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

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Abstract

A new species of the synthemistid genus *Palaeosynthemis* is described from the Trauna River valley in Western Highlands Province, Papua New Guinea. The new species is most similar to *P. cyrene* from which it can be distinguished, among other characters, by the coloration of the pterostigma (jet-black in the new species vs brownish yellow in *P. cyrene*) and of the wing bases (not darkened vs strongly darkened). The new species also differs from *P. cyrene* in having a narrow, almost parallel-sided yellow lateral synthoracic stripe and a well-defined yellow marking along most of the ventral margin of the metepimeron. In *P. cyrene* the lateral synthoracic stripe is markedly wider and tapered, and the yellow element along the ventral margin of the metepimeron is absent. Characters of the adult male are illustrated and the affinities of the species are discussed.

Key words

Synthemistidae, *Palaeosynthemis*, Trauna River valley, Western Highlands Province, Papua New Guinea

Introduction

North of Australia the family Synthemistidae is represented by 11 species of which one is found on Halmahera, nine on mainland New Guinea and one on Guadalcanal, Solomon Islands. In addition to this Michalski (2012), based on Tsuda (2000), lists *Syn-*



themis claviculata, currently placed in *Tonyosynthemis* Theischinger, 1998 from south-eastern New Guinea. This is however almost certainly incorrect, and this species is not considered to occur on New Guinea. Most of these were originally described in *Synthemis* but Carle (1995) established the genus *Palaeosynthemis* for these species. The only exception is *Eusynthemis frontalis* which is only known from a single female from Guadalcanal. Its reduced ovipositor shows that it does not belong in *Palaeosynthemis* but the male is needed to test if this species indeed belongs to the Australian genus *Eusynthemis* or represents an undescribed genus. The species of *Palaeosynthemis* can be identified using Michalski (2012) with the exception of *P. elegans* which was described by Theischinger & Richards (2013) almost simultaneously with the appearance of Michalski's (2012) book.

During field work along a tributary of the Baiyer River in Western Highlands Province, Papua New Guinea, one of us (SJR) collected two males of a *Palaeosynthemis* that, because it bore a mid-dorsal spine on the male abdominal segment 10, at first appeared to belong to *P. cyrene*, a species described by Lieftinck (1953). However detailed study of the original description, and of photos of the holotype of *P. cyrene* revealed significant differences between it and the newly collected specimens. These are described as a new species of *Palaeosynthemis* close to *P. cyrene*.

Material and Methods

Descriptive terminology largely follows Watson & O'Farrell (1991). Coloration is given as seen in preserved material, supported by photographs in life. Measurements are given in millimeters (mm). Drawings were prepared with the aid of a camera lucida and are not to scale. Coordinates are given using the GPS datum WGS 84.

The holotype of the new species is deposited in the collection of the South Australian Museum (SAMA) in Adelaide, Australia; the paratype is lodged in Naturalis Biodiversity Center (RMNH) in Leiden, the Netherlands.

Palaeosynthemis nigrostigma sp. nov.

Figures 1, 3, 4, 7

Material. – Holotype: ♂ (SAMA 07-000986): Papua New Guinea, Western Highlands Province, Trauna River Valley, 5.4855°S, 144.2355°E, 1,611 m a.s.l., 16-xi-2013, S.J. Richards.

Paratype: 1 ♂, same data as holotype (RMNH).

Etymology. – The specific name is a combination of *niger*, Latin for black, and *stigma* and refers to the jet-black pterostigma of this species as opposed to the pale pterostigma of its probable sister species, *Palaeosynthemis cyrene*.



