

**THE GENUS *NEONEURA*, WITH KEYS AND DESCRIPTION
OF A NEW SPECIES, *NEONEURA JURZITZAI* SPEC. NOV.
(ZYGOPTERA: PROTONEURIDAE)**

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A synopsis of all 23 spp. includes keys to both sexes, based primarily on caudal appendage morphology in males and morphology of the hind lobe of the prothorax in females, diagnoses, distributional notes and diagnostic illustrations. *N. jurzitzai* sp.n. (holotype ♂: Brazil, Santa Catarina state, Nova Teutonia, 5-XI-1942, in UMMZ) is described, and the ♂ and ♀ of *N. rufithorax* Selys are described based on specimens from Peru.

INTRODUCTION

The genus *Neoneura* was first proposed by SELYS (1860) to include two new species, *N. rubriventris* and *N. bilinearis*. Later, SELYS (1886) expanded the genus to include eight species, of which four were new. CALVERT (1903, 1907) described three species (*N. aaroni*, *N. amelia*, and *N. paya*) from southern Texas, Mexico, and Central America. WILLIAMSON (1917), in his seminal revision monographed all known species, described six new species, and included diagnostic illustrations of all known species. It is the only paper which attempted to key all species. Besides the illustrations, the work is valuable for Williamson's attempt to determine the identity of some of the poorly known Selysian species. Although Williamson keyed the males for all species, he did not have material of *N. rufithorax* Selys or *N. waltheri* Selys. At about the same time, KENNEDY (1917) illustrated the penes of all known species. Since Williamson, a few isolated descriptions of species have been added (RÁCENIS, 1953, 1955; MACHADO, 1975; and DE MARMELS, 1989).

I describe a new species, *N. jurzitzai*, and provide illustrations of the caudal appendages for all species known to me. I have not been able to see specimens of *N.*

schreiberi Machado, but have included it in the keys based on illustrations modified from his paper. I also provide illustrations and descriptions of both sexes of what I believe are *N. rufithorax*, based on Selys' original description and proximity to the type locality as well as examination of material in the FSCA determined as this species by Dr. A.B.M. Machado in 1989.

Although specimens of *Neoneura* may be commonly encountered, and their beautiful body coloration has been noted in the previous literature, the complex morphology of the male cerci, coupled with their speciose nature, have not allowed for keys based on morphology. Williamson provided a general description of the male cerci and emphasized the importance of their components. Under certain species accounts, Williamson provided diagnoses based on the morphology of the cercus when viewed in oblique posterior view. Unfortunately, the illustrations provided by Williamson, which were executed by Kennedy, were diagrammatic and presented mostly the lateral and dorsal views. Because of the complex structure of the cerci, it is difficult to reconcile those descriptions without the aid of illustrations in oblique posterior view. In this paper, I have tried to rectify that problem by providing such illustrations.

Familiarization with the structures of the male cercus is necessary in order to identify material using the keys. The cercus is divided into a dorsal and ventral branch (Fig. 2c), the shape of which varies interspecifically. The ventral branch is visible in lateral view, but is largely hidden by a large decumbent tooth (Fig. 2b). The tooth is of paramount importance in determining species. Viewed posteriorly, it often originates along the dorsodistal margin and runs diagonally toward the ventromedial margin. In some species (*N. joana* Williamson, *N. bilinearis* Selys, *N. rufithorax*, *N. desana* Machado, and *N. waltheri*), the tooth is present but small. In those species possessing a large tooth, its shape varies from a large inverted triangle to a narrow, fingerlike structure. Its placement along the ventral margin of the dorsal branch of the cercus is important. In some species, the tooth occupies the basal half or more of the margin (Fig. 17a) and is often recessed, not visible when the appendages are viewed laterally. In other species, the tooth occupies the distal-most margin of that area (Fig. 18a). The tooth may be so broad and shallow that it forms an extension of the ventral margin. In those species, the distal margin of the upper branch of the cercus is broadly truncate.

Although the cerci in *Neoneura* are structurally complex, I believe that most species fall within three groups. The *N. fulvicollis* group, containing *N. cristina* Rácenis, *N. fulvicollis* Selys, and *N. gaida* Rácenis, has the large, decumbent tooth of the cercus perpendicular to the transverse axis, when viewed posteriorly. All three species occur in South America. Most other species possess a decumbent tooth whose ventral tip extends medioventrally when viewed posteriorly. The *N. rubriventris* group possesses a large tooth located along the basal margin of the upper branch of the cercus when viewed in oblique posterior view. This group contains *N. ethela* Williamson, *N. jurzitzi*, *N. mariana* Williamson, *N. myrthea*

Williamson, *N. rubriventris* Selys, *N. sylvatica* Hagen in Selys, and *N. schreiberi*. The group is entirely South American. The third group, the *N. maria* group, possesses a large tooth or lobe located along the distal margin of the upper branch of the cercus, when viewed in oblique posterior view. This group contains *N. aaroni* Calvert, *N. amelia* Calvert, *N. carnatica* Selys, *N. esthera* Williamson, *N. maria* (Scudder), and *N. paya* Calvert. Its members occur in Middle America and Cuba, with *N. esthera* extending to Colombia, Venezuela, and Trinidad. The remaining species include those whose affinities are unclear.

Damselflies of the genus *Neoneura* often hover just above the water over various streams and pools. Much on the habits of certain species was enumerated by WILLIAMSON (1917). Adults are often difficult to collect. I have had experience with *N. aaroni*, *N. amelia*, *N. gaida*, *N. paya*, and *N. sylvatica*. In Mexico, for example, solitary males of *N. amelia* and *N. paya* could only be collected by pancaking the net resulting in submerging the net and specimen.

METHODS

The keys which follow are based primarily on the morphology of the male cerci and the female prothoracic lobe. Williamson's key relied entirely on body coloration and maculation, but he warned that care needed to be exercised, because ontogenetic variation might yield erroneous identifications. His paper should be consulted to confirm species identification based on body coloration. As with my paper on *Argia* (GARRISON, 1994), I have separated the keys into subordinate keys, so that new species may be added with little difficulty. The subordinate keys are not meant to imply natural (phylogenetic) groupings. The illustrations of the structures in this paper were made using a Wild M-8 microscope equipped with a camera lucida. The wings of a paratype of *N. jurzitzi* were prepared as follows: The right pair of wings was removed and placed in a 24 × 36 mm temporary glass slide mount. The slide mount was computer scanned to a digital image using a Hewlett Packard *PhotoSmart*[®] slide scanner at 2400 dpi. The resulting file was converted from color to grayscale, then converted to a high contrast black and white image using "threshold" filter in *Micrographx Picture Publisher 8[®]*.

In the following keys and species accounts, FW = fore wing, HW = hind wing, and Abd = abdomen. I give diagnoses, followed by brief notes on type depositions and distributions. Full descriptions are given only for *N. jurzitzi* and *N. rufithorax*.

The following acronyms are used throughout the paper:

- AM Angelo B.M. Machado, Minas Gerais, Brazil
- ANS Academy of Natural Sciences, Philadelphia
- BMNH British Museum (Natural History), London
- DRP Dennis R. Paulson, Seattle
- FSCA Florida State Collection of Arthropods, Gainesville
- IRSN Institut Royal des Sciences Naturelles, Brussels
- MIZA Museo del Instituto de Zoología Agrícola, Universidad Central de Venezuela, Maracay
- MCZ Museum of Comparative Zoology, Cambridge
- NRS Naturhistoriska Riksmuseet, Stockholm
- KJT Kenneth J. Tennessen, Florence, Alabama
- OSU Ohio State University, Columbus
- RWG Rosser W. Garrison, Azusa, California
- UMMZ Museum of Zoology, University of Michigan, Ann Arbor
- USNM National Museum of Natural History, Smithsonian Institution, Washington, D.C.

KEY TO MALES OF *NEONEURA*

Proper viewing exposure of the caudal appendages is necessary for character discrimination. This key should be used in conjunction with WILLIAMSON's (1917) figures for body patterns and additional descriptions of many species not elaborated upon here. For most species, it will be necessary to relax the caudal appendages and gently separate the cerci from the paraprocts. A brief description of the process is in GARRISON (1994).

- 1 Cercus in lateral view twice as long as paraproct (Fig. 5b) Key M-1
- 1' Cercus in lateral view shorter than or subequal to paraproct (Fig. 1b) 2
- 2(1') Paraproct about 1.5 times longer than cercus (Fig. 1b); Guianas, northern Brazil *joana*
- 2' Paraproct subequal (Fig. 2b) or (*N. bilinearis*, Fig. 4b) slightly longer than cercus 3
- 3(2') Largely dark species, HW 23-24 mm, Cu₁ ending three cells beyond level of nodus (Fig. 48); abd 33 mm or longer, abd black, cercus as in Fig. 2; Santa Catarina State, Brazil *jurútzai*
- 3' Smaller species, HW less than 21 mm, Cu₁ ending within a cell beyond level of nodus, abd less than 30 mm, abd entirely pale or marked with black (entirely dark in *N. aaroni*) 4
- 4(3') Small decumbent tooth on ventral margin of upper branch of cercus in oblique posterior view small (Figs 3a, 4a) 5
- 4' Decumbent tooth of cercus well-defined in oblique posterior view, forming a long, narrow or obtuse tooth or a broad lobe at basal or apical part of cercus (Figs 5a, 17a, 18a) 6
- 5(4) Epicranium entirely pale, thorax largely pale, light brown with remnants of dark spots along lateral and obsolete second lateral sutures (Fig. 51); upper branch of cercus with one small ventral tooth, tip of upper branch long, acute (Fig. 3); northern Brazil, Madre de Dios Province, Peru *rufithorax*
- 5' Epicranium and thorax with definite dark markings; upper branch of cercus with two small ventral teeth, tip of upper branch short, bluntly rounded (Fig. 4a); widespread, Guianas to southern Brazil, Bolivia, and northern Argentina *bilinearis*
- 6(4') Decumbent tooth or lobe on ventral margin of upper branch of cercus *basal*, distinctly not forming a part of the distal margin of the upper branch of cercus; this prominent appendage may be in the form of a broadly decumbent, inverted triangle (Fig. 15a), or a narrow, parallel-sided tooth (Fig. 17a); species from South America Key M-2
- 6' Decumbent tooth or lobe apical, becoming the distoventral part of the upper branch of cercus, and causing the distal margin to be broadly spatulate (Fig. 18a), or concavely truncate (Fig. 23a); species from Middle America, Cuba, and with one species, *N. esthera*, from Colombia, Venezuela, and Trinidad Key M-3

KEY M-1 (CERCUS TWO TIMES LONGER THAN PARAPROCT)

