging into a rounded knob towards coxa; round this knob the rich brown from above curls, bending under it and more than half enclosing it. After this follows an irregular area of a beautiful mauve colour bordered with brown in the sutures; a greenish-yellow spot touches it near the hind wing-join, and a large spot of the same colour touches the metacoxa. Below the mauve area runs an irregular sublateral grey band similar to the former one, and, like it, nearly surrounded by a brown line or band in the sutures. Next to the abdomen is another, but smaller, area of mauve, touching the brown line on each side and shading into the sublateral band itself. Notum brown, scuta and scutella greenish-yellow. *Legs*: coxæ and trochanters dull yellowish-grey, femora dirty yellowish, much marked with brown lines and shaded with black, elbows yellowish, rest black. *Abdomen* fairly cylindrical, 1-2 swollen, 7-10 very slightly enlarged. Colour rich dark brown, shading to black, and marked with pale greenish-yellow as follows: 1, a small dorsal spot, a pair of large lateral spots; 2, a dorsal longitudinal band, rather narrow and irregular; spurs greenish-yellow above and below, ridged with a brown line; behind each spur a somewhat crescent-shaped spot; genital shield very large, yellowish-grey: 3, a round basal dorsal spot; bases greyish-yellow on sides; a pair of central dorsal spots very close and much pointed anally: 4-6, a broad transverse basal band, deeply cleft along dorsum, and a pair of central dorsal spots, narrow and elongated, and only separated by a fine line along the dorsum. This set of markings is such as to isolate a conspicuous brown spear-head mark on each segment. Low down on each side of 3-7 is an anal spot, largest in 7; 7 has the basal band and the central spots almost united, a fine transverse line only just separating them; 8, a pair of irregular basal dorsal marks almost united, and very often forming a single round spot, sides low down marked irregularly with yellowish,

often with two small anal spots; 9, very irregularly varied with yellow and brown both above and on the sides, the brown on the dorsum cleaving the yellow by a sharp point running up almost to the base; 10, yellow, shaded with brown in the suture. The markings of 7-10 are very irregular and varied, no two specimens being alike. *Appendages*: *Superior* about 1 mm., separated, divergent, subcornute, pale yellow, carrying underneath a large hook, brown tipped with black. *Inferior* wide apart, divergent, slightly upcurved, pale brownish, 0.3 mm.

♀ (unique). Differs from the male as follows:—A somewhat larger insect; pterostigma larger, orange-brown between black nervures. *Head* and *thorax* as in male. *Abdomen* slightly broader than in male, more cylindrical; 1-2 slightly swollen, 8-10 tapering. Scheme of markings as in male, but giving a very different effect, owing to the difference in the size of the markings. Ground colour almost black, appearing as if burnt to a reddish-brown in places. Yellow markings as follows:—1, a dorsal spot, and a large spot low down on each side; 2, an irregular longitudinal dorsal mark, shading to brown; a small yellow spot on each side; rest of sides mottled with brown and yellow: 3, a double basal dorsal spot, a pair of central dorsal spots just separated and pointed anally; basal half of sides yellow; a small lateral anal spot on each side: 4-7, the transverse basal band very broad on the sides, then narrowing above and cut into lobes by a fine dorsal line of brown; on 3-4 the central dorsal markings are present, but on 5-6 they are obsolete or almost so, a tinge of burnt sienna taking their places; on 7 they are present and close up to the basal band. All these segments have also a small round sublateral anal spot on each side; 8, a dorsal spot tinged with burnt sienna; sublateral parts yellowish; 9, as in the male; 10, brownish above, yellow on sides. *Appendages* straight, separate, 1 mm., somewhat pointed, yellow.

Hab.—Margaret River district; very rare. I took several males, but only one female. It is fond of settling on trees and bushes, and is not difficult to capture, though its flight is erratic and fairly fast.

