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Author

Orr, AG, Kalkman, VJ, Richards, SJ

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A REVIEW OF THE NEW GUINEAN GENUS *PARAMECOCNEMIS* LIEFTINCK (ODONATA: PLATYCNEMIDIDAE), WITH THE DESCRIPTION OF THREE NEW SPECIES

A.G. ORR¹, V.J. KALKMAN² and S.J. RICHARDS³

¹Griffith School of the Environment, Griffith University, Nathan, Qld 4111

²National Museum of Natural History, Leiden, Netherlands

³South Australian Museum, North Terrace, Adelaide, SA 5000 and Museum and Art Gallery of the Northern Territory, PO Box 4646, Darwin, NT 0801

Abstract

The genus *Paramecocnemis* Lieftinck, previously known from two species from northern New Guinea, is redefined on the basis of new material recently collected in the Sepik Basin and Western Province of Papua New Guinea. Three new species are described: *P. spinosus* sp. n. and *P. similis* sp. n. are quite close to the generic type species, *P. erythrostigma* Lieftinck, while *P. eos* sp. n. is more distantly related to known species and probably of basal stock.

Introduction

The zygopteran family Platycnemididae¹, which is absent from Australia (Kalkman *et al* 2008, Kalkman and Orr 2012), is richly represented in New Guinea by over 40 species in 11 genera in the subfamily Calicnemiinae (excluding *Hylaeargia* Lieftinck and *Palaeargia* Förster). Almost all New Guinean members of the subfamily may be recognised by the distinctive marginal crenulations at the wing tips, a feature found elsewhere only in the Philippine subgenus *Risioecnemis* (*Risioecnemis*) Cowley.

The genus *Paramecocnemis* Lieftinck, 1932, was erected to accommodate the long-bodied *P. erythrostigma* Lieftinck, 1932, which exhibited several venational features not then known in the related *Idiocnemis* Selys, including the fusion of M₃ and R_s for a short section slightly distad of their independent origins, a feature unknown in other Platycnemididae. The main diagnosis of the genus, as given by Lieftinck (1932), is based on venational characters found in both sexes. Various other unique male characters relating to the venter of the thorax and abdomen were also listed. Subsequently, another even longer bodied species, *P. stillacruoris* Lieftinck, 1956, was described. It too exhibited the critical fusion of M₃ and R_s, possessed roughly similar male terminal appendages and shared with *P. erythrostigma* several of the unique male characters already identified in Lieftinck (1932).

Recent collections sponsored by Conservation International's RAP (Rapid Biodiversity Assessment Programme) in the Muller Range and by Xstrata Copper in the Sepik Basin have yielded representatives of three new species from Papua New Guinea, two of which are very similar to *P. erythrostigma* with the exception that their abdomens are much shorter, and another more distant species which, while lacking the diagnostic venational characteristics of the genus, possesses other male structures which clearly ally it more closely with *Paramecocnemis* than *Idiocnemis*, the other genus in which it might be placed. These three species are described here.

It is, however, necessary first to review Liefstinck's (1932) original diagnosis of the genus, with greater emphasis placed on clear synapomorphies in male structures, with wing venation generally and abdomen length being shown as more labile and, in consequence, less reliable in generic definition. Terminology used follows Westfall and May (2006), with exception of the anal appendages, where we follow Watson *et al.* (1991). Type specimens are deposited in The National Museum of Natural History, Leiden (RMNH), the Museum and Art Gallery of the Northern Territory (NTM) and the South Australian Museum (SAM).

Generic definition of *Paramecocnemis*

In his original definition of the genus *Paramecocnemis*, Liefstinck (1932) stressed the shape of the wing and venational characters, particularly with respect to the differences between the typical species, *P. erythro stigma*, and known members of the genus *Idiocnemis*, with which *Paramecocnemis* is undoubtedly most closely allied (Gassmann 2005). This definition was repeated with few alterations in a key to genera of Platycnemididae (Liefstinck 1949). Since the original definition, numerous new species of *Idiocnemis* have been discovered, some of which exhibit characters already listed in the original description as unique to *Paramecocnemis*. In addition, new material collected in the last decade, evidently belonging to *Paramecocnemis*, does not conform to Liefstinck's generic characters. Therefore, the following generic traits with respect to *Idiocnemis* must be discarded: (1), wings less strongly petiolated with distal portion narrower – this is a tendency only, with several exceptions in *Idiocnemis*; (2), quadrilateral longer with the lower distal angle more acute – this is also a general trend associated with long thin wings and the acute distal angle is not especially noticeable in the type species, *P. erythro stigma*; (3), M_2 and M_{1a} more widely separated at the origin in *Paramecocnemis* – this is a trend only, with the two veins separated by 2 crossveins in the forewing and 3 crossveins in the hindwing commonly occurring in both *Paramecocnemis* and *Idiocnemis*; (4), R_s and M_3 arising separately near subnodus but fused for one cell breadth or more – in the Platycnemididae this character is unique to *Paramecocnemis* but the present study includes one species in which the fusion does not occur, although the two veins approximate very closely just beyond their origins – in another species the character is variable, with complete fusion for nearly a cell breadth in some specimens, none in others. Other male characters noted were: (5), abdomen very long, at least twice as long as hindwing – abdomen length is highly unreliable as a character and clear examples of *Paramecocnemis* are now known in which the abdomen is of moderate length; (6), abdominal segments 5-7 with patches of long fine ventral setae – these are present only in some species and may be confined to S7; (7), male anal appendages highly modified – this character refers mainly to the strongly down-turned superior appendage, not present in all members of the genus as recognised here.