- 1 Cercus in lateral view with upper branch 0.25 or less the length of ventral branch (Fig. 5b) . 2
- 1' Cercus in lateral view with upper branch twice or more the length of ventral branch (Fig. 8b) 3
- 2(1) Medial margins of cerci in posterior view approximate, decumbent ventromedial arms of cerci nearly straight or slightly diverging (Fig. 5c); Venezuela *cristina*
- 2' Medial margins of cerci in posterior view separated by width of epiproct, decumbent ventromedial arms of cerci converging, their tips curving toward and almost touching medial margin of external branch of cercus (Fig. 6c, e); Venezuela, northern Brazil *gaida*
- 3(1') Cercus in lateral view with lower branch poorly developed, upper branch about four times as long as lower branch (Figs 7b, 8b) 4

- 3' Cercus in lateral view with lower branch well developed, upper branch about two times as long as lower branch (Figs 9b, 10b) 5
- 4(3) Body blue, cercus in lateral view angled ventrally at middle (Fig. 7b), no preapical tooth on medial margin of cercus (Fig. 7a), tip of ventral branch of cercus in posterior and oblique posterior views with two small teeth (Figs 7b, c); southern Brazil, northern Argentina *waltheri*
- 4' Body red, cercus linear (Fig. 8a), preapical tooth on medial margin of cercus (Fig. 8a), tip of ventral branch of cercus in posterior and oblique posterior views with one small tooth (Figs 8b, c); Venezuela; Pará State, Brazil; Peru *desana*
- 5(3') Lower branch of cercus in oblique posterior view long, about three times as long as wide; anteapical tooth on medial margin of cercus present (Fig. 9a); Venezuela, northern Brazil *luzmarina*
- 5' Lower branch of cercus in oblique posterior view short, blunt, about as long as wide; anteapical tooth on medial margin of cercus absent or present (Fig. 10a); Venezuela, Peru, northern and central Brazil *denticulata*

KEY M-2 (DECUMBENT TOOTH OF CERCUS BASAL)

- 1 In posterior view, decumbent tooth of upper branch of cercus vertical, with medial margins approximate (Fig. 11c); Venezuela, southern Brazil, northern Argentina *fulvicollis*
- 1' In posterior view, decumbent tooth of upper branch of cercus diagonal, with upper ends divergent from one another (Figs 12c, 13c) 2
- 2(1') In oblique posterior view, apical 0.30 of upper branch of cercus with a vertical carina (Figs 12a, 13a) 3
- 2' Apical 0.30 of upper branch of cercus without vertical ridge; this area concave or flat (Fig. 15a) 4
- 3(2) Smaller species, abd 25-27.5 mm; head, thorax, abdominal segments 1, 2, and part of 3 sky blue, remainder of abd red; dorsal markings of thorax reduced to irregular areas along middorsal carina (appendages as in Fig. 12); Venezuela, southern Brazil, Bolivia, northern Argentina *sylvatica*
- 3' Larger species, abd 26-29.5 mm; thorax slate gray to fulvous, abd entirely red; dorsal markings of thorax extensive, solid or in the form of coalescing cross-bars occupying 0.50 or more of mesepisternum; (appendages as in Fig. 13); Rio Grande do Sol, Brazil; Bolivia, Paraguay *ethela*
- 4(2') Tip of paraproct truncate (Fig. 14b); Territory of Amapa, Brazil *schreiberi*
- 4' Tip of paraproct acute (Fig. 15b) 5
- 5(4') Decumbent tooth of superior branch of cercus forming a broad-based ventrally directed inverted triangle (Fig. 15a); Guianas, Venezuela, Ecuador, Peru, Brazil (Pará) *rubriventris*
- 5' Decumbent tooth of superior branch of cercus forming a ventroposteriorly directed lobe or a ventrally directed digit-like process (Fig. 17a) 6
- 6(5') Abd about 30 mm, decumbent tooth of cercus forming a ventroposteriorly directed lobe (Fig. 16a); Guianas, Venezuela *mariana*
- 6' Abd about 24 mm, decumbent tooth of superior branch of cercus forming a ventrally directed digit-like process (Fig. 17a); Colombia, Venezuela, Guianas *myrthea*

KEY M-3 (DECUMBENT TOOTH OF CERCUS APICAL)

- 1 Decumbent tooth of upper branch of cercus when viewed in oblique posterior view prominent, forming an inverted blunt triangle that is clearly differentiated from basal part of cercus (Figs 18a, 20a) 2
- 1' Decumbent tooth of upper branch of cercus when viewed in oblique posterior view broad at

- base and not clearly differentiated from ventral margin of cercus (Figs 21a, 22a) 4
- 2(1) Lower branch of cercus in lateral view narrower than upper branch (Fig. 18b); dorsoapical tip of cercus when viewed in oblique posterior view not developed (Fig. 18a); pale body color yellow; Mexico, Central America *paya*
- 2' Lower branch of cercus in lateral view as thick as or thicker than upper branch (Figs 19b, 20b); dorsoapical tip of cercus when viewed in oblique posterior view developed into a broadly truncate point (Figs 19a, 20a); pale body color red 3
- 3(2') Abd segments 4-10 black; paraproct in lateral view pointed (Fig. 19b); northern Mexico south to Costa Rica *amelia*
- 3 Abd segments 4-10 red; paraproct in lateral view rounded (Fig. 20b); Costa Rica, Panama, Colombia, Trinidad, Venezuela *esthera*
- 4(1') Species from Mexico and Central America; appendages as in Fig. 21 *aaroni*
- 4' Species from Cuba 5
- 5(4') Pale color of head and thorax blue; appendages as in Fig. 22 *maria*
- 5' Pale color of head and thorax orange; appendages as in Fig. 23 *carнатica*

KEY TO FEMALES OF *NEONEURA*

This key, modified from Williamson (1917), should be used with caution. For several species, I have seen only one or two specimens and my illustrations may not account for geographic variation. Two species are excluded from the key because their females are undescribed (*N. gaida*) or unknown (*N. jurzitzi*). I have not seen females of the following species: *N. joana*, *N. schreiberi*, and *N. waltheri*. The shape of the posterior lobe of the prothorax of these species has been gleaned from WILLIAMSON (1917), MACHADO (1989), and JURZITZA (1981).

- 1 Synthorax with medium dark color, dorsum largely black (WILLIAMSON 1917, fig. 12) or with extensive amounts of lateral cross bars (WILLIAMSON, 1917, fig. 9) Key F-1
- 1' Synthorax largely pale, with dark areas confined to a series of irregular spots or lines on either side of middorsal carina (WILLIAMSON, 1917, figs 18, 26, 29) Key F-2

KEY F-1 (SYNTHORAX WITH DORSUM LARGELY DARK)

- 1 Lateral lobes of prothorax well developed and divergent (Figs 24, 25) 2
- 1' Lateral lobes of prothorax inconspicuous, small (Fig. 27), or absent (Fig. 28) 3
- 2(1) Lateral lobes separated by a distance greater than their basal width; medial margin of pronotum broadly convex (Fig. 24); Colombia, Venezuela, Guianas *myrthea*
- 2' Lateral lobes separated by a distance less than their basal width; medial margin of pronotum evenly concave (Fig. 25); Venezuela, Peru, northern and central Brazil *denticulata*
- 3(1') Hind margin of pronotum forming three equal-sized, broadly rounded lobes (JURZITZA, 1981, fig. 5c); southern Brazil, northern Argentina *waltheri*
- 3' Medial margin of pronotum forming a small, broadly based triangle (Figs 26, 28) 4
- 4(3') Abd about 28 mm; posterodistal margin of pronotum broadly rounded (Fig. 26); Guianas, Venezuela *mariana*
- 4' Abd about 20-25 mm; posterodistal margin of pronotum truncately rounded (Fig. 28) or almost linear (Figs 27, 32) 5
- 5(4') Pointed medial lobe extending posteriorly past level of lateral lobes (Fig. 32); Venezuela; Pará State, Brazil; Peru *desana* (in part)
- 5' Pointed medial lobe recessed, not extending past level of lateral lobes (Figs 27, 28) 6

- 6(5') Lateral lobes small, pointed, restricted to midlateral portion of margin of pronotum (Fig. 27); Territory of Amapa, Brazil *schreiberi*
- 6' Lateral lobes inconspicuous, poorly developed, forming a broad transverse plate on either side of pointed medial lobe (Fig. 28); Venezuela, northern Brazil *luzmarina*

KEY F-2 (SYNTHORAX WITH DORSUM LARGELY PALE)

- 1 Medial lobe absent on prothorax (Figs 29, 30, 31) 2
- 1' Medial lobe present, although it may be in the form of a small, low, convex tubercle (Fig. 34, 35) 4
- 2(1) Lateral lobe two times as long as broad, its tip forming an acute point (Fig. 29); Venezuela *cristina*
- 2' Lateral lobe only as long as broad, or less (Figs 30, 31) 3
- 3(2') Lateral lobe broadly rounded; medial margin of pronotum a deeply recessed, U-shaped area (Fig. 30); Venezuela, southern Brazil, northern Argentina *fulvicollis*
- 3' Lateral lobe dorsally erect, forming a small, dorsally directed cone; its rear margin with a dorsally directed carina; back of pronotum visible, consisting of a pair of midlateral tubercles (Fig. 31); northern Brazil; Madre de Dios Province, Peru *rufithorax*
- 4(1') Medial lobe smaller than (Figs 33, 34, 35) or about the same size (Fig. 32) as lateral lobe .
..... 5
- 4' Medial lobe larger than lateral lobe (Figs 36, 37, 39, 42) 8
- 5(4) Medial lobe broadly triangular, about the same size as lateral lobe (Fig. 32); Venezuela; Pará State, Brazil; Peru *desana* (in part)
- 5' Medial lobe round, smaller than lateral lobe (Figs 33, 35) 6
- 6(5') Medial lobe erect, its anterior margin forming a round trough (Fig. 33); Guianas, Venezuela, Ecuador, Peru, Brazil (Pará) *rubriventris*
- 6' Medial lobe not erect, anteriorly forming a swollen tubercle (Figs 34, 35) 7
- 7(6') Abd 27-27.5 mm, thorax pale olive maize; Rio Grande do Sol, Brazil; Bolivia, Paraguay ..
..... *ethela*
- 7' Abd 23.5-26 mm, thorax pale, tinged with light blue; Venezuela, southern Brazil, Bolivia, northern Argentina *sylvatica*
- 8(4') Lateral lobe with a small supplementary pointed lobe (Fig. 36) 9
- 8' Lateral lobe with no supplementary pointed lobe 10
- 9(8) Tip of femora black (couplet from WILLIAMSON, 1917); prothorax as in fig. 76 (WILLIAMSON, 1917); Guianas, northern Brazil *joana*
- 9' Legs pale; prothorax as in Fig. 36; widespread, Guianas to southern Brazil, Bolivia, and northern Argentina *bilinearis*
- 10(8') Lateral lobe vestigial, forming a small tubercle (Fig. 37); Mexico and Central America
..... *aaroni*
- 10' Lateral lobe well developed, acute (Figs 38, 39, 40, 42) 11
- 11(10') Species from Texas, Middle America, and northern South America 12
- 11' Species from Cuba 14
- 12(11) Lateral lobe surpassing posterior margin of medial lobe (Fig. 38); in dorsolateral view, lateral lobe with sides not parallel (Fig. 43); Costa Rica, Panama, Colombia, Trinidad, Venezuela
..... *esthera*
- 12' Lateral lobe not surpassing posterior margin of medial lobe (Fig. 39); in dorsolateral view, lateral lobe with sides parallel (Figs 44, 45); species from northern Mexico south through Costa Rica 13
- 13(12') Lateral lobe in dorsolateral view spatulate, prominent (Fig. 44); northern Mexico south to Costa Rica *amelia*
- 13' Lateral lobe in dorsolateral view small, thumblike (Fig. 45); Mexico, Central America