This is a most remarkable species, with a coloration quite different from all known *Austrogomphids*, which are invariably black with bright yellow or greenish-yellow markings. There is no character in the wings which would warrant the formation of a new genus, though the shape of the abdomen, together with the remarkable colouring, might make one pause and consider the question. But the genus *Austrogomphus* is of itself artificial, and formed for the convenience of collecting together into one group all the Australian species of *Gomphus*; so that, until this genus is scientifically treated, this new species had better remain in it.

Subfamily **ÆSCHNINÆ**.

16. **HEMIANAX PAPUENSIS** Burm.

Common everywhere along the coast-line, rarer inland. It is found commonly all over Australia. A large insect, abdomen dull brown, mottled and marked all over with darker brown in intricate pattern. The forehead carries a thick black **T**-mark. Anal angle of hindwing of male rounded.

17. **ÆSCHNA BREVISTYLA** Rambur.

Common all over the district. It is found nearly all over Australia, but is either absent or exceedingly rare in the tropical portion of the continent. It is a beautiful insect, of similar size and shape to the preceding, but the thorax is marked with light green bands, and the abdomen profusely spotted with green. In many specimens the markings are bluish, and in immature specimens they are pale, almost cream-coloured. The front carries the thick black **T**-mark, but the anal angle of the hindwing of the male is strongly angulated, a characteristic of all the *Æschnidæ* except *Hemianax* and *Anax*. Appendages of the male short.

18. **AUSTROÆSCHNA ANACANTHA**, n.sp.

(Plate xxxv., figs.7-10; Plate xxxvi., fig.4.)

♂. Total length 63-67 mm., abdomen 49-52 mm.; forewing 40-44 mm., hindwing 39-43 mm.

Wings: *Neuration* black. *Pterostigma* 3.5 mm., narrow, black, covering 3-4 cellules. *Membranule*, fore small, hind about 2 mm., dirty whitish in young specimens, grey-brown or fuscous in the mature insect. *Nodal Indicator* ||15-19 14-17|

Head: *Occiput* carrying a small horn or tubercle, ||11-15 14-17| yellow. *Vertex* hairy, small, tubercled, black. *Antennæ* black, basal joint thickened. *Front* slightly hairy, black above, carrying two round yellow spots; lower part of front pale dirty brownish, shading to yellow next the eyes; a black transverse line in the suture bordering the postclypeus. *Postclypeus* dirty brown, black next anteclypeus; *anteclypeus* jet black, with a small brownish line next labrum, the middle of the line enlarged upwards into a sharp point. *Labrum* black with a pair of round brownish spots close together; *genæ* blackish with a round yellow spot; *labium* dull blackish, shading to brownish on mandibles and underneath. *Thorax*: *Prothorax* very small, black. *Meso-* and *metathorax* hairy, black, marked with pale dirty yellowish-brown spots as follows:—on each side of the dorsal ridge two small round antehumeral spots, also the interalar ridge is marked on each side by ill-defined elongated marks of olive-brown. On either side, a lateral row of 5 or 6 small irregular spots, and below these again two small spots, one on each side of the metaspiracle; also a row of three small spots low down on the metathorax near the abdomen. Underside black with grey hairs. Notum black, a small yellowish spot on mesoscutellum; metanotum with grey hairs. *Legs* black, a brown spot at bases of tibiæ. *Abdomen* slender, 1-2 enlarged, 3 rather pinched. Colour black, marked with pale dirty brownish spots as follows: 1, all black, with grey hairs; 2, black, with some grey hairs on the dorsum, which carries either a conspicuous longitudinal mark or a fine line 2 mm. long; a pair of small basal spots; a pair of small central spots, very pointed and slanting, and a similar pair of anal spots: on each side an irregular elongated mark, skirting the top of the spur, the rest of which is black; also a smaller irregular anal spot; under the spur an elongated spot, followed by a smaller anal spot on the genital shield: 3-7, a pale elongated

