

# Studies on neotropical Protoneuridae. 19. Two new species of *Neoneura* from Southern Brazil (Odonata, Protoneuridae)

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**ABSTRACT.** *Neoneura anaclara* sp. nov. and *Neoneura leonardo* sp. nov. are described and illustrated from specimens collected in Southern Brazil. These two species are unique in the genus *Neoneura* by the structure of their anal appendages.

**KEYWORDS.** Odonata, Protoneuridae, *Neoneura*, taxonomy.

**RESUMO.** Estudos sobre Protoneuridae neotropicais. 19. Duas novas espécies de *Neoneura* do sul do Brasil (Odonata, Protoneuridae). *Neoneura anaclara* sp. nov. e *N. leonardo* sp. nov. são descritas e ilustradas com base em espécimes coletados no sul do Brasil. Essas duas espécies são únicas no gênero *Neoneura* pela estrutura de seus apêndices anais.

**PALAVRAS-CHAVE.** Odonata, Protoneuridae, *Neoneura*, taxonomia.

Erected by SELYS-LONGCHAMPS (1860) the genus *Neoneura* contains 25 species, most of them Neotropical, with only two species reaching the Nearctic region. Brazil has 18 species described or recorded by SELYS-LONGCHAMPS (1860, 1886), WILLIAMSON (1917), MACHADO (1975, 1989, 2002, 2003, 2004) and GARRISON (1999). Most Brazilian species are concentrated in the Amazonian States of the Northern region with only two species being recorded in the Southern region. We describe now two new species from the Southern States of Paraná, Santa Catarina and Rio Grande do Sul, thus increasing the number of known species to 27.

## *Neoneura anaclara* sp. nov.

(Figs. 1-5)

Male. Head. Labium, genae, base of mandibles and anteclypeus yellow. Postclypeus dark with a pale rounded spot at each side; frons reddish brown with the following black areas: a curved stripe connecting one eye to the other. This stripe extends behind the lateral ocelli and penetrates between them forming a small transverse band lateral to the median ocellus. This ocellar dark area is connected with a dark trident whose branches end at the frontal crest. At the hind part of the frons there is a transverse dark band and a large rounded postocular spot between it and the interocular dark stripe. Antennae brown.

Thorax. Prothorax with the median lobe and propleuron reddish brown. Posterior and anterior lobes black, united to each other through the median lobe by a longitudinal middorsal black stripe.

Pterothorax (Fig. 1). General color reddish brown. A black band at each side of the yellow middorsal carina occupying about half of the width of the sclerite containing some pale streaks and spots (Fig. 1). A black mesepisternal line along the humeral suture dilated above into an elongated black area and continuing into the

mesinfraepisternum. This sclerite is black with two pale areas at its ventral and dorsal parts. Mesepimeron with a broad longitudinal black stripe connected above with the black mesepisternal area bifurcating below in an anterior branch connected with the humeral black line and a posterior branch connected with mesinfraepisternal black area. Metapleuron reddish brown with a metepisternal black stripe adjacent to the second lateral suture continuing into the metinfraepisternum (Fig. 1). Ventral part of the metepimeron slightly pruinose with a comma-shaped dark area at each side. Poststernum black with whitish pruinosity. Legs: femora laterally dark brown, medially yellow; tibiae and tarsi yellow. Wings hyaline with the apex of the hindwing slightly smoky (Fig. 2). Venation black. Pterostigma brown, occupying one cell.

Venation. (Fig. 2). Postnodals in forewing (FW) 11; in hindwing (HW) 10. R3 in FW originating at the level of the 4<sup>th</sup>; in HW at the level of the 3<sup>rd</sup> postnodal. IR2 in FW originating at the level of the 7<sup>th</sup> postnodal; in HW at the level of the 6<sup>th</sup> (50%) or 7<sup>th</sup> (50%) postnodal. CUP in FW ending within the cell beyond the level of the crossvein descending from the subnodus. In HW ending at the crossvein descending from the first postnodal (50%) or within the cell beyond it (50%). Arculus in both wings distinctly distant from the 2<sup>nd</sup> antenodal.

Abdomen. General color red. Segments 1-2 dark brown laterally. Segments 3-5 with the ventral part of tergum adjacent to the lateral carina with a dark brown stripe that increases in width on segments 6-7 enlarging into a lateral subtriangular spot at segments 7-10. Superior appendages dark brown with a pale area at the lateral part of the ventral branch. Inferior appendages dark brown with the apex reddish.