- *paya*
 14(11') A broad black stripe running diagonally across the mesepimeron, confluent with the humeral stripe anteriorly and with the stripe of the interpleural suture posteriorly; pale color of dorsum of abd segment 2 orange (couplet from WESTFALL & MAY, 1996) *carnatica*
 14' This stripe represented only by one or two indistinct spots; pale color of dorsum of abd segment 2 blue *maria*

SPECIES ACCOUNTS

NEONEURA AARONI CALVERT

Figures 21, 37

Neoneura aaroni CALVERT, 1903: 139 (♂, ♀, figs)

DIAGNOSIS. — Next to *N. jurzitzi*, males of *N. aaroni* are the most melanic of the genus. The decumbent tooth, when viewed in oblique posterior view, forms a broad base and the ventral margin is shallow. The tooth is distal and appears to form part of the ventrodiscal margin of the superior branch of the cercus. The entire superior branch, therefore, when viewed in oblique posterior view, appears hatchet-shaped. The morphology of this structure appears almost identical to that of the two Cuban species, *N. carnatica* (Fig. 23) and *N. maria* (Fig. 42). This may indicate that *N. aaroni* is the sister taxon of the two Cuban species. Males of these three species are keyed by WILLIAMSON (1917) and WESTFALL & MAY (1996).

Females of these three species are treated by WILLIAMSON (1917) and WESTFALL & MAY (1996). In contrast with the close similarity in the caudal appendages of the males of the three species discussed above, the females of *N. aaroni* (Fig. 37) lack the well-developed lateral lobes, present in females of *N. maria* (Fig. 42) and *N. carnatica* (Fig. 41).

TYPES. — I have seen a pair of paratypes in MCZ; the holotype is probably in ANS.

DISTRIBUTION. — *Neoneura aaroni* is one of two species found in southern Texas. According to PAULSON (1997), there is a questionable record of its occurrence in Guatemala. It has thus far not been taken in Mexico.

REMARKS. — Detailed descriptions of this species are found in CALVERT (1903) and WESTFALL & MAY (1996). PAULSON (1999) provides an illustration of a male hovering over water.

NEONEURA AMELIA CALVERT

Figures 19, 39, 44

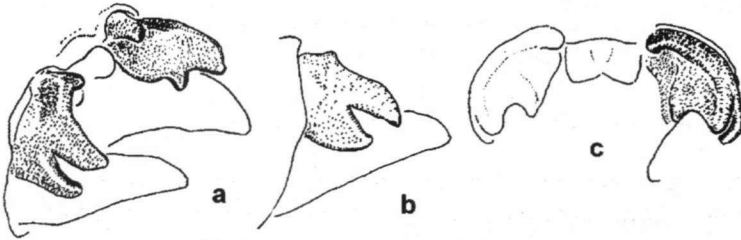
Neoneura amelia CALVERT, 1903: 138 (♂, ♀, figs)

DIAGNOSIS. — By morphology of the cerci, *N. amelia* appears to be the northern counterpart to *N. esthera*. Both species apparently occur in Costa Rica and Panama.

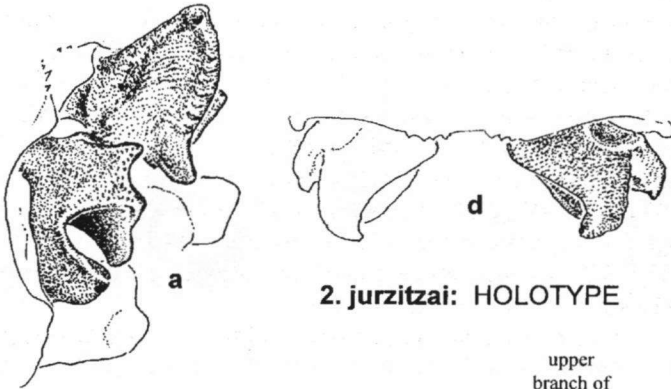
Despite the similarity in the male appendages, both species are easily distinguished by overall body coloration: the abd is largely black in *N. amelia*, and entirely red in *N. esthera*.

Note: For illustrations 1-23, **a** = oblique posterior view, **b** = lateral view; **c** = posterior view; **d** = dorsal view, unless otherwise stated

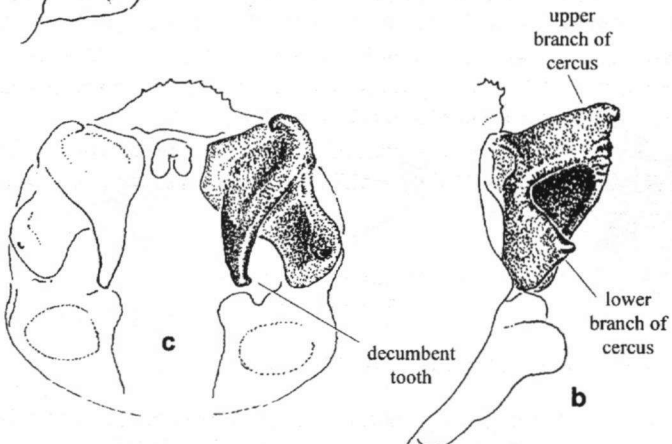
Scale for Figs. 1-47, 49 \longrightarrow 2 mm



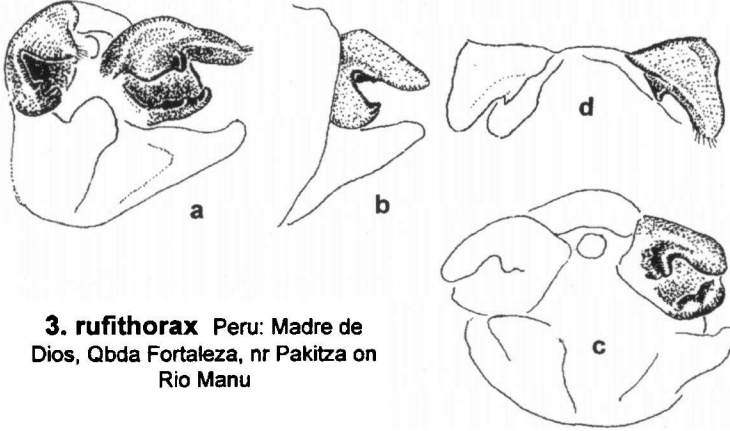
1. joana Brazil: Para, Rio Xingu Camp, ca 60 mi S of Altamira



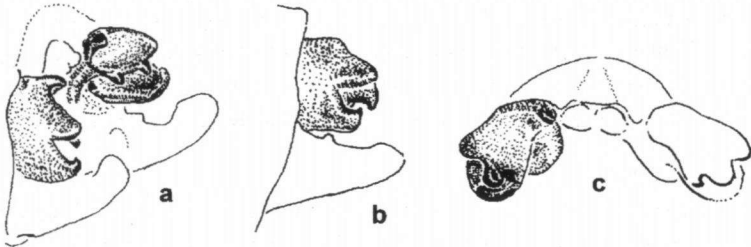
2. jurzitzi: HOLOTYPE



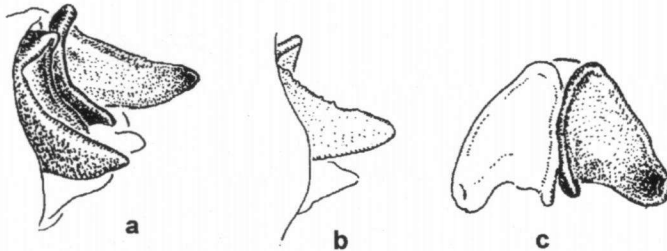
As is to be expected, the posterior lobe of the prothorax in females of these two species and *N. paya* is similar. The lateral lobes of *N. amelia* are well developed, but do not surpass the posterior margin of the medial lobe (Fig. 39); the lateral lobes of *N. esthera* do surpass the medial lobe. The shape of the lateral lobe of *N.*



3. rufithorax Peru: Madre de Dios, Qbda Fortaleza, nr Pakitza on Rio Manu



4. bilinearis Bolivia: Santa Cruz Dept, Rio Palometillas, E of Buena Vista



5. cristina Venezuela: T.F. Amazonas, Tower Rio Baria

amelia in dorsolateral view (Fig. 44) is spatulate; the same structure in *N. paya* is smaller and thumblike (Fig. 45). Further differences are given in key F-2.

TYPES. — The lectotype ♂ is in BMNH (KIMMINS, 1970).

DISTRIBUTION. — This species was recently found in southern Texas (NIKULA, 1998; PAULSON, 1998), and is also known from Mexico south through Panama.

REMARKS. — Detailed descriptions of this species are found in CALVERT (1903) and WESTFALL & MAY (1996).

NEONEURA BILINEARIS SELYS

Figures 4, 36

Neoneura bilinearis SELYS, 1860: 460 (32 reprint)

DIAGNOSIS. — Overall body markings bright yellow to greenish, with broad stripe of black on medial third or more of mesepisternum (fig. 3, WILLIAMSON, 1917), and bidentate condition of the ventral margin of the upper branch of cercus in oblique posterior view (Fig. 4a) easily distinguish this widespread species. *Neoneura bilinearis* and *N. joana* (Fig. 1b) are the only two species which possess two small teeth along the ventral margin of the superior branch of the cercus.

The lateral lobe of the posterior lobe of the prothorax in females is raised and possesses a small tooth (Fig. 36), a condition shared apparently only by *N. joana* (not seen). I have used the character given by WILLIAMSON (1917) to separate the two species. The similarity of the prothoracic structure and the bidentate condition of the male cercus (discussed above) suggest that these two species are related morphologically.

TYPES. — In IRSN.

DISTRIBUTION. — Confined to South America but widely distributed. It has been taken in the Guianas, Venezuela, Colombia, Peru, and as far south as Bolivia.

REMARKS. — WILLIAMSON (1917) provides a detailed description and illustrations of the thorax for both sexes.