basal spot or mark on each side of the dorsal ridge (on segment 3 these run down and spread over the underside); four small spots close together near the centre of the segment, formed by the supplementary carina cutting a pair of central spots transversely; a pair of very small anal spots, very often obsolete, on 5-7; on each side two small irregular spots, one basal and one anal, absent in 6-7; 8, a fine basal line in the suture on each side, a pair of dorsal spots one-third of the segment from the base; sometimes a dorsal anal spot; 9, a touch of pale brown on dorsal ridge, sometimes an anal dorsal spot; a lateral oval spot on each side; 10, sometimes a small spot at the base of each superior appendage; *no dorsal spine or tubercle*. Appendages: *Superior* wide apart, 4 mm., black, narrow sublanceolate, tips rounded; a tiny spine above the base of each, then a short stalk for about 1 mm., carrying underneath an obtuse spine, rest of appendages flat, with soft hairs on the inner margin. Viewed laterally, the inner margin is seen to bend down, forming an obtuse-angled projection underneath. *Inferior* short, 1.8 mm., thick, black, somewhat truncated, with the tip 0.5 mm. broad and slightly bifid; hollow above, slightly upcurved at tip, very rounded and convex beneath.

♀. Differs from male as follows:—Pterostigma brownish. Dorsal spots of thorax exceedingly small. *Abdomen* much thicker than in male, 1-2 swollen, 7-10 slightly enlarged. General scheme of markings similar to male, but some of the dorsal spots on 2 either very indistinct or entirely absent; basal marks of 3-7 very small, and anal spots generally quite absent; lateral spots much larger than in male, the basal ones half cut into on 3-5 by a short black hook or intrusion; 8, rather short, black; on each side a tiny basal spot low down, also an anal spot; ovipositor black, large, carrying two fine filaments nearly 2 mm. long, with their basal joints thickened; 9, black, with a pair of anal spots; 10, black, carrying beneath the appendages a rounded black hairy tubercle, and beneath this again a small ridge armed with four or five small teeth. *Appendages* very short, slightly separated, 0.8 mm., very flat, rather wide at bases, black, tips blunt and rounded.

Hab.—Mountain-brooks, Armadale, Waroona, Bridgetown; exceedingly abundant at Wilgarrup and Margaret River; December-February.

This fine but very black-looking insect is a splendid flyer, skimming swiftly over the running streams, or dodging in and out of the overhanging herbage at great speed. Sometimes they will hover almost motionless over a pool for a long time or travel slowly up and down in search of prey. On hot summer days they may be seen dashing about at great speed in almost bewildering succession, especially towards evening. This species, to which I have given the name *anacantha* because of the absence of the large dorsal spike on segment 10 of the male, is very closely allied to *A. parvistigma* and *A. multipunctata* of the Eastern States. The males may be at once distinguished by the absence of the spine referred to, and both sexes by the comparative minuteness of the spots on the thorax and abdomen. In the evenings it settles in the dried undergrowth of the "black-boys," or sometimes on the trunks, or on the trunks of trees and bushes; and in such a position its protective colouring renders it exceedingly difficult to discover. It is easily disturbed, and dashes off at lightning speed. It is not easy to capture.

Family CALOPTERYGIDÆ.

None.

Family AGRIONIDÆ.

19. ARGIOLESTES MINIMUS, n.sp.

(Plate xxxv., figs. 11-12.)

♂. Very variable in size, the commonest form being:—total length 32-34 mm., abdomen 26-27 mm., forewing 21 mm., hindwing 20 mm.

Wings: *Neuration* black. *Pterostigma* 1·3, white in the young insect, but gradually darkening to brown or even black in the mature insect. *Nodal Indicator* || 2 9-14|. *Head*: *Eyes* black; *epicranium* black, shading to || 2 9-12| dull grey near eyes and postclypeus; *postclypeus* dark grey; *anteclypeus* black,

with a white line edging the labrum; *labrum* black, *genæ* pale dull yellowish, *labium* black, shading to pale brown below. **Thorax:** *Prothorax* black. *Meso-* and *metathorax* dark metallic green (black in the aged insect), lower parts of sides and under-side brownish, with two slanting black spots close to coxæ. *Legs* slender, black, coxæ pale. **Abdomen:** slender, cylindrical, 1-2 and 7-10 slightly enlarged. Colour very dark metallic-green throughout (black in the aged insect); a fine white transverse line in the anal suture of 8, a broad one in the anal suture of 9, a tiny white v at the end of 10. On each side a tiny white mark in the anal suture of 2-5. **Appendages:** *Superior* forcipate, thin, 1 mm., black; a small spine on the inner margin near the tip, and 3 or 4 minute spines and hairs on the outer margin. *Inferior* very short, black, wide apart, upcurved, tips blunt.

