

***Neoneura angelensis* sp. nov. from French Guyana
(Odonata: Protoneuridae)**

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ABSTRACT

Neoneura angelensis sp. nov. is described and illustrated from two males collected in French Guyana. The holotype was collected by the author on 29 December 2003 on Crique Angèle near Saut Athanase, an affluent of Approuague River and is deposited in Muséum d'Histoire naturelle in Neuchâtel (MHNN). On the basis of the structure of the cercus, this species belongs to the *rubriventris*-group and is close to *N. ethela*, *N. kiautai* and *N. sylvatica*, from which it is diagnosed.

INTRODUCTION

Neoneura is a large zygopteran genus erected by Selys (1860). Garrison (1999) reviewed the genus, and five new species have recently been described from Brazil (Machado 2002, 2003, 2005, 2007). It presently contains 28 primarily neotropical species, six of which are known from French Guyana, viz. *N. bilinearis* Selys, 1860 (Machet 1989), *N. fulvicollis* Selys, 1886 (Machet 2004), *N. joana* Williamson, 1917 (Geijskes 1971), *N. mariana* Williamson, 1917 (Machet 2004), *N. myrthea* Williamson, 1917 (Geijskes 1971) and *N. sylvatica* Hagen in Selys, 1886 (Machet 2004). I describe a new species from this region, thus increasing the number of known species in the genus to 29.

***Neoneura angelensis* sp. nov.
(Figs 1a-f, 2a, b)**

Etymology

This species is named after the river Crique Angèle where the holotype was collected.

Specimens examined

Holotype ♂: French Guyana, Régina, near Saut Athanase, first waterfall on Crique Angèle, an affluent of Approuague River (04°09'16.6"N, 52°20'02.6"W; elevation 50 m), 29 xii 2003, L. Juillerat leg., deposited in collection of Muséum d'Histoire naturelle in Neuchâtel (MHNN), Switzerland. — **Paratype** (1 ♂): French Guyana, Saül, Saut Marmite on Crique Limonade (03°27'17.4"N, 53°11'01.5"W), 08 x 2006, J.-C. Gerber leg., deposited in R.W. Garrison personal collection, Sacramento, USA.

Description of holotype

Wing vein terminology follows Riek & Kukalová-Peck (1984).

Head: Labium ivory, labrum dark brown except for central black depression (Fig. 1a) and paired mediolateral yellow spots on basal margin, mandibles dark brown, genae yellow, postclypeus black with two reddish-brown spots on both sides near the posterior border (Fig. 1a), anteclypeus and antefrons reddish-brown, dorsum of head black with reticulate reddish-brown pattern as in Figure 1a, rear of head black. Antennae dark brown.

Thorax: Prothorax reddish-brown with following areas black: anterior lobe of prothorax except for reddish-brown along anterior margin and a spot on each side; a middorsal band and an S-shaped spot on each side of middle lobe; a spot anteriorly on propleuron which is slightly pruinose inferiorly; posterior lobe except for a thin reddish-brown posterior margin expanding laterally. Posterior lobe of prothorax roundly truncated laterally, medial margin slightly concave with a small convex tongue. Synthorax reddish-brown on dorsum, light brown to golden brown laterally and marked with black (Fig. 1b) as follows: middorsal stripe occupying $\frac{2}{3}$ to $\frac{3}{4}$ of mesepisternum interrupted with occasional pale streaks and spots; thin black mesepisternal line along mesopleural suture dilated at ventral and dorsal ends; a broad longitudinal black stripe on anterior half of mesepimeron separated from first lateral suture; an abbreviated spatulate spot at dorsal end of obsolete second lateral suture; a black stripe along third lateral suture; ventral part of metepimeron becoming slightly pruinose with a dark area along metapleural carina. Mesinfraepisternum reddish-brown with small black spot below and a black line bordering mesothoracic suture; metinfraepisternum golden pale yellow with a brown stripe along metathoracic suture. — Legs: Coxae golden brown covered with pruinosity on medial side; femora medially yellow chamois, laterally black except for anterior third of extensor surface of posterior femora yellow chamois; tibiae black with posterior side yellow chamois; tarsi and armature brownish-black. — Wings very slightly smoked, venation dark brown to black, Pt dark brown, occupying one cell. Venation: 10 or 11 Px in Fw, 8 Px in Hw. RP_2 in Fw originating little proximal to the 4th Px, in Hw little proximal to 3rd Px. IR_1 in Fw originating at level of 6th or 7th Px, in Hw at level of 6th Px. MP in Fw terminating at $\frac{3}{5}$, in Hw at $\frac{1}{2}$ or $\frac{3}{5}$ of the distance between the crossvein descending from the subnodus and that descending from the first Px.