NEONEURA CARNATICA HAGEN *in* SELYS

Figures 23, 41

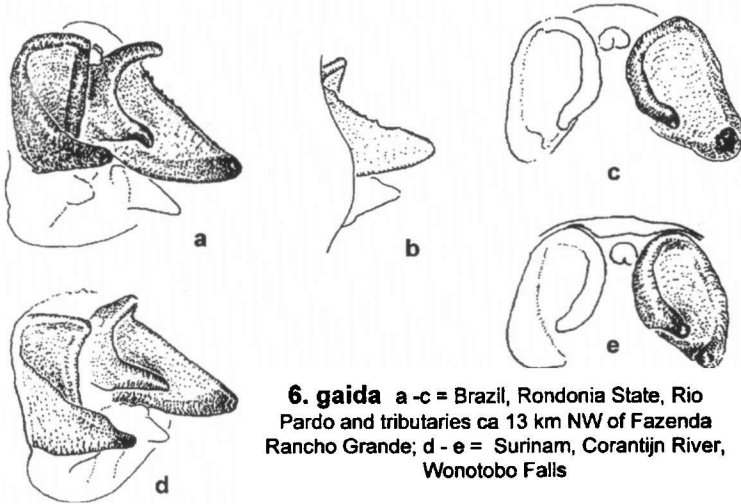
Neoneura carnatica Hagen *in* SELYS, 1886: 200 (♂, ♀)

DIAGNOSIS. — Differences between this species and *N. maria* are discussed at length by WILLIAMSON (1917), and are further elaborated by WESTFALL & MAY (1996). As can be seen from my illustrations of the cerci of both species, the morphology is essentially identical. WESTFALL & MAY (1996: 566) state, "Various workers have questioned whether the species are distinct, but their colors, orange in *N. carnatica*, blue in *N. maria*, are so strikingly different, and other differences in pattern so consistent, that the consensus favors their separate status; we agree."

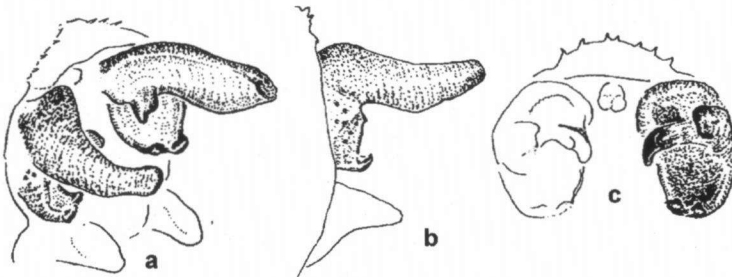
Females are keyed by WILLIAMSON (1917) and WESTFALL & MAY (1996). The hind lobe of this species (Fig. 41) is essentially the same as for *N. maria* (Fig. 42). I incorporate the diagnostic characters of WESTFALL & MAY (1996).

The similarity of *N. carnatica* to *N. aaroni* is discussed under that species.

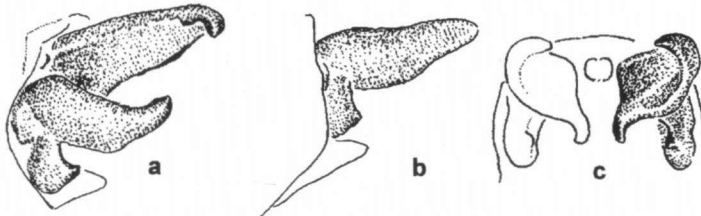
TYPES. — Probably in IRSN. This species was first mentioned by HAGEN (1867) without description as “on stream about Cardenas, April.” The first description is



6. gaida a - c = Brazil, Rondonia State, Rio Pardo and tributaries ca 13 km NW of Fazenda Rancho Grande; d - e = Surinam, Corantijn River, Wonotobo Falls



7. waltheri Argentina: Misiones Prov, Reserva Nac. Iguazu, Alto Iguazu bei Camping Nandu, Rio Palometillas, E of Buena Vista



8. desana Peru, Oriente Prov, Rio Igara Parana

by Hagen in SELYS (1886), where the deposition for material examined is "Coll. Selys, MacLachlan." KIMMINS (1970) does not list the types as in the BMNH.
DISTRIBUTION. — Endemic to Cuba.

NEONEURA CRISTINA RÁCENIS

Figures 5, 29

Neoneura cristina RÁCENIS, 1955: 49 (♂, ♀, figs)

DIAGNOSIS. — The male is easily distinguished from all other species by the long ventral branch of the cercus, which surpasses the paraproct (Fig. 5b). The female possesses long, pointed lateral lobes, which cover the mesostigmal plate, a unique character for the genus.

I have seen no females of the only other close relative, *N. gaida*, which is apparently unknown. Because of the similarity of male abdominal appendages between these two species, the female of this species will probably approximate that of *N. cristina*.

TYPES. — Holotype is in MIZA.

DISTRIBUTION. — Thus far known only from Venezuela.

NEONEURA DENTICULATA WILLIAMSON

Figures 10, 25

Neoneura denticulata WILLIAMSON, 1917: 227

?*N. pardalina* SJÖSTEDT, 1918: 24 (synonymized by FRASER, 1946: 43)

DIAGNOSIS. — Males of *N. denticulata* are most similar to the recently described *N. luzmarina*, and DE MARMELS (1989) differentiates the two. DE MARMELS (1989: 25) states that *N. denticulata* lacks the "postmedial internal denticle on the dorsal surface of the superior branch [of the cercus]". Six male *N. denticulata* that I collected in Brazil (Rondonia State: Rio Pardo and tributaries, ca. 13 km NW of Fazenda Rancho Grande, 62 km SW of Ariquemes 10°50'S, 63°07'W) agree with this characteristic. However, five males from Pará State (Rio Xingu Camp, ca. 60 km S of Altamira, 52°22'W, 3°39'S, Igarape) all possess such a small postmedial denticle.

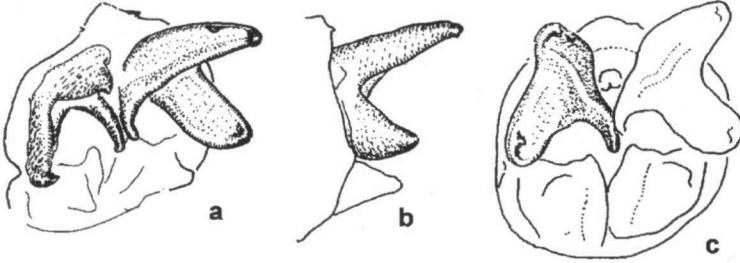
The female of *N. denticulata* was first described by FRASER (1946), who did not figure the posterior margin of the prothorax. My illustration is of one of three females, (two from Rio Pardo, one from Rio Xingu, Brazil) which were collected in tandem with males. The broadly expansive, diverging lateral lobes (Fig. 25) are unique. These structures in *N. luzmarina* (Fig. 28, paratype) are undeveloped. The median area of the hind lobe of the prothorax of *N. denticulata* is concave but there is a distinct, small, triangularly pointed medial lobe in *N. luzmarina*.

TYPES. — The holotype of *N. denticulata* is a teneral male in poor condition and

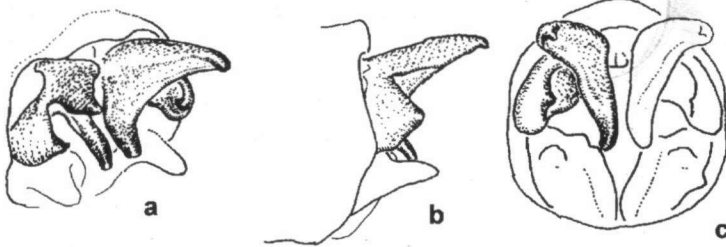
is in MCZ. The holotype of *N. pardalina* is in NRS.

DISTRIBUTION. — Venezuela, Ecuador, Peru, and Brazil.

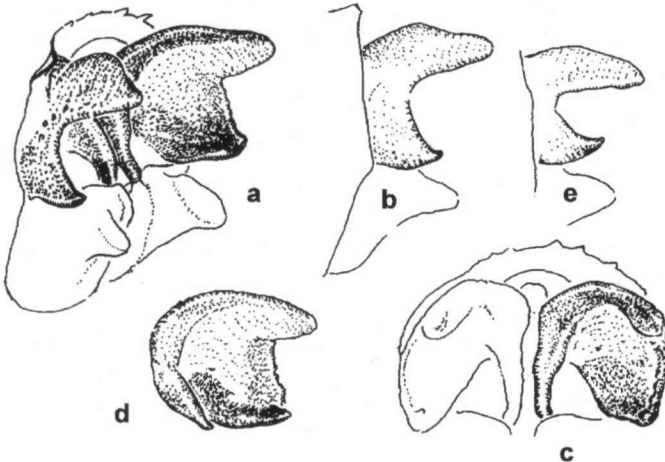
REMARKS. — *Neoneura pardalina* was described from an incomplete male lacking abdominal segments 8-10 from "Amazonas, Solimoens, zwischen Manaus und



9. luzmarina Brazil, State of Amazonas, Reserva Campinas, 60 km N of Manaus



10. denticulata Brazil, Rondonia State, Rio Pardo and tributaries ca 13 km NW of Fazenda Rancho Grande



11. fulvicollis a -c = Argentina: Misiones Prov, Reserva Nac. Iguazu, Apepu; d -e = Brazil, Sao Paulo State, Jocel dos Campos

Teffe". In his redescription of *N. denticulata* based on one male and three females, FRASER (1946) synonymized *N. pardalina*, stating that the "close similarity of the dark markings, especially the intricate pattern on the head, are similar to the present specimens [of *N. denticulata*] so that I have no doubts about the synonymy." The holotype of *N. pardalina* should be compared with the more recently described *N. luzmarina* to confirm Fraser's synonymy with *N. denticulata*. I have examined a paratype pair of *N. luzmarina* from Venezuela and specimens from Brazil (Pará State, Jacareacanga; Amazonas State; Reserva Campinas, 60 km N Manaus), and it is possible that *N. luzmarina* could be conspecific with *N. pardalina*.

NEONEURA DESANA MACHADO

Figures 8, 32

Neoneura desana MACHADO, 1989: 225 (♂, ♀, figs)

DIAGNOSIS. — Males of *N. desana* resemble *N. waltheri* in morphology of the cercus. Their differences are given in key M-1. Males of *N. desana* are red and black, while *N. waltheri* is a blue and black species. In females, the lateral lobes of the prothorax form a small point whose dorsal surface forms a medial trough (Fig. 32). The lateral lobes of *N. waltheri* (fig. 5c, JURZITZA, 1981) form a gently rounded lobe. The posterior margin of the prothorax of *N. desana* resembles that of *N. rufithorax* (Fig. 31). However, the small lateral lobes are strongly erect and possess a dorsal-ventral carina on the swollen posterior margin.