Lieftinck (1932, 1949) also noted several characters, unique to the male, not found in *Idiocnemis* or other platycnemidid genera, which together completely define the genus (see Fig. 6). These include: (1), 'posterior third of poststernum rather swollen in its middle, the convex surface being closely beset with a bunch of soft golden hairs which are directed caudad' – although the degree of swelling is somewhat variable, a dense narrow tuft of long caudally directed setae is present in all species of *Paramecocnemis* (in *Idiocnemis* only sparse unbunched setae occur in a few species and there is no swelling; in other unrelated genera a swelling and fairly dense setae may be present but never in the same arrangement or of the same length); (2), the sides of the first tergite project straight down, rather than turning to enclose the segment, and each bears a fringe of long coarse setae – this character appears unique although it is variably developed, being especially prominent in *P. erythrostigma* and reduced in *P. stillacruroris*; (3), the lower margin of the second tergite with strong tooth, well before caudal margin – this character does not occur in *Idiocnemis* and is a clear synapomorphy. Lieftinck (1956) noted that this character is less developed in *P. stillacruroris*, but it is nevertheless clearly present.

Characters present in male *P. erythrostigma*, not mentioned by Lieftinck in his generic diagnosis and found in some but not all species sharing the above three characters include: (1), median lobe of prothorax with strong projecting cone on either side (much reduced in *P. stillacruroris*); (2), gonopore of abdominal S9 situated slightly beyond midpoint of segment; (3), genital valves flanking gonopore large and bearing long setae, giving the segment a ventrally notched appearance in profile; (4), abdominal S9 produced ventrally and bearing a dense tuft of long, backward directed setae. None of these characters of S9 are present in *Idiocnemis*, where the gonopore is situated nearer the apex of S9 and the genital valves lack long setae, but this condition also occurs in one species which appears best placed in *Paramecocnemis*.

Owing to lack of material, female *Paramecocnemis* cannot yet be unambiguously defined, but the following venational character reliably separates them from *Idiocnemis* in all cases known so far: Rs and M₃ arising separately near subnodus but united near base for half one cell breadth or more.

Paramecocnemis eos sp. n.

(Figs 1a-e)

Type material. Holotype ♂, PAPUA NEW GUINEA: Western Province, CI Muller Range expedition, Camp 1 (Gugusu), 05°43.751'S, 142°15.797'E, 515 m asl, 04-11.ix.2009, leg VJ Kalkman; deposited in RMNH.

Diagnosis. A finely built damselfly of small-medium size; ground colour dark with pale green and cerulean blue markings. Males with ventral tufts of setae on post sternum and on tergites of the first abdominal segment. Wings

with moderately dense reticulation; pterostigma small, dark and lozenge shaped; distal margins crenulated. It may be distinguished from its congeners by its shorter abdomen and/or the form of the male anal appendages.

Description. Head (Fig. 1a): short and lightly built. Labium pale bluish white, dark at extremities; medium lobe with small shallow 'V' shaped incision. Remainder of underside of head dark. Labrum and clypeus black. Front of head, including mandibles, genae and frons pale bluish green, forming a broad transverse band not reaching antennal sockets. Remainder of head black except for two medium sized, bright blue postocular spots, roughly triangular in outline; several long black setae arise from these spots. Antennae black; 2nd segment long; remaining segments missing from specimen. Eyes black above, probably light green below in life (pale ochre in specimen).

Thorax (Fig. 1a): prothorax: anterior lobe small, dark, posteriorly curving into a groove marking boundary with median lobe; median lobe mainly pale green laterally; dorsally with two strong conical horns, pale bluish green on their outer face, otherwise dark; dorsal area of median lobe dark, these extending laterally anterior to and along part of the base of the horns; posterior lobe dark; produced into a flat small semi-erect process, roughly rectangular in profile with a slight curve to its posterior margin. Synthorax: dorsally with pale bluish green antehumeral band, broad anteriorly, terminating acutely level with a point at two thirds of length humeral suture, inner margin of band obscured posteriorly; mesepimeron with upper two thirds pale bluish green except for fine black line bordering humeral suture, remainder dark; metepisternum pale green; merging with pale area of mesepimeron, except for a narrow dark margin along metapleural suture, becoming broader toward metinfraepisternum; metepimeron with pale yellowish green triangular patch posteriorly, separated from green of metepisternum by broad black band; mesinfraepisternum and metinfraepisternum both black except for small pale green mark in posterior corner; venter of synthorax pale yellowish; posterior third of post sternum with elevated tubercle bearing tuft of long, dark, coarse setae. Legs missing beyond trochanters on synthorax. Legs of prothorax short with dense, long, fine spines; overall coxae pale green; trochanters pale on meso and metathorax with posterior dark marking; on prothorax legs trochanters and remainder of legs dark, except for inner surface of trochanters and femora which are pale yellowish. Wings (Fig. 1b): hyaline with relatively dense neuration; weakly petiolated but fairly broad (max. breadth: length ratio – 0.20 forewing; 0.21 hindwing); distal margins crenulated; M_3 and R_s arising near subnodus; closely approximated near origin but not fused at any point; quadrilateral moderately long, distinctly longer and narrower in hindwing, with lower distal angle strongly acute in both wings; origins of M_2 and M_{1a} separated by two cross veins in forewing, three in hindwing; forewing 17.5 Px; hindwing 15.5 Px; pterostigmata small and black, diamond-shaped,

