

**SYNTHEMIS OFARRELLI SPEC. NOV., A NEW CORDULIID  
DRAGONFLY FROM AUSTRALIA (ANISOPTERA)**

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*S. ofarrelli* sp. n. is described from males collected near Kenilworth, in south-eastern Queensland. The new sp. is compared with its closest ally, *S. claviculata* Tillyard, from north-eastern Queensland.

**INTRODUCTION**

The south-west Pacific genus *Synthemis* Selys includes eight species described from Australia (WATSON, 1974; HOUSTON & WATSON, 1986). The most recently described of these, *S. spiniger* Tillyard, was discovered 75 years ago, in January, 1912 (TILLYARD, 1913), and it seemed strange that, despite the extensive collections that have been made since then, resulting in the discovery of many new forms of Australian Odonata, no new *Synthemis* had been found. Within the last year, however, two have been recognised. One, from south-eastern New South Wales, is known only as a larva (Hawking & Watson, unpublished). The other, collected in January, 1986, in south-eastern Queensland, was first thought to be *S. claviculata* Tillyard, known from only a few localities in north-eastern Queensland (cf. below). However, comparison with *S. claviculata* has shown that it is a distinct but closely allied species.

We describe it here, and dedicate it to Professor A.F. O'FARRELL, previously Professor of Zoology in the University of New England, Armidale, Australia, in honour of his 70th birthday (9th January, 1987), and in recognition of the great contribution he has made to the knowledge of the Australian Odonata.

The terminology is that of CHAO (1953), except for the wings, where we follow O'FARRELL (1970).

*SYNTHEMIS OFARRELLI* SP. N.

Figures 1-4, 8, 9-11

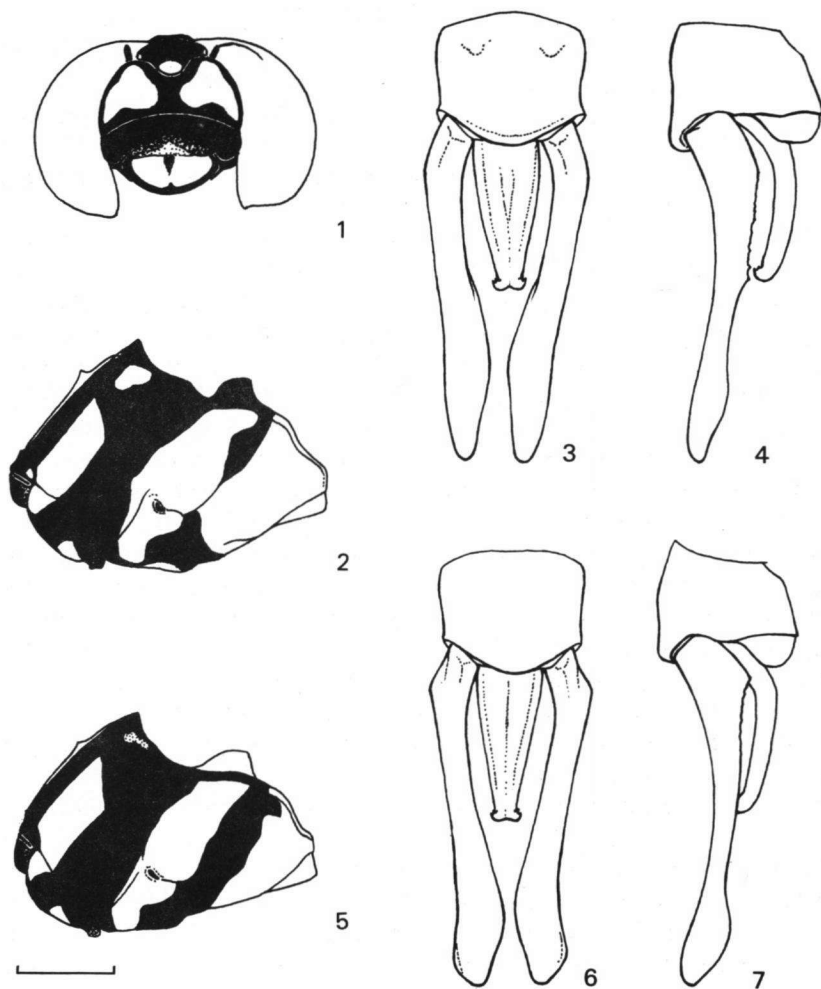
**Material.** — Holotype ♂ (Australian National Insect Collection Type No. 9900) and 5 ♂ paratypes: Australian, Queensland, Booloumba Creek near Kenilworth (26°36'S, 152°44'E), 11-12 January, 1986, G. Theischinger and L. Müller (ANIC, Canberra).