♀. Total length 29-31 mm., abdomen 24-25 mm. It differs from the male as follows:—*Eyes* pale milky-blue behind, black in front, epicranium milky-white in front along the orbits. *Abdomen* cylindrical, stouter and shorter than in the male, seen sideways 8-10 much enlarged; 8 has a pale cream-coloured transverse band next the suture, nearly half a millimetre broad in the middle. Ovipositor black and projecting beyond appendages. *Appendages* very short, black, cylindrical, slightly separated.

Race *pusillus*.—An extremely small race found in the southern districts, and differing considerably from the type. Were it not for the fact that intermediate forms are commonly found, connecting this with the type, one would certainly see in them two distinct species. The differences are as follows:—

♂. Total length 27 mm., abdomen 21 mm.; forewing 15 mm., hindwing nearly 16 mm. *Pterostigma* rather narrow, 0.7 mm., black; *forewings* shorter than *hindwings*. *Legs* rich brown or reddish-brown. *Anteclypeus* pale brownish-yellow. *Thorax* and first two segments of abdomen slightly powdered with greyish bloom, groundcolour deep black. *Appendages* with the spine on inner margin very conspicuous.

♀. Similar to male, but of stouter build. Eyes brownish; notum touched with brown; abdomen fairly stout, cylindrical, black with a slight tinge of metallic green. Ovipositor projecting further beyond appendages than in the type.

Hab.—Common on all the mountain-brooks; rare on the larger rivers and coastal lagoons. Race *pusillus* occurs, together with the type-form and intermediate forms, at Bridgetown, Wilgarrup, and probably in many other localities. It also occurs at Albany; all the specimens in the Macleay Museum, Sydney, from Albany, are of the race *pusillus*.

It is generally found sitting about with outspread wings on the stems of grass and reeds overhanging running streams. Often several specimens could be netted at once by a sweep of the reed-clumps. Its flight is weak and slow, and it is easily captured, even with the hand. The race *pusillus* often sits with its wings closed, a peculiarity shared by *A. griseus*, which is sometimes found in that position.

It appears to me that *pusillus* holds very much the same relation to the type *minimus* as *griseus* does to *icteromelas*. But in the case of the two common Eastern species the intermediate forms are absent, and the two species easily separated, though in some districts rather small forms of *icteromelas* occur. In *pusillus* we have a species in course of formation. Put *pusillus* and *minimus* side by side, and one sees two absolutely distinct species. But take two dozen of the insects from any one locality, and they can be arranged so as to link together, gradually and almost insensibly, the two extreme forms. The type-form *minimus* can be easily distinguished from *A. griseus* of the Eastern States, to which it is closely allied, by its smaller size, more slender build, the lack of thoracic markings, the shape of the appendages, which are much slenderer, and the lack of grey bloom on the abdomen. The race *pusillus* approaches *griseus* closely in having grey bloom on the thorax and part of abdomen, but it is less than half the size of *griseus*, and differs from it in other respects as the type does.

20. *LESTES ANALIS* Rambur.

Common everywhere. It is also found very abundantly in S. Australia and Victoria, and fairly commonly in New South Wales. A very variable insect, both in size and colouring, the markings generally being pinkish, but pale blue in very mature specimens. On the mountain-brooks at Armadale and Waroona, a dwarf form occurs with dull greyish markings.

21. *LESTES ANNULOSUS* Selys.