covering less than one cell in forewing and one cell exactly in hindwing. Articulated sclerites at each wing base (costal plates - as viewed with wings closed) with large external bright blue spot.

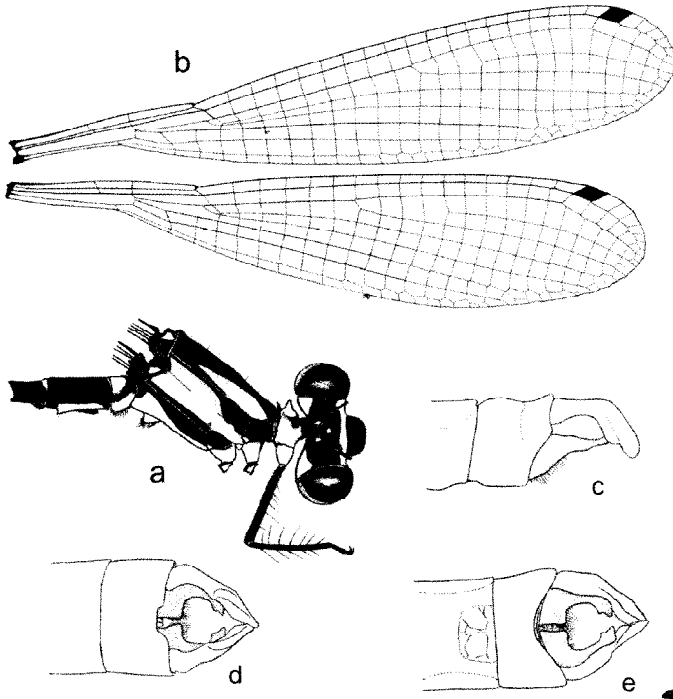


Fig. 1. *Paramecocnemis eos* sp. n., male: (a) right lateral view of thorax and first two abdominal segments and dorsal view of head; (b) right wings; (c) S10 and anal appendages in left lateral view; (d) S10 and anal appendages in dorsal view (inferiors shaded); (e) distal part of S9, with genital valves, S10 and anal appendages in ventral view (inferiors shaded).

Abdomen: long and very thin; slightly expanded in basal segments (S1 and S2); strongly laterally expanded in terminal segments (S8-S10); S1 with lateral margins of tergites slightly produced downward and not wrapped under the base of the segment and bearing definite tuft of fairly short but

thick setae; S2 with well defined subapical tooth on ventral margins of tergites. Ground colour of abdomen dark; basal segments marked with pale blue-green as shown in Fig. 1a; S4-S7 unmarked; S8-S9 with broad bright cerulean blue patches on their dorsal surface, somewhat tapered inward towards base of S8. S10 and appendages black; S10 (Figs 1b-d) about as long as deep; superior appendages about as long as S10; curved downward strongly from a point about two-thirds of the way along the dorsal margin; forcipate in dorsal view; inferiors basally broad, attenuating rapidly to incurved, slightly bifid tip, which reaches just beyond inner margin of superiors; basal part with thick ventral tuft of long setae; gonopore situated near posterior margin of S9; genital valves small, lacking long setae, not visible in profile. Fine ventral setae occur sparsely along the abdomen but are best developed on S1 and the tooth of S2 (Fig. 1a). No obvious ventral setae on S5-S7.

Measurements (mm): forewing, 23; hindwing, 22; abdomen + appendages, 36.5.

Variation. Unknown; the holotype is the only known specimen.

Etymology. The name *eos* is a noun in apposition from the Greek ἠώς, meaning 'dawn', a reference to the probable basal position of the species within the genus.

Habitat. Only a single specimen was seen, which was collected along a small and steep stream in virgin forest.

***Paramecocnemis spinosus* sp. n.**

(Figs 2a-d, 3a-b)

Type material. Holotype ♂ (I008588), PAPUA NEW GUINEA: West Sepik Province, upper Sepik Basin, 4°39'S, 141°43'E, 800 m asl, 07.vi.2010, leg S.J. Richards; deposited in NTM. Paratypes: 1 ♂, 1 ♀ (supposition), same locality, 06.vi.2010; 3 ♂♂ 3 ♀♀, collected within 200 m radius of type locality between 30.xi.2009-4.xii.2009, leg S.J. Richards. All deposited in RMNH.

