

Description of *Idiocnemis patriciae* spec. nov. from Papua New Guinea (Odonata: Platycnemididae), with new distributional records of other *Idiocnemis* species

D. Gassmann & S.J. Richards

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D. Gassmann, Institute of Biology, Leiden University, c/o National Museum of Natural History (Naturalis), P.O. Box 9517, NL-2300 RA Leiden, The Netherlands.

S.J. Richards. Vertebrates Department, South Australian Museum, North Terrace, Adelaide, South Australia 5000, Australia.

Key words: Platycnemididae; Calicnemiinae; *Idiocnemis inornata*-group; *Idiocnemis patriciae* spec. nov.; Papua New Guinea.

Abstract

Idiocnemis patriciae spec. nov. is described from lowland rainforests of the Dark-End Lumber and Lakekamu regions in Gulf Province, Papua New Guinea. Biogeographically, the new species is near-endemic to the Papuan Gulf Coastal Lowlands area of endemism. Notes on the habitat of the new species and on a female specimen from the Lakekamu Basin tentatively assigned to it, are included. The distributions of *I. australis* Gassmann, *I. chloropleura* Lieftinck and *I. kimminsi* Lieftinck are updated. *I. chloropleura* is recorded from Yapen island for the first time. A revised key to the males of the *Idiocnemis inornata* species-group is provided.

Introduction

Idiocnemis Selys, 1878, is the most speciose genus of Platycnemididae in New Guinea and its surrounding islands. The constituent species are quite uniform morphologically compared to those of other genera of Platycnemididae in the Papuan region. However, two species-groups can be readily defined: the *I. inornata*-group (Gassmann, 1999) and the *I. bidentata*-group (Gassmann, 2000). Cladistic studies have shown the *Idiocnemis bidentata*-group to be a paraphyletic assemblage, from which the monophyletic clade of the *Idiocnemis inornata*-group branches off (Gassmann, 2005a).

The *Idiocnemis inornata*-group comprises quite inconspicuous species with a red-brown ground colour in life (rather brown in collection specimens), and normally furnished with some turquoise markings. Field observations of both authors and remarks by Lieftinck (1958) suggest that the *inornata*-group species share common ecological preferences, i.e. small brooklets in shady environments, and that they are rather stenoeious compared to the *I. bidentata*-group species (Gassmann, 2005b).

The present study is mainly based on specimens collected by the second author in lowland rainforest in the Sire River valley around the Dark End Lumber (DEL) ecoforestry project in Gulf Province, Papua New Guinea and during the 1996 Lakekamu Basin

Rapid Assessment Program (RAP) biodiversity survey (Mack, 1998). Additional specimens examined were collected by Dr Dan A. Polhemus during the Wapoga River RAP survey in 1998 (see Mack and Alonso, 2000 for a summary), and by Vincent J. Kalkman in Yapen Island in 2006. The taxonomy and distribution of the *I. inornata*-group is brought up to date. With the new species described here, *Idiocnemis* now includes 20 species, of which 12 are assigned to the *I. inornata*-group.

The present paper is the seventh in a series of publications based on new damselfly discoveries during expeditions of SJR to New Guinea between 1996 and 2001 (Theischinger & Richards, 2005, 2006a, b, c, 2007a, b).

Material and methods

The specimens examined are held in the following collections:

- RMNH National Natuurhistorisch Museum (Naturalis) Leiden, The Netherlands
- SAMA South Australian Museum, Adelaide, Australia
- USNM National Museum of Natural History, Washington D.C.
- ZMUC Zoological Museum of the University of Copenhagen, Denmark

Scanning electron microscopy.— The ligula of the male holotype of *I. patriciae* spec. nov. (figs 11a-c) was studied by scanning electron microscopy (SEM) at the Zoological Museum of Copenhagen. The object was coated with platinum/palladium (80/20%) for 1min 40s. and scanned using a JEOL JSM-6335F. The ligula of the specimens of *I. chloropleura* from Yapen (figs 10a, b) and from mainland New Guinea (Wapoga area, PTFI landing site; specimen not figured here) were coated with gold/palladium for 2-4 min and scanned with a JEOL JSM 6480 microscope at Naturalis, Leiden.

Measurements.— Measurements of the length of wing and abdomen were taken with a precision of 0.5 mm.

Terminology.— To denote details of odonate wing venation, we follow the modified Tillyard-Fraser system (Watson & O’Farrell, 1991).

