

Neuroptera of the Amazon Basin. Part 2. Dilaridae

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Abstract

Three new species of *Nallachusius* (Neuroptera: Dilaridae) are described from the Amazon Basin.

INTRODUCTION

The neuropteran family Dilaridae is one of the smallest and least known of the Neuroptera, even though the geographical distribution is quite widespread. Adams (1970) in his revision of New World Dilaridae listed 13 species in one genus, ranging from Michigan in northern U.S.A. south to Argentina. However, 11 of these species are known from only one locality and none have previously been recorded from the Amazon Basin. The present study describes three new species of *Nallachusius* from this region.

BIOLOGY

Very little is known of the biology of Dilaridae. MacLeod & Spiegler (1961) found larvae of *Nallachusius americanus* (MacLachlan) under the bark of recently dead trees. Other larvae were found in more decayed wood. They appear to be predators and were successfully reared on soft-bodied insect larvae and eggs.

SYSTEMATICS

The Dilaridae are subdivided into two subfamilies: Dilarinae in the Eastern Hemisphere and Nallachiinae in the Western Hemisphere (Adams, *Ibid.*). Three genera have been described from the Americas — *Nallachusius* Navás, *Nulema* Navás and *Neodilar* Carpenter. In the most recent revision Adams (*Ibid.*) places the last two genera in synonymy with the first. He further recognizes three species groups — the "pulchellus" group in which the second posterior medial vein (MP2) is not coalesced with the anterior cubital vein (CuA) in the forewing, the "limai" group with broad, rounded wings

and much secondary branching of the longitudinal veins, and the "americanus" group with MP2 fused with CuA. The present study describes one new species from the "americanus" group.

Genus *Nallachusius* Navás

(Fig. 1)

Nallachusius Navás, 1909, *Mems. R. Acad. cienc. artes Barcelona*, 7:665.

Nulema Navás, 1914, *Gen. Insect.*, 156:12.

Neodilar Carpenter, 1947, *Psyche, Camb.*, 54:107.

Type Species: of *Nallachusius* is *Dilar prestoni* MacLachlan, designated by Navás, 1914; of *Nulema* is *Nulema championi* Navás by original designation; of *Neodilar* is *Dilar hermosa* Banks by original designation.

Head: Flattened and somewhat elongate. One medial, two lateral setiferous tubercles on vertex. Mouthparts tiny, partly sunken within anterior portion of head. Compound eyes very large, laterally prominent. Ocelli absent. Male antennae flabellate, of 10 to 16 segments. Female antennae filiform, of about 16 segments. *Thorax:* Pronotum setiferous, flattened, quadrate. Pleural region elongate. Conical coxa; short, quadrate trochanter; elongate, pilose tibia and femur; five-segmented tarsi, with first segment elongate, last segment swollen; two tarsal claws. Tibial spurs absent.

Wings: Oblong to rounded, very pilose, pale with dark pattern. Forewing length in male 2.9 to 16 mm; in female 5.1 to 22.5 mm. Costal area with numerous crossveins. Much branching of longitudinal veins at wing margin. MA appearing as branch of Rs.

Abdomen: Ten abdominal segments with prominent, pilose tubercles at anterior margin of anterior tergites. Female bearing long, recurved ovipositor over abdomen; male bearing a series of small tubercles and more elongate, sclerotized gonocoxites.

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KEY TO SPECIES OF NALLACHIUS (MALES ONLY) (*)

