Pseudagrion fumipennis, a remarkable new species of damselfly from New Guinea (Odonata: Zygoptera: Coenagrionidae)

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Pseudagrion fumipennis sp. nov. is described from widely separated localities in the lowlands of New Guinea and immediately adjacent islands. It is the first known coenagrionid from the Papuan region to possess brown-tinted apices on all four wings. The new species appears to be structurally most similar to P. farinicolle from New Guinea and P. ustum from Sulawesi, but its precise relationships are obscure.

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Introduction

The coenagrionid genus Pseudagrion Selys is distributed widely from south Asia through Melanesia, with at least 42 described species recorded from the region between India and the Solomon Islands (Tsuda 1991). In New Guinea and the Moluccas the genus is represented by 10 described species (Ris 1915; Lieftinck 1932, 1937, 1949), but additional undescribed taxa are known from the region. During recent field surveys in the vast lowland rainforests of New Guinea, two of us (DP, SJR) collected a distinctive new species in this genus (Polhemus 1995, 1998, 2000; Polhemus et al. 2004; Richards et al. 1998), described herein.

The new species is tentatively identified as a member of Pseudagrion based on its wing venation and male terminalia. However, it is set apart from all other New Guinean Coenagrionidae by the rich chestnut color which decorates the apices of all four wings.

Material and methods

All measurements in the following descriptions are given in millimeters. CL numbers in the Material Examined section refer to collection locality numbers used by the senior author to cross reference specimens, field notes, and habitat photographs. The holotype of Pseudagrion fumipennis is deposited in the Australian Museum of Natural History, Sydney (AUSM); paratypes are deposited in the Smithsonian Institution, Washington, DC (USNM), and the Bishop Museum, Honolulu (BPBM).

Taxonomy

Pseudagrion fumipennis sp. nov.

Figs 1–5

Type material. – Holotype ♂: Papua New Guinea: Gulf Prov., Sapoi River, 2 km S. Ivimka Camp, Lakekamu Basin, 146°29'45"E, 7°44'05"S, ca 100 m a.s.l., 29 November 1996, coll. S.J. Richards

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(AUSM). **Paratypes:** Papua New Guinea, Gulf Prov.: Lubu River above Omo, 50 m., water temp. 19° C., 1 March 1995, 09:00–12:00 hrs. 06°58′41″S, 144°18′15″E, CL 7002, D. A. Polhemus, 1♂ (BPBM). **Southern Highlands Prov.**: Ai’io River at pipeline road, NE of Hedinia in Hedinia Valley, 480 m., water temp. 23.5° C., 23 March 1995, 10:00-11:00 hrs., CL 7032, D. A. Polhemus, 1♂ (BPBM). **Milne Bay Prov.**: Sideia Is., upper Kwabunamo River, in south central interior, 20 m. [65 ft.], 10°35′59″S, 150°50′54″E, water temp. 29° C., 15 January 2004, 11:30–14:00 hrs., CL 7288, D. A. Polhemus, 2♂ (USNM). **Indonesia: Irian Jaya Prov.** [= Papua Prov.]: 1 male, rainforest stream approx. 0.5 km. E. of PTFI Siewa exploration camp, 60 m. [200 ft.], 3°02′08″S, 136°22′40″E, water temp. 26° C., 11 April 1998, 09:00–11:00 hrs., CL 7089, D. A. Polhemus (USNM); 1 male, same locality as above except 21 April 1998, D. A. Polhemus (USNM); 1 male, small intermittent stream with pools in lowland forest at Kuala Kencana light industrial park, N. of Timika, 90 m. [300 ft.], 4°26′13″S, 136°51′50″E, water temp. 25° C., 27 March 1997, 13:00–14:00 hrs., CL 7043, D. A. Polhemus (USNM); 1 male, tributary to Iweka River, approx. 3 km. W. of Kuala Kencana, N. of Timika, 90 m. [300 ft.], 4°24′05″S, 136°50′06″E, water temp. 25° C., pH 6.95, 26 March 1997, 09:00–12:30 hrs., CL 7042, D. A. Polhemus (USNM).

**Description of male**

**Size.** A moderate sized damselfly; overall coloration brown and black, with pronotum and sides of thorax densely pruinose (Fig. 1). Body length 38–47 mm (mean = 42.0 mm, N = 8); abdomen length 32–40 mm (mean = 35.0 mm, N = 8); fore wing length 23–27 mm (mean = 25.0 mm, N = 7); hind wing length 20–28 mm (mean = 23.5 mm, N = 7). Female unknown.

**Colour.** Male: head with labium beige, rear of head black with whitish pruinosity. Labrum pale with a median black spot along hind margin, which is also thinly lined with black. Clypeus blackish, top of head deep rich dark brown, the ocelli each ringed with black. Occiput blackish, with barely visible dark brown postocular spots. Thorax with pronotum dark brown to black, covered by whitish pruinosity. Hind lobe fringed with long tan hairs. Mesepisternum rich dark brown, bearing scattered, very slender, erect, brown setae; mesopleural suture covered by a black stripe, this stripe rounded along dorsal margin just below wing bases, upper terminus of this stripe hooked downwards and facing posteriorly, anterior section narrowing evenly to a fine point which ends before reaching anterior (lower) end of mesopleural suture. Sides of thorax rich dark brown, metapleural suture thinly marked with black, entire side of thorax covered in whitish pruinosity posterior to mesopleural suture, leaving only upper portion of mesepimeron exposed. Legs, including femoral and tibial spines, black. Wings with overall coloration hyaline, with rich brown pigment enfusing the
membrane of both pairs of wings from the apices to a point five cells proximal to pterostigma in fore-wing, four cells proximal to pterostigma in hindwing (Fig. 2). Abdomen black dorsally, dark brown ventrally. S1 covered with whitish pruinosity. Male terminal appendages entirely blackish.

