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ABSTRACT

Nine species of Hemerobiidae in six genera are described and their distributions given. Keys are provided for their identification and notes are given on biology and habitat preferences.

INTRODUCTION:

Hemerobiidae, or brown lacewings, is one of the larger families of Neuroptera. They are small to medium-sized insects (3.5 to 16 mm wing length) of generally brown coloration. They have moniliform antennae, two to seven radial sectors in the forewing, trichosors along the wing margin, and well sclerotized male genitalia and associated appendages. They lack ocelli. Brown lacewings are quite common in temperate regions, where at times they are important biological control agents of aphids, coccids, and other soft-bodied pest insects. Larvae are also aggressive predators, having elongate, hollow mandibles for sucking fluids from the bodies of their prey. Hemerobiidae are much less frequently encountered in tropical areas, and dominant genera are different.

Nakahara (1960) listed 37 genera of Hemerobiidae, while Tjeder (1961) mentioned 80 genera and 600 species described, although he felt that far too little work had been done on the group to give an estimate of true numbers. Penny

(1977) listed 20 genera and 111 species from Latin America. Within the Amazon Basin, hemerobiids have only been mentioned three times: Gerstaecker (1888), Penny and Arias (1982) and Monserrat and Penny (1983).

BIOLOGY

Eggs of Hemerobiidae are laid singly on twigs, leaves, or bark. The egg is elongate oval, or cylindrical with rounded ends (Tjeder, 1961). One female can lay up to 619 eggs during 18 days (Williams, 1927). Larvae are elongate predators which feed on soft-bodied insects. Bodies of their prey and trash are not carried on the backs of larvae, as is the case of some Chrysopidae. After passing through three larval instars, pupation takes place in a cocoon of white silk, on twigs, under bark, and frequently in pine cones in temperate areas. The pharate adult later emerges from this cocoon, climbs to a nearby vantage point, and casts away the pupal skin. There seems to be a food preference among various species (Aspöck, et al., 1980), and a given species can often be encountered associated with a specific plant or tree.

These insects have good potential as biological control agents, and as such *Symphorobius barberi* Banks and *Nesomicromus navigatorum* (Brauer) have been introduced into Hawaii, where they prey upon mealy bugs (Pseudococcidae) and aphids (Zimmerman, 1957).

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Systematics: Pioneering works on Hemerobiidae often split the family into two subfamilies, Hemerobiinae and Sympherobiinae, on the basis of number of radial sectors (Rs). This still remains a useful character, but Tillyard (1916) pointed out that even within the genus *Hemerobius* two or three Rs can exist. Thus, this classification of Hemerobiidae is highly unstable, and has not been recently utilized. Nakahara (1960) revised the higher classification, basing his work on male genital characters. Nakahara's classification created a separate subfamily for *Notiobiella* based upon the high degree of development of the arcessus. Tjeder (1961), in dealing with the South African species, felt that the development of one genital structure was insufficient for creation of a separate subfamily, and declined to attempt any such division. In this respect, the present treatment of Amazonian species follows Tjeder's viewpoint, and no subfamily or tribal division is attempted.

Within the Amazon Basin nine species in six genera have been recognized, three of which are new species. The six genera can be separated, using the following key:

KEY TO AMAZONIAN GENERA OF HEMEROBIIDAE

- 1a. Forewing with two radial sectors (Figs. 2-7) 2
- 1b. Forewing with three or more radial sectors (Figs. 8-10) 4
- 2a. First radial sector branching well before origin of second Rs (Figs. 2-4) 3
- 2b. First radial sector branching at level of origin of second Rs (Figs. 5-7) **Notiobiella**
- 3a. Forewings appear "beaded" along longitudinal veins (Figs. 4); male sternite 9 very narrow and apically upturned; male ectoprocts without caudal projections . . . **Nomerobius**

- 3b. Forewings without "beading" along longitudinal veins (Figs. 2-3), male sternite no more than twice as long as wide and apically rounded; male ectoprocts with caudal projections. **Sympherobius**
- 4a. Forewing with 3 radial sectors (Fig. 10) **Hemerobius**
- 4b. Forewing with 4 radial sectors (Fig. 8) **Nusalala**
- 4c. Forewing with 5 or more radial sectors (Fig. 9) **Megalomus**

Notiobiella Banks, 1909

Notiobiella Banks, 1909, *Proc. ent. Soc. Wash.*, 11: 80.