Systematic Part

- Revised key to the males of the *Idiocnemis inornata* species-group
- 1(0). Superior appendage in interior dorsal view with a subdistal inner hook (fig. 1) or a finger-shaped subdistal process (Gassmann, 1999: Fig. 24). 2
 - Superior appendage in interior dorsal view with an inner tubercle situated about halfway the length of appendage (fig. 2). 9
 - 2(1). Superior appendage with an inner finger-shaped subdistal process, clearly visible in lateral view; inferior appendages half as long as superiors. Waigeo. *I. fissidens*
 - Superior appendage with a short and robust inner subdistal hook (e.g. fig. 9b-c); inferior appendages at least 2/3 the length of superiors (except *I. leonardi*). 3
 - 3(2). Superior appendage with a subdistal swelling furnished with a slender spine, positioned relatively distally so that the tip of appendage appears bifid (figs 3, 6); inferior appendages 3/4 the length of superior ones. Bird’s Head Peninsula *sensu lato*; Misool. *I. strumidens*

- Superior appendage with a small hook at the base of distal third or fourth of appendage; inferior appendages either 2/3 the length of superiors, or of subequal length. 4
- 4(3). Upper dorsal margin of last segment distinctly protruded (Gassmann, 1999: Fig. 19); inferior appendages 2/3 the length of superior ones. Bird's Head Peninsula. *I. inornata*
- Upper dorsal margin of last segment not protruded; inferior appendages at least 2/3 the length of superior ones. 5
- 5(4). Superior appendage in interior dorsal view with a distinct ridge-like protrusion so that the entire section basal to the subdistal spine is widened in relation to the apical section of the appendage (fig. 9b); inferior appendages nearly, i.e. 9/10, the length of superior ones (fig. 9a). Southeastern central New Guinea. *I. patriciae* spec. nov.
- Superior appendage in interior dorsal view lacking such a protrusion so that the entire section proximal to the subdistal spine is just as wide as the tip of appendage; inferior appendages at least 2/3 the length of superior ones. 6
- 6(5). Inferior appendages strongly curved upwards, two-thirds the length of superior ones (fig. 4). Northern New Guinea; Yapen. *I. chloropleura*
- Inferior appendages more smoothly curved (figs 5-6), about the same length as superiors. 7
- 7(6). Head lacking postocellar spots. Adelbert Range. *I. adelbertensis*
- Head with large black postocellar spots, broadly attached to the eye margin. . 8
- 8(7). Superior appendage with an additional minute subdistal hook (Gassmann 1999, Fig. 26). New Britain, Mioko. *I. kimminsi*
- Superior appendage lacking an additional hook. Huon Peninsula. *I. huonensis*
- 9(1). Inferior appendages about half as long as superior ones (Gassmann, 1999: Fig. 23). Tagula (Sudest). *I. leonardi*
- Inferior appendages at least 4/5 the length of superiors. 10
- 10(9). Inferior appendages about 4/5 the length of superior ones. Papuan Peninsula; Fergusson, Goodenough, Normanby. *I. zebrina*
- Inferior appendages of subequal length. 11
- 11(10). Mes- and metepisternal fossae marked with elongate black spots; head with subcircular postocellar spots (original colour usually lost in collection specimens). Misima, Rossel, Woodlark. *I. louisiadensis*
- Mes- and metepisternal fossae lacking black markings; head with postocellar spots lacking. Southern central and southern New Guinea. *I. australis*

Idiocnemis australis Gassmann, 1999
(fig. 12)

Idiocnemis australis Gassmann, 1999: 997-1000 (description), figs 17-18 (ligula), figs 37-38 (♀ prothorax), figs 39-40 (appendages: ♂ holotype), fig. 43 (distribution), Table 1 (differential diagnosis).— Gassmann, 2005: 60 (phylogenetic relationships), 62/63 (cladogram), 70 (distribution), 74 (character matrix), Plate 1c (habitus). — Oppel, 2005a: 11 (species list), 17 (ecological notes); 2005b: 246 (species list), 250 (notes on habitat and abundance); 2006: 95 (species list, comparison of primary and secondary forest).

New specimens examined. — **Papua New Guinea, Western Province:** 1 ♂, Star Mountains, Kiunga-Tabubil road at 120 km mark, 5°20'30", 141°16'50", 250 m asl., 10.ix.1995, leg. S.J. Richards, SAMA.

Measurements (this ♂). — Forewing length 23.5 mm, hind wing length 22.5 mm; abdomen length 33.5 mm.

Ecology. — Oppel (2005) considers *I. australis* a potential indicator species for primary rain forest areas.

Distribution. — Southern New Guinea. *I. australis* apparently is quite widespread in New Guinea south of the central ranges (Gassmann, 1999). Its known distribution extends from the southwestern lowlands of Papua Province, Indonesian New Guinea (this only record, however, is based on a single female from Lorentz Expedition) to Lake Kutubu in Southern Highlands Province, Papua New Guinea. The new locality in the Star Mountains is comparatively close to the Mindiptana sample site (Gassmann, 1999) on the opposite side of the border between Indonesia and Papua New Guinea.