- 1a. In forewing, MP2 fused with CuA, costal veinlets simple (*americanus* group) 2
- 1b. In forewing, MP2 not fused with CuA, some costal veinlets occasionally forked 6
- 2a. Wing apex rounded, nearly symmetrical about long axis 3
- 2b. Wing apex plainly asymmetrical, posterior margin angulate 4
- 3a. In forewing, four Rs branches beyond fused MA (Amazon) *N. maculatus*
- 3b. In forewing, three Rs branches beyond fused MA (Paraguay) *N. pupillus*
- 4a. More than 2 radial crossveins in forewing; several crossveins between branches of Rs in both wings (Ecuador) *N. loxanus*
- 4b. Only two radial crossveins in forewing, no crossveins between branches of Rs in either wing 5
- 5a. Dorsal lobes of male ectoprocts broadly tapering to distal point; digitiform process much smaller than dorsal lobes (North America south to Venezuela) *N. americanus*
- 5b. Dorsal lobes of male ectoprocts narrowly elongate, with rounded tip; digitiform process almost as large as dorsal lobes (Amazonia) *N. adamsi*
- 6a. Male antennae with 16 elongate processes (Guatemala) *N. championi*
- 6b. Male antennae with 14 or fewer elongate processes 7
- 7a. Wings rounded; male genitalia with dorso-lateral plate of gonarcus (*limai* group) *N. limai*
- 7b. Wings more elongate; male genitalia lacking dorso-lateral plate of gonarcus (*pulchellus* group, except *N. championi*) 8
- 8a. Dorsal lobe of ectoproct inflated, costal veinlets simple (Cuba and southwestern U.S.) *N. pulchellus*
- 8b. Dorsal lobe of ectoproct flat 9
- 9a. Dorsal lobes of ectoprocts approximated on midline 10
- 9b. Dorsal lobes of ectoprocts widely separated in middle 11
- 10a. Costal area wider, most distal costal veinlets forked (sou. Brazil) *N. ovalis*
- 10b. Costal area narrow, most costal veinlets simple (southern Brazil) *N. bicolor*
- 11a. Subcosta nearly straight, costal area narrow, many costal veinlets forked (southern Brazil) *N. prestoni*
- 11b. Subcosta curved posteriorly at stigma, costal area wider, few costal veinlets forked 12
- 12a. Gonocoxites apically expanded in blade-shape; digitiform process of ectoproct with medial hook (Amazonia) *N. infuscatus*
- 12b. Gonocoxites slender, not apically expanded; digitiform process of ectoproct lacking medial hook (Paraguay) *N. reductus*

(*) — Modified from Adams, 1970.



Fig. 1 — Lateral view of *Nallachius ovalis* Adams (reprinted from Penny and Arias, 1981) (drawn by Artemio Coelho da Silva).

***Nallachius adamsi*, n. sp.**

(Figs. 3, 6, 9)

Original description based on four males on slides.

Head: Reddish brown. Mouthparts tiny; labrum pale. Maxillary palpi three-segmented. Labial palpi reduced to small papillae. Antennae 12-segmented, with segmented 2-10 bearing long, apical appendages in males.

Thorax: Diffuse, dark fuscous pigment covering meso- and metanota. Pleural region pale fuscous; coxa trochanter, femur and basal part of tibia pale. Apical part of tibia and tarsal segments pale fuscous.

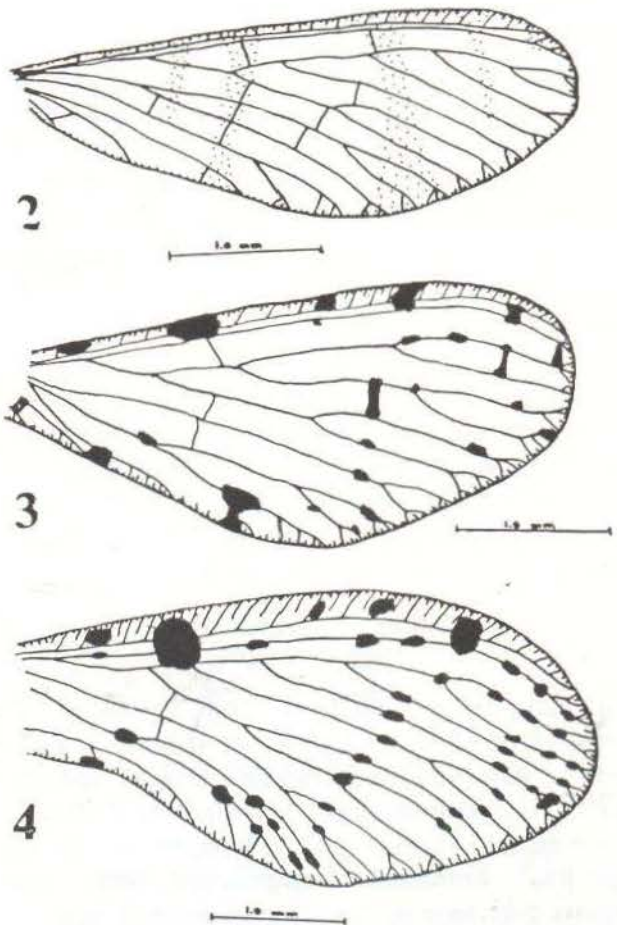
Forewing: Pale with numerous, small, dark fuscous spots. Four spots on costal margin, the largest one about halfway to wing apex. Four spots, evenly spaced along anal margin. Costal crossveins numerous with short intercalary veins between. Radial sector (Rs) three-branched with terminal twiggings. Anterior medius (MA) appearing as lower branch of Rs. Posterior medius (MP2) fused with anterior oubitus (CuA) (Fig. 3).