TYPES. — Holotype in AM.

DISTRIBUTION. — The type locality is near a small village near the Colombian border in Amazonas State, Brazil. I have examined a pair from Oriente Province (Rio Igara, Parana) in Peru, and DE MARMELS (1990) lists it from Venezuela.

NEONEURA ESTHERA WILLIAMSON

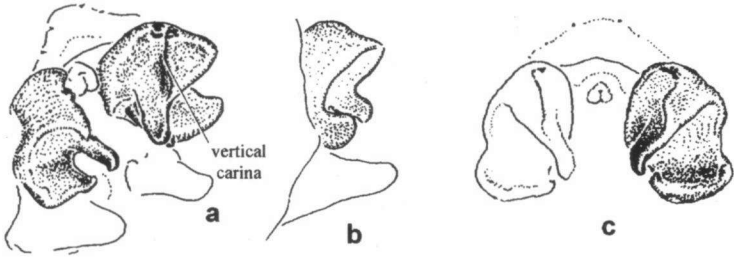
Figures 20, 38, 43

Neoneura esthera WILLIAMSON, 1917: 232 (♂, ♀, figs)

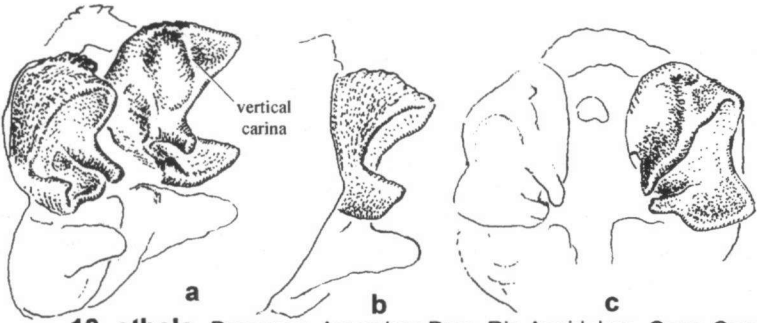
DIAGNOSIS. — Males and females of *N. esthera* are most similar to *N. amelia* and are diagnosed under that species.

TYPES. — Holotype in ANS.

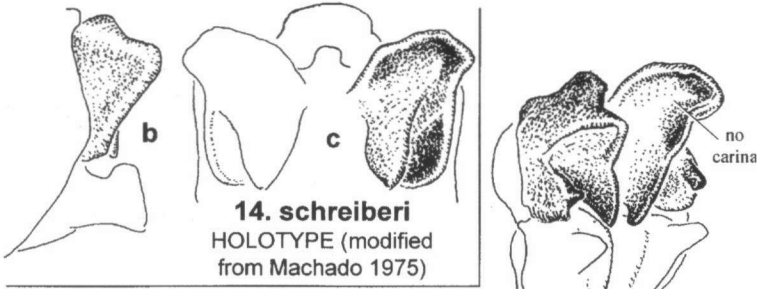
DISTRIBUTION. — This species occurs with *N. amelia* in Costa Rica and Panama, and has been collected with *N. amelia* in at least three localities in Costa Rica (WILLIAMSON, 1917). In South America, *N. esthera* occurs in Colombia, Venezuela, and Trinidad.



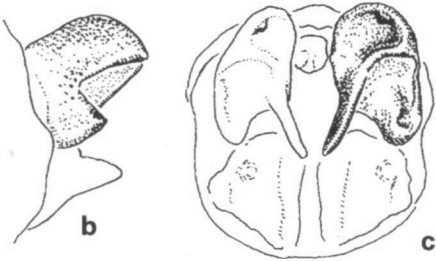
12. sylvatica Brazil, Rondonia State, Rio Pardo and tributaries ca 13 km NW of Fazenda Rancho Grande



13. ethela Paraguay, Amambay Prov, Rio Aquidaban, Cerro Cora



14. schreiberi
HOLOTYPE (modified from Machado 1975)



15. rubriventris
Venezuela, Edo. Bolivar, Rio Corumo, 11 km E of Tumeremo

NEONEURA ETHELA WILLIAMSON

Figures 13, 34

Neoneura rubriventris CALVERT, 1909: 212*Neoneura ethela* WILLIAMSON, 1917: 222 (♂, figs)

DIAGNOSIS. — Males of this species and *N. sylvatica* are the only members of the genus that have a transverse raised area across the apical 0.33 of the cercus in oblique posterior view (Figs 12a, 13a). WILLIAMSON (1917) was unable to find structural differences between both sexes of these species. After examining a small series of *N. ethela* from Paraguay (Amambay and Guaira Provinces) and Bolivia (Santa Cruz Dept.), neither have I. The specimens are generally larger (♂ HW 17-19 mm, abd 26-29.5 mm, N = 6; ♀ HW 19-19.5 mm, abd 27-27.5 mm, N = 2) than *N. sylvatica* (♂ HW 16.5-19 mm, abd 25-27.5 mm, N = 10; ♀ HW 17-18.5 mm, abd 23.5-26 mm, N = 3), but there is considerable overlap.

Except for the characters given by WILLIAMSON (1917), and those in the key, I have been unable to provide better discriminatory characters. However, the consistently different markings on the thorax for males (fig. 7, WILLIAMSON, 1917) and overall coloration (dull olive with red abd), compared with *N. sylvatica* (fig. 6, WILLIAMSON, 1917), which has body coloration and abd segment 1 to the first 0.5 of segment 3 blue, remainder of abd red, lead me to agree with Williamson that they are separate species.

TYPES. — Holotype male in ANS.

DISTRIBUTION. — The holotype is from Brazil (Rio Grande do Sul). Newly acquired material expands the range to Paraguay (Amambay Prov., Rio Aquidaban, Cerro Cora, 30-XI-1973, O.S. Flint, Jr leg., 2 ♂, 1 ♀; Guaira Prov., stream 3.9 km S of Villarrica on rd to Caazapa, 2-XII-1973, O.S. Flint, Jr leg., 3 ♂; in USNM and RWG; and Bolivia (Santa Cruz Dept., Ñuflo de Chavez Prov., pond 4.2 km E of San Ramon, 15-XI-1998, K.J. Tennessen leg., 1 ♂, 1 ♀, KJT).

REMARKS. — Most of the males are less heavily marked on the thorax than shown in WILLIAMSON's (1917) figure of the holotype. Most of the males have the medial black portion of the mesepisternum broken up into a series of intricate anastomosing crossbars.

Dr Ken Tennessen first recognized the Bolivian specimens he collected as *N. ethela*, and he very kindly allowed me to examine his material. From his specimens, I was able to associate the specimens from Paraguay as conspecific.

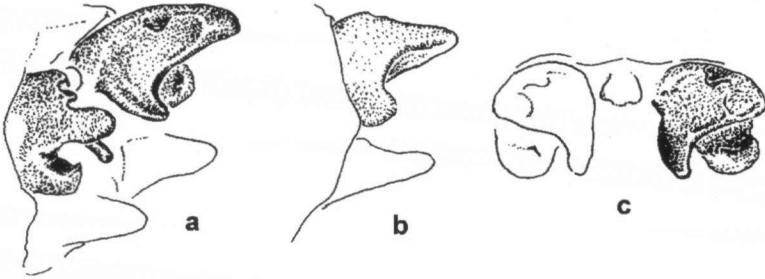
NEONEURA FULVICOLLIS SELYS

Figures 11, 30

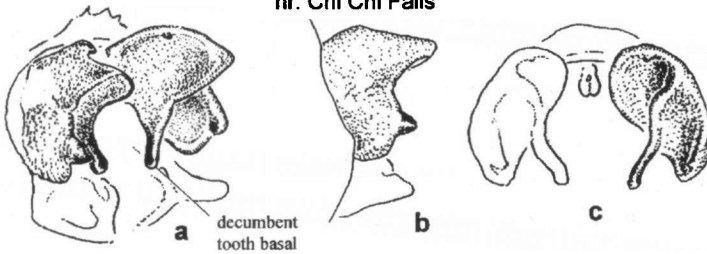
Neoneura fulvicollis SELYS, 1886: 202

DIAGNOSIS. — The appendage morphology of this species (Fig. 11) is unique,

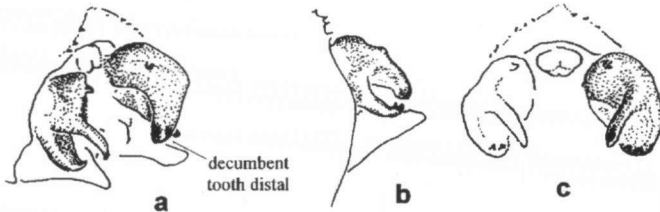
allowing for easy identification. The large, decumbent tooth on the cercus, when viewed posteriorly, is vertical (Fig. 11c), not diagonal as for most other species. Males of this species and *N. rufithorax* are the most lightly marked of the genus, but the morphology of the caudal appendages for each species is entirely different.



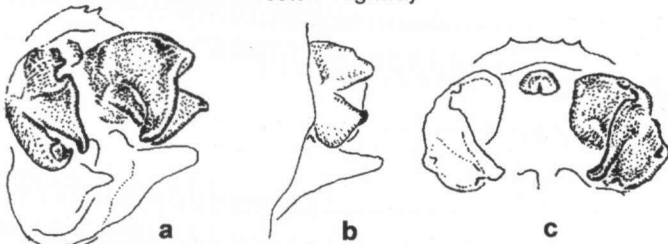
16. mariana Guyana: Kamarang Dist., vic. Imbaimadai, Mazaruni R. nr. Chi Chi Falls



17. myrthea Surinam: Para River (upper part)



18. paya Belize: Cayo District, Belmopan, Roaring Creek at Western Highway



19. amelia Mexico, Veracruz state, Rio Otapa, 8 km S La Tinaja

Females of *N. fulvicollis* are easily separated by the shape of the posterior lobe (Fig. 30). The lateral lobes are most similar to those of *N. denticulata* (Fig. 25). Like *N. denticulata*, the medial margin of the posterior lobe is convex, but *N. denticulata* lacks the small medial notch present in *N. fulvicollis*.

TYPES. — Syntype in IRSN.

DISTRIBUTION. — This species is known from Venezuela, Brazil, and Argentina.

REMARKS. — Through the kindness of Frederico Lencioni, I illustrate a male from São Paulo State, Brazil (Figs 11d, e). The branches of the cercus in lateral view are not as divergent as for material I illustrate from Argentina (Figs 11a, b).

NEONEURA GAIDA RÁCENIS

Figure 6

Neoneura gaida RACENIS, 1953: 155 (♂, fig.)

DIAGNOSIS. — This unusual species approaches *N. cristina* in appendage morphology, but is distinguished by characters given in the key.

The female of *N. gaida* has not been described.

TYPES. — Holotype in MIZA.