Diagnosis. A finely built damselfly of small-medium size; ground colour dark with pale blue and cerulean blue markings (the former discoloured in preserved specimens). Males with ventral tufts of setae on post sternum and on tergites of the first and sternum of last abdominal segment. Wings with moderately dense reticulation; distal margins crenulated; pterostigma small, dark and lozenge shaped. It may be distinguished from its congeners by its shorter abdomen and/or the form of the male anal appendages.

Description of Holotype male. Head: lightly built; labium entirely black bearing sparse long setae; median lobe with shallow 'V' shaped incision; labrum and clypeus black, margin of labrum with long coarse setae; mandibles, genae and lower half of frons with narrow transverse pale blue band, broadly stepped slightly caudad on genae; upper part of frons black

with paired low prominences, each bearing a tuft of long setae, anterior and interior to the antennal sockets; remainder of head black except for postocular lobes which bear large, bright blue spots. Antennae black; segments 2-7 relatively long. Eyes black above, pale blue below in life (Fig. 4).

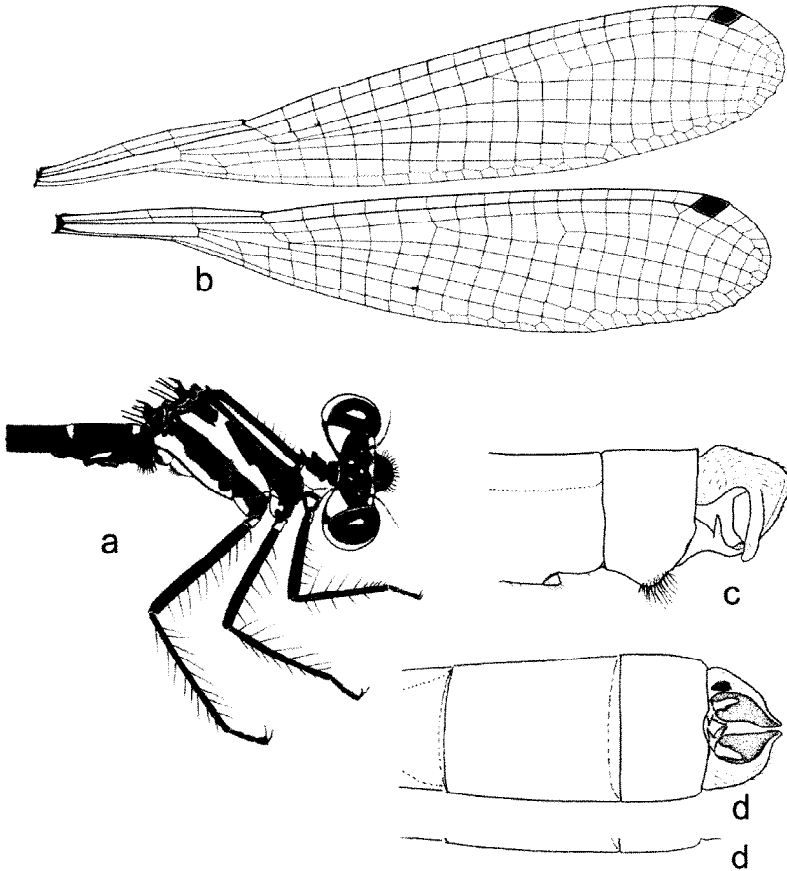


Fig. 2. *Paramecocnemis spinosus* sp. n. male holotype: (a) right lateral view of thorax and first two abdominal segments and dorsal view of head; (b) right wings; (c) posterior section of S9, S10 and anal appendages in left lateral view; (d) S9, S10 and anal appendages in dorsal view.

Thorax: posterior lobe small, black, with slight transverse furrow; median lobe with lower half of sides pale blue; upper half black; dorsum black with two prominent blunt conical horns; posterior lobe small, slightly elevated triangular flap; black except for slight blue edging laterally. Synthorax finely

built with black ground colour; antehumeral bands about half breadth of mesepisternum, parallel sided for most of their length and ending diffusely at about a point at 7/8ths of length of mesepisternum; laterally synthorax with thin pale blue band extending along the length of the metepisternum and separated from metapleural suture along its length by a black band; small contiguous patch of pale blue curving up to form diffuse narrow block of colour around the upper one quarter of the mesepimeron. Metepisternum with irregularly defined, long, pale blue patch in its posterior half; mesinfraepisternum with blue mark at postero-ventral corner; metinfraepisternum black; venter of synthorax except for posterior 2/5ths of post sternum, which is pale, including a raised protuberance bearing a tuft of heavy, long, golden brown setae. Legs fine and moderately long, bearing long thin spines; mainly dark with pale markings posteriorly on coxae, anteriorly and internally on trochanters and femora, the pale coloration becoming paler from the pro- to the metathoracic legs. Wings (Fig. 2b): hyaline with relatively dense neuration; weakly petiolated and moderately broad (max. breadth: length ratio – 0.19 forewing; 0.20 hindwing); distal margins crenulated; M_3 and R_s arising near subnodus; closely approximated near origin and fused for about 1 cell length in forewing and half a cell length in hindwing to about the level of Px_1 ; quadrilateral long, distinctly longer and narrower in hindwing, with lower distal angle strongly acute in both wings; origins of M_2 and M_{1a} separated by two cross veins in forewing, four in hindwing; forewing 17.5 Px; hindwing 15 Px; pterostigmata small and black with fine pale margin, diamond-shaped, covering less than one cell in forewing and one cell exactly in hindwing.