Abdomen of Male: Abdominal segments 2-8 with dorsal, setiferous tubercles. Gonocoxites long, stoutly pointed, with longitudinal groove and subapical notch; connected basally by arched gonarcus. Between gonocoxites two shorter, acutely pointed mediuncus lobes. Mediuncus lobes basally complexly curved and closely approximated. Digitiform process of ectoproct well-developed, tapering to acute point. Dorsal lobe of ectoproct long, narrow, evenly rounded at apex, with apical dark pigmentation (Figs. 6,9).

Body Length: male, 2.3 mm.

Forewing Length: male, 4.1 mm.

Geographical Distribution: Material in the Systematic Entomology Collections of INPA, Manaus include: BRAZIL: Amazonas, Reserva Ducke, km 26 - AM 010, 6-XII-1977, J. R. Arias, 1 male; Amazonas, Reserva Ducke, km 26- AM



Figs. 2-4 — Right forewing of 2) *Nallachius infuscatus*, n. sp., 3) *Nallachius adamsi* n. sp., 4) *Nallachius maculatus*, n. sp.

010, 6-VII-1978, J.R. Arias, 1 male; Amazonas, Manaus, 29-V-1978, J.R. Arias, 1 male. One additional paratype in the collection of Phillip A. Adams from Amazonas, AM 010, km 246, 15-VII-1979, J.R. Arias, 1 male (Map 2).

Temporal Distribution: Collections of Amazonian specimens have been made in May, June, July and December. It appears that there are at least two broods per year, or perhaps emergence does not occur in broods.

This species is a member of the *americanus* group which includes four other species, *N. americanus* (MacLachlan), *N. loxanus* Navás, *N. maculatus* and *N. pupillus*. *N. adamsi* can be separated from the latter two species by its expanded anal region of forewings, creating a wing which is very asymmetrical along the long axis. The radial crossveins separates it from *N. loxanus*. This species is most certainly closely related to *N. americanus*, but differs in some fine details of the male genitalia. In *N. adamsi* the gonocoxites are stouter, with a subapical notch, which is absent in *N. americanus*. The mediuncus lobes are basally much more sharply curved, and the dorsal lobes of the ectoprocts are apically rounded, not acutely pointed in *N. adamsi*.

This species is named for Dr. Phillip A. Adams, a leading specialist on South American Neuroptera.