**Male: Dimensions.** — Forewing 30.3-31.4 mm; hindwing 29.8-30.9 mm; abdomen with appendages 37.0-38.6 mm.

**Head (Fig. 1).** — Labium, postclypeus, genae and antennae glossy, slightly metallic black; labrum yellow with narrow, glossy black anterior and lateral margin and narrow, triangular, brownish black mediobasal stripe extending approximately half way across labrum; anteclypeus black to greyish black with wide, short and ill-defined, dull yellow subtriangular patch; frons shiny black with large, irregularly shaped yellow patch on each side, extending almost to eye and to epistomal suture; vertex glossy black with or without small dull yellow spot on top; occiput brownish- to glossy black in front and along eye margins, bright yellow behind; postgenae black with or without small yellow spot just below evagination of eye.

**Cervix and prothorax.** — Dorsal cervical sclerites and dorsal part of eucervicale yellow, ventral part of eucervicale and postcervicale greyish brown; episternum greyish black with small, pale yellowish patch anteriorly; epimeron greyish black with small, ill-defined, slightly lighter patch near ventral edge; pronotum largely glossy black, anterior rim and lateral edges of anterior lobe yellow, a very small spot on each side near midline and the posterolateral corner of median lobe and the posterior edge of slightly bilobed posterior lobe greyish yellow; coxa brownish on inner, yellow on outer surface; trochanter yellow; femur yellow basally, black distally; tibia, tarsus and claw black, tibial keel greyish yellow, 50-55% of tibial length.

**Synthorax (Fig. 2).** — Mesostigmatic lamina reddish- to blackish brown; spiracular dorsum black with yellow spot on each side, close to lateral margin; collar black; dorsal carina yellow; antealar ridge and sinus largely black, only anteromedial part yellow; front of synthorax largely black, slightly metallic, with large, subrectangular yellow patch along lower mesopleural suture, joining anterior yellow band across mesokatepisternum, small outer and smaller inner yellow mark along antealar ridge, the inner mark confluent with yellow anteromedial part of antealar ridge and sinus; posterior corner of mesokatepisternum yellow; mesepimeron broadly metallic black in front, narrowly yellow behind; metanepisternum and metepimeron yellow with broad black stripe along upper half of metapleural suture and around lower convexity of metepimeron, adjoining metakatepisternum; metakatepisternum largely black, yellow in front and along central part of ventral margin; subalar ridge black to metapleural suture, yellow behind it; metapostepimeron and poststernum yellow; meso- and metapostscutellum yellow, rest of tergal sclerites greyish brown to black; coxae black in front,



Figs 1-7. Male *Synthemis*. — Figs 1,4, *S. ofarrelli* sp. n.: (1) head, frontal view; — (2) synthorax, left lateral view; — (3, 4) anal appendages, dorsal and right lateral views. — Figs 5-7, *S. claviculata*: (5) synthorax, left lateral view; — (6-7) anal appendages, dorsal and right lateral views. — [Scale line = 2 mm for Figs 1, 2, 5; 1 mm for Figs 3, 4, 6, 7].

yellow behind; trochanters yellow on upper, black on lower face; femora with narrow yellow basal ring, narrower on metafemur; tibiae, tarsi and claws black; tibial keels yellowish grey, 50-58% of tibial length on mesotibia, 72-77% on metatibia.

Wings (Fig. 8). — Membrane hyaline; veins black except for yellow median ray

of costa in all wings; axillary and humeral plates brownish black, intermediary piece yellow in all wings; antenodals 12-13/8-11, postnodals 6-9/9-11;  $Ax_1$  and  $Ax_3$  strongly thickened in both wings,  $Ax_4$  in forewing and all remaining antenodals except  $Ax_2$  in hindwing thickened, most strongly near base of wing; costal and subcostal sections of antenodals coinciding in hindwing, coinciding or not in distal antenodal region of forewing; costal part of  $Ax_2$  missing in hindwing; pterostigma black, 2.1-2.6 mm long in all wings, generally overlying 2 cells; sectors of arcus with stalk markedly longer in hindwing than in forewing; triangles and forewing subtriangle free of crossveins, hypertriangles generally crossed by 1 vein; discoidal field of forewing comprising a single row of cells to about level of proximal fork of  $R_s$ , thence widening to 10-12 cells at wing margin; discoidal