Abdomen: basal $\frac{2}{3}$ of dorsum of S1 black, apical $\frac{1}{3}$ red, sides brown except a basal black spot linked with the black dorsum. S2 red, ventrally with a yellow longitudinal stripe surmounted by a black stripe. S3-6 red, paler ventrolaterally, with an obscure wash of brown at posteroventral margin of each segment; annuli dark. S7-10 becoming gradually reddish-brown. Basal $\frac{1}{3}$ of dorsum of segment 10 dark reddish-brown. Sternites 3-10 black. Upper branch of cercus blackish-brown, lower branch of cercus and paraproct reddish-brown. — Cercus in dorsal view (Fig. 1c) slightly shorter than S10, bean-shaped with two tubercles medially followed ventrally by a basal decumbent tooth; lower branch hardly visible laterally. In lateral view (Fig. 1d),

cercus length subequal to paraproct, its lower branch shorter than upper. In oblique posterior view (Fig. 1e), medial surface of upper branch of cercus with raised distal $\frac{1}{3}$ bordered basally by an incomplete oblique carina; basal part of upper branch broadly U-shaped. Decumbent tooth slightly longer than upper branch measured along tooth's axis. In posterior view (Fig. 1f) decumbent processes convergent ventromedially. — Genital ligula (Figs 2a, b) with distal segment cup-shaped and armed anteroexternally with a curved process; an internal fold present.

Measurements [mm]: Fw: 20, Hw 19, abdomen 28.5.

Variation

The paratype differs from the holotype by less extensive dark thoracic markings and less developed tubercles on the cercus. S7 red as in S3-6. Venation of paratype as follows: 10 Px in Fw, 9 in Hw. RP_2 in Fw originating little proximal to the 4th Px or at level of the 4th Px, in Hw little proximal to 3rd Px. IR_1 in Fw originating at level of 6th Px, in Hw at level of 5th or 6th Px. MP in Fw terminating at $\frac{3}{5}$ or $\frac{2}{3}$, in Hw at $\frac{3}{5}$ or $\frac{2}{3}$ of the distance between the crossvein descending from the subnodus and that descending from the first Px. Female unknown.

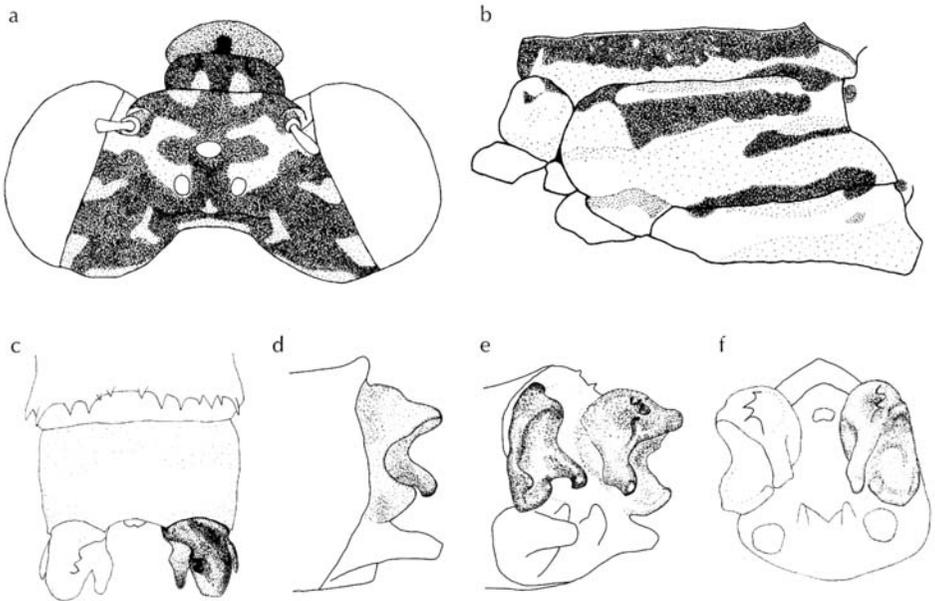


Figure 1: *Neoneura angelensis* sp. nov., male holotype — (a) dorsum of head; (b) color pattern of synthorax; (c-f) anal appendages, in dorsal (c), lateral (d), oblique posterior (e) and posterior (f) views.