DISTRIBUTION. — Previously known only from Venezuela and Surinam. I collected a male in Brazil (Rondonia State, Rio Pardo and tributaries, about 13 km NW of Fazenda Rancho Grande, 62 km SW of Ariquemes, 10°50'S, 63°7'W, alt. 187 m, 5/10-XI-1989).

REMARKS. — The Brazilian male (Fig. 6c) has the tip of the decumbent tooth not externally directed as in a male illustrated from Venezuela (Fig. 6e). However, despite these differences, I consider the Brazilian male to represent *N. gaida*.

NEONEURA JOANA WILLIAMSON

Figure 1

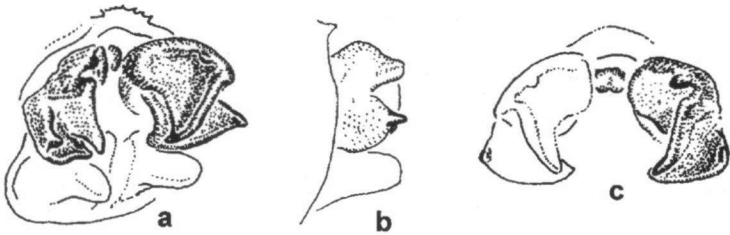
Neoneura joana WILLIAMSON, 1917: 215 (♂, ♀, figs)

DIAGNOSIS. — The shape of the male cercus (Fig. 1) is unique and allows for easy separation from all other members of the genus.

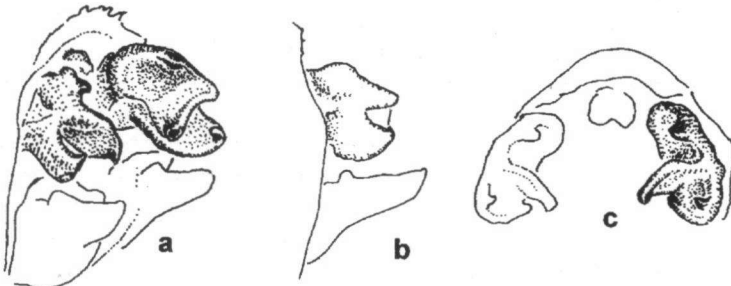
I have not seen a female and have relied on WILLIAMSON's (1917) couplet to identify members of this sex.

TYPES. — Holotype in UMMZ.

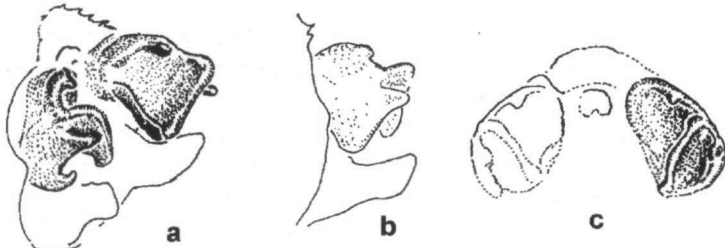
DISTRIBUTION. — This species occurs in the Guianas, Venezuela, and Amapá State, Brazil (MACHADO, 1975). I illustrate a male from Para State (Rio Xingu camp, about 60 km S of Altamira, 52°22'W, 3°39'S, 2-X-1986, P. Spangler and O.S. Flint, Jr leg., RWG). In this specimen, the upper and lower branches of the cercus (Fig. 1b) are not as divergent as those shown for the holotype (fig. 31, WILLIAMSON, 1917).



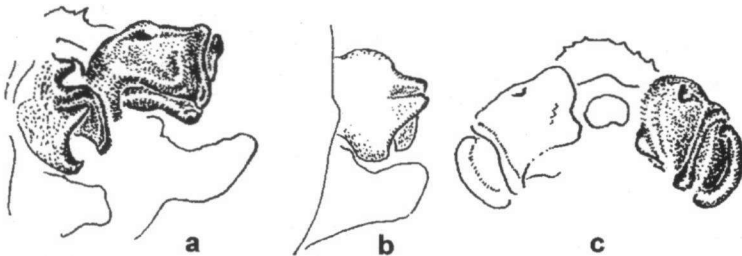
20. esthera Trinidad: St. George Co., Arima River at Churchill-Roosevelt Hwy, about 2.25 mi SSE of Arima



21. aaroni U.S.A.: Texas, Caldwell Co., San Marcos River at U.S. Hwy 90, W of Luling



22. maria Cuba: Las Villas Prov., stream 7 mi SE of Soledad



23. carnatica Cuba: Havana Prov., Mariano

NEONEURA JURZITZAI SP. NOV.

Figures 2, 46, 48-49

Material. — **Holotype** ♂: BRAZIL, Santa Catarina state, Nova Teutonia [27°11'S, 52°13'W, see CALVERT, 1956: 85], 5-XI-1942, Fritz Plaumann leg., in UMMZ; — **Paratypes** (2 ♂) same data as holotype, 1 ♂; same data as holotype but 6-XI-1942, 1 ♂.

Etymology. — This species is named for my friend, Prof. Dr Gerhard Jurzitza whose work on the biology and systematics of the Odonata of Europe and South America serves as an inspiration to us all.

MALE. — Labrum, distal 0.40 of mandible ivory, remainder of head dark coal gray, slightly paler along postocular area; postgena light gray with irregular dusting of pruinosity. Prothorax coal gray, slightly paler on medial portion of middle lobes, hind lobe gently curved, roundly truncate at side (left side of hind lobe damaged); synthorax (Fig. 49) entirely coal gray with vestiges of pruinosity on leg bases, mesepisternum with vestiges of a few pale transverse streaks, mesepimeron dull ivory brown with longitudinal coal gray stripe extending from wing base to lower 0.80 and roundly angled anteriorly meeting coal gray along first lateral suture; metepimeron with lower half dull ivory brown with a half length coal gray stripe occupying upper 0.60; poststernum dull ivory yellow brown, with darker wash of coal gray along lateral areas. Coxae, trochanters dull ivory yellow brown, coal gray on anterior surface of coxae, femora coal gray with dusting of pruinosity; tibiae black with exterior surfaces dull yellow but becoming black distally, armature black, pretarsi dull yellow brown.

Wings hyaline, venation black. Postnodals 12 and 11 on right and left FW, respectively, 9 and 8 on right and left HW, respectively; R_3 originating at fourth postnodal in FW, at third in HW.

Abdomen entirely dark coal gray becoming dull yellow brown along ventral margins of tergites, entire abd lightly dusted with pruinosity. Penis (Fig. 46) with well developed ventral lobe; tip of fourth segment flared in lateral and dorsal view. Cercus (Fig. 2b) shorter than segment 10, cercus broadly triangular in lateral view, upper branch longer and extending dorsodistally with a marked acute tip, ventral branch smaller, also armed with a blunt tooth; decumbent tooth on upper branch of cercus forming a broadly based triangle with ventrolateral 0.30 forming a smaller branched flat tooth when viewed in oblique posterior view (Fig. 2a); medial surface of decumbent tooth shallowly concave, marked with irregular transverse microstriations, margins strongly costate. Paraproct shorter than cercus, bluntly rounded in lateral view, the tip transversely truncate in posterior view (Fig. 2c).

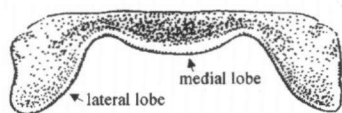
Measurements (mm): — HW 23, abd 34.

FEMALE. — Unknown.

REMARKS. — The two paratype males are similar to the holotype. One has faint indications of a pair of pale spots above epicranial suture lateral to lateral ocellus. The other male has the dark medial mesepimeral stripe incomplete above.

Measurements (mm). — HW 23-24, abd 34-35, postnodals, FW: 11-12, HW 9.

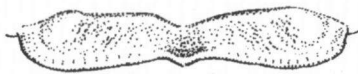
Neoneura jurzitzi, with a body length of about 44 mm, is the largest known species of the genus. Its large size, almost entirely coal gray coloration, and large, ear-like appearance of the cerci, easily distinguish this species from all others. The



24. myrthea Surinam:
Para River (upper part)



25. denticulata
Brazil, Rondonia State, Rio Pardo
and tributaries ca 13 km NW of
Fazenda Rancho Grande



26. mariana
French Guiana, Mana River,
Tamanoir

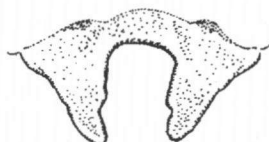


27. schreiberi
ALLOTYPE (modified
from Machado 1975)

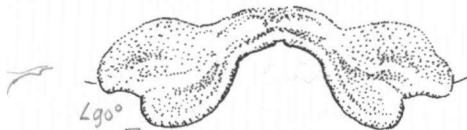
Figs. 24-42 = hind lobe of
prothorax of female



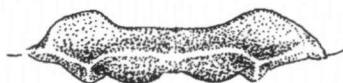
28. luzmarina
ALLOTYPE



29. cristina Venezuela:
T.F. Amazonas, Tower Rio
Baria



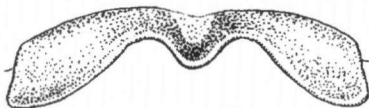
30. fulvicollis Argentina:
Misiones Prov, Reserva Nac. Iguazu,
Apepu



31. rufithorax Peru: Madre
de Dios, Qbda Fortaleza, nr
Pakitza on Rio Manu



32. desana Peru, Oriente Prov,
Rio Igara Parana



33. rubriventris Peru, Loreto
Prov, Explorama Lodge, 50 mi NE
Iquitos on Amazon River



34. ethela Bolivia: Santa Cruz
Dept., pond 4.2 mi E of San Ramon



35. sylvatica Brazil,
Rondonia State, Rio Pardo
and tributaries ca 13 km NW of
Fazenda Rancho Grande

light dusting of pruinosity, especially on the legs between wing bases and abd, is unique for the genus. Cu_1 extends 3 cell rows beyond the level of the subnodus (Fig. 48), compared with usually just one in other species.

NEONEURA LUZMARINA DE MARMELS

Figures 9, 28

Neoneura luzmarina DE MARMELS, 1989: 23 (♂, ♀, figs)

DIAGNOSIS. — The male of this species is most similar to *N. denticulata* and is diagnosed under that species. The shape of the female posterior lobe (Fig. 28) is unique and is not similar to that of the female of *N. denticulata* (Fig. 25).

TYPES. — Holotype in MIZA.

DISTRIBUTION. — Known from Venezuela and Brazil. I have examined material from Brazil (Para State, Jacareacanga, Nov. 1969, F.R. Barbosa leg., 2 ♂; Amazonas State, Reserva Campinas, 60 km N Manaus, 6-II-1979, O.S. Flint, Jr leg., 1 ♂, RWG), as well as a paratype pair kindly given to me by Lic. J. De Marmels.