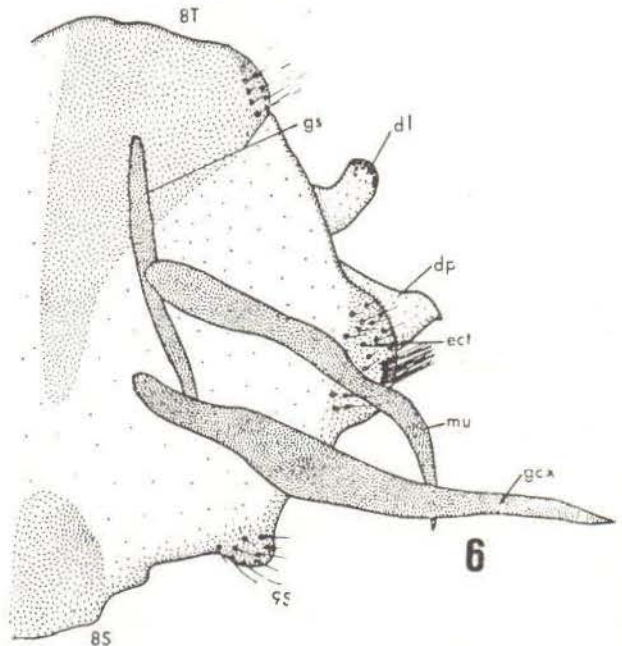
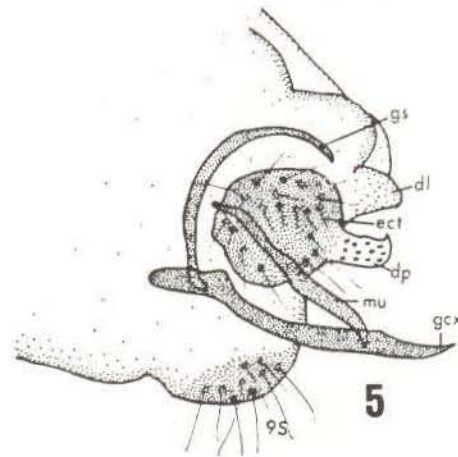
Holotype male (from Manaus) in the Systematic Entomology Collections of INPA, Manaus. Paratype males in Museu de Zoologia, USP, São Paulo, Brazil; United States National Museum, Washington, D. C., U. S. A.; and collection of Phillip A. Adams, Fullerton, California.

***Nallachius infuscatus*, n. sp.**

(Figs. 2, 5, 8)

Original description based on 32 males, 2 females on slides; 4 males, 1 female in alcohol. **Head:** Pale yellow to reddish brown. Mouthparts tiny; labrum pale. Maxillary palpi three-segmented. Labial palpi reduced to small papillae. Antennae 12-segmented, with segments 2-11 bearing long, apical appendages.

Thorax: Diffuse, dark fuscous pigment covering meso- and metanota. Pleural region pale fuscous to pale yellowish. Legs with diffuse, pale fuscous coloration.



Figs. 5-6 — Lateral view of male genitalia of 5) *Nallachius infuscatus*, n. sp., 6) *Nallachius adamsi*, n. sp., dl = dorsal lobe, dp = digitiform process, ect = ectoproct, gcx = gonocoxite, gs = gonarcus, mu = mediuncus

Forewing: Pale with numerous diffuse, coalescing pale fuscous spots. Costal crossveins numerous with short intercalary veins between. Subcosta vein curved caudally at apex. Radial sector three-branched with terminal twiggings. MA appearing as lower branch of Rs. MP branched basad of Rs-MA fork. CuA apically forked. MP2 not coalesced with CuA (Fig. 2). **Abdomen of Male:** Abdominal segments 2-8 with dorsal, setiferous tubercles. Gonocoxites long, blade-shaped, acutely pointed; connected basally by arched gonarcus; longitudinally grooved. Between gonocoxites two shorter, sigmoidally sinuous, acutely pointed mediuncus lobes (Figs. 5,8). Dorsal lobes of ectoproct