Vaja Navás, 1925, *Mems R. Acad. Cienc. Artes Barcelona*, 19 (5): 14.

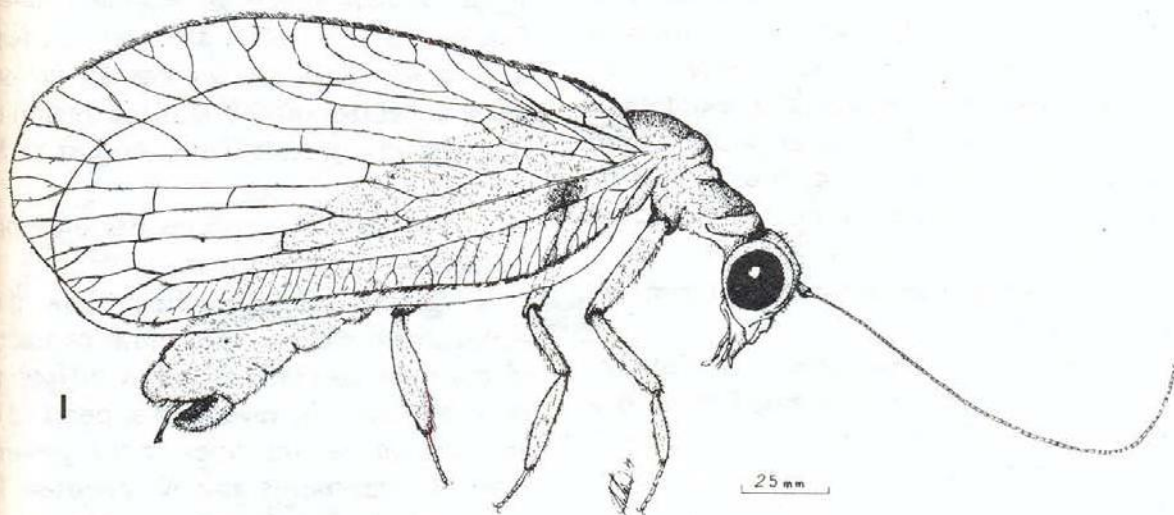
Buxtonia Esben-Petersen, 1928, *Ins. Samoa*, 7: 93.

Ganchetus Navás, 1929, *Mems Accad. pont. Nuovi Lincei*, (2) 12: 21.

Type Species: *Notiobiella unita* Banks (1909).

Notiobiella are medium-sized hemerobiids (forewing length approximately 5 mm), often with some pigmentation at forewing bifurcations, and red pigmentation in the pterostigma. There are only two radial sectors, with the first sector having a very long stalk before the first branch, which is invariably at the level of the origin of the second sector. The male genitalia consists of ectoprocts with an elongate caudal lobe, and an arcessus which is large and truncate, being partially enclosed by the encompassing gonarcus. This genus is known from Africa, Australia, Japan, South and Central America, with approximately 33 described species. However, few of these species have been described from the New World, with Penny (1977) recording only three species, while Monserrat (1983) and Monserrat and Penny (1983) have described four other new species.

Banks (1913) listed *Annandalia* as a synonym of *Notiobiella*, but more re-



Figs. 1. *Notiobiella paddiae* Monserrat, lateral view. Drawing by Artêmio Coelho da Silva).

cently this genus has been listed as a synonym of *Psectra*, most notably by Tjeder (1961) and Aspöck, et al. (1980). The genera *Vaja*, *Buxtonia*, and *Ganchetus* were synonymized with *Notiobiella* by Banks (1932) and have been accepted by subsequent authors.