Structural characters. Posterior lobe of prothorax with the hind margin smoothly rounded. Superior appendages in dorsal view (Fig. 3), bean-shaped with two medially directed teeth. In lateral view (Fig. 4) the dorsal and ventral branches are directed posteriorly. They

are united at their  $\frac{1}{4}$  length, then separated by a narrow cleft and fitted together at the apex where the dorsal branch bears a ventrally directed tooth that has as counterpart a dorsally directed tooth of the ventral branch. In postero medial view (Fig. 5) the dorsal branch appears as a large concavity with two medio ventrally directed teeth at its dorsal margin and one ventrally directed apical tooth at the point where the dorsal and ventral margins meet. The narrow and elongated ventral branch is located alongside the ventral margin of the dorsal branch and its dorsally directed tooth is lodged in the small concavity immediately in front of the ventrally directed apical tooth of the dorsal branch.

Measurements (mm). Abdomen 26.2; superior appendage 4.6; inferior appendages 4.9; hindwing 20.0; pterostigma 0.8.

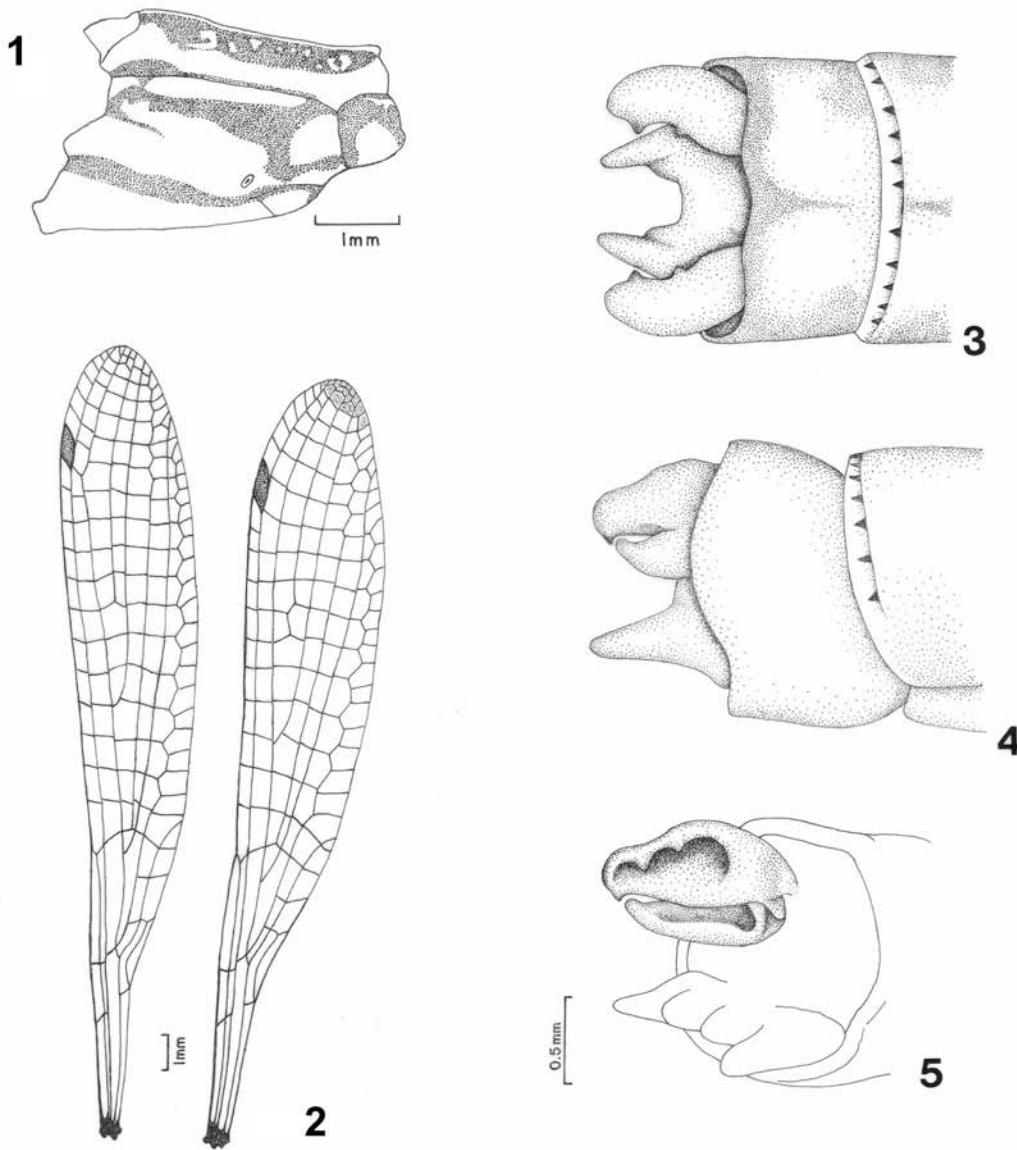
Type material. Holotype ♂, BRAZIL, **Paraná**: Candido de Abreu (Fazenda do Conde, 500m), 10.XII.1994, Mielke col., deposited in collection A.B.M. Machado, Belo Horizonte. The right anal appendage was accidentally lost after being described and illustrated.