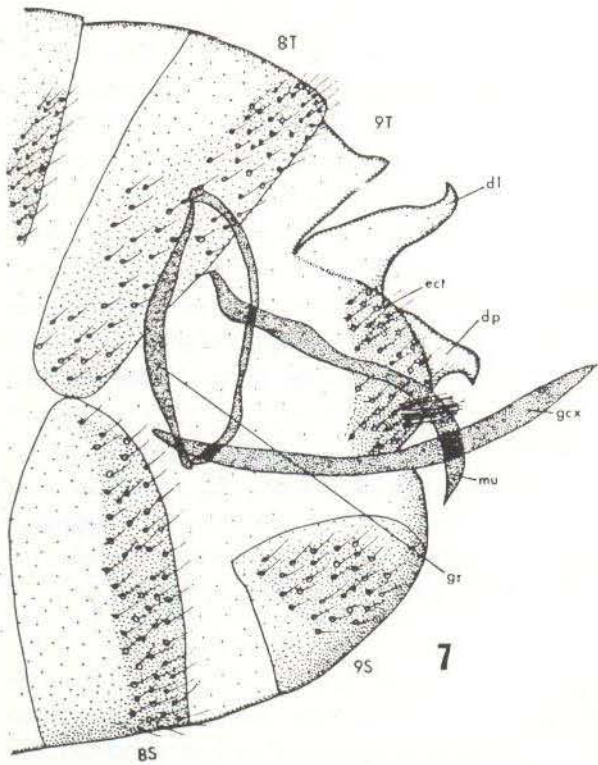


Fig. 7 — Lateral view of male genitalia of *Nallachius maculatus*, n. sp., dl = dorsal lobe, dp = digitiform process, ect = ectoproct, gcx = gonocoxite, gs = gnathos, mu = mediuncus.

small, tubular, not approximated along midline. Digitiform process of ectoproct bulbous, with numerous pore openings, and apical hook.

Body Length: male, 2.0 — 3.3 mm; female, 2.0 — 2.1 mm.

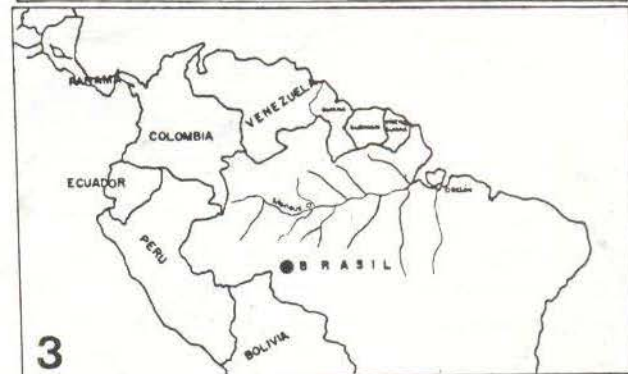
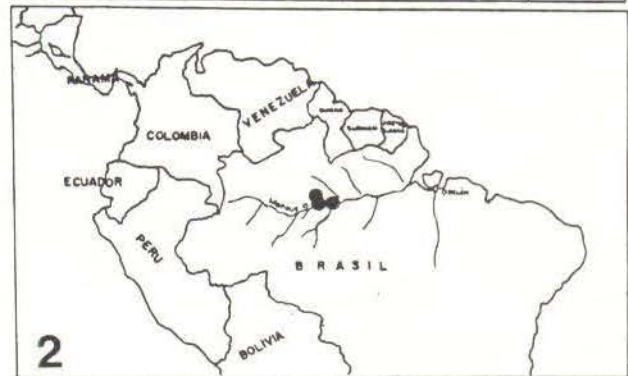
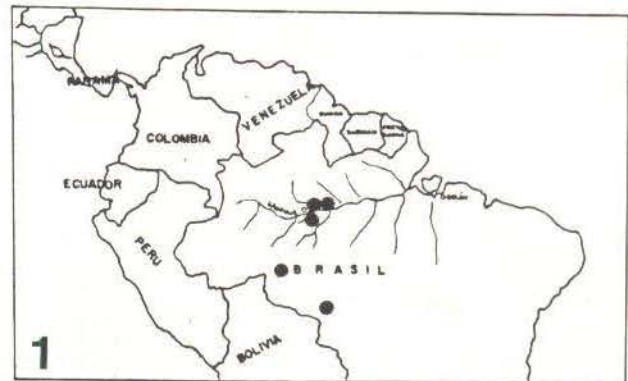
Forewing Length: male, 2.9 — 5.3 mm; female, 4.0 — 4.3 mm.

Variation: There is a general variation in shade of forewing pigmentation and a large size difference, with some specimens being almost twice the size of others.