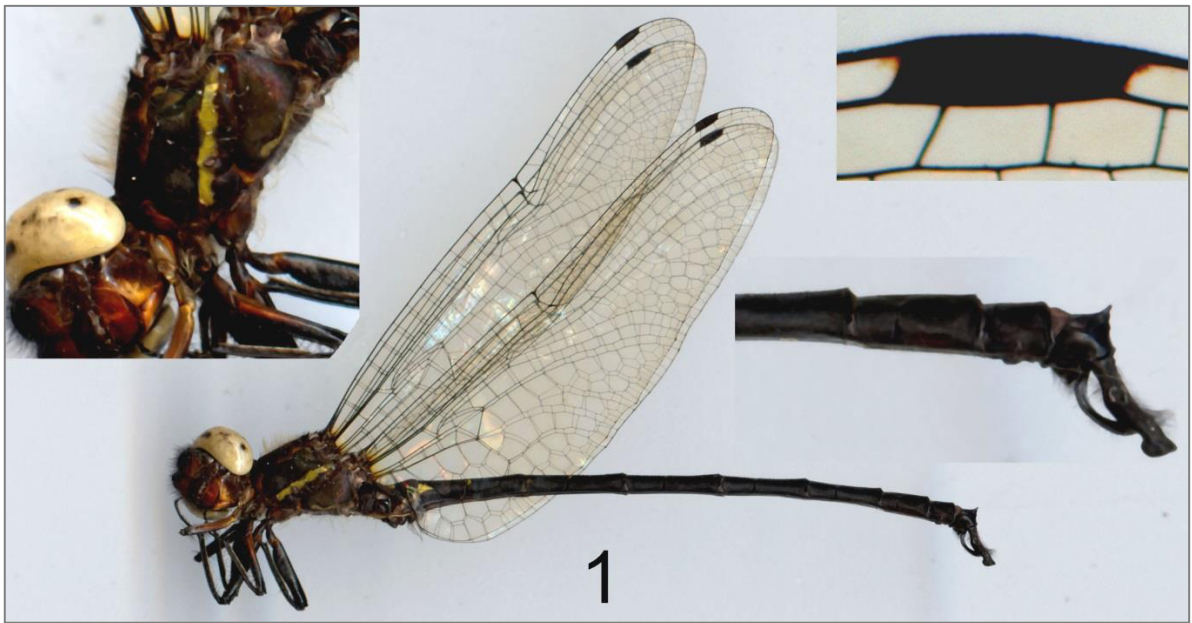


Fig. 1. *Palaeosynthemis nigrostigma* sp. nov., male: habitus, lateral; inset and enlarged, clockwise from top left: head and thorax, largely lateral; pterostigma, dorsal; terminal abdominal segments, lateral.