Abdomen: long and thin; slightly expanded in basal segments (S1 and S2); distinctly laterally expanded and flattened in terminal segments (S8-S10); S1 with lateral margins of tergites produced downward bearing dense tuft of long black setae; S2 with well defined subapical tooth on ventral margins of tergites. Ground colour of abdomen dark; basal segments marked with small pale blue patches as shown in Fig. 1a; S4-S7 unmarked; S6 with patch of fine long ventral setae towards apex, S7 with patch of fine long ventral setae in basal half; S8-S9 with broad bright cerulean blue patches on their dorsal surface, that of S8 triangular, tapered to a rounded point 2/3rds of way to the base of the segment. S10 and appendages black; S10 (Fig. 2b, c.) almost as long as deep with strong ventral swelling bearing dense tuft of long black setae; superior appendages about as long as S10; heavy and curved downward more than 90° from a point about halfway along the dorsal margin; outer margin forcipate in dorsal view but with interior surface filling almost all intervening space ventrally; inferiors basally broad, attenuating rapidly to incurved, slightly bifid tip, which reaches just beyond inner margin of superiors; arising from around the midpoint of the outer part of the appendage is a long strong spine, directed inwards, upwards and slightly cephalad, the pair nearly meeting in dorsal view; gonopore situated slightly

distad of midpoint of S9; genital valves large, bearing long setae, visible in profile as a distinct notch in the underside of the segment.

Measurements (mm): forewing, 21.5; hindwing, 20.5; abdomen + appendages, 36.

Female (supposition) (Figs 3a-b). Head: marked as in the male but with pale coloration more extensive; anterior transverse band across head covers almost all of frons being level with markings on genae; frontal prominences not defined as entire frons is slightly protruding, but tufts of long dark setae arise from similar locations to those on male; postocular lobes are pale blue and more extensive, being connected by a fine band along the occipital bar.

Thorax: prothorax anterior lobe black; remainder pale blue; median lobe without horns found in male; posterior lobe a short, triangular flap. Synthorax marked as in male but pale areas more extensive; antehumeral bands broader and nearly reaching alar triangle; upper one quarter of mesepimeron and most of metepisternum pale; posterior half of metepimeron pale; posterior one third of poststernum pale. Legs moderately long, mainly black; coxae and trochanters paler than in male; femora marked as in male with pale inner streaks. Wings moderately broad (breath: length 0.20 in both wings) but not strongly petiolated; outer margins crenulated. Differs from male slightly in venation; M_2 and M_{1a} separated by 1 and 2 cross veins in the forewing and hindwing respectively. M_3 and Rs fused for one cell length in forewing and half a cell length in hindwing. Pterostigma medium brown.

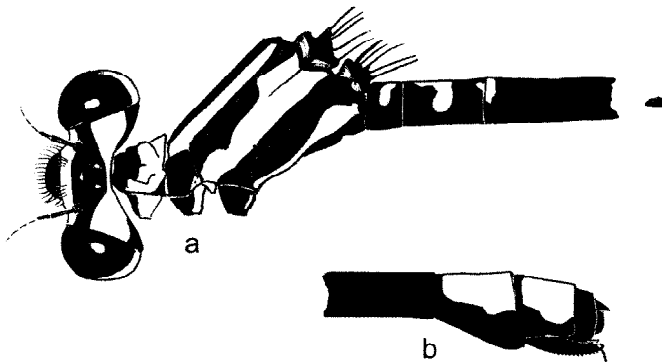


Fig. 3. *P. spinosus* sp. n., female: (a) left lateral view of thorax and first two abdominal segments and dorsal view of head; (b) left lateral view of terminal abdominal segments showing ovipositor and anal appendages.

Abdomen: S1 and S2 both with a blue saddle mark; small subdorsal blue flecks present at the posterior margin of S2; base of S3 with thin dorsal blue marking; remainder of segments black except for S8 and S9 which are broadly cerulean blue dorsally (Fig. 3b). Terminal segments distinctly clubbed. Anal appendages thin and conical, slightly shorter than S10; valves with slightly pale tip, serrated ventrally, extending just beyond level of anal tubercle.

Measurements (mm): forewing, 21-22.5; hindwing, 20.5-22; abdomen + appendages 29.5-32.