Within the Amazon Basin three species of *Notiobiella* have been found, and can be separated using the following key:

KEY TO AMAZONIAN SPECIES OF NOTIOBIELLA

- 1a. Fore and mid-tibia with subapical black spot **N. maculatus**
- 1b. Fore and mid-tibia uniformly pale 2
- 2a. Forewing pterostigma pale-colored; faint indications of streaking in costal area of forewing; male parameres more than twice as long as wide **N. brasiliensis**
- 2b. Forewing pterostigma dark-colored, often with red streaks; costal area of forewing without streaking of membrane; male parameres oval-shaped. **N. paddiae**

Notiobiella brasiliensis Monserrat & Penny, 1983
(Fig. 5, Map 1)

Notiobiella brasiliensis Monserrat & Penny, 1983, *Nouv. Rev. Ent.*, 13: 129. Holotype male in the Systematic Entomology Collection, INPA, Manaus.

As an adequate description has only recently been published, only a synoptic description will be given here.

Wings: (Fig. 5) Forewing suffused with pale fusous, which is not present close to veins, giving appearance of streaking along all membranous areas; most strongly indicated in costal area. Crossveins only faintly margined. Pterostigma without indication of dark pigmentation, or red streaks. Hindwing pale, without pigmentation.

Legs: Forelegs completely pale, without very distinctive pigmented spot at apex of fore and mid tibiae.

Male Genitalia: Gonarcus with broad dorsal plate and narrow, elongate endoprocessus, united ventrally; broader, antero-ventral plate abruptly tapering to thin anterior arm connected to parame-

res. Parameres anteriorly positioned, and thinly sclerotized; flattened, elongate (about three times as long as wide); with postero-ventral arm apically expanded. Arcessus basally folded at acute angle, apically fused to tip of endoprocessus of gonarcus. Entire genital complex rotated 90° to a position opening ventrally.

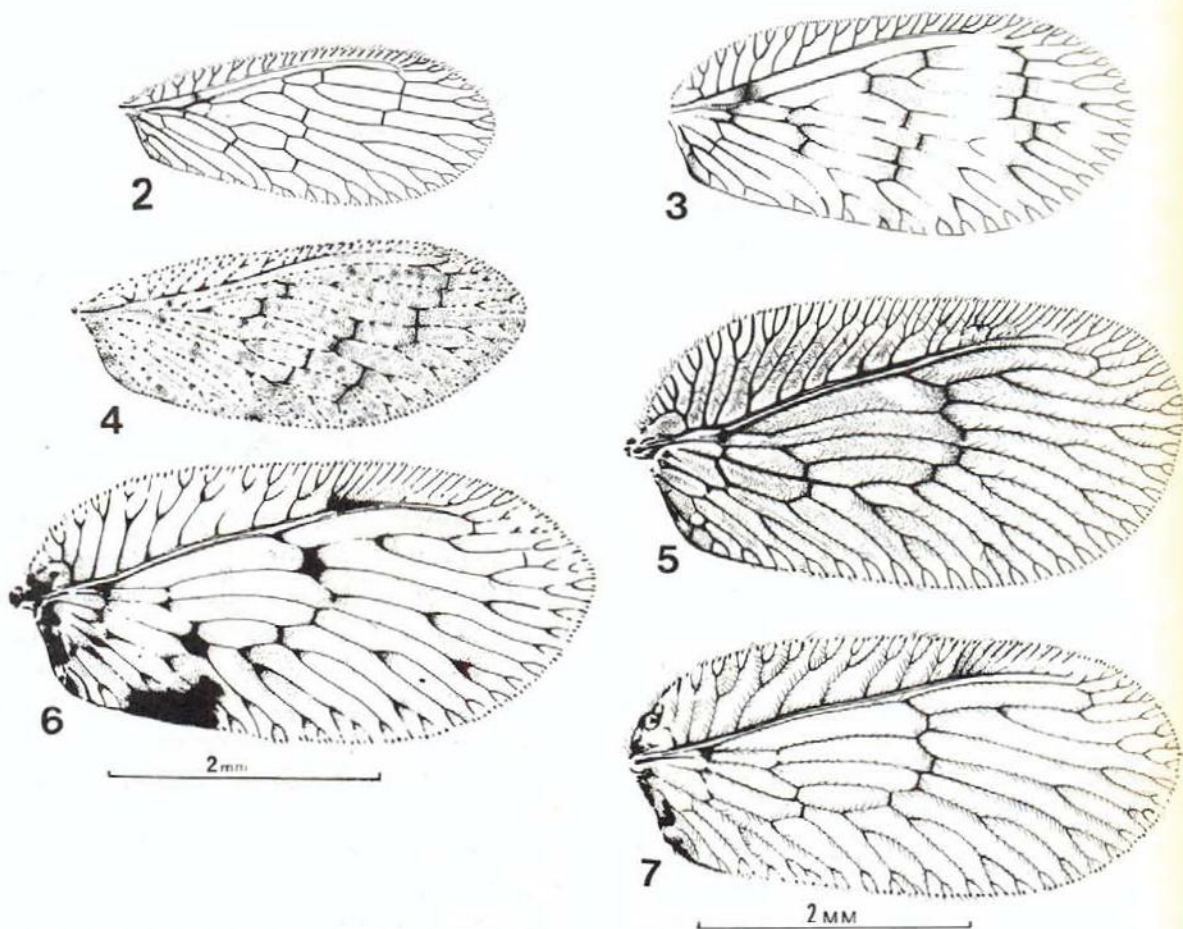
Forewing Length: male, 5.1 mm; female, 5.2 mm.