REMARKS. — I discuss the possible relationship of Sjöstedt's *N. pardalina* with both *N. denticulata* and *N. luzmarina* under the species account for *N. denticulata*.

NEONEURA MARIA (SCUDDER)

Figures 22, 42

Agrion maria SCUDDER, 1866: 188

Neoneura palustris HAGEN, 1867: 98

DIAGNOSIS. — See under species accounts for *N. aaroni* and *N. carnatica*.

TYPES. — MUTTKOWSKI (1910) states that the type female is in "Coll. Scudder". I do not know the present location of the type.

DISTRIBUTION. — Endemic to Cuba.

REMARKS. — Full treatment of this species can be found in WESTFALL & MAY (1996).

NEONEURA MARIANA WILLIAMSON

Figures 16, 26

Neoneura mariana WILLIAMSON, 1917: 224 (♂, ♀, figs)

DIAGNOSIS. — Appendage morphology of this large species is unique. Its large size, dark coloration, and characters stated in the key will easily distinguish this species.

The unspecialized condition of the hind lobe of the prothorax (Fig. 26), coupled with its dark thoracic markings and large size, should allow for easy identification.

TYPES. — Holotype male in UMMZ.

DISTRIBUTION. — Guianas, Venezuela.

REMARKS. — WILLIAMSON (1917) provides a detailed description of both sexes and illustrations of the thoracic pattern.



36. bilinearis Bolivia: Santa Cruz Dept., Rio Palometillas, E of Buena Vista



37. aaroni U.S.A.: Texas, Caldwell Co., San Marcos River at U.S. Hwy 90, W of Luling



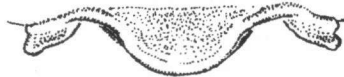
38. esthera Colombia: Magdalena Dept., Rio Frio



39. amelia Honduras: Francisco Morazan Dept., Zamorano, 30 km ESE Tegucigalpa



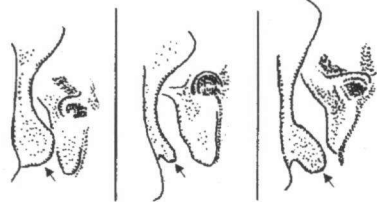
40. paya Mexico: Veracruz State, Rio Otapa, 8 km S of La Tinaja



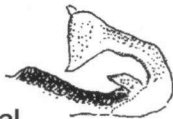
41. carnatica Cuba: Pinar Del Rio Prov., Pinar del Rio



42. maria Cuba: Las Villas Prov., stream 7 mi SE of Soledad



left lateral lobe of prothorax; dorsolateral view

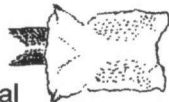


lateral

43. esthera
same as 38

44. amelia
same as 39

45. paya
same as 40



dorsal

46. jurzitzi HOLOTYPE
penis



47. rufithorax same data
as 3



NEONEURA MYRTHEA WILLIAMSON

Figures 17, 24

Neoneura myrthea WILLIAMSON, 1917: 228 (♂, ♀, figs)

DIAGNOSIS. — For males, the basal location and digit-like shape of the decumbent tooth (Fig. 17a) will separate this species from others.

The combination of the large, divergent lateral lobes and gently convex medial lobe of the hind margin of the prothorax will distinguish females.

TYPES. — Holotype male in UMMZ.

DISTRIBUTION. — Guianas, Venezuela.

REMARKS. — Detailed descriptions of both sexes, including illustrations of the thorax, are given in WILLIAMSON (1917).

NEONEURA PAYA CALVERT

Figures 18, 40, 45

Neoneura paya CALVERT, 1907: 393 (♂, figs)

DIAGNOSIS. — Males of this yellow species possess the smallest cerci in the genus. The decumbent tooth is apical, and is moderately broad (Fig. 18a). In lateral view, the superior and inferior branches of the cercus are approximately of equal thickness (Fig. 18b); no other species has such a narrow superior branch.

The posterior lobe of the prothorax in the female (Fig. 40) is similar to that of *N. amelia* (Fig. 39), but the lateral lobe is narrower at base, and is more divergent.

TYPES. — The holotype, according to CALVERT (1907: 394), is in OSU. There are three male paratypes in MCZ.

DISTRIBUTION. — Mexico, Guatemala, and Belize.

NEONEURA RUBRIVENTRIS SELYS

Figures 15, 33

Neoneura rubriventris SELYS, 1860: 459 (31 separate)

DIAGNOSIS. — The cercus (Fig. 15a) is most similar to that of *N. myrthea* (Fig. 17a), but the decumbent tooth forms a large, broad, inverted triangular tooth.

The laterally divergent lateral lobes (Fig. 33) are similar to those of *N. denticulata* (Fig. 25), but the medial lobe protrudes posteriorly into a round trough.

TYPES. — Holotype female in IRSN.

DISTRIBUTION. — Widely distributed from Venezuela, the Guianas, and south through Ecuador, Peru, and Brazil (Rondonia state).

REMARKS. — The identity of *N. rubriventris* was confirmed by WILLIAMSON (1917), who illustrated the cerci of Selys' type. WILLIAMSON (1917) provides an excellent description and illustrations of the thorax of the male of this species.

NEONEURA RUFITHORAX SELYS

Figures 3, 31, 47, 50-52

Neoneura rufithorax SELYS, 1886: 204

Neoneura rufithorax is known only from Selys' original description translated as follows:

"[MALE] Abdomen 24-26. Hind wing 15-16. Pterostigma yellowish-rust, kidney-shaped, covering one cell, 10 postcubitals in fore wings.

Size very small.

Head light red dorsally and ventrally, yellowish posteriorly with a blackish basal spot. Prothorax yellowish-rust, posterior lobe slightly rounded.

Thorax pale red, with a series of very small black spots next to the anterior of each side of the dorsal carina, and on the sides a small dark comma above the first suture at the stigma and at the medial suture.

Abdomen appearing pale bluish, but posterior end of segments pale yellowish, as well as the sides of the ventral suture. There is also a basal spot on the first, a ring at the articulations, a lateral dash on the second forming an angular 'U,' an oblique mark on each side of the dorsal edge of the 5th-6th, a lateral band on the dark 7th-9th, as well as the 10th; this last lightly emarginated.

Anal appendages shorter than the 10th segment. The thick superiors subconical, pointed at tip ventrally bearing a strong tooth or short submedial branch. The subcylindrical inferiors not as thick, almost equal to the superiors.

Legs yellowish; femora marked with a dark line, almost spot-like. Spines normally black; 4-5th [*sic*] on posterior tibiae.

[FEMALE] (Unknown.)

Locality: S. Paulo (upper Amazon). Selys collection.

The smallest known of the species; easy to distinguish from *bilinearis* by the absence of black on the head, prothorax and thorax, which are yellowish-rust."

WILLIAMSON (1917) was unable to provide figures of the caudal appendages of the type of this species, presumably because the appendages are missing. Specimens I examined from Peru and illustrated here compare well with the original description. Although I have not seen the type of *N. rufithorax*, I believe these specimens probably represent this species. I subsequently examined specimens in the FSCA identified as this species from Brazil (State of Amazonas, Rio Purus, Hyatanahan, and Arimã) by Dr A.B.M. Machado in 1989. A redescription of the species follows.

Material. — 10 ♂, 3 ♀; PERU: Madre de Dios Dept., Pakitza Reserved Zone, Quebrada Fortaleza, near Pakitza on Río Manu, 12°7' S, 70°58' W, 9-IX-1988, J. Louton leg., 1 ♂, 1 ♀ in copula; same data but Fortaleza Creek, IX-1988, Louis Reyes A. leg., 1 ♀; same data but Panagua, first stream on left upstream Manu River from Pakitza, 11°56' S, 71°18' W, 9-IX-1988, Nancy E. Adams leg., 4 ♂, 1 ♀; same data but confluence of Río Manu and R. Panagua, J. Louton leg., 5 ♂, USNM, RWG.

MALE. — Labrum, genae ivory, remainder of head maize (possibly light orange in life) except for narrow black diagonal hairline from compound eye and disappearing 0.50 distance to lateral ocellus, and obscure dark mark at lateral end of

occiput; rear of head pale with black around occipital foramen extending about 0.50 distance to eye. Prothorax orange maize with darker wash of brown along sulci; hind lobe of prothorax slightly rounded (Fig. 50); synthorax (Fig. 51) entirely orange maize, paler on sides, most specimens with irregular longitudinal indications of brown lateral to middorsal carina, irregular brown spot at upper and lower 0.10 of humeral suture, middle of obsolete second lateral suture, upper 0.10 of third lateral suture; legs maize, outer surfaces of femora washed with brown, armature black. Wings hyaline, basal venation maize, becoming darker distally, pterostigma brown. Ten postnodal crossveins in FW; 8 in HW, R3 originating at fourth postnodal in FW, at third in HW.

Abdomen: segment 1 pale olive-maize; segment 2 similar but tinged with wash of pale blue, an obscure dorsal brown half ring at posterior 0.30, an irregular lateral streak along basal 0.50 of segment, a black annulus at posterior end; segment 3 pale olive blue with obscure brown lateral streak near base, extending to distal 0.90 of segment, its posterior end enlarged with an extension basally, touching middorsal area, annulus black; segments 4-6 similar to segment 3 but brown areas darker and more extensive (Fig. 52); segment 7 with full lateral streak of black curving anteriorly at tip, connecting with opposite stripe; segment 8 with abbreviated lateral streak of black; segment 9 mostly black with vestiges of maize posteriorly; segment 10 pale with basal ring of black and with narrow middorsal line extending posteriorly to black apical ring.

Penis (Fig. 47) with well developed internal lobe; tip of fourth segment expanded into a laterally directed arm, its tip armed with an acuminate forwardly directed point.

Cerci (Fig. 3b) shorter than segment 10, upper branch twice as long as ventral branch in lateral view, upper branch linear, slightly declinate, forming an acute angle with smaller ventral branch. Tip of upper branch of cercus long, narrow, roundly pointed; decumbent tooth of mesal part of upper branch of cercus, in oblique posterior view, small (Fig. 3a), ventral branch of cercus armed with two small dorsally projecting teeth (Fig. 3c). Paraproct linear, digit-shaped, about as long as cercus.

FEMALE. — Similar to male with following differences: Head with ill-defined light brown transverse streak just anterior to posterior margin of head on either side of occiput, a medial brown spot on labrum; posterior lobe of prothorax (Fig. 31) with a pair of strongly elevated lateral, broadly based triangular lobes, medial margins of each lobe posteriorly with a carina extending from base to point of lobe; area between lateral lobes forming a V-shaped cleft as shown in Fig. 31. Abd with black less extensive; segment 1 with dark transverse half-ring dorsally, as in male, these markings similar on succeeding segments, except that they become separated medially, and on segments 3-5, the lateral end becomes flared with anteriorly directed points; on segment 6, lateral extension of spot reaching full length as a narrow subbasal streak; on segments 7-9, subbasal streak becoming thicker

anteriorly, but disappearing at basal 0.10 of each segment; segment 9 with large, irregularly formed dark spot; segment 10 pale with basal 0.10 of segment dark brown; typical black annuli present on segments 2-6, black at end of segments 7-8 limited to lateral articulation areas.