Variation. The following variation occurs in males: The pale marking on the mesepimeron may be either slightly more extensive than in the holotype, occupying most of the upper quarter, or absent, resulting in a single thin, regular stripe laterally. The poststernum may be deeply infuscated, with only the raised protuberance clearly pale. M_2 and M_{1a} may be separated by 3 cross veins in the forewing and/or hindwing and two wings are not always symmetrical in this character. The degree of fusion of M_3 and R_s varies, especially in the hindwing, with no fusion in the hindwing of one specimen. Variation in size is negligible.

Females show slight variation in the extent of pale banding on the side of the synthorax and variation in size as noted. In two female specimens, the pale blue marking on the dorsum of androminal segments S8-S9 is not clearly evident but this appears to be an artefact of poor preservation.

Etymology. The name *spinosus*, a Latin adjective, refers to the distinctive spine on the inferior appendage of the male.

Habitat. All specimens were found in sun patches in rainforest along trails near clear, rocky streams.

***Paramecocnemis similis* sp. n.**

(Figs 4, 5a-d)

Type material. Holotype ♂, PAPUA NEW GUINEA: upper Sepik Basin, West Sepik Province, 4°44'S, 141°47'E, 425 m asl, 18.ii.2010, leg S.J. Richards; deposited in RMNH. *Paratypes:* 1 ♂, same data; 1 ♂, same locality, 19.ii.2010; 1 ♂, same locality, 20.ii.2010. All deposited in RMNH.

Diagnosis. A finely built damselfly of small-medium size; ground colour dark with pale blue and cerulean blue markings. Males with ventral tufts of setae on post sternum and on tergites of the first and sternum of last abdominal segment. Wings with moderately dense reticulation; distal margins crenulated; pterostigma small, dark and lozenge shaped. It may be distinguished from its congeners, especially *P. spinosus*, by its slightly darker markings and the form of the male anal appendages.



Fig. 4. *Paramecocnemis similis* sp. n. in nature.

Description of Holotype male. This species is so similar to *P. spinosus* that it is best defined by comparative notes: In general slightly darker than *P. spinosus* (Fig. 5a). Head with pale band across frons slightly narrower, just visible in dorsal view; postocular spots smaller, darker blue and more definitely triangular. Prothorax in lateral view darker than in *P. spinosus*, with reduced lateral pale markings barely reaching anterior lobe and just touching coxa at a point directly below the median lobe processes. Scutellum with pale antehumeral band shorter, terminating sharply at a point about 2/3 of the length of the mesepisternum. Laterally with pale, irregularly edged band covering anterior half of mesepisternum and extending slightly in places onto mesepimeron; no specimens with broad pale coloration on mesepimeron as found in some *P. spinosus* specimens; metepimeron with posterior 1/3 pale; poststernum dark, rather than pale, as in *P. spinosus*. Legs with posterior pale marking on meso- and metacoxae broader than in *P. spinosus*; otherwise similar to that species. Wings of the holotype with M_2 and M_{1a} separated by two cross veins in forewing, three in hindwing; M_3 and Rs fused for about 1 cell length in both wings to about the level of Px_1 ; pterostigmata small and black without fine pale margin found in *P. spinosus*. Abdomen in shape and ventral setae like *P. spinosus*; S1 with small obscure ventrolateral pale mark as well as reduced dorsal blue saddle mark; S2 with ventral margin anterior to tooth with obscure pale streak, longer than in *P. spinosus*; no pale marking in S3; S8-S9 as in *P. spinosus* with broad bright cerulean blue

patches on the dorsal surface. S10 less projected ventrally than in *P. spinosus*, but also bearing dense tuft of dark setae. Superior appendages (Fig. 5c) bent downward, slightly less strongly than in *P. spinosus*. Inferior appendages distinct; not quite reaching tips of superiors; apically strongly bifurcated but apparently lacking strong upwardly directed inner spine visible in profile in *P. spinosus* (Fig. 2b); strong inner spine nearly meeting its partner interiorly; not visible in lateral view but evident in dorsal view (Fig. 5d). In dorsal view superiors more smoothly rounded than in *P. spinosus*.