Etymology. The name of this species is dedicated to my granddaughter Ana Clara Machado Tomelin.

***Neoneura leonardo* sp. nov.**

(Figs. 6-9)

Male head. Color as herein described for *N. anaclara*. In some paratypes, however, the black postocular spot may be completely separated from the interocular stripe or partially fused with it.



Figs. 1-5. *Neoneura anaclara* sp. nov. holotype ♂: 1, pterothoracic color pattern; 2, wing venation; 3-5, anal appendages in dorsal (3), lateral (4) and postero medial (5) views.

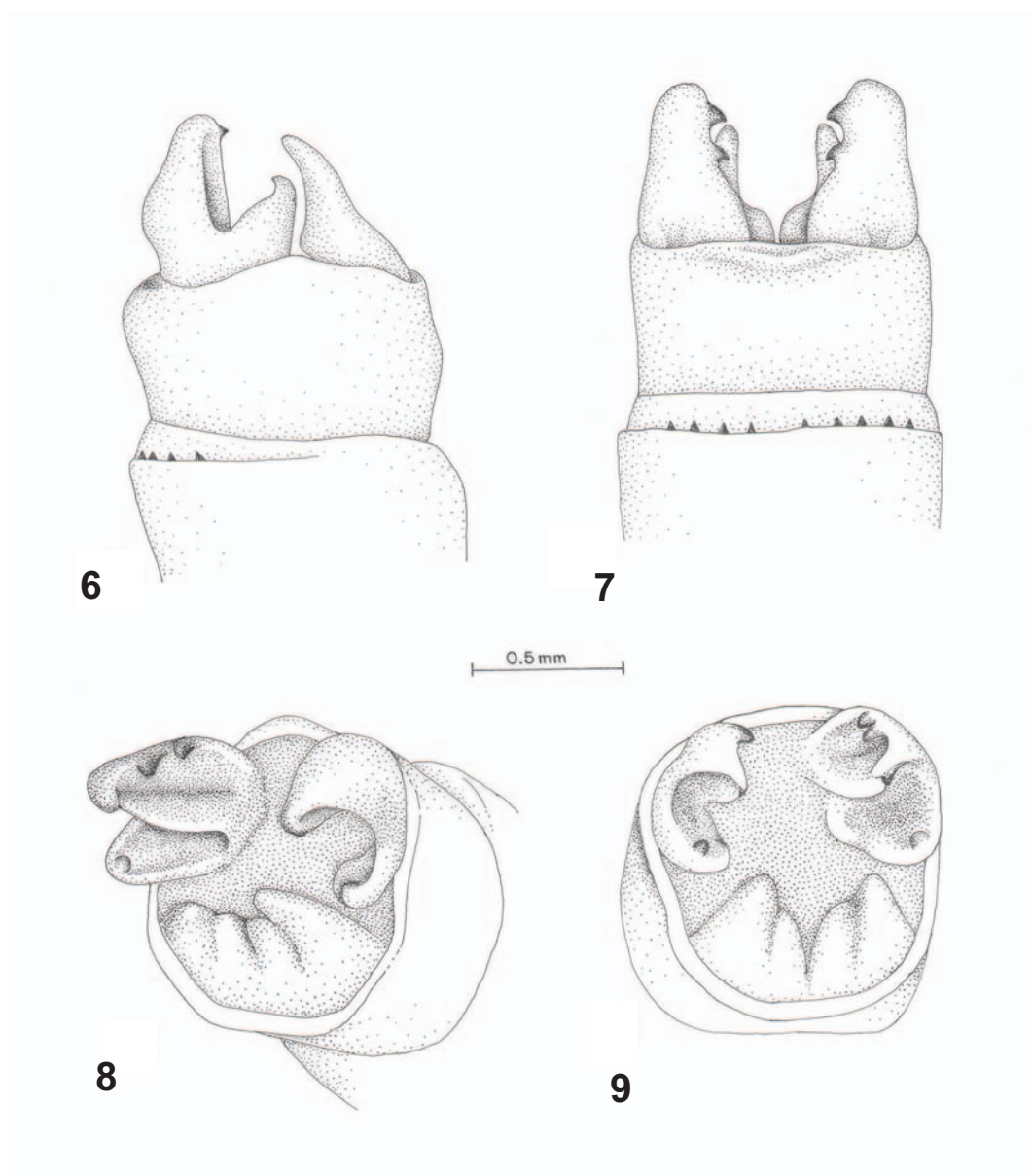
Thorax. As herein described for *N. anaclara* (Fig. 1) except for: a) the mesepimeral black stripe does not reach the upper part of the sclerite and, in some paratypes, its upper part is broken; b) there is no black area on the mesinfraepisternum; c) the metepisternal black stripe is reduced to a line and does not reach the metinfraepisternum.