Material Examined: Holotype, BRAZIL: Amazonas, Manaus, Parque das Laranjeiras, 12-VIII-1981, J.R. Arias, 1 male (INPA); Amazonas, Reserva Ducke, AM-010, km 26, 13-IX-1977, J.R. Arias, 1 female paratype (Univ. of Murcia); Reserva Ducke, 20-IX-1977, J.R.

Arias, 1 male (Univ. of Murcia); Reserva Ducke, 15-XI-1977, J.R. Arias, 1 female (INPA). This species has so far only been collected in the Manaus region during the dry season, from August to November.

Habitat: This species has only been collected in upland forest.

Species Relationships: The three Amazonian species offer few characters in the male genitalia to aid in differentiation, although *N. maculata* appears to have narrower lateral lobes of the gonarcus than *N. brasiliensis* and *N. paddiae*. The wings of *N. brasiliensis* are darker than the other two species, but without pigmentation in the pterostigmal region, nor



Figs. 2-7. Right forewings of: 2) *Symphorobius amazonicus*, n. sp., 3) *Symphorobius ariasi*, n. sp., 4) *Nomerobius psychodoides* (Blanchard), 5) *Notiobiella brasiliensis*, Monserrat & Penny, 6) *Notiobiella maculata*, Monserrat & Penny, 7) *Notiobiella paddiae*, Monserrat. (drawings by Artêmio Coelho da Silva).



Map 1. Geographical distribution of Amazonian species of *Notiobiella*.

at crossveins, vein bifurcations, or the anal margin. Unlike *N. maculata*, there is no large dark spot at the apex of fore and mid tibiae.

Notiobiella maculata Monserrat & Penny,
1983

(Figs. 6, 11–17, Map 1)

Notiobiella maculata Monserrat and Penny, 1983, *Nouv. Rev. Ent.*, 13: 130. Holotype female in the Systematic Entomology Collections, INPA, Manaus.

As an adequate description has only recently been published, only a synoptic description will be given here.

Wings: Forewing pale. Gradate crossveins, vein forks, apex of 1A and 2A, and base of pterostigma margined with fuscous, which is especially heavy at gradate crossveins and apex of 1A and 2A. Hindwing pale, without red pigmentation at costal margin of pterostigma.

Legs: (Fig. 16) Fore and midlegs with large dark spot at apex of tibia. Hind tibia pale.