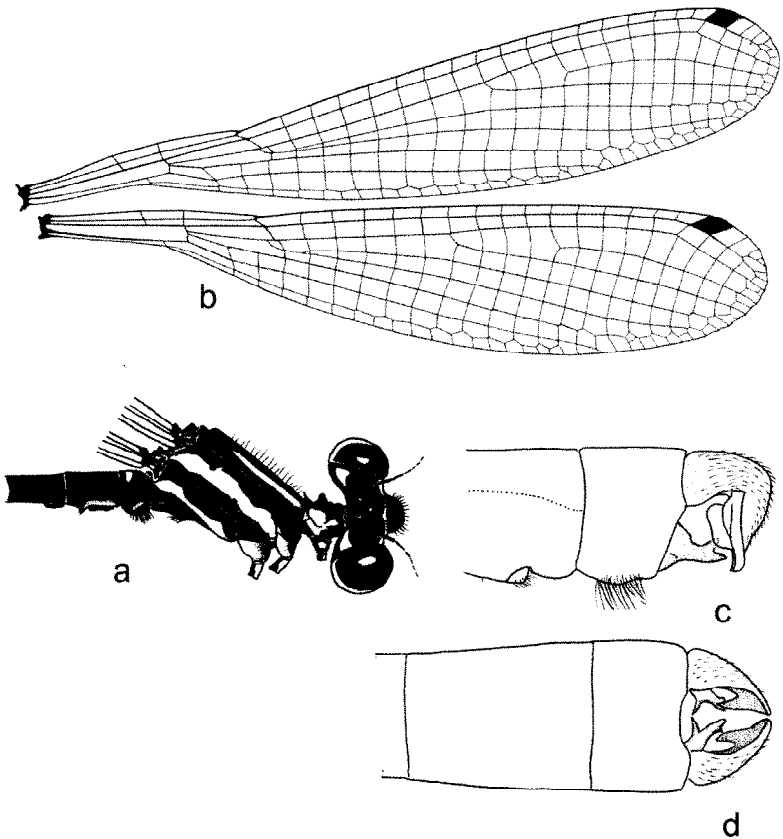


Fig. 5. *Paramecocnemis similis* sp. n. male holotype: (a) right lateral view of thorax and first two abdominal segments and dorsal view of head; (b) right wings; (c) posterior section of S9, S10 and anal appendages in left lateral view; (d) S9, S10 and anal appendages in dorsal view.

Measurements (mm): forewing, 20.5; hindwing, 20.0; abdomen + appendages, 35.

Variation. In two specimens the antehumeral band reaches nearly to the alar triangle, thus this character does not separate all specimens from *P. spinosus*. There are slight differences in the outline of the lateral band on the thorax, particularly along its irregular anterior margin. M_2 and M_{1a} may be separated by one cross vein in the forewing and/or two in the hindwing and two wings are not always symmetrical in this character. The degree of fusion of M_3 and Rs varies, especially in the hindwing, with no fusion in the hindwing of one specimen. Variation in size is slight, the hindwing ranging from 20-22 mm; abdomen+appendages from 35-36.5 mm.

Etymology. The name *similis*, a Latin adjective (= similar), is derived from its similarity to the previous species, *P. spinosus* sp. n.

Habitat. Found along small, clear streams in dappled sun in primary rainforest.

Discussion

Table 1 lists the distribution of the main characters which serve to define the genus. The first three, relating to the poststernum, abdominal S1 and S2 are essentially similar in all species, although developed to varying extents (Fig. 6). Similarly, the prothorax in all species bears two conical horns although these are slightly reduced in *P. stillacrororis*. Although similar structures are known in distant genera they do not occur in *Idiocnemis*, the presumed sister group of *Paramecognemis*. The remainder of the characters show distinct variation within the genus.

Allowing that abdomen length is labile, the greatest similarity is shown by *P. erythro stigma*, *P. spinosus* and *P. similis*. The lack of fusion of M_3 and Rs in some wings of some specimens of *P. spinosus* and *P. similis* may not be of great significance, especially given that the wings in those two species are slightly shorter than in *P. erythro stigma*, while the body stature is very similar.

It is fairly clear that *P. stillacrororis* is less closely allied, as remarked by Lieftinck (1949), but *P. eos* appears to be still further removed. The male anal appendages in this species do not differ significantly from certain species of *Idiocnemis* and in the single known specimen M_3 and Rs are clearly separate. Based on these comparisons it appears to be the most basal member of the genus *Paramecognemis*.

The five species of *Paramecognemis* are confined to parts of the central mountain range and to the hills in the northern lowlands of New Guinea (Fig. 7). *P. eos*, *P. spinosus* and *P. similis* are each known from a single location in, or on the edge of, the central mountain range at heights of respectively 515, 800 and 425 m but, given the extent of suitable mountainous habitat in

Table 1. Summary of significant male characters in known *Paramecognemis* spp.

Species	<i>erythrostigma</i>	<i>stillacuroris</i>	<i>spinus</i>	<i>similis</i>	<i>eos</i>
Post-sternum	with protuberance bearing dense tuft of long setae	with protuberance bearing dense tuft of long setae	with protuberance bearing dense tuft of long setae	with protuberance bearing dense tuft of long setae	with protuberance bearing dense tuft of long setae
S1 venter	fringe of setae at margins of tergites creating distinct tuft	fringe of setae at margins of tergites creating distinct tuft (less well developed)	fringe of setae at margins of tergites creating distinct tuft	fringe of setae at margins of tergites creating distinct tuft	fringe of setae at margins of tergites creating distinct tuft (less well developed)
Tergum S2	ventral margin dentate	ventral margin slightly dentate	ventral margin dentate	ventral margin dentate	ventral margin dentate
Prothorax	2 conical horns	2 reduced conical orns.	2 conical horns	2 conical horns	2 conical horns
Fusion of M ₃ and Rs	M ₃ Rs fused for at least one cell-length in both wings	M ₃ Rs fused for at least one cell-length in both wings	M ₃ Rs fused for nearly one cell-length in one or both wings	M ₃ Rs fused for nearly one cell-length in one or both wings	M ₃ Rs not fused
S7 ventral setae	long fine ventral setae	setae absent	long fine ventral setae	long fine ventral setae	setae absent
Male genital valves (of S9 venter)	large, inserted at point just beyond midpoint of S9 creating notch seen in profile – bearing long setae	small, inserted near midpoint of S9 creating notch seen in profile – lacking long setae	large inserted at point just beyond midpoint of S9 creating notch seen in profile - bearing long setae	large inserted at point just beyond midpoint of S9 creating notch seen in profile - bearing long setae	small, inserted near distal end of S9. lacking long setae
S10 venter	tuft of long setae	lacking long setae	tuft of long setae	tuft of long setae	lacking long setae
Superior appendages	bent downwards	bent downwards but elongated	bent downwards	bent downwards	bent downwards slightly
Abdomen length M	long, about twice as long as hindwing	very long, more than twice as long as hindwing	moderate	moderate	moderate