Geographical Distribution: Material in the Systematic Entomology Collection of INPA, Manaus include: BRAZIL: Amazonas, Reserva, Ducke, km 26 — AM 010, J. R. Arias, 2-VIII-1977, 1 male; 9-VIII-1977, 2 males; 6-IX-1977, 1 male; 6-XII-1977, 2 males; 27-XII-1977, 1 male; 31-I-1978, 1 male; 14-II-1978, 1 male; 9-V-1978, 1 male; 16-V-1978, 1 male; 6-VI-1978, 1 male; 27-VI-1978, 1 male; 13-IX-1978, 1 male; Amazonas, km 52-BR 319, 26-I-1979, Eloy Castellon, 1 male; Amazonas, Manaus, Parque das Laranjeiras, 28-I-1981,

J.R. Arias 1 female; II-1981, 2 males; Amazonas, km 246- AM 010, 14-15-VII-1979, J.R. Arias, 2 males; Rondonia, km 48- BR 364, 27-IX-1979, J. R. Arias, 2 males; Rondonia Vilhena, 6-8-XI-1979, J. R. Arias, 9 males, 1 female; Rondonia, km 48- BR 364, 8-9-X-1979, S.U.C.A.M., 1 male, 2 females; Rondonia, km 50- BR 364, 17-X-1979, S.U.C.A.M., 1 male (Map 1).

Temporal Distribution: It appears that this species has a bimodal emergence from May to September and December to mid-February in the central Amazonian region, although it can be collected in October and November in Rondonia.



Maps 1-3 — Geographical distribution of 1) *Nallachius infuscatus*, n. sp., 2) *Nallachius adamsi*, n. sp., and 3) *Nallachius maculatus*, n. sp.

Habitat: This species has only been collected from light traps set in the tops of trees in primary forest.

Holotype male (collected 6-IX-1977), allotype female (collected 6-XI-1979) and some paratypes in the Systematic Entomology Collection, INPA, Manaus. Further male paratypes (two each) in U. S. National Museum, Washington, D.C., U.S.A.; British Museum (Natural History), London, England; Museu Paraense Emilio Goeldi, Belém, Pará, Brazil; Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil; Museu Nacional, Rio de Janeiro, Brazil, and the Phillip A. Adams collection.

This species is a member of the *pulchellus* group having MP2 not coalesced with CuA.

N. infuscatus appears to be the smallest species of this group, and indeed of the whole genus, although *N. prestoni* is quite small and I have seen a specimen of *N. bicolor* which is much smaller than average for the species. The male genitalia for this group are very similar and differences hard to discern. However some differences do exist, and can be used. The dorsal lobes of the ectoprocts are developed and appear very similar to *N. prestoni* and *N. reductus*. The form of the costal region of the forewing, with no forked crossveins and apical curvature, separates *N. infuscatus* from *N. prestoni*. *N. reductus* apparently has narrow gonocoxites without apical, blade-like expansions, and no apical hook on the digitiform process of the ectoproct.