Fairly common at Mungar's Lake, Perth; a few specimens also at Bridgetown. It is also found in South Australia and in the western parts of Victoria. A most beautiful species, dark bronze with light blue stripes on thorax and rings on abdomen, the dorsal surface appearing to have a series of dark bronze arrow-heads along a blue ground. Female duller, with less blue. Males much commoner than the females.

22. *LESTES IO* Selys.

Widely distributed, but local and rather rare. Two males at Wilgarrup, one female at Bridgetown, one at Armadale; fairly common at Margaret River, but requires searching for. A rather small species with very slender abdomen, bronze with narrow blue rings; wings narrow and rather pointed.

23. *LESTES PSYCHE* Selys.

Somewhat commoner than the preceding. Several at Mungar's Lake, Perth; two at Armadale; fairly common at Margaret River. Very similar to the preceding species, but with shorter abdomen, and wider and more rounded wings. Also occurs sparingly in New South Wales.

These two species are at first sight exceedingly alike, but may be distinguished as follows:—In the male, the second segment of the abdomen of *L. io* is dark bronze, or black, *without markings* on the dorsal surface, while in *L. psyche* it is more or less blue, the blue from the sides of the segment intruding and cutting

out the black centrally, leaving a more or less clepsydrate black or bronze dorsal mark. The thoracic stripes are slightly different in shape; the abdomen of *L. io* narrower but larger than that of *L. psyche*. The females are exceedingly similar in shape and markings, and are best separated by the shape of the wings, which are narrower and much more pointed in *L. io* than in *L. psyche*.

24. ISCHNURA DELICATA Selys.

Common in all marshy localities and on the lagoons, rarer on the large mountain-streams. At Wilgarrup every patch of long grass or sedge in the marshes yielded hundreds; and it was a beautiful sight to see the swarms of males like brilliant red needles tipped with blue, hovering over the grass after being disturbed. This is one of the smallest known dragonflies, and also one of the most beautiful. The abdomen of the male is very slender, bright red tipped with light blue and a little black. The ordinary female is either dull black or olive-green. At Bridgetown and Wilgarrup I found a remarkable dimorphic female, which imitates the colouring of the male. [See These Proceedings, p. 190, "On Dimorphism in the Females of Australian Agrionidæ."] The proportion of dimorphs to ordinary females was about 10%. This insect is abundant over the whole of Australia, even in the dry central districts and in the tropics; the northern forms are exceedingly small. The dimorphic female has not been found outside of Western Australia.

24. PSEUDAGRION CÆRULEUM, n.sp.

(Plate xxxv. figs. 13-14).

♂. Total length 27 mm.; abdomen 22 mm.; forewing 14.5 mm., hindwing 14 mm.

Wings: *Neuration* slender, black. *Pterostigma* 0.6 mm., black. *Nodal Indicator* || 2 7-9 | Head: *Eyes* dark blue, black behind. *Epicranium* || 2 6-7 | hairy, black, a brilliant blue wavy transverse band behind, reaching from eye to eye, and very slightly enlarged at the ends; front ocellus transparent; two tiny

blue spots at bases of ocelli; in front a dull greenish-blue area carrying a small black flattened T-mark, the base of which proceeds from under the front ocellus. *Postclypeus* hairy, black; *anteclypeus* blue; *labrum* blue with a tiny black spot. *Orbits* blue inwards, with a small black spot near the epicranium. *Labium* pale dirty brown. *Thorax*: *Prothorax* black, a narrow blue collar in front, a small blue spot on each side. *Meso-* and *metathorax* brilliant blue, a broad metallic dorsal black band, and on each side a narrower lateral black band; some black in the sublateral suture; underside dirty brown. *Legs* blackish above, pale beneath. *Abdomen*: 1-2 slightly enlarged, 7-10 swollen. *Colour*: 1, blue with a black basal spot; 2, brilliant blue, a large cup-shaped dorsal blotch of black, and an anal black band in the suture; 3, basal three-fourths brilliant blue, rest black, the black running up into a point along the dorsum; 4-6, metallic bronzy-black, with a bright blue basal band, which extends underneath along the sides nearly the whole length of each segment; 7, basal three-fourths black, rest blue, basal sutures blackish; 8-9 bright blue, blackish in the sutures; 10 black. *Appendages*: *Superior* very short, separated, black, a stiff hair near the tips on the inner margin. *Inferior* minute.