Idiocnemis chloropleura Lieftinck, 1932
(figs 4, 10a-b, 12)

Idiocnemis chloropleura, Gassmann, 1999: 987-989 (diagnosis, synonymies, revalidation of species status), figs 5-6: ligula, specimen from Hollandia (Jayapura) [erroneously supplemented by 'Bird Head's Peninsula', correct to: 'Northern New Guinea']

New specimens examined. — **Indonesia, West Papua Province:** 1 ♂, Yapen, 14.vii.2006, 2 km from Ambaidiru village (S01°45.795, E136° 09.406), small seepage area in forest, leg. V.J. Kalkman. 1 ♂ (in alcohol), small tributary to Ziwa River at PTFI Wapoga Alpha drill camp, 1050 m, 19.iv.1998, leg. D.A. Polhemus, USNM. 2 ♂ ♂, 1 ♀ (all in alcohol), Logari River and tributaries at PTFI landing site 21, 1050 ft., 07.iv.1998, leg. D.A. Polhemus, USNM.



Fig. 1, *Idiocnemis inornata*, ♂, Sorong, apical half of right superior appendage, interior view. Scale bar = 50 µm.

Fig. 2, *Idiocnemis louisiadensis*, ♂, Misima, right superior appendage, interior view. Scale bar = 100 µm.

Fig. 3, *Idiocnemis strumidensis*, ♂, Klamono, apex of right superior appendage, dorsal view. Scale bar = 50 µm.

Measurements (δ , Yapen specimen).— Forewing length 23.5 mm; hindwing length: 22.5 mm. Abdomen length: 33.0 mm.

Ligula (δ , Yapen specimen).— The ligula of the present specimen (figs 10a, b) is not distinctly different from those of the mainland specimens (Gassmann, 1999: Figs 5-6). We consider minor differences in the angle of the terminal lobes to the ligula head, and in the ventral surface of the latter, to be part of the intraspecific variation.

Distribution.— Yapen Island, northern and northwestern central New Guinea from the Wapoga River basin area in the west to the Torricelli Mountains in the east.

Remarks.— This is the first record of *I. chloropleura* Lieftinck from Yapen island, which is situated off the northern coast of Papua Province (fig. 12). With its characteristic subtriangular postocellar spots, the distinct pronotal tubercles, its synthoracic colour pattern, the strongly upcurved inferior appendages and the ligula structure, the present specimen is clearly conspecific with those described from the mainland of New Guinea. The new records from the Wapoga River area (i.e. the Ziwa and Logari River localities) extend the known distribution of *I. chloropleura* far more to the west, to the point where the western tip of the Van Rees Mountains meets the central ranges.

In Gassmann (1999), erroneously the sampling locality for the paralectotype specimen of *I. chloropleura* illustrated in Figures 5-6, was given as 'Bird's Head Peninsula' The correct locality is Hollandia (= Jayapura).

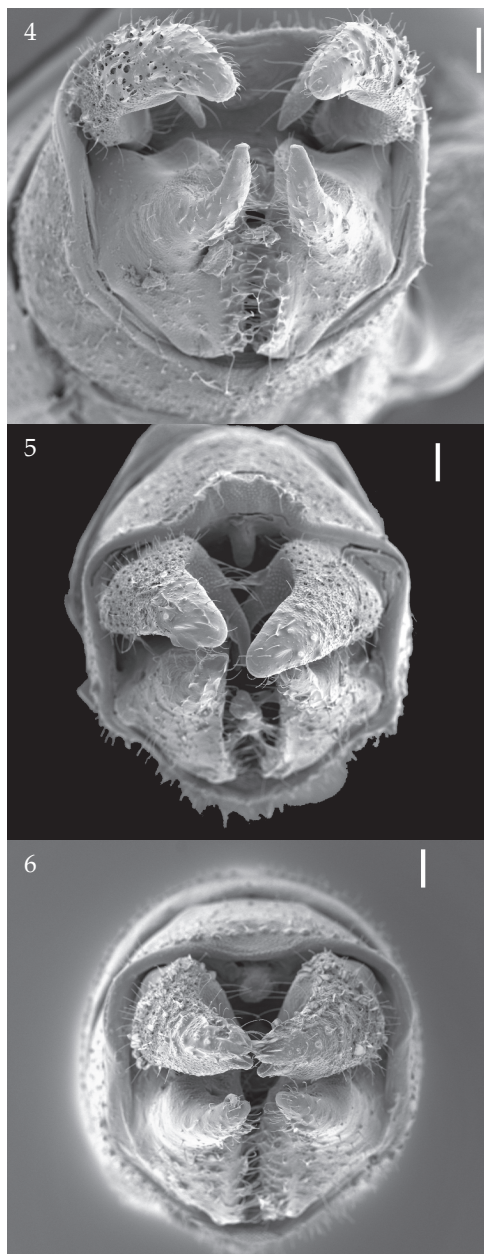


Fig. 4, *Idiocnemis chloropleura*, δ , Hollandia (= Jayapura), anal appendages, caudal view. Scale bar = 100 μ m.