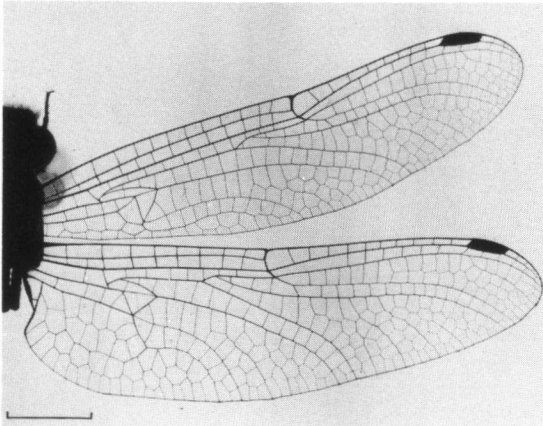


Fig. 8. Wings of male *Synthemis ofarrelli* sp. n. — [Scale line = 5 mm].

field of hindwing a single row of cells for only 3-5 cells, then widening strongly to about 10-12 cells at wing margin; 3-4 bridge crossveins in both fore- and hindwings; generally 1, occasionally 2, crossveins in median spaces; 3-4  $cux$  in all wings; anal loop 3-5 cells long, 2 cells deep; anal triangle short, 2-celled; anal angle very obtuse; membranule well-developed, grey.

Abdomen. — Elongate, slender; segments 1 and 2 enlarged, 1 broadest distally, 2 basally, segments 3-5 slightly compressed overall, each slightly constricted at about centre; segments 6-7 widening progressively; segment 8 narrowing and segment 9 widening from base to tip; segment 10 subcylindrical. Tergites 1-8 slightly metallic black, marked with yellow as follows: 1, sides and ill-defined subtriangular dorsal mark, apex to front; 2, auricles and lateral tergite in front of them, and behind their lower edge, above ventral carina, plus ill-defined, elongate, subrectangular dorsal patch in basal half broadly connected to almond-shaped transverse patch on each side, across supplementary transverse carina, and narrowly to narrow, mid-dorsal stripe behind it; 3, a broad, lanceolate dorsal patch approximately 1/5 segment length and pointed in front, covering supplementary transverse carina, and triangular lateral patch, broad in front, extending along and above ventral carina almost to supplementary transverse carina; tergites 4-7 similar to 3 but lacking

field of hindwing a single row of cells for only 3-5 cells, then widening strongly to about 10-12 cells at wing margin; 3-4 bridge crossveins in both fore- and hindwings; generally 1, occasionally 2, crossveins in median spaces; 3-4  $cux$  in all wings; anal loop 3-5 cells long, 2 cells deep; anal triangle short, 2-celled; anal angle very obtuse; membranule well-developed, grey.

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lateral patch and with progressively smaller dorsal patch, reduced to pair of narrow, triangular spots along supplementary transverse carina on tergites 6 and 7, lacking in some individuals; tergite 8 with large dorsal mark covering much of basal half and basal, greyish yellow subtriangular patch, broadest in front, along and above ventral carina; tergite 9 and segment 10 black. Sternite 1 brown; secondary genitalia largely yellow, penis, posterior part of anterior lamina, vesicle, and anterior face of hamule dark brown; sternites 3-9 blackish brown to black; bipartite sternite 11 black. Anal appendages black.

Anal appendages (Figs 3, 4). — Superiors approximately 3.5 mm long, slender, gently convergent overall; ventral keel present near base, slightly angulated at basal fifth of appendage; inner margin keeled in distal half, the appendage broadening then evenly tapered to narrow, rounded apex; inferior appendage almost half length of superiors seen from above, apex expanded, bilobed, bearing two minute dorsal teeth on each side.

Secondary genitalia (Figs 9-11). — Anterior lamina deeply cleft, terminating in strongly toothed, rugose ridge on each side (Fig. 10); posterior hamules broad, low, their ends convergent, each with rounded, bifid apex, the upper, longer lobe abutting on the vesicle, its inturned tip strongly dentate, the lower, shorter lobe constituting the end of rugose lower (anterior) margin of hamule, armed with inturned spines (Fig. 11); vesicle upright, tufted in front (Fig. 9); penis not examined.

Female and larva unknown.