Male Genitalia: (Figs. 11–15) Gonarcus with narrow dorsal plate and narrow, elongate endoprocessus, united ventrally; broader, anterio-ventral projections abruptly tapering to thin anterior arm connected to parameres. Parameres anteriorly positioned and thinly sclerotized; flattened elongate (about twice as long as wide); with postero-ventral arm apically expanded. Arcessus basally folded at acute angle, apically fused to tip of endoprocessus of gonarcus. Entire genital complex rotated 90° to a position opening ventrally.

Forewing Length: male, 5.2 mm; female, 5.2 mm.

Material Examined: Holotype, BRAZIL: Amazonas, Manacapuru 13-IX-1981, eq. J.R. Arias, 1 female (INPA); Amazonas, Balbina-Rio Uatumã, 100 km north of Manaus, 9–11–III–1983, eq.

J.R. Arias, 1 male (INPA); Amazonas, Manaus, INPA campus, 6–VI–1979, eq. J.R. Arias, 1 female (INPA).

Habitat: This species has been collected in primary and secondary, upland forest.

Species Relationships: This species can easily be separated from the other two species known from Amazonia by the large, dark spot at the apex of fore and mid tibiae, and the more narrow lateral plate of the male gonarcus. There is a large, dark spot along the anal margin of the forewing, which is not found in *N. brasiliensis* and most individuals of *N. paddiae*. However, occasionally a very dark individual of *N. paddiae* will have this forewing spot.

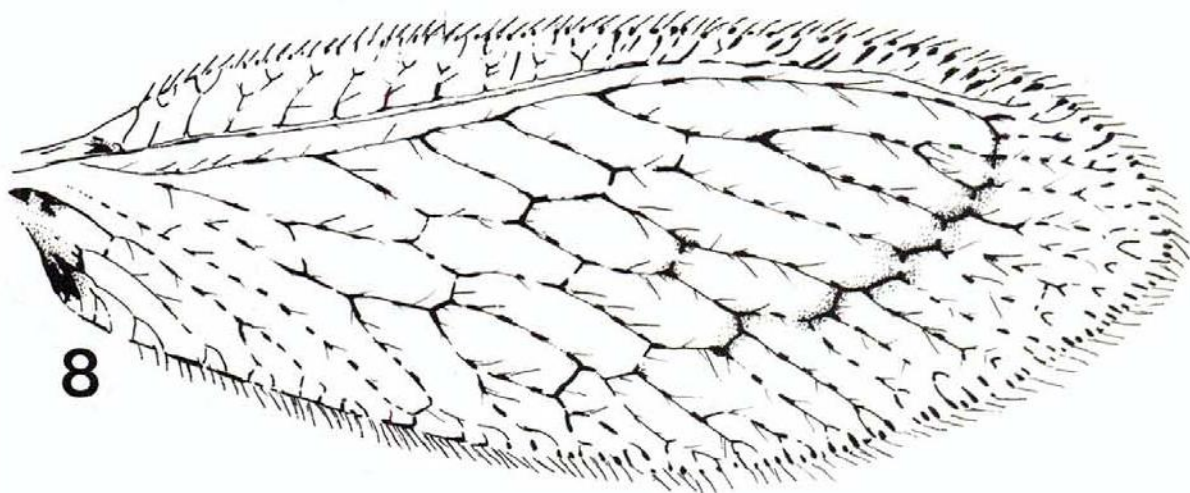
Notiobiella paddiae Monserrat, 1983
(Fig. 7, Map 1)

Notiobiella paddiae Monserrat, 1983, *First Int. Symposium on Neuropterology*, p. As an adequate description has only recently been published, only a synoptic description will be given here.