Fig. 5, *Idiocnemis inornata*, δ , Sorong, anal appendages, caudal view. Scale bar = 100 μ m.

Fig. 6, *Idiocnemis strumidens*, δ , Misool, anal appendages, caudal view. Scale bar = 100 μ m.

Idiocnemis kimminsi Lieftinck, 1958
(fig. 12)

New specimens examined.— **Papua New Guinea, East New Britain Province:** 8 ♂♂, 3 ♀♀, New Britain, Komgi, 1000 m, 14.v.1962, Noona Dan Exp. 1961-62, ZMUC. 4 ♂♂, 6 ♀♀, New Britain, Yalom, 1000 m, 14., 17., 18. & 22.v.1962, Noona Dan Exp. 1961-62, ZMUC. 3 ♂♂, 5 ♀♀, ENB garden site at forest trail, 14.iii.2000, leg. S.J. Richards, SAMA. Wanui Camp area, trail in forest in mid-morning, 18.iii.2000, leg. S.R. Richards, SAMA. Trail next to Wanui Camp, 2.45 pm in shade, 20.iii.2000 leg. S.J. Richards, SAMA.

Measurements (East New Britain specimens collected by SJR).— Forewing length (♂) 23.0-26.0 mm (n = 7), (♀) 23.0-25.0 (n = 7); hindwing length (♂): 21.5-25.0 mm (n = 7), (♀) 21.5-24.0 (n = 7); abdomen length (♂): 33.5-37.0 mm (n = 7), (♀) 32.0-35.5 (n = 7).

Distribution.— Bismarck Archipelago: New Britain, Mioko (Duke of York Islands).

Remarks.— The new collections from the eastern part of New Britain just below the Gazelle Peninsula supplement our knowledge of the distribution of *I. kimminsi* in eastern New Britain. However, the species still has not been recorded from the western part of the island (i.e. from West New Britain Province). We suspect that this is due to sampling bias, although the first author has not encountered this species during collecting in the eastern part of West New Britain Province.

Idiocnemis patriciae spec. nov.
(figs 7a-c, 8a-b, 9a-c, 11a-c, 12, table 1)

Specimens examined.— Holotype (SAMA I217783) ♂, Papua New Guinea, Gulf Province, 02.x.1999, 'small torrent adjacent DEL camp in shade' (07°08.894'S, 144°22.937'E; ~40 m elevation). Paratypes: **Papua New Guinea, Gulf Province:** 3 ♂♂, (all juvenile), nr. DEL Camp, 03.-08.x.1999, SAMA. 1 ♂ (juvenile), nr. DEL Camp, 03.-08.x.1999, RMNH. Additional specimens examined.— 1 ♂, Lakekamu Basin, RT (River Trail) in forest, 22.xi.1996, RMNH. 1 ♀, Lakekamu basin, 1996, SAMA. All leg. S.J. Richards.

Description (holotype, ♂) — Measurements of holotype: forewing length 21.5 mm; hindwing length: 20.5 mm; abdomen length: 30.5 mm.

Head.— Red-brown, except for the orange-brown labrum and genae as well as for a pair of black spots on anteclypeus and some black rings around the ocelli.

Thorax.— Prothorax, legs and synthorax of red-brown ground colour. Prothorax with a longitudinal turquoise marking at pleurae and a transverse turquoise stripe on anterior lobe. Legs with weak diffuse black markings around the joints. Synthorax with antehumeral stripe reduced to a short but slightly elongate light-brown anterior marking and a turquoise spot situated at the beginning of posterior third of mesepisternum. Metepisternum largely covered by a slightly curved turquoise stripe (fig. 7b-c) which reaches from second third of synthorax to just short of the ante-alar ridge. The stripe is more regular than in *I. australis* and, in contrast to the latter species, only weakly constricted during its course.

Table 1. Variation of venational traits in males of *Idiocnemis patriciae* spec. nov.: origin of veins R3 and IR2 (numbers refer to postnodal veins), and number of postnodals (Px). [fw = forewing; hw = hindwing.]

