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***Palaeosynthemis opaca* sp. nov., a new dragonfly from Papua New Guinea (Anisoptera: Synthemistidae)**

Günther Theischinger¹ & Stephen J. Richards²

¹Office of Environment and Heritage New South Wales, Sydney, NSW, Australia, and Australian Museum, Entomology, 6 College Street, Sydney, NSW, 2010, Australia
E-mail: gunther.theischinger@environment.nsw.gov.au

²Herpetology Department, South Australian Museum, North Terrace, Adelaide, S. A. 5000, Australia
E-mail: steve.richards@samuseum.sa.gov.au

Abstract

A new species of the synthemistid genus *Palaeosynthemis* is described from the northern slopes of Papua New Guinea's central cordillera. It is distinguished from all congeners by having females with large, nearly black patches at the bases of both wings. The male is most similar to *P. cervula* and *P. feronia*, but it differs from those species in having superior anal appendages less than three times as long as S10, basally enlarged and otherwise unarmed vs basally not enlarged (*feronia*) and almost four times as long as S10 and armed (*cervula*). Characters of the adults (both sexes) are illustrated and the affinities of the species are discussed.

Key words: Synthemistidae, *Palaeosynthemis*, new species, Sandaun Province, Papua New Guinea

Introduction

Dragonflies of the predominantly New Guinean genus *Palaeosynthemis* Förster, 1903 are medium-sized, slender species with a colour pattern consisting of sparse yellow markings against a dark green and black background (Orr & Kalkman 2015). Ten species have been described to date, the most recent by Theischinger & Richards (2014), but Orr and Kalkman (2015) noted the existence of additional undescribed species. Here we describe a new species of *Palaeosynthemis* obtained by the second author from the northern slopes of the central cordillera in western Papua New Guinea.

Material and methods

Descriptive terminology largely follows Watson & O'Farrell (1991). Colouration is given as detected from preserved material and supported by live photos. Measurements

are given in millimeters (mm). All illustrations were prepared with the aid of a camera lucida and are not to scale. Coordinates are given using the GPS datum WGS 84.

The type series is deposited in the collection of the South Australian Museum (SAM) in Adelaide, Australia.

***Palaeosynthemis opaca* sp. nov.**

Figures 1-8

Material

Holotype: ♂ (SAM 07-001322): Papua New Guinea, Sandaun Province, un-named camp in upper Sepik River basin (4°42.859'S, 141°55.517'E; 135 m a.s.l.), 26-v-2010, S.J. Richards (SAM).

Paratypes (all from Papua New Guinea): 2 ♂ (SAM 07001324, 001353), 4 ♀ (SAM 07001328, 001344, 001346, 001451), same data as holotype; 1 ♂ (SAM 07001452), 1 ♀ (SAM 07001453), East Sepik Province, unnamed camp in upper Sepik River basin, Papua New Guinea (4°37.247'S, 141°41.380'E; 440 m a.s.l.), 5-8-xii-2009 (SAM); all S.J. Richards.

Etymology

The specific name (*opacus* = Latin for dark) refers to the strongly darkened wing bases of the female.

Diagnosis

A medium-sized black dragonfly with rich yellow pattern (Figs 1-4); the male with long sinuous, basally markedly strengthened superior anal appendages (Figs 6, 7), the mature female with large, very dark basal wing patches, particularly in Hw (Figs 2, 4).

Holotype. – Male (Figures 1, 3, 5-7)

Head. – Labium including lobes yellow with yellowish brown; labrum largely black, pale brownish yellow only medio-basally; anteclypeus largely yellow; postclypeus brown medially, merging into black laterally; frons largely yellow anteriorly and laterally, top and lateral margins of frons, and all of vertex and occipital triangle black with metallic sheen; postgenae black along eye margin, otherwise variably brown with patches of brownish yellow.

Prothorax. – Pronotum brown and black with only margin of anterior lobe yellow; propleura brownish yellow.