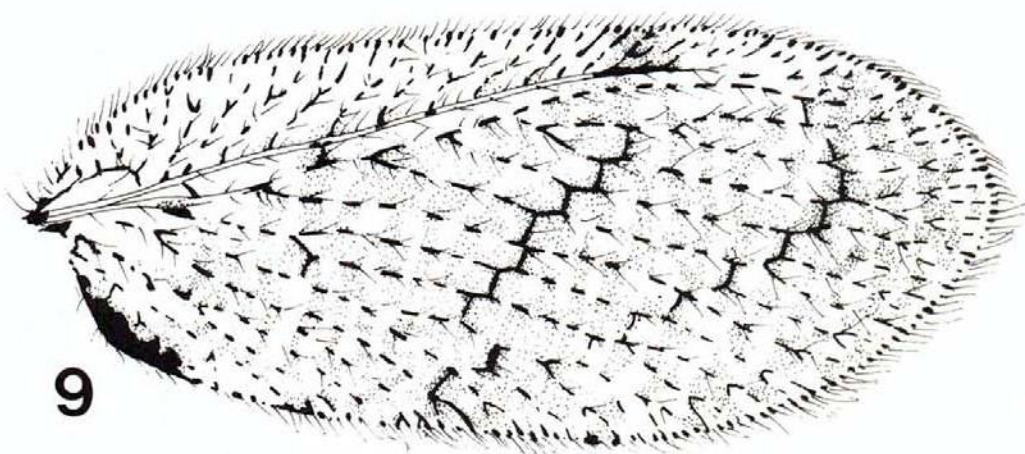
Wings: Forewing pale. Gradate crossveins, vein forks, humeral crossvein, apex of 1A and 2A (only in heavily pigmented individuals), and base of pterostigma margined with fuscous. Hindwing pale, with costal margin of pterostigma heavily pigmented with red.

Legs: Forelegs completely pale, without very distinct pigmented spot at apex of fore and mid tibiae.

Male Genitalia: Gonarcus with broad dorsal plate and narrow, elongate endoprocessus, united ventrally; broader, anterio-ventral projections abruptly tapering to thin anterior arm connected to parameres. Parameres anteriorly positioned, and thinly sclerotized; oval, and apically expanded. Arcessus basally folded at acute angle, apically fused to tip of endoprocessus of gonarcus. Entire genital complex rotated 90° to a position opening ventrally.