R3		IR2		Px	
fw	hw	fw	hw	fw	hw
7-9	5-6	9-11	8-10	16-19	14-17

Wings.— Arculus distal to Ax2. R4 slightly distal to Sn in forewings or at Sn (hindwings). IR3 inserting about half-way (left forewing, right hindwing) between Sn and Px1, or slightly distal to that level (right forewing, left hindwing). R3 inserting at the level of Px8 in forewings, at Px6 in hindwings. IR2 inserting at Px11 in forewings, at Px10 in hindwings. Forewing with 18 Px; right hindwing 17 Px, left hindwing 16 Px. Pterostigma moderately oblique.

Abdomen.— Red-brown ground colour but dorsally slightly darkened. Anal appendages yellow-brown; inferior appendages four-fifths the length of superior ones.

Ligula.— The ligula belongs to the Group I type as recognized by Gassmann (1999) and is similar to that of *I. inornata* in having elongate but apically rounded terminal lobes (fig. 11b). There is no distal median cleft as in the northerly distributed *inornata*-group species (Group II - type). The ligula is distinctly different from the East Papuan species as well as from its western vicariant *I. australis*, all of them having the terminal lobes entirely reduced (Group III - type).

Variation in males.— The R4 vein inserts distinctly distal to the subnodal vein in the specimen from Lakekamu. The specimen is smaller than the males from Dark-End Lumber (14-16 postnodal veins in forewing).

Measurements (all males).— Fore wing length 20.0-22.0 (n = 5); hind wing length 19.0-21.0 (n = 5). Abdomen length 28.5-31.0 mm (n = 5).

Diagnosis.— *Idiocnemis patriciae* spec. nov. is a comparatively small *Idiocnemis* with the characteristic habitus of the *I. inornata*-group species (Gassmann, 1999). However, the structure of the ligula separates the male from those of almost all members of the same species group from the northern ranges and the Bismarck Archipelago by the lack of a distal median cleft, and from males of species in southern and southeastern New Guinea by having fully developed terminal lobes. Instead, the ligula is similar to



Fig. 7, *Idiocnemis patriciae* spec. nov., ♂ holotype, DEL area, Gulf Province, Papua New Guinea: (a) habitus, right lateral view; (b) habitus (detail); (c) pro- and synthorax. Scale bar = 5 mm (a); (b), (c) not to scale.

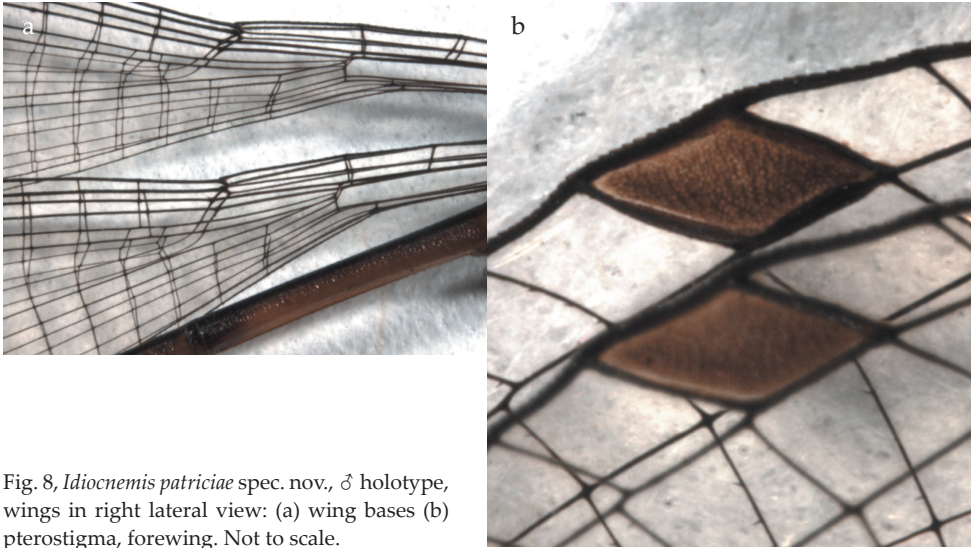


Fig. 8, *Idiocnemis patriciae* spec. nov., ♂ holotype, wings in right lateral view: (a) wing bases (b) pterostigma, forewing. Not to scale.