Diagnosis

N. angelensis sp. nov. can be distinguished from its most similar congeners *N. ethela* Williamson, 1917, *N. kiautai* Machado, 2007 and *N. sylvatica* Hagen in Selys, 1886 by the presence of an incomplete oblique carina at apical $\frac{1}{3}$ of upper branch of cercus (Fig. 1e, f) instead of a complete one, and by the length of the decumbent tooth measured along tooth's axis, which is slightly longer than that of upper branch (Fig. 1e). The decumbent tooth in *N. angelensis*, like that in *N. ethela*, is directed ventroposteriorly and joins the main branch of the cercus to form a broadly U-shaped concavity. In *N. kiautai*, the decumbent tooth is directed posteriorly and joins the main branch of the cercus to form a narrower U-shaped concavity. The apical lobes of the genital ligula in *N. angelensis* (Figs 2a, b) are comparatively shorter than in either *N. ethela* (Figs 2c, d) or *N. kiautai*.

DISCUSSION

Based on the structure of the cercus, *Neoneura angelensis* sp. nov. belongs to the South American *rubriventris*-group characterised by the presence of a large tooth located along the basal margin of the upper branch of the cercus when viewed in

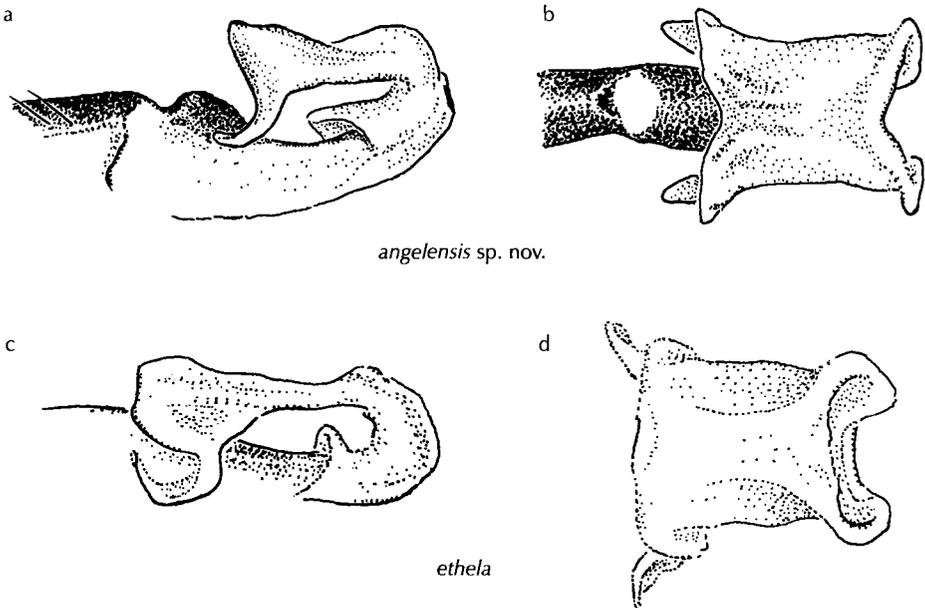


Figure 2: Genital ligula of two *Neoneura* species — (a, b) *N. angelensis* sp. nov., male paratype; (c, d) *N. ethela*, male holotype; (a, c) in lateral view, (b, d) in dorsal view. Drawings by R.W. Garrison.

oblique posterior view (Garrison 1999; Machado 2007) and is morphologically similar to *N. ethela*, *N. kiauta* and *N. sylvatica*, since they all possess a transverse raised area across the apical $\frac{1}{3}$ of the cercus in oblique posterior view.