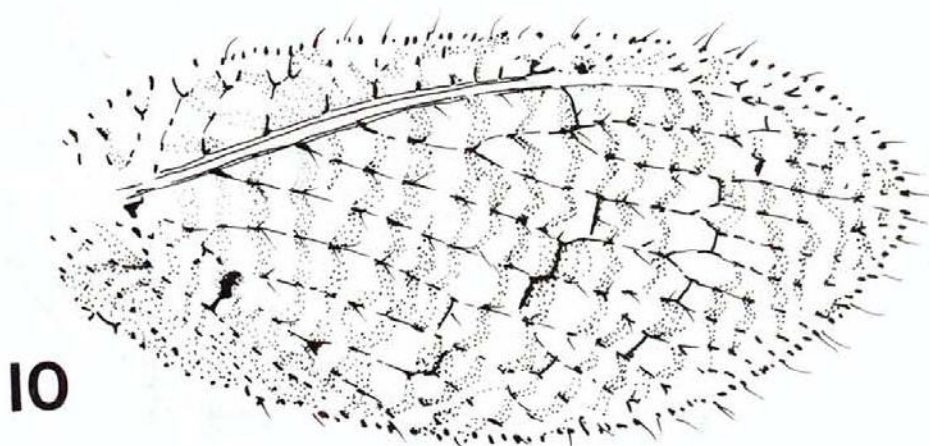


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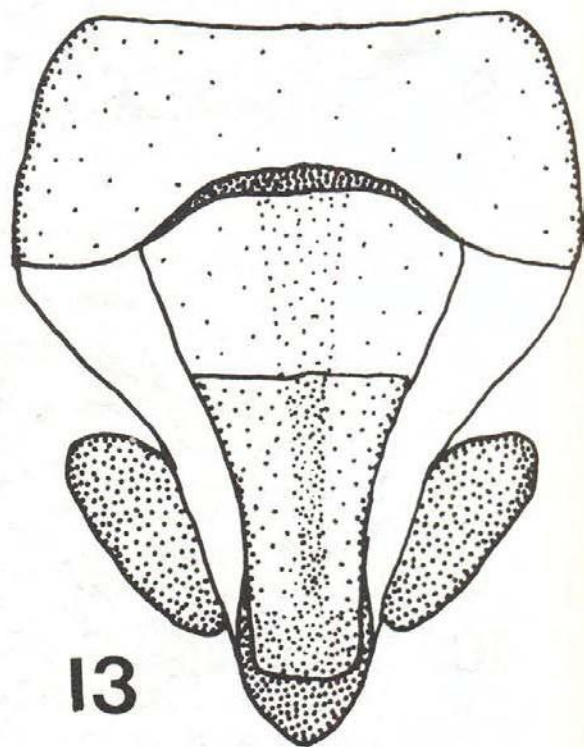
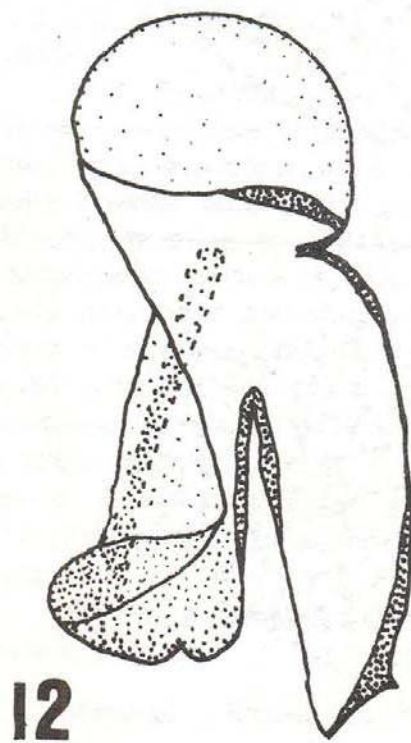