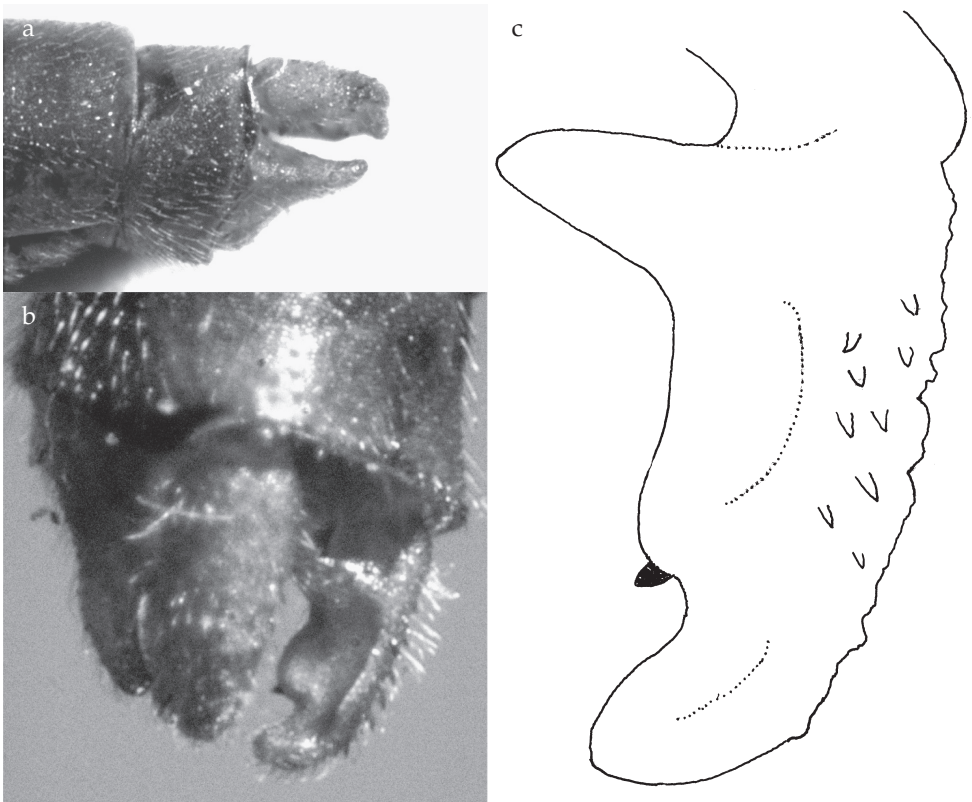


Fig. 9, *Idiocnemis patriciae* spec. nov., ♂ holotype: anal appendages, (a) in left lateral view (b) right superior appendage in latero-dorsal view; ♂, Lakekamu: (c) left superior appendage in interior view. Not to scale.

that of *I. inornata*. The latter species, however, has postocellar spots and no distinct thoracic markings, whereas *I. patriciae* spec. nov. has both a rudimentary antehumeral stripe and a well developed metepisternal stripe. The new species shares the lack of postocellar spots with *I. adelbertensis* and *I. australis*. From those species, it most distinctly differs by the well developed inner ridge of the superior appendage (fig. 9b), from *I. australis* also by not having the inner subdistal spine reduced to a tubercle. The new species' superior appendage is similar to that of *I. strumidens*, which, however, has the inner subdistal spine positioned more distally, and - proximal to that spine - only a subdistal swollen protrusion instead of a continuous ridge.

Female (supposition).— Head.— Postocellar spots absent. Coloration otherwise as in male, but black markings less distinct. Prothorax coloured as in male, without black spots on pronotum as in other *inornata*-group species. Posterior pronotal lobe about $0.75 \times$ (0.3 mm) the length of median lobe [$0.6 \times$ in *I. australis* (2.5 mm)], not noticeably raised; posterior lobe gently sinuous laterally, but not protruding.

Synthorax coloured as in male, but turquoise markings more diffuse and somewhat confluent.

Wings.— Arculus distal to Ax2. R4 slightly distal to or nearly at Sn. IR3 inserting about halfway between Sn and Px1. R3 inserting at the level of Px8 in forewings, at Px6 in hindwings. IR2 inserting at Px10 in forewing, at Px9 in hindwing. Forewing with 16 Px; hindwing 14 Px.

Abdomen.— Colour as in male, but rather pale. Projecting part of valvae about the length of last abdominal segment. Cerci of same colour as remainder of abdomen.

Measurements.— Forewing length 21.5 mm; hindwing length 20.0 mm. Abdomen length 27.0 mm.