Of the species discussed here, *N. sylvatica* has the broadest distribution within South America (Machado 2007). Of the other three red species, *N. angelensis* is the only one known from northern South America; the others are restricted to southern Brazil, Paraguay and Bolivia. *N. angelensis* will likely be found in Suriname and Amapá state in Brazil. Contrarily to most species of *Neoneura*, which live on streams or large rivers, *N. ethela*, *N. kiautai* and *N. sylvatica* occur at both lotic and lentic environments (Machado 2007). *Neoneura angelensis* has been found only in lotic environments thus far. The holotype was caught while patrolling less than 1 cm over the water surface in the middle of a 5 m broad stream, a few meters upstream from cascades.

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REFERENCES

- Garrison, R.W., 1999. The genus *Neoneura*, with keys and description of a new species, *Neoneura jurzitzai* spec. nov. (Zygoptera: Protoneuridae). *Odonatologica* 28: 343-375.
- Geijskes, D.C., 1971. List of Odonata known from French Guyana, mainly based on a collection brought together by the mission of the "Muséum National d'Histoire Naturelle", Paris. *Annales de la Société Entomologique de France (N.S.)* 7 (3): 655-677.
- Machado, A.B.M., 2002. *Neoneura lucas* spec. nov. from Brazilian Pantanal (Zygoptera: Protoneuridae). *Odonatologica* 31: 199-204.
- Machado, A.B.M., 2003. *Neoneura moorei* spec. nov. from the Amazonian region of Brazil (Zygoptera: Protoneuridae). *Odonatologica* 32: 8-93.
- Machado, A.B.M., 2005. Studies on neotropical Protoneuridae. 19. Two new species of *Neoneura* from Southern Brazil (Odonata, Protoneuridae). *Iheringia (Série Zoologia)*, Porto Alegre 95: 405-409.
- Machado, A.B.M., 2007. Studies on Neotropical Protoneuridae. 20. *Neoneura kiautai* spec. nov. from southeastern Brazil (Zygoptera, Protoneuridae). In: Tyagi, B.K. (ed.) "Odonata: biology of dragonflies", Scientific Publisher, Jodhpur, pp. 25-32.
- Machet, P., 1989. Contribution à l'étude des Odonates de la Guyane Française. 1: Zygoptera. *Opuscula Zoologica Fluminensia* 40: 1-16.

- Machet, P., 2004. Liste actualisée des Odonates de la Guyane française. *Martinia* 20: 145-149.
- Riek, E.J. & J. Kukalová-Peck, 1984. A new interpretation of dragonfly wing venation based upon Early Upper Carboniferous fossils from Argentina (Insecta: Odonatoidea) and basic character states in pterygote wings. *Canadian Journal of Zoology* 62: 1150-1166.
- Selys-Longchamps, E. de, 1860. Synopsis des Agrionines, dernière légion: *Protonevra*. *Bulletin de l'Académie Royale des Sciences de Belgique (2ème Série)* 10: 431-462.



Colour plate I: The 'compact' configuration of the tags glued to the abdomen of Anisoptera — (a) male *Aeshna mixta*; (b) female *Libellula fulva*.



Colour plate II: Males of *Libellago* from Sulawesi — (a) *L. c. celebensis* ssp. nov., Central Sulawesi, Gimpu, 1997; (b) *L. celebensis dorsonigra* ssp. nov., N of Palopo, 1993; (c) *L. celebensis orientalis* ssp. nov., Banggai peninsula, Luwuk, 1989; (d) *L. daviesi* sp. nov., N Sulawesi, Dumoga Bone National Park, 1985; (e) *L. rufescens*, W of Palopo, 1991; (f) *L. xanthocyana*, Tangkoko National Park, 2006; Photos by Jan van Tol (a-e) and Peter Los (f).



Colour plate III: Males of Chlorocyphidae from Sulawesi — (a) *Libellago asclepiades*, SW Sulawesi, Bantimurung, 1991; (b) *Sclerocypha bisignata*, Batas, between Wotu and Poso, 1993. Photos by Jan van Tol.



Colour plate IV: Biting midges (*Forcipomyia paludis*) as ectoparasites of Anisoptera — (a) *Cordulegaster boltonii* with feeding midges (arrows). Hinwil, Switzerland, 7 July 2002; (b) Teneral male of *Cordulia aenea* with a biting midge on the abdomen. In Anisoptera biting midges are very rarely found on other body parts than the wings. Hinwil, Switzerland, 9 Mai 1981. Photos by Hansruedi Wildermuth.