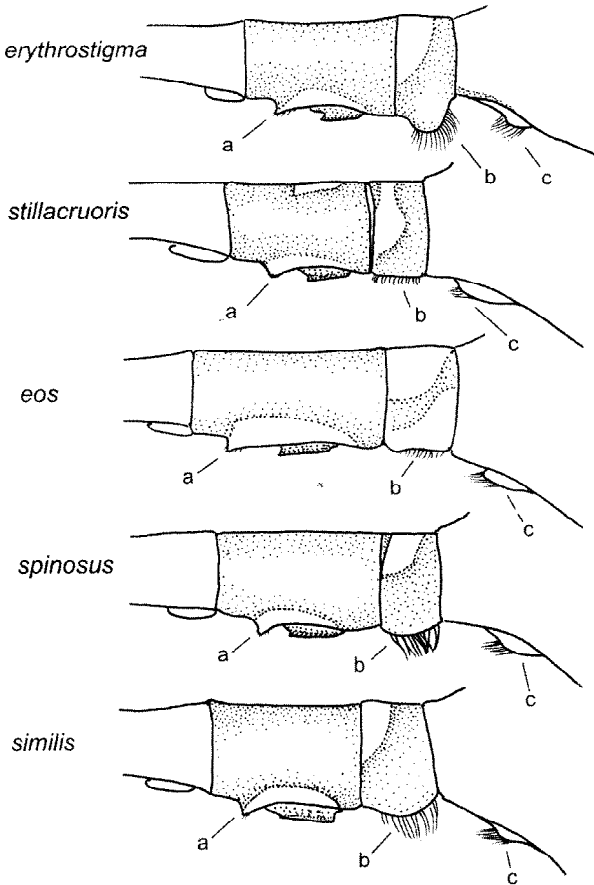


Fig. 6. Comparison of the structure of the poststernum and abdominal S1 and S2, and the distribution of setae on the post sternum and ventral margins of abdominal S1: (a) ventral tooth on S2; (b) ventral tuft of setae on S1; (c) tuft of setae on poststernum.

both northern and southern New Guinea, the new species almost certainly all have broad distributions in the region. *P. stillacruroris* is known from three locations and seems widespread in the central mountain range seemingly only occurring at higher altitudes from 900-1300 m (Lieftinck 1949, Opiel 2005, 2006). *P. erythro stigma* is the only species known from the northern lowlands of New Guinea and has a wide altitudinal range (250-1000 m). All species are found on steep rocky streams in forest. Further details on habitat or behaviour are lacking.

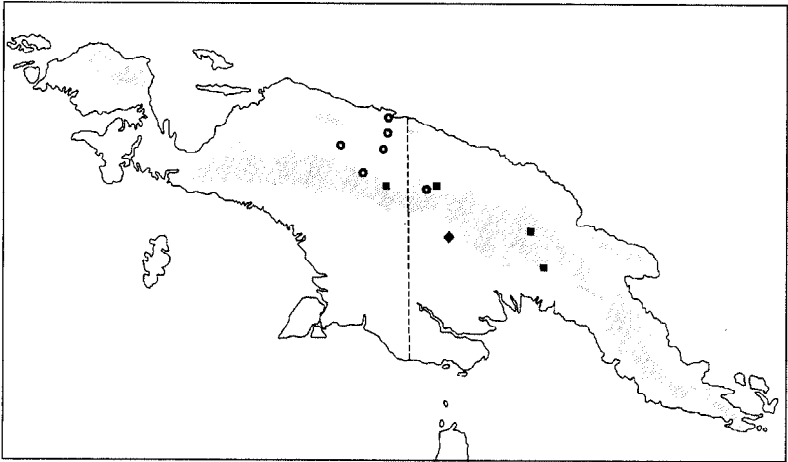


Fig. 7. The distribution of the five known species of *Paramecocnemis*: green circles – *P. erythrostigma*; green squares – *P. stillacuroris*; red diamond – *P. eos*; blue circle – *P. spinosus*; blue square – *P. similis*.

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