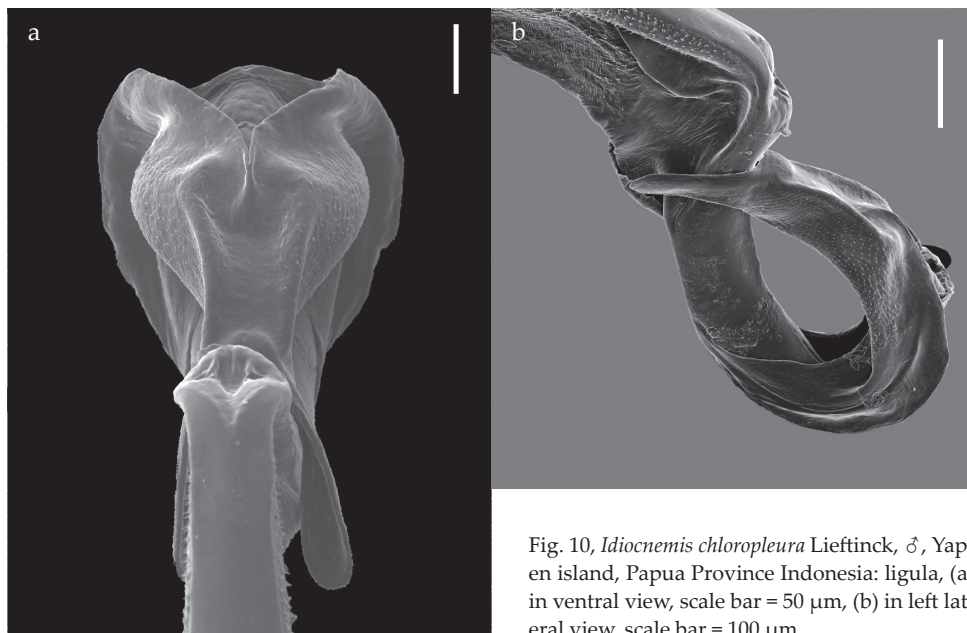


Fig. 10, *Idiocnemis chloropleura* Lieftinck, ♂, Yapen island, Papua Province Indonesia: ligula, (a) in ventral view, scale bar = 50 μ m, (b) in left lateral view, scale bar = 100 μ m.

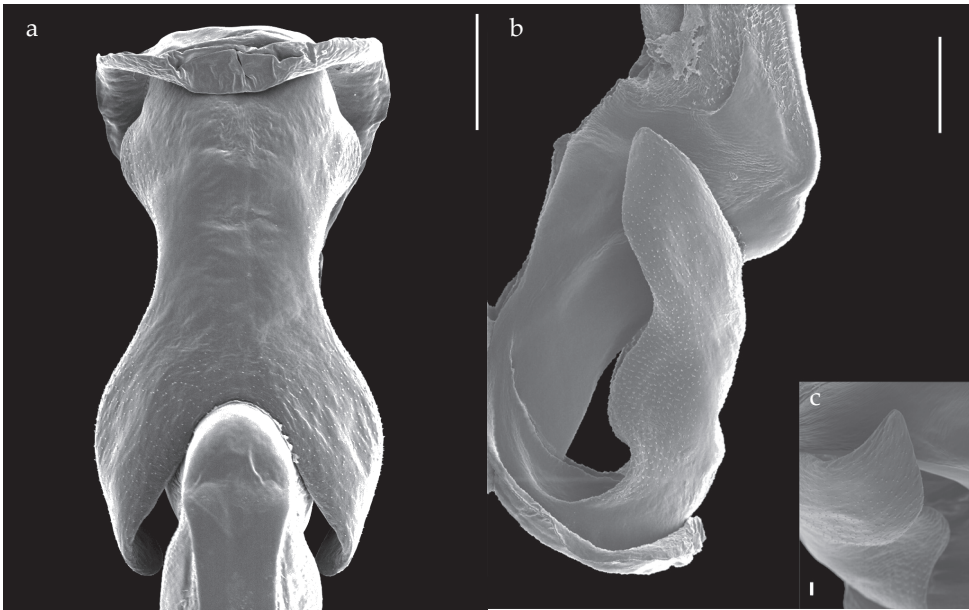


Fig. 11, *Idiocnemis patriciae* spec. nov., holotype ♂: ligula, (a) in ventral view, scale bar = 100 μ m, (b) in left lateral view, scale bar = 100 μ m. (c) tip of right terminal lobe, detail.

Remarks.— The single female specimen from Lakekamu was not caught in copula, and its assignment to the new species remains suppositional. Only two *I. inornata*-group species have a posterior pronotal lobe of similar size (i.e. length): *I. adelbertensis* Gassmann, from which *I. patriciae* spec. nov. differs in having the lateral margins not distinctly pronounced, and *I. inornata* Selys which has a very similarly shaped but strongly raised posterior pronotal lobe (Gassmann, 1999: figs. 27–28). *I. patriciae* spec. nov. differs distinctly from *I. australis* by the shape and especially the length of the posterior pronotal lobe; however, it is very similar to the female of *I. adelbertensis* Gassmann, 1999, which is only known from northern New Guinea. Given these remaining uncertainties, we assign the present female to the new species *I. patriciae* spec. nov. only tentatively and await further collections and/or observations from that region.