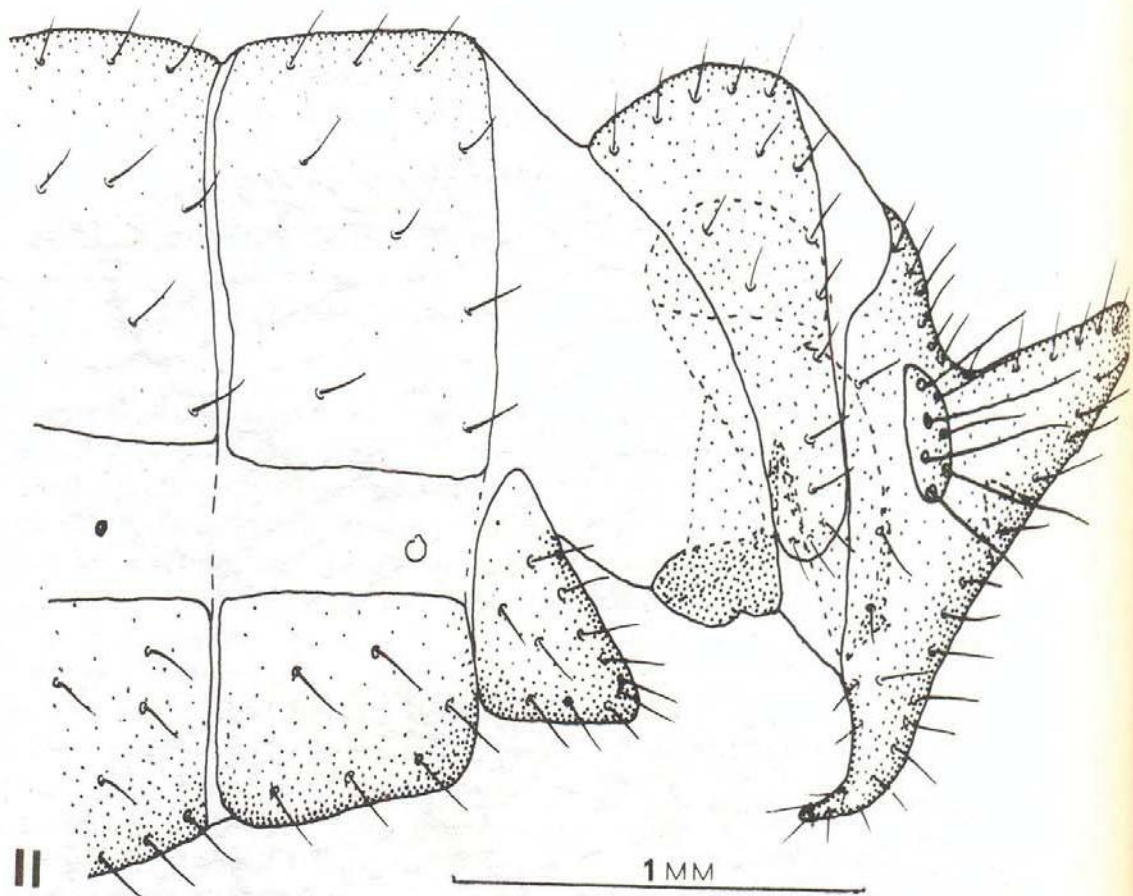
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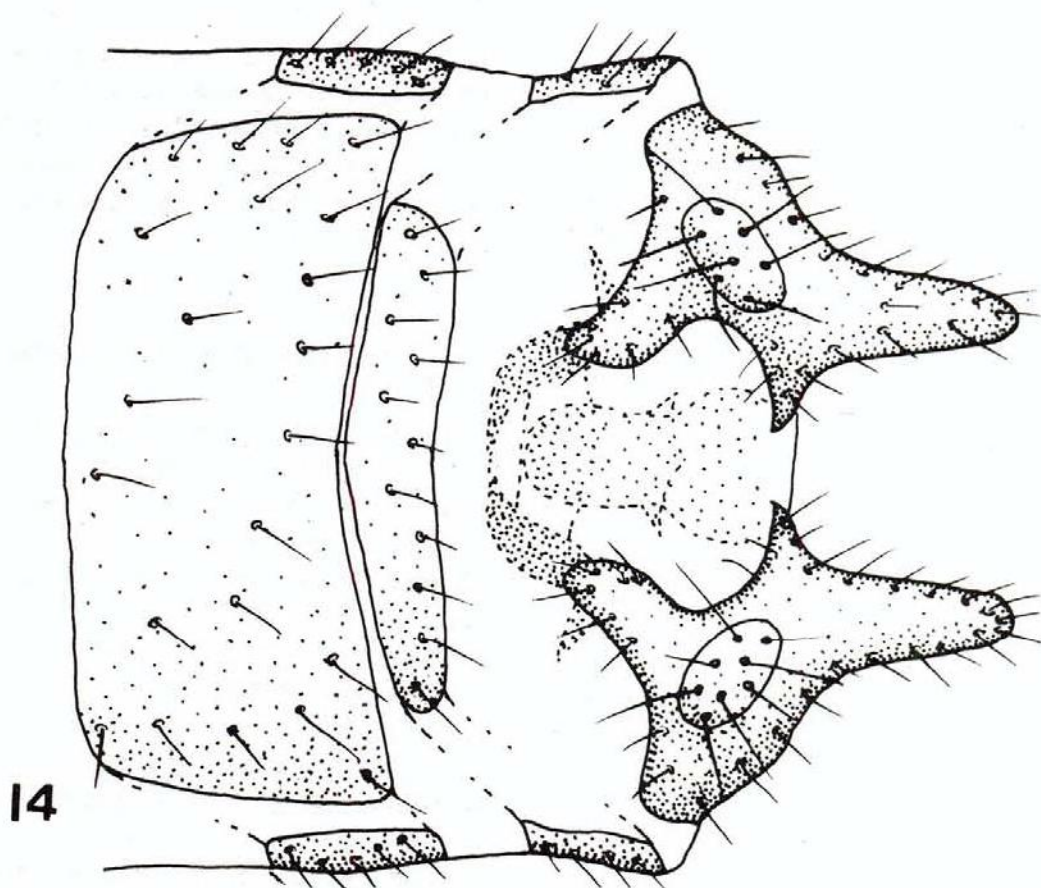


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