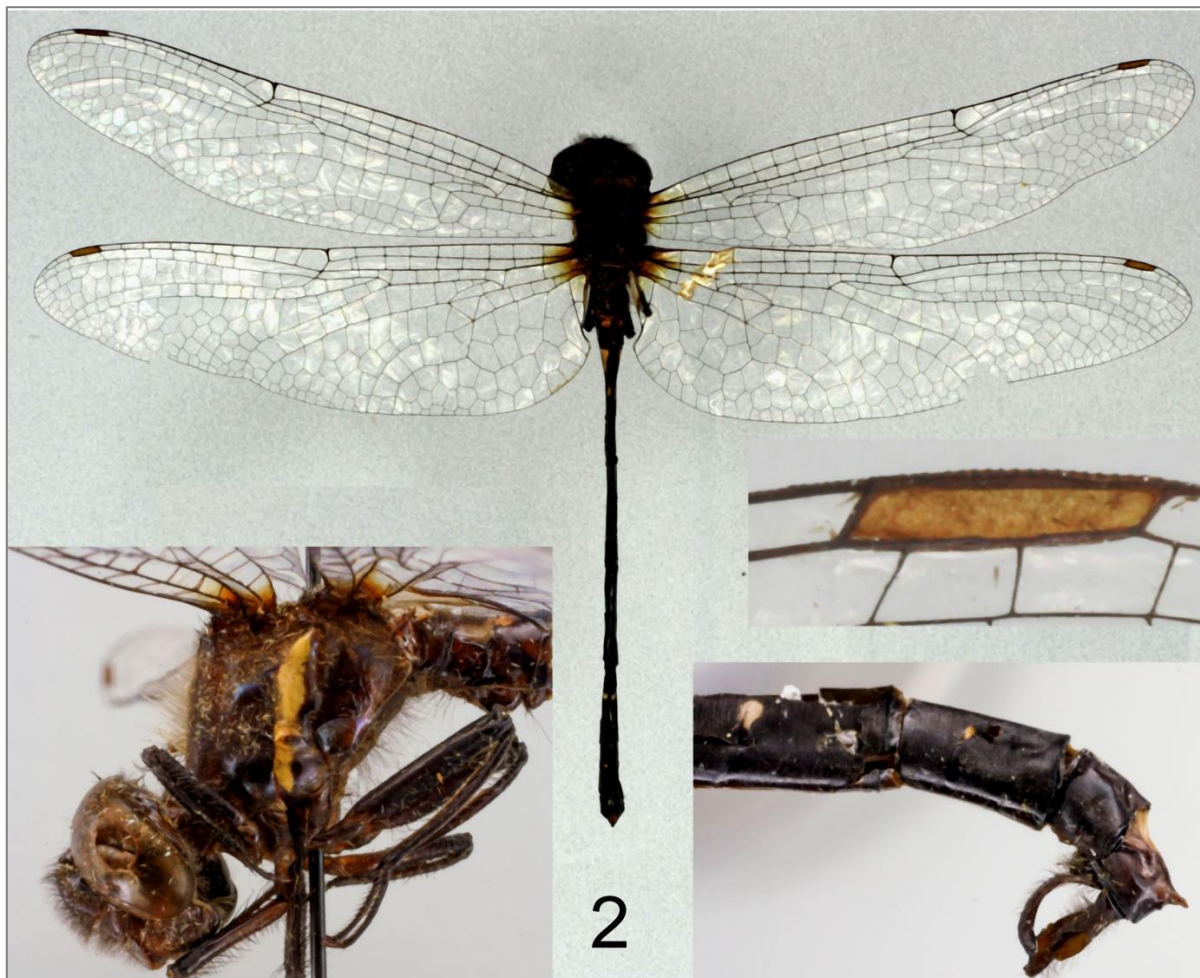


Fig. 2. *Palaeosynthemis cyrene* Lieftinck, holotype male: habitus, dorsal; inset and enlarged, clockwise from bottom left: head and thorax, lateral; pterostigma, dorsal; terminal abdominal segments, lateral.



Diagnosis of male. – A medium-sized, largely black dragonfly with moderately distinct yellow thoracic markings, but sparse abdominal pattern and jet-black pterostigma; the male (Figs 1, 7) with a mid-dorsal spine on S10.

Holotype male - Head (Fig. 1). – Median lobe of labium blackish brown, lateral lobes largely blackish brown with a subtriangular anteromedian portion paler yellowish brown; labrum orange to reddish brown, anterior frons yellowish brown basally, merging into blackish brown more dorsally; anteclypeus medially whitish grey merging into brown laterally; postclypeus, sides of frons and genae dark brown; top of frons, vertex and occipital triangle shiny black; postgenae largely yellowish brown merging into blackish brown near occiput and along eye margin.

Prothorax. – Pronotum and pleura largely blackish brown, posterior lobe almost black, only narrow rim of anterior lobe yellow.