Synthorax – Pleura largely black with some sheen; yellow markings cover: most of edge of dorsal carina, inner posterior edge of antealar ridge, ante-humeral edges that cover approximately basal half and lateral ¼ of mesanepisternum, a spot in the antero-dorsal corner of mesepimeon, a large metepisternal patch and a spot dorsal to it, and all of metapostepimeron and narrow adjacent area on metepimeron. Poststernum whitish

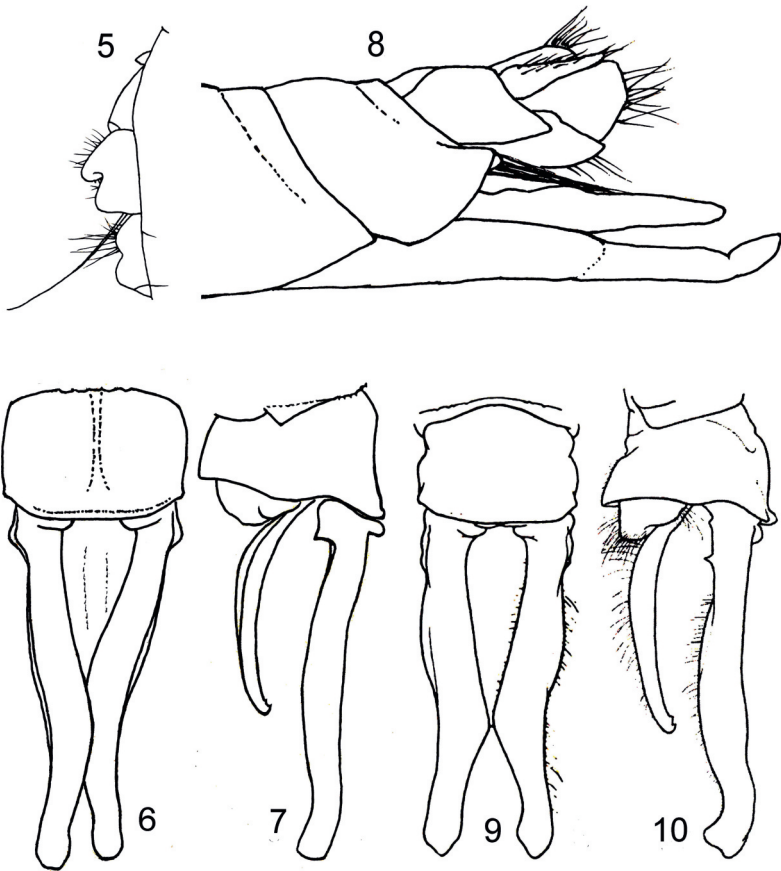


Fig. 1. *Palaeosynthemis opaca* sp. nov., male, habitus, lateral.

Fig. 2. *Palaeosynthemis opaca* sp. nov., female, habitus, lateral.



Figs 3, 4. *Palaeosynthemis opaca* sp. nov., in life; Sepik River basin, Papua New Guinea, 26-v-2010: (3) male; (4) female. Photographs by SJR.



Figs 5-8. *Palaeosynthemis opaca* sp. nov.: (5) male, secondary genitalia, lateral; (6, 7) male, anal appendages: (6) dorsal; (7) lateral; (8) female, terminal abdominal segments, lateral. **Figs 9, 10. *Palaeosynthemis feronia*, male, anal appendages (modified from Lieffinck (1938)):** (9) dorsal; (10) lateral.

yellow, with rather extensive patches of blackish grey. Legs with coxae and trochanters and part of basal half of pro- and mesofemur pale to brownish and greyish yellow; otherwise largely black, only fibial keels edged whitish and claws brown. Wings with membrane hyaline, slightly tinged with blackish brown; venation and pterostigma (2.0 mm long and generally overlying 2 cells) black; a basal antenodal cross-vein in subcostal space in all wings; Ax1 and Ax3 thickened in Fw; every second Ax thickened in Hw; 16/10 antenodals; 7-9/9 postnodals; 2/2 medial cross-veins; 5/4-5 cubital cross-

veins (including base of subtriangle in hindwing); Fw triangles free; Hw triangles and subtriangles of Fw crossed; 1/1 cross-veins in supertriangles; 3/2-3 bridge cross-veins; anal loop made up of 6 cells; anal triangle 2-celled; membranula small, greyish.

Abdomen. – Largely black; S2 each side with yellow spot dorsal to auricle and adjacent to or continuing into dorsal spot on transverse carina; secondary genitalia as illustrated (Fig. 5); S3 and S4 with dorso-lateral spot each side at base and more dorsal spot each side on transverse carina; S5-S7 with dorsal spot each side on transverse carina only. Sternites largely yellow. Anal appendages (Figs 6, 7) black, the superiors slightly and evenly sinuous with base ventrally enlarged and toothed, the inferiors narrow and widely arched.

Measurements. – Hindwing 35.2 mm, abdomen+appendages 44.5 mm.

Female (n =5) (Figures 2, 4, 8)

Head – Much as in male.

Thorax - Much as in male; the large yellow metepisternal patch may appear dissolved into two smaller patches; yellow patch around metapostepimeron larger; profemur with yellow streak for most of its length; tibiae without keels. Wings with base brownish black to level of, or including triangles and merging into dark again several cells before level of pterostigma; 14-16/9-10 antenodals; 7-8/8-10 postnodals; 1-2/1-2 medial cross-veins; 5-6/5-6 cubital cross-veins (including base of subtriangle in hindwing); triangles of Hw generally crossed, subtriangles of Fw free or crossed; 1-2/1-2 cross-veins in supertriangles; anal loop made up of 6-11 cells, with or without central cell. One subadult specimen has largely hyaline wings with the base pale orange to brown only slightly beyond level of arculus, and the apex strongly darkened.

Abdomen – Much as in male; tergites of S2-7 narrowly yellow along ventral margin; indication of yellow basal dorsal spot each side also in S5; apical portion of S8 and S9 with ill-defined patch of brown each side. Ovipositor long and slender with upper and lower blades almost straight but distinctly narrowed towards the end in profile view, the upper blades brown and noticeably shorter than the black lower blades (Fig. 8).

Measurements: Hindwing 37.5-39.1 mm, abdomen 42.5-44.8 mm.

Variability of male paratypes (n = 3)

Paratypes differ little from the holotype. They have 12-16/9-10 antenodals, 6-9/7-10 postnodals, 4-5/4-5 cubital cross-veins (including base of subtriangle in hindwing); the Hw triangles and subtriangles of Fw free or crossed; 1-2/1-2 cross-veins in the supertriangles and 2-3/2-4 bridge cross-veins. Their Hw length ranges from 33.0 to 35.2 mm, their abdomen length from 38.2-45.5 mm.

Habitat

Both known localities are in primary foothill rainforest at altitudes of 130-440 m a.s.l. on the northern slopes of Papua New Guinea's central cordillera. All specimens were captured when they flew, often in large numbers, over small clearings adjacent to clear forest streams in late afternoon and at dusk.

Differential diagnosis

Palaeosynthemis opaca sp. nov. can be distinguished from all congeners except *P. cervula*, *P. feronia* and *P. primigenia* by having (vs lacking) yellow markings on the face. It is distinguished from *P. primigenia* by its yellow (vs dark brown) labium. The general shape of the new species' anal appendages is most similar to *P. feronia* and *P. cervula*. However, whereas the superior anal appendages of male *P. feronia* (Figs 9, 10) are basally not enlarged, bear a small tooth some distance from the base and have the apical section arching rather narrowly, the appendages of *P. opaca* sp. n. (Figs 6, 7) have the base ventrally distinctly enlarged for a short distance with a tooth at the end of this enlargement and are evenly and rather slightly sinuous throughout. The base of the male anal appendages of *P. opaca* sp. nov. is most similar to *P. cervula*, but in this species the appendages as a whole are much longer (almost four times as long as S10) than in both *P. opaca* and *P. feronia* (less than three times as long as S10) and bear a small tooth at about 2/3 length on their inner edge. The long and slender ovipositor of *P. opaca*, with upper and lower blades almost straight but distinctly narrowed distally in profile view and the upper blades noticeably shorter than the lower blades (Fig. 8), agrees very closely with *P. feronia* and differs markedly from *P. cervula* (ovipositor extremely long and slender and with the upper blades nearly as long as the lower pair, very narrow and parallel sided in profile view). Mature females of *P. opaca* sp. nov. further differ from *P. feronia* and *P. cervula* by having large, almost black (Figs 2, 4), as opposed to deep yellow (*P. feronia*) or almost entirely hyaline (*P. cervula*), wing bases. Even a subadult female of *P. opaca* has darker (orange to brown) wing bases than *P. feronia*. These nearly black basal wing patches in the female of *P. opaca* appear to be unique among all *Palaeosynthemis* for which the female is known.

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