**Structural characters.** Legs with femoral spines short, length subequal to or shorter than width of femur; tibial spines relatively short, angled distally, length approximately $2 \times$ the width of the tibia. Abdomen with male terminal appendages as in Figs 3 & 4; cercus roughly diamond-shaped when viewed laterally, length approximately $2 \times$ that of paraproct, posterior apex slender and bluntly acute when viewed laterally, hooked when viewed dorsally, central section of cercus bearing a vertically oriented, triangular process arising from broad inner dorsal shelf, apex of this process sharply acute; paraproct elongate in lateral view, apex blunt, rounded. Male secondary genitalia with penis shaft slender, bifurcate distally; sperm vesicle roughly in the form of an elongate triangle with the apex directed anteriorly, anterior apex rounded, with a pair (1+1) of small, rounded lateral lobes; posterior margin truncate, membranous, with a shallow medial indentation; anterior hamulae roughly quadrate.

**Etymology**
The name “fumipennis” is treated as an adjective, and refers to the embrowned wing apices of this species.

**Distribution**
*Pseudagrion fumipennis* is widely distributed across southern New Guinea, from Sideia Island on the eastern side of the China Strait, westward through the Lakekamu, Kikori, and Ajkwa river basins; two specimens also at hand from the lowlands of the Wapoga River basin, on the northern side of the central ranges in west-central New Guinea (Fig. 5).

**Comparative notes**
This interesting new coenagriomid is the only New Guinean member of its genus and family to possess dark brown pigment in the apices of each wing (Fig. 1), although this pigmentation is superficially similar to the wing patterning seen in certain Moluccan and Melanesian species in the chlorocyphid genus *Rhinocypha*. Within the Coenagrionidae, *P. fumipennis* falls most comfortably in the genus *Pseudagrion*, sharing structural and color features with *P. farinicolle* Lieftinck, 1932 from New Guinea and *P. ustum* Selys, 1876 from Sulawesi. The previous taxonomic ambiguity that has accompanied this species in the existing literature can be gauged by the
fact that it has been treated in past publications as “Teinobasis (?) sp. nov.” by Richards et al. (1998), “Teinobasis (?) n. sp.” by Polhemus (1998), and as “Teinobasis sp. under. #1” by Polhemus & Polhemus (2000). Despite these previous provisional identifications, we now feel on the basis of subsequent analysis that this species is in fact most properly assignable to *Pseudagrion*. In particular, *P. fumipennis* shares with *P. farinicolle* and *P. ustum* the peculiar development of a dorsally-projecting, thorn-like process arising from the inner dorsal shelf of the cerci. In *P. farinicolle* this spike is only visible in dorsal or posterior view, while in *P. ustum* this spike is very large — much larger than in the present species — and plainly visible in lateral view. In all three species the thoracic color is rich brown overall with black sutures, accompanied by a coating of whitish pruinosity.

Among the specimens at hand, those from the Wapoga River basin, north of the central mountains, are clearly larger in size, with a mean body length of 47 mm (n = 2) and a mean abdomen length of 40 mm (n = 2). By contrast, specimens from south of the central mountains, from the Ajkwa River basin in the west to Sideia Island in the east, have a mean body length of 40 mm (n = 6) and a mean abdomen length of 33 mm (n = 6). All of the specimens involved, however, are identical in regard to their other structural characters and genitalic morphology, thus the size differences are considered to be merely intraspecific variation indicative of incipient speciation.

**Biological notes**

Based on current collections, *P. fumipennis* appears to be an inhabitant of first or second order streams in the New Guinea pre-montane foreland, frequenting reaches shaded by intact or at best lightly disturbed primary lowland forest. To date, it has never been found in numbers; instead, only single individuals are collected after an entire day spent along a given stream, during which time dozens of specimens of other species of *Pseudagrion*, *Nososticta*, and *Idiocnemis* will have been netted by a competent collector. One of us (DAP) has observed this species at four different localities on New Guinea and nearby islands; in each case individuals were seen to fly swiftly and close over the water, staying near the stream margin and appearing at irregular intervals. The latter implies that such individuals may have large territories or fly long beats.

At the Siewa airstrip, in the lower Wapoga River basin, the few specimens that were taken came from a heavily shaded rainforest creek that lay east of the research camp, and the species was by contrast never encountered along the more open overflow channels bordering the large Tirawiwa River, or along the main river itself. The sole Lakekamu specimen was perched in full sun on a twig overhanging the Sapoi River, a permanent river flowing through lowland alluvial rainforest (Richards et al. 1998). At the type locality the Sapoi was ca 1 m deep and had clear, turbulent water and numerous emergent boulders. No females of *P. fumipennis* have yet been collected, suggesting that they occupy different habitats from males. That even the distinctive males have been encountered in such low numbers despite intense surveys at the type locality and other known localities indicates that the population density of this species is extremely low, or that both sexes spend most of their time in inaccessible habitats, possibly in the rainforest canopy.

Given its relatively broad geographical range within
New Guinea, it is notable that \textit{P. fumipennis} has escaped discovery until recent times. The lack of previous captures is most likely due to the fact that the species inhabits lowland forest habitats that most collectors fly over on their way to the more comfortable environments of the interior mountains, and that the species is relatively uncommon even in areas where it is present.

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