Synthorax (Fig. 1). – Front and sides largely shiny black, with the following elements pale to dull yellow: top of mid-dorsal carina; a vague, ill-defined streak along parts of humeral suture; a small but well-defined spot in the extreme corner of mesepimeron; an almost parallel sided stripe, approximately 0.5 mm wide, along almost all of intersegmental suture and enclosing the spiracle; a well-defined narrow patch along anterior two-thirds of ventral margin of metepimeron; and much of metapostepimeron. Postcoxae and poststernum blackish brown to black. Legs largely black; coxae and trochanters of fore and middle leg and base of foreleg brown interiorly; tibial keels distinct, about 70% of tibial length in fore and middle leg, about 80 % in hind leg. Wings with membrane hyaline, slightly tinged with brown all over and not darkened basally; venation black; pterostigma 1.8 mm long and entirely jet-black, overlying 1-2 cells. 12/8 antenodals; 8/11 postnodals; medial crossveins 1/1; cubital crossveins (including base of subtriangle in hindwing) 4/4; crossveins in supertriangles 2/1; bridge crossveins 4/4; anal loop made up of 7 cells, anal triangle of 2 cells; membranula small, dark grey.

Abdomen (Fig. 1). – largely black, patterned with yellow as follows; S2 with small spot on each side of mid-line on transverse carina; S3 and S4 with pair of subtriangular baso-lateral and pair of small medio-dorsal spots; S5-S8 with hardly detectable line on each side on transverse carina; S9 and S10 black, S 10 with conspicuous mid-dorsal spine. Anal appendages (Figs 3, 4) black, the superiors thicker in second than in basal third, the inferior strongly and evenly arched with two pairs of denticles apically.

Measurements. – Hindwing 37.1 mm, abdomen 45.0 mm.

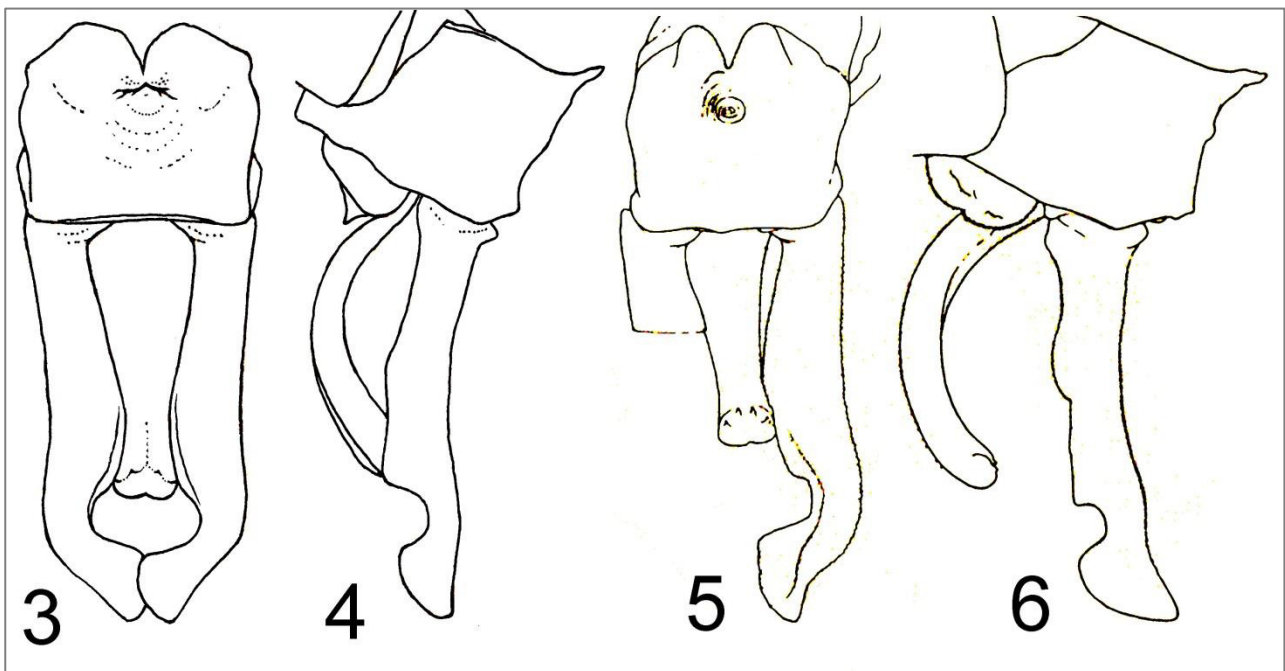
Female. – unknown.