Etymology.— It is the first author's pleasure to name the new species after his dear colleague Dr Patricia Beldade of Leiden University.

Habitat.— The Dark End Lumber (DEL) ecoforestry project is located in lowland rainforest on the banks of the Sire river, a tributary of the Sirebi River which in turn flows into the Kikori River; 40–60m asl, Gulf Province (07°08.894'S, 144°22.937'E). The camp was located at the base of a low ridge rising to 120m asl. Several small streams drain the ridge, and their different gradients provide a number of aquatic habitats ranging from deep pools to shallow, fast-flowing riffles and small waterfalls. Surveys at the DEL site were undertaken from October 1–9, 1999. The *Idiocnemis* specimens were found in dappled sunlight along forest trails around the camp except for the Lakekamu specimen which was caught aside a river sitting on a fern plant.

Altitudinal range.— Ca. 40–60 m.

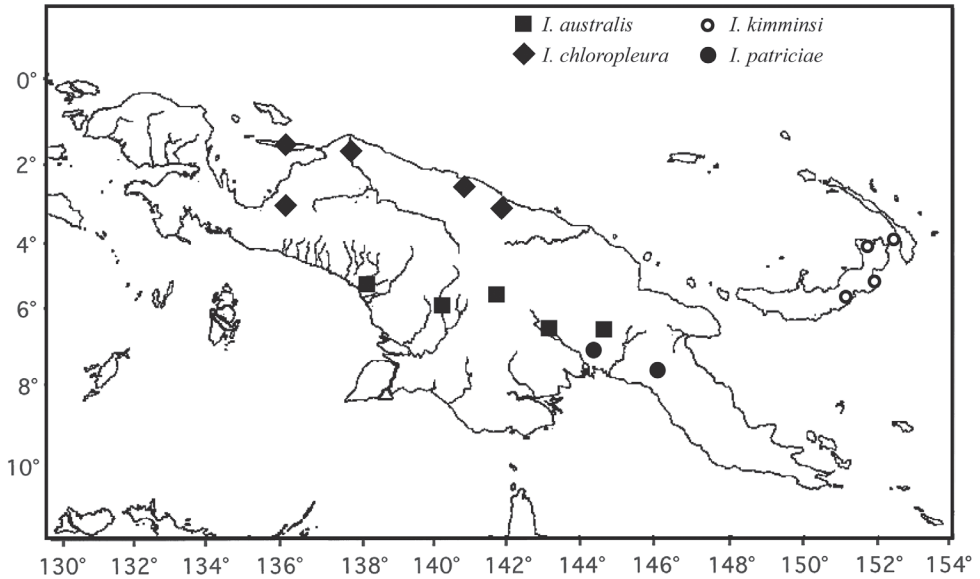


Fig. 12. Map of New Guinea, indicating the (revised) distributions of *I. australis*, *I. chloropleura*, *I. kimminsi* and *I. patriciae* spec. nov.

Distribution.— Southern central New Guinea, between the Sire and Lakekamu Rivers.

Discussion

Oppel (2005a, b) recorded two species of the *Idiocnemis inornata* - group (Gassmann, 1999) from the Crater Mountain Wildlife Management Area (Papua New Guinea). Due to difficulties in distinguishing them in the field, they were treated as one morphotype. Subsequently, however, they were listed as *I. australis* and *I. strumidens* (Oppel, 2005a, b, 2006). Because *I. strumidens* previously had been recorded only from the Bird's Head Peninsula *sensu lato*, we suspect that the Crater Mountain specimens belong to the new species *I. patriciae* spec. nov., which has a much more easterly distribution than *I. strumidens* (see distribution map in Gassmann, 1999). We recommend that the specimens from the Crater Mountain Wildlife Area be reexamined to confirm their identity. Polhemus et al. (2004) recognise the Papuan Gulf Coastal Lowlands as an area of freshwater endemism based largely on the presence of endemic Veliidae, Hydrometridae and trepobatine Gerridae. In the east, the distribution of the new species extends slightly beyond that area, but can still be considered part of that area of endemism. The discovery of *I. patriciae* spec. nov., and the recent description of several other new zygopteran taxa known only from Dark End Lumber (Theischinger & Richards 1996a, b) supports the contention that this region harbours a significant endemic aquatic fauna.

The phylogenetic relationships of the new species will be dealt with in a future paper on the biogeography of New Guinean Platycnemididae (Gassmann, in prep.).

Acknowledgments

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