Biology. — The only known habitat of *Synthemis ofarrelli* is a rainforest stream, with a stony bottom and without a closed canopy.

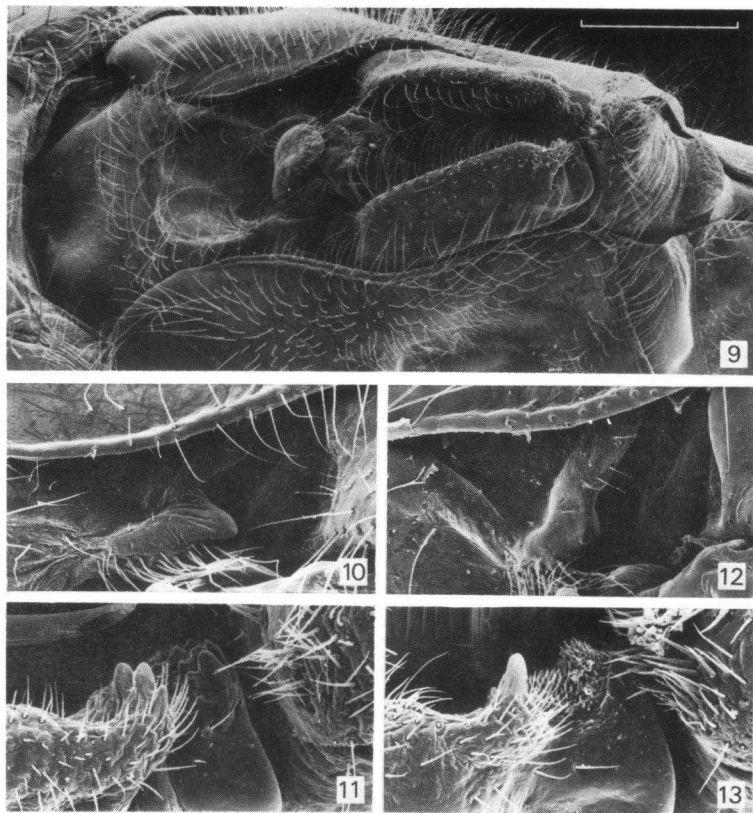
### *SYNTHEMIS CLAVICULATE* TILLYARD, 1909

Figures 5-7, 12, 13

*Synthemis claviculata* TILLYARD, 1909: 749-750, pl. xxi figs 11, 12, pl. xxii fig. 5, ♂, Kuranda, Queensland; — TILLYARD, 1910: 359-360, 373, 374, pl. iv fig. 6, pl. vi fig. 14, pl. vii figs 6a, b, ♂, ♀, Kuranda. — WATSON, 1974: 146, north-eastern Queensland.

Material. — Queensland: 1 ♀, Mary Creek, 5 miles (8 km) SE Mt Carbine, 27 March, 1969, J.A.L. Watson; 1 ♀, 16° 38'S, 145° 15'E, between Mt Molloy and Maryfarms, 23 November, 1976, G. Theischinger; holotype ♂, Kuranda, Jan. 1908, E. Allen [British Museum (Natural History), London]; 1 ♀, Redlynch, near Cairns, 24 January, 1951, R. Dobson; 1 ♂, Atherton, Jan. 1963, C. Vallis; 1 ♂, Millstream Falls, near Ravenshoe, 3 December, 1967, R. Dobson; 3 ♂, 6 ♀, same locality and collector, 27 December, 1967; 4 ♂, 3 ♀, same locality, 22-23 March, 1969, J.A.L. Watson. (All in ANIC, Canberra, unless otherwise indicated).

TILLYARD (1909) described *S. claviculata* from a single male and, in 1910, augmented the description from a further male and a female, also from Kuranda. Although extensive material has been collected during the last 20 years, the known range has been little expanded: *S. claviculata* has been found only in a



Figs 9-13. Secondary genitalia of male *Synthemis*. — Figs 9-11, *S. ofarrelli* sp. n.: (9) right ventrolateral view; — (10) left posterior margin of anterior lamina, ventral view; — (11) tips of right posterior hamule, ventral view. — Figs 12-13, *S. claviculata*: (12) right posterior margin of anterior lamina, ventral view, print reversed; — (13) tips of right posterior hamule, ventral view. — [Scale line = ca 0.6 mm for Fig. 9; ca 0.25 mm for Figs 10, 12; ca 0.15 mm for Figs 11, 13].

narrow band, primarily of rainforest, extending from the southern margin of the Atherton Tableland to streams draining westwards from Mt Lewis, approximately 120 km to the north.