♀. Differs from the male as follows: *Head*: Postocular band dull blue; other parts which are blue in male are grey in female. *Thorax* as in the male. *Abdomen* cylindrical, thicker than in the male. *Colour*: 1, blue, with a dorsal black spot; 2, a large irregular black dorsal patch; sides blue; 3-6, metallic bronzy-black above, with blue sides and a narrow transverse basal blue band; the black dorsal area is somewhat narrowed for four-fifths of the segment, then slightly notched, and finally enlarged at the anal end into a rounded patch covering *all* the dorsal portion and a little of the lateral besides; 7, black above, blue on sides; a transverse basal blue line; 8, black above, with a basal transverse blue line; a blue line in the anal suture, and close up to it on either side a small round blue spot; 9-10, black, sutures blue. Underside greyish. Ovipositor carries two very short black filaments. *Appendages* very short, wide apart, conical, black.

Hab.—Common at Mungar's Lake, Perth; rather rare at Armadale, Bridgetown, Wilgarrup and Margaret River. A very beautiful and conspicuous little insect. It flies close to the water and is fond of settling on floating leaves of water-plants, or on stems of grass or reeds.

This species is very closely allied to *P. cyane* Selys, of the eastern States. The males can be at once distinguished by the greater amount of blue on the abdomen of *P. coeruleum*; in particular, segments 3 and 7-9; *P. cyane* has only a narrow band of blue on 3, *no blue on 7*, and some black at the anal end of 9. The females are absolutely different; that of *P. cyane* being dark bronzy-black with pale olive-green markings.

26. XANTHAGRION ERYTHRONEURUM Selys.

Common at Mungar's Lake, Perth. I did not find it in any other locality. It is widely distributed over Australia, local, but generally abundant where it occurs. It is a beautiful insect with deep brick-red thorax; base of abdomen red, rest metallic bronzy-black tipped with blue. Female considerably duller. It is probably confined to the coastal lagoons.

EXPLANATION OF PLATES XXXIV.-XXXVI.

Plate xxxiv.

Map of South-Western Australia.

Railways — — — — —

Isohyetals 35"

Plate xxxv.

- Fig.1.—*Synthemis Martini*, n.sp.; ♂ appendages, dorsal view.
 Fig.2.— „ „ „ „ lateral view.
 Fig.3.—*Synthemis cyanitincta*, n.sp.; ♂ appendages, dorsal view.
 Fig.4.— „ „ „ „ lateral view.
 Fig.5.—*Austrogomphus occidentalis*, n.sp.; ♂ appendages, dorsal view.
 Fig.6.— „ „ „ „ lateral view.
 Fig.7.—*Austroaeschna anacantha*, n.sp.; ♂ appendages, dorsal view.
 Fig.8.— „ „ „ „ lateral view.

- Fig.9.—*Austroæschna anacantha*, n.sp.; ♀ appendages, dorsal view.
Fig.10.— ,, ,, ,, lateral view.
Fig.11.—*Argiolestes minima*, n.sp.; ♂ appendages, dorsal view.
Fig.12.— ,, ,, ♀ appendages, lateral view.
Fig.13.—*Pseudagrion cæruleum*, n.sp.; ♂ appendages, dorsal view.
Fig.14.— ,, ,, ♀ appendages, lateral view.

Plate xxxvi.

- Fig.1.—*Synthemis cyanitincta*, n.sp. ♂.
Fig.2.—*Synthemis Martini*, n.sp. ♂.
Fig.3.—*Austrogomphus occidentalis*, n.sp. ♂.
Fig.4.—*Austroæschna anacantha*, n.sp. ♂.



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