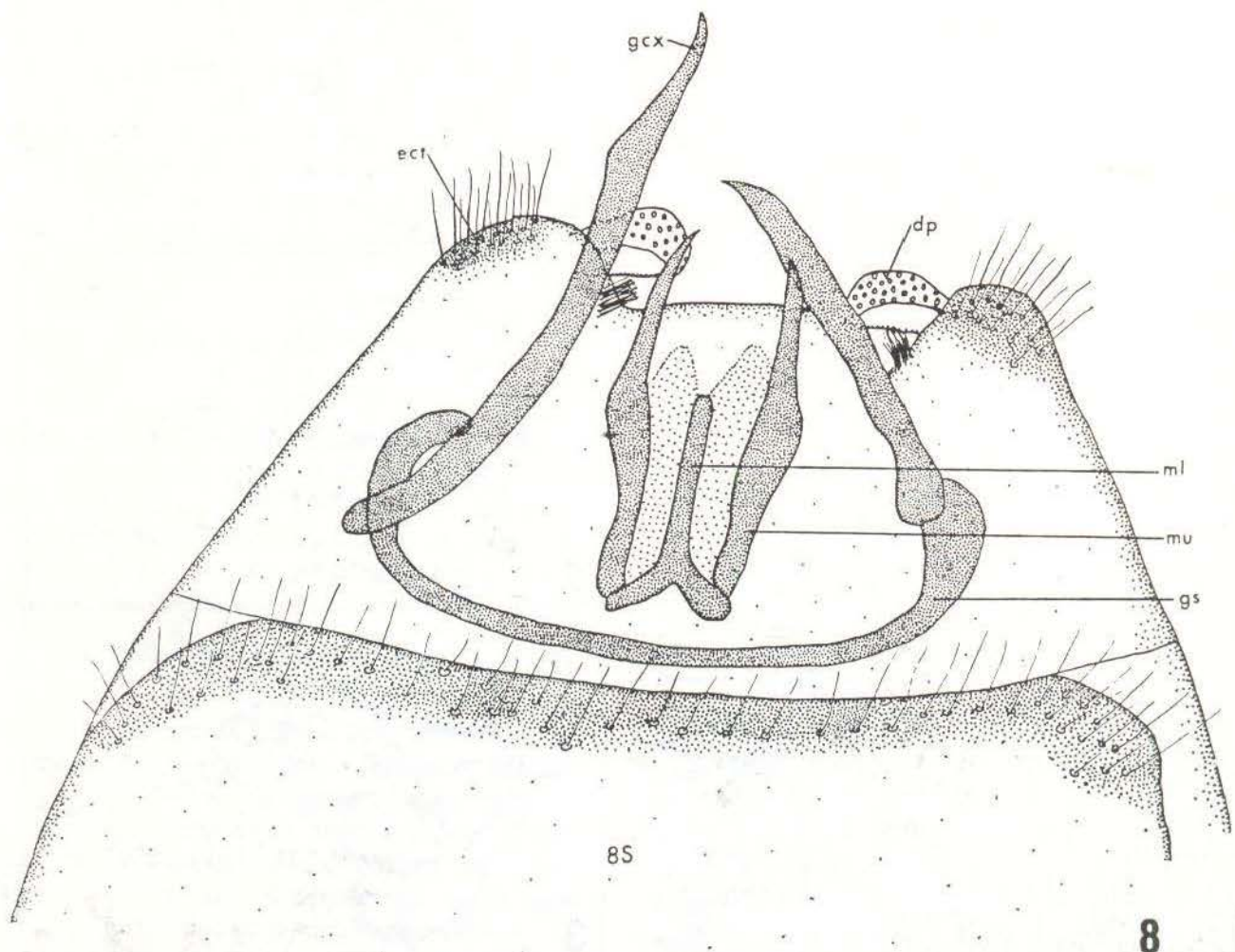


Fig. 8 — Ventral view of male genitalia of *Nallachius infuscatus*, n. sp. dp = digitiform process, ect = ectoproct, gcx = gonocoxite, gs = gonarcus, ml = median lobe, mu = mediuncus.

Nallachus maculatus, n. sp.

(Figs. 4, 7, 10)

Holotype male in the Systematic Entomology Collection of INPA, Manaus. Original description based on 1 male, on slide, cleared in 10% KOH.

Head: Pink. Mouthparts tiny; labrum pale. Maxillary palpi three-segmented. Labial palpi reduced to small papillae. Antennae with only five segments remaining, with segments 2-5 bearing long, apical appendages in male.

Thorax: Clear, with dark pigment spot at base of each wing. Pleural region clear. What remains of legs clear, except tip of tibiae fuscous.

Forewing: Pale with numerous, small, dark fuscous spots. Eight spots along costal margin, the largest about halfway to wing apex. Three spots along anal margin. Costal crossveins numerous with short intercalary veins between. Rs four-branched with terminal twiggings. MA appearing as lower branch of Rs. MP unbranched, except for marginal fork. MP2 fused with CuA (Fig. 4).

Abdomen of Male: Abdominal segments 2-8 with dorsal, setiferous tubercles. Posterior margin of ninth tergite forming a medial point; dorsal lobes of ectoprocts large, terminally approximated, apically pointed; digitiform process with stout hook protruding near apex. Gonocoxites long, acutely pointed, without longitudinal groove; connected basally by circular gonarcus. Gonarcus with dorso-lateral, weakly sclerotized connective, which when viewed dorsally gives the gonarcus a double oval configuration (Fig. 10).