Venation. Postnodals in FW 10 (16.5%), 11 (66.6%); 12 (16.5%); in HW 8 (33.3%), 9 (50%), 10 (16.6%). R3 in FW originating at the level of the 4<sup>th</sup> (100%) postnodal; in HW at the level of 3<sup>rd</sup> (100%). IR2 in FW originating at the level of the 6<sup>th</sup> (33.3%) or 7<sup>th</sup> (66.7%) postnodal; in HW at the level of the 5<sup>th</sup> (33.3%) or 6<sup>th</sup> (66.7%) postnodal. CUP in FW ending within a cell beyond the crossvein descending from the subnodus (20%) or at this crossvein (80%). In HW CUP ending at the crossveins from the first postnodal (70%) or within a cell beyond it

(30%). First postnodal descending crossvein forked at its posterior end to enclose a marginal four-sided cell in FW (19%) in HW (45%). Arculus in FW distinctly distal (16.5%) or slightly distal (84.4%) to the second antenodal; in HW coinciding (80%) or distinctly distal to the 2<sup>nd</sup> antenodal (20%).

Abdomen. Orange red throughout with a narrow, scarcely discernible brownish ring at the transverse carinae. Segments 1-2 with a brownish lateral stripe. Distal part of segment 7 with a rounded dark brown spot. Proximal and distal parts of 8-9 and posterior part of 10 dark brown. Superior appendages brown. Inferior appendage yellowish brown.

Structural characters. Posterior lobe of prothorax with the hind margin smoothly rounded. Superior appendages about as long as segment 10, dorsal branch in lateral view (Fig. 6) twice as long as the ventral one,



Figs. 6-9. *Neoneura leonardo* sp. nov., holotype ♂. Anal appendages: 6, lateral; 7, dorsal; 8, oblique posterior; 9, oblique ventral views. In Fig. 8 the left appendage was slightly displaced laterally.



provided with an apical tooth; in dorsal view (Fig. 7) broad on the basal half, narrowing to the apex, inner border with two teeth. Ventral branch triangular, with the tip produced in an upturned tooth (Fig. 6). The medial surface of the dorsal branch shows a decumbent process shaped as a slightly curved toothless shelf, extending from the base to the apex (Figs. 6, 8, 9). Inferior appendage conical (Fig. 6) slightly smaller than the superior one.

Measurements (mm). Abdomen 26.4-28.4 (mean 27.4); superior appendages 5.7; inferior appendages 4.1; hindwings 16.6-18.2 (mean 17.6); pterostigma 0.7.

Type material. Holotype ♂, and 2♂ paratypes, BRAZIL, **Rio Grande do Sul**: Erechim 5.I.1958, K. Lenko col. Paratypes, 3♂, BRAZIL, **Santa Catarina**: Nova Teutonia (27°11'S, 52°23'W), 24.XII.1942, XII.1967, Fritz Plaumann col. Holotype and one paratype from Erechim deposited in collection A. B. M. Machado, Belo Horizonte. One paratype from Erechim deposited in the entomological collection on the Department of Zoology, UFMG, Belo Horizonte. The 3♂ paratypes from Santa Catarina deposited in C. H. Kennedy collection at the Museum of Zoology, University of Michigan, Ann Arbor (MZUM).