TILLYARD's descriptions [particularly his coloured pl. iv fig. 6 (1910)] adequately portray *S. claviculata*. A few further notes on the male are given below.

Anal appendages (Figs 6, 7). — Superiors slender, approximately 3.5 mm long; distal quarter to third broadened, initially on inner margin, towards tip on outer margin, the tips divergent as a result, and not evenly tapered; ventrobasal keel angulated at basal eighth of appendage; inferior appendage almost half length of superiors, apex much as in *S. ofarrelli*.

Secondary genitalia (Figs 12, 13). Much as in *S. ofarelli* (cf. Fig. 9); posterior ridge of anterior lamina with low teeth (Fig. 12); upper apical lobe of posterior hamule with marginal row of teeth and inner patch of short setae; lower, shorter apical lobe armed with 1-2 large, inturned teeth (Fig. 13).

## DISCUSSION

TILLYARD (1910) recognised that *Synthemis cyanitincta* Tillyard, from south-western Australia, is similar to *S. claviculata* "in the reduction of its ovipositor, and in possessing antehumeral thoracic stripes, but not in other respects" (p. 361). There can, however, be no doubt that *S. ofarelli* is far more closely related to *S. claviculata*; the size, colour, overall colour pattern, and the overall shapes of the male anal appendages and secondary genitalia are closely similar. *S. cyanitincta* is far smaller, and the colour and its pattern, and the anal appendages and secondary genitalia, differ markedly from those of both *S. claviculata* and *S. ofarelli* (cf. TILLYARD, 1908, 1909, 1910; WATSON & THEISCHINGER, unpublished).

Some differences between *S. claviculata* and *S. ofarelli* do, however, provide ready markers. The black band along the metapleural suture is entire in *S. claviculata* (Fig. 5) but broadly broken in *S. ofarelli* (Fig. 2); the yellow abdominal marks are more extensive in *S. claviculata* (cf. TILLYARD, 1910, pl. iv fig. 6); the ventrobasal angulation of the male superior appendages is sharper, and more basal, in *S. claviculata* (Figs 4, 7), and their tips are markedly broader (Figs 3, 6); and although the overall shape of the secondary genitalia is similar in the two species, the anterior lamina and apices of the posterior hamule differ (Figs 10-13). These morphological differences are of much the same kind as those found between sister species of Odonata and other freshwater insects north and south of the Paluma-Eungella gap in north-eastern Queensland (WATSON & THEISCHINGER, 1984), although the southernmost record of *S. claviculata* is approximately 160 km NNW of Paluma, and the type-locality of *S. ofarelli* approximately 1100 km to its south-east.

## ACKNOWLEDGEMENTS

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## REFERENCES

- CHAO, H.-f., 1953. The external morphology of the dragonfly *Onychogomphus ardens* Needham. *Smithson. misc. Collns* 122(6): 1-56.  
HOUSTON, W.W.K. & J.A.L. WATSON, 1986. Odonata. In: *Zoological Catalogue of Australia*

- Volume 6 Insecta: Small Orders I. Bureau of Flora and Fauna / Australian Government Publishing Service, Canberra. (In the press).
- O'FARRELL, A.F., 1970. Odonata (dragonflies and damselflies). *In*: CSIRO The insects of Australia, pp. 241-261, pl. 1 excl. Melbourne Univ. Press, Melbourne.
- TILLYARD, R.J., 1908. The dragonflies of south-western Australia. *Proc. Linn. Soc. N.S.W.* 32: 719-742.
- TILLYARD, R.J., 1909. On some remarkable Australian Corduliinae, with descriptions of new species. *Proc. Linn. Soc. N.S.W.* 33: 737-751.
- TILLYARD, R.J., 1910. Monograph of the genus *Synthemis* (Neuroptera: Odonata). *Proc. Linn. Soc. N.S.W.* 35: 312-377.
- TILLYARD, R.J., 1913. On some Australian Anisoptera, with descriptions of new species. *Proc. Linn. Soc. N.S.W.* 37: 572-584.
- WATSON, J.A.L., 1974. The distributions of the Australian dragonflies (Odonata). *J. Aust. ent. Soc.* 13: 137-149.
- WATSON, J.A.L. & G. THEISCHINGER, 1984. Regions of taxonomic disjunction in Australian Odonata and other freshwater insects. *Odonatologica* 13: 147-157.