DISTRIBUTION. — Peru and Brazil.

REMARKS. — The series of 10 males and 3 females shows little variability. For males, HW length ranges from 16-18 mm, abdominal length 26-28 mm, postnodals FW 9-10, HW 7-8. One male has a full complement of subbasal streaks along abdominal segments 3-8, and another male lacks any dark markings along middorsal carina. Postnodal counts for females: FW 9-10, HW 8-9.

I have been unable to detect any significant difference from Selys' description of *N. rufithorax* with the series of specimens I include under this name. Selys' description of the cerci, though brief, tallies well with the specimens I illustrate here. Assuming the caudal appendages of the types to be missing, it may be possible to confirm the identity of this species with the type by an examination of the penis.

NEONEURA SCHREIBERI MACHADO

Figures 14, 27

Neoneura schreiberi MACHADO, 1975: 764 (♂, ♀, figs)

I have not seen examples of this species. It is thus far known only from two males and one female from the state of Amapá, northern Brazil. Frederico Lencioni kindly provided me with an English translation of Dr. Machado's original description, which I have slightly modified in format here.

“MALE: H e a d. — Labium yellow; labrum dark brown with the border yellow and a black central point; anteclypeus light brown; postclypeus black; lateral side of mandibles olive; antefrons, gena and post-gena yellow; epicranium black with metallic green reflections, with three small comma shaped yellow spots: one anterior to median ocellus; two in two small depressions located lateral to each lateral ocellus. Antennae brown.

T h o r a x. — Prothorax, mesepisternum, mesinfraepisternum, mesepimeron, dorsal carina and antearlar crest dark with metallic green reflections less evident along humeral suture; metapleural region yellow with a narrow dark stripe at middle of the metepimeron and another along to 2nd lateral suture. [Poststernum] yellow. Trochanter and tarsus brown; articulations femur-trochanter, medial side of the femur and distal half of lateral side of mid and hind tibiae yellowish, lateral side of the femur, fore-leg tibia and proximal half of medial and fore tibia black. Wings hyaline and lightly opal reflections; pterostigma brown with fine yellow margin.

A b d o m e n. — Dark with slight metallic green reflections. Dorsally on segments 3-8 a fine yellow longitudinal line. The posterior part of segments 3-7 with a yellow ring close to articulations. Cercus dark; apices of the paraproct yellow.

V e n a t i o n. — Postnodals in FW 10, in HW 9 (8 in paratype); R_1 in FW, originating close to 4th postnodal, in HW at the level of 3rd or slightly before; IR_2 in FW originating at level of 8th postnodal, in HW at level of 7th or 8th postnodal; pterostigma covering 4/5 of cell in FW and HW; arculus coinciding with 2nd antenodal; transverse vein continuing from first postnodal, ending at wing margin without forking.

Structural characters. — Posterior margin of posterior lobe of prothorax rounded, slightly more prominent in median third and without any peculiar configuration. Cercus smaller than segment 10, each formed by a curved lamina (figs. 1 and 2) of concavity recurved inside and back. In dorsal view the lamina are divergent at anterior 2/3 and slightly convergent at the posterior 1/3. A little ahead of the junction between the convergent part and the divergent part, the dorsal margin of each lamina shows a minuscule chitinous tooth (fig. 2). From the concavity of each lamina emerges a great finger-like process [decumbent tooth of this paper] (fig. 2) that extends ventrally and lightly back [anteriorly], finishing as a visible point in lateral view (fig. 1). In the borders of each lamina there is no division that allows division into a superior part and an inferior, as happens in other species of *Neoneura*. Paraproct smaller than cercus, paraproct with approximately cylindrical shape, finishing in slight dilation limited behind by a planar surface (figs. 1 and 2).

Measurements. — Abdomen 26 mm; FW 18 mm; HW 17 mm.

FEMALE: Head. — Labium, gena, post-gena, anteclypeus and antefrons white-yellowish; labrum brown with black central stain; postclypeus black with two yellow points; head black with the following yellowish areas: 1 - a small stain in front of each ocellus; 2 - small stain on each side in the middle of the distance between the base of the antenna and median ocellus; 3 - curved line from middle of each eye extending medioposteriorly, finishing as a small dilation before occipital crest; 4 - horizontal line along the occipital crest.

Thorax. — Anterior lobe of prothorax black with two yellow points; middle lobe yellow, except for a lateral stain and a medial black line; posterior lobe black; mesepisternum black with a yellow stripe adjacent to humeral suture occupying approximately 1/3 of its width. Small yellow stain in superior and lateral part of mesepisternum. Remainder of pterothorax yellowish-brown with following dark areas: 1 - black central stripe, occupying 3/4 width of mesepimeron ending ventrally as a narrower and contiguous extremity with humeral suture; 2 - dark line along 1st and 2nd lateral sutures. Medial side of femur and lateral side of tibia yellow; lateral side of femur and medial side of tibia black; tarsus brown; wings hyaline and with lightly opal reflections; pterostigma light brown.

Abdomen. — Dorsally black with slight metallic green color more evident on last 4 segments. Yellowish-brown longitudinal line covering anterior 3/4 of segments 2-8; yellowish ring placed at proximal part of segments 1-7. Lateral side of the abdomen brown; ventral side black.

Venation. — Postnodals in FW 10, in HW 8 and 9; R_3 in FW originating at the level of the 4th postnodal, in HW at the level of 3rd postnodal; IR_2 in the FW originating at the level of 8th postnodal, in the HW at the level of 7th and 8th postnodal. Pterostigma in FW and HW covering 4/5 of cell. The transversal vein that continues from the first postnodal, ending at posterior margin without forking.

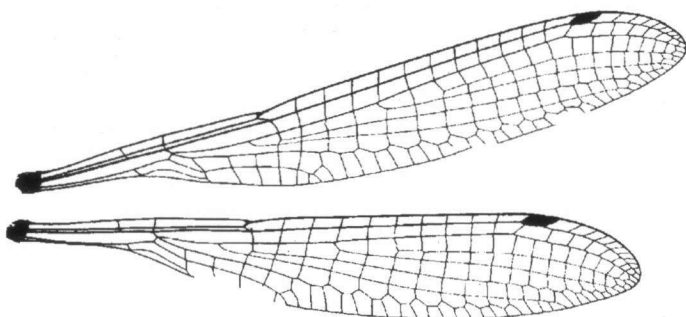
Structural characters. — Posterior lobe of prothorax with two conspicuous lateral processes turned back and a small triangular medial process (fig. 3).

Measurements. — Abdomen 25 mm; FW 19 mm; HW 18 mm.

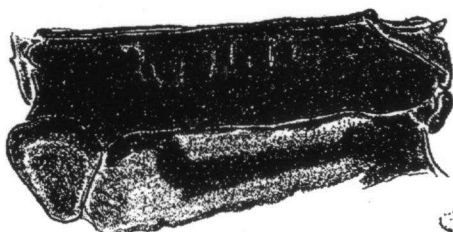
Discussion. — The three specimens of *N. schreiberi* [were] collected close to the Serra do Navio in Rio Amapari. In this place were also collected *N. joana* Williamson, 1917 and *N. myrthea* Williamson, 1917, the latter now mentioned for the first time in Brazil. The occurrence of *N. rubriventris* Selys, 1860, in Rio Amapari (Machado, 1964) is due to a misidentification of specimens of *N. myrthea*. Of the three species of *Neoneura* observed in Rio Amapari, in the month of January, *N. schreiberi* was the less frequent..... *N. schreiberi* can be easily identified by the great extension of the dark areas of the head, thorax and abdomen of both sexes, by the peculiar aspect of the posterior lobe of the prothorax of the female and by the male's anal appendages. In these stands out the fact of the external lamina of the cercus not divided into a superior part and inferior [part] as happens in the other species of *Neoneura*. This combination of characters is not observed in any of the species of the genus,

which makes [it] difficult [to] study the relationships of the species [within] the genus.....”

I have modified the illustrations of the holotype male and paratype female from MACHADO (1975) and have tried to place this species within my keys.

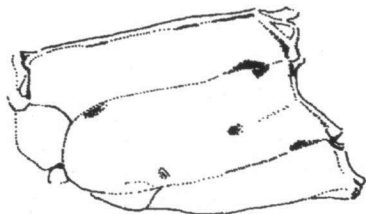
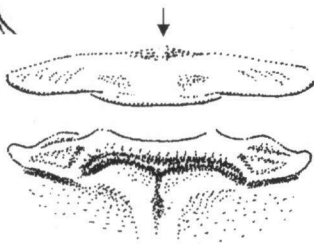


48. jurzitai PARATYPE wings



49. jurzitai HOLOTYPE
(mesepisternum and mesepimeron)

50. rufithorax hind
lobe of prothorax and
mesostigmal plates of
male; same data as Fig. 3



51. rufithorax
synthorax of male; same
data as Fig. 3



52. rufithorax abdominal segments 5-10; same data as Fig. 3

NEONEURA SYLVATICA HAGEN in SELYS

Figures 12, 35

Neoneura sylvatica Hagen in SELYS, 1886: 204DIAGNOSIS. — See under *N. ethela*.

TYPES. — Selys (1886: 204) cites “Brésil (Rio-Janeiro?) par Olfers. Musée de Berlin”, but ST. QUENTIN (1970) does not mention it in his type catalog for that museum, nor did I find it in the Hagen collection at the MCZ. I do not know the present location of the holotype male.

DISTRIBUTION. — Venezuela south through Brazil, northern Argentina, and Bolivia.

NEONEURA WALTHERI SELYS

Figure 7

Neoneura waltheri SELYS, 1886: 198

DIAGNOSIS. — The elongate upper branch of the cercus (Figs 7a, b) separates it from all other species except *N. desana* (Figs 8a, b). The separation of those two species is discussed under *N. desana*.

I have included the female of *N. waltheri* in the key by incorporating the description and illustrations of the female from JURZITZA (1981).

TYPES. — Holotype in IRSN.

DISTRIBUTION. — Southern Brazil, northern Argentina.

REMARKS. — A full description of both sexes, illustrations, and notes on the behavior are given by JURZITZA (1981). He was able to compare newly captured specimens with the holotype, which lacked the all-important caudal appendages. The male I illustrate here was kindly supplied by Dr Jurzitza.

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I am especially grateful to William Mauffray, Jerrell Daigle, and Ken Tennesen for critically testing the keys against material in their collections. I greatly appreciate the help of Frederico Lencioni

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