Etymology. This species is dedicated to my grandson Leonardo Machado Haertel.

## DISCUSSION

The two species of *Neoneura* herein described are unique in the genus and have characters that allow their easy identification. In *N. leonardo* the decumbent process of the superior appendages is shaped as a toothless shelf, occupying the whole extension of the medial part of the appendage from the apex to the base. This contrasts with the other *Neoneura* in which the decumbent process has a tooth and is variously shaped, but never as a shelf. In *N. anaclara* the dorsal and ventral branches of the superior appendages are directed posteriorly and fit together at the apex with only a narrow cleft separating them. This is in marked contrast to the appendages of the other *Neoneura* species in which the ventral branch either lacks completely, as in *N. schreiber* Machado, 1975 or is widely separated from the dorsal one. Another unique character of *N. anaclara* is the absence of a decumbent process as described by GARRISON (1999) and MACHADO (2002). It is possible that the fitting together between the ventrally directed tooth of the dorsal branch and the dorsally directed tooth of the ventral branch might improve the mechanical stability of the superior appendage, simplified by the lack of a decumbent process. This would enhance the efficiency of the appendage in grasping the thorax of the female during the tandem position for mating and guarding the female during oviposition. Examples in which the superior and inferior appendages fit to each other are known for many Zygoptera and Anisoptera. As far as I know, however, no such example exists between the dorsal and ventral branches of the same appendage, as now described for *N. anaclara*. Another unique character of *N. anaclara* seems to be the smoky area at the apex of the hindwing although it is difficult to know whether this character will be constant or not. Based on the structure of the male superior appendages, GARRISON (1999)

recognized three species groups of *Neoneura*: the *fulvicollis*, the *rubriventris*, and the *maria* group. *Neoneura anaclara* and *N. leonardo* do not belong to any of these groups and should be placed, together with six other species, into the category regarded by GARRISON (1999) as containing species whose affinities are unclear. With regards to the venation characters, in *N. anaclara* and *N. leonardo* the ending of CUP in HW at the crossveins descending from the 1<sup>st</sup> postnodal or within a cell beyond it is also an unique character among the *Neoneura* only similar to that of *N. jurzitzai* Garrison, 1999 where CUP ends at the cell beyond the crossvein descending from the 2<sup>nd</sup> postnodal. The fact that in *N. leonardo* 19% (FW) and 45% (HW) of the studied wings CUP is forked at its termination enclosing a four sided cell shows that this character is quite variable and not specific of *N. waltheri* Selys, 1880 as stated by SELYS-LONGCHAMPS (1886) and WILLIAMSON (1917). Indeed it seems to be a taxonomically unimportant character as shown by JURZITZA (1981) for *N. waltheri* and now for *N. leonardo*.

Both *N. anaclara* and *N. leonardo* were collected in Southern Brazil in the States of Paraná (*N. anaclara*), Santa Catarina and Rio Grande do Sul (*N. leonardo*). *Neoneura anaclara* is the first species of *Neoneura* recorded for Paraná and *N. leonardo* the second from Rio Grande do Sul, the first one being *N. ethela* Williamson, 1917, collected by H. von Ihering. With the addition of these two species the number of *Neoneura* species recorded from Southern Brazil is 4 contrasting, for instance, with the Amazonian States of Northern Brazil, that have 13 species. Further studies might reveal whether the poor representation of *Neoneura* in Southern Brazil is due to a low collection effort, to a poor *Neoneura* fauna or both. There is no information about the habitat of *N. anaclara* and *N. leonardo* but as virtually all *Neoneura* species are lotic it is likely that these two species inhabit rivers. Since the two localities where the specimens of *N. leonardo* were collected (Nova Teotonia and Erechim) are in the basin of the Uruguay river it is probable that they have been collected on this river or its tributaries. The females of *N. anaclara* and *N. leonardo* remain unknown. The finding of the females of these two species, especially that of *N. anaclara* would be interesting in order to verify whether the unique structure of the male anal appendages in these species would have a counterpart in the posterior prothoracic lobe and mesostigmal complex of the female.

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