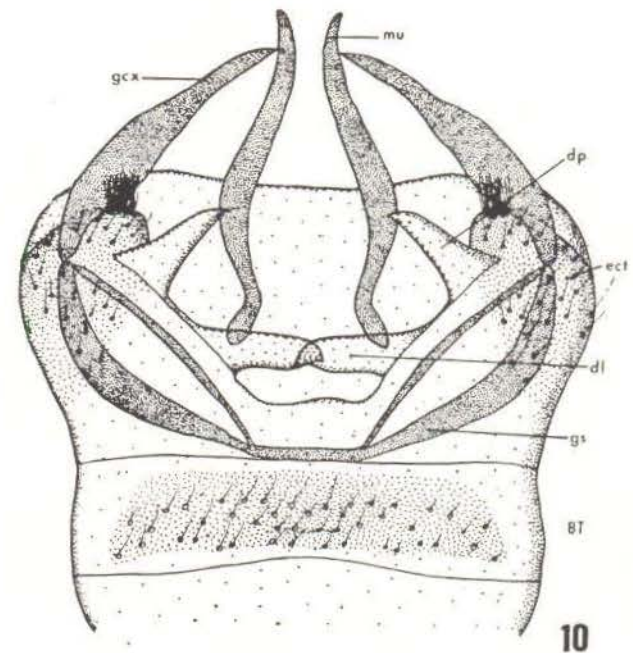
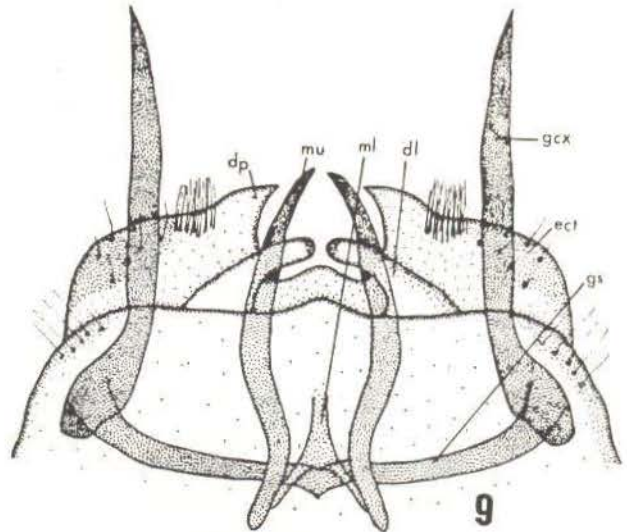
Between gonocoxites two shorter, ventrally curved, acutely pointed mediuncus lobes (Fig. 7).

Body Length: male, 3.8 mm.

Forewing Length: male, 4.6 mm.

Damage: The apical part of both antennae are broken off, leaving only five basal segments. Only parts of two legs remain, and wings are torn.

Geographical Distribution: The only known specimen of this species was collected at BRAZIL: Rondonia, 48 km east of Porto Velho, 1-XI-1979, J.R. Arias (Map 3).



Figs. 9-10 — Dorsal view of male genitalia of 9) *Nallachus adamsi*, n. sp., and 10) *Nallachus maculatus*, n. sp., dl = dorsal lobe, dp = digitiform process, ect = ectoproct, gcx = gonocoxite, gs = gonarcus, ml = median lobe, mu = mediuncus.

Temporal Distribution: The only known specimen was collected on the first of November. **Habitat:** The holotype was collected in a C.D.C. miniature light trap, 10 meters high in the forest canopy.

This species is part of the *americanus* group, having MP2 of the forewing fused with CuA. The rounded wing and extensive "twig-

ging" at the end of the longitudinal veins allies it most closely with *N. pupillus* Navás. The extra branch of the Rs separates *N. maculatus* from *N. pupillus*.

This species is named for the numerous spots on the wings, from the Latin word *maculatus*.

ACKNOWLEDGMENTS

Dr. Jorge R. Arias has collected almost all the material used in this study while doing field research on vectors of cutaneous leishmaniasis. Very small light traps were utilized in the forest canopy, and the resulting abundant material is gratefully acknowledged. Dr. Phillip A. Adams has looked over, and corrected, two early drafts of this manuscript, as well as comparing specimens of *N. adamsi* with *N. americanus*, and giving this author many valuable notes. His help has been tremendous, and he is to be greatly thanked for this effort, although all errors of content remain those of the author.

Resumo

Três novas espécies de *Nallachius* (Neuroptera: Dilaridae) são descritos da Bacia Amazônica.

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