Variability. – The paratype agrees closely with the holotype. It has, however, 8/10 postnodals, 1/1 crossveins in supertriangle, 3/3 bridge crossveins, the anal loop made up of only 6 cells, and the yellow pattern element on abdominal S2 is even smaller. Its Hw length is 35.7 mm, the abdomen measures 44.5 mm.

Habitat. – The type locality is a small (< 2 m wide) steep and rocky stream that intersects the Baiyer River to Jimi Valley road in lower montane forest at an altitude of 1,600 m a.s.l. The forest along the stream has been moderately disturbed and the types were collected as they flew along a small trail running parallel to, and within 5 m of, the stream about 50 m above the road around mid-morning.

Differential diagnosis. – *Palaeosynthemis nigrostigma* sp. nov. was initially identified as *P. cyrene*, reflecting its similarity to that peculiar species. However careful comparison of the new material with both the type description of *cyrene*, and with images of the holotype of that species, revealed clear-cut differences between them. Diagnostic features are provided by the colour of the pterostigma (jet black in *P. nigrostigma* (Fig. 1) vs brownish yellow in *P. cyrene* (Fig. 2), and of the wing bases (not darkened in *P. nigrostigma* versus strongly darkened in *P. cyrene*). *P. nigrostigma* also differs from *P. cyrene* in having a narrow, almost parallel-sided yellow lateral synthoracic stripe and a well-defined yellow marking along most of the ventral margin of the metepimeron (Fig. 1). In *P. cyrene* the lateral synthoracic stripe is markedly wider and tapered, and the yellow element along the ventral margin of the metepimeron is absent (Fig. 2). Finally, whereas the superior anal appendages of male *P. nigrostigma* (Figs 3, 4)



Figs 3, 4. *Palaeosynthemis nigrostigma* sp. nov., male, anal appendages: 3) dorsal; 4) lateral.

Figs 5, 6. *Palaeosynthemis cyrene* Lieftinck, male, anal appendages, modified from Lieftinck (1953): 5) dorsal; 6) lateral.



appear thinner in their basal third than in the second third, they appear thicker in the basal third than in the second in *P. cyrene* (Figs 5, 6). Differences in number of median cross-veins in Fw, and in the richness and size of yellow abdominal pattern elements (compare Figs 1 and 2) may or may not be diagnostic. Despite these differences a close affinity between *P. nigrostigma* and *P. cyrene* is suggested by the similar shape of the male S10, unique in the genus, and the anal appendages.



Fig. 7. *Palaeosynthemis nigrostigma* sp. nov., male, in life, photo by S.J. Richards.



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Dr Ben Price (London) is thanked for making available diagnostic photos of the holotype of *Palaeosynthemis cyrene*. The survey during which this new species was discovered was supported by the National Government of Papua New Guinea through the Department of Environment and Conservation (DEC), with funds provided by the Prime Minister's Office. It is part of a project being undertaken by the Mul Baiyer Lumusa District Administration to redevelop the Baiyer River Sanctuary and we particularly thank the Honourable Koi Trappe, MP, Douglas Kilipi, Bevi Korua, Clem Kila and Ogla Makindi, the Mul Baiyer District Administrator, for their support. Assistance from Gunther Joku (Acting Secretary), and Barnabas Wilmott from DEC ensured the success of the biodiversity survey and SJR is most grateful to them. The communities at Baiyer River warmly welcomed the survey team to the area and their hospitality and willingness to share their extensive knowledge with the team is greatly appreciated. GT is grateful for ongoing support by the management of the NSW Office of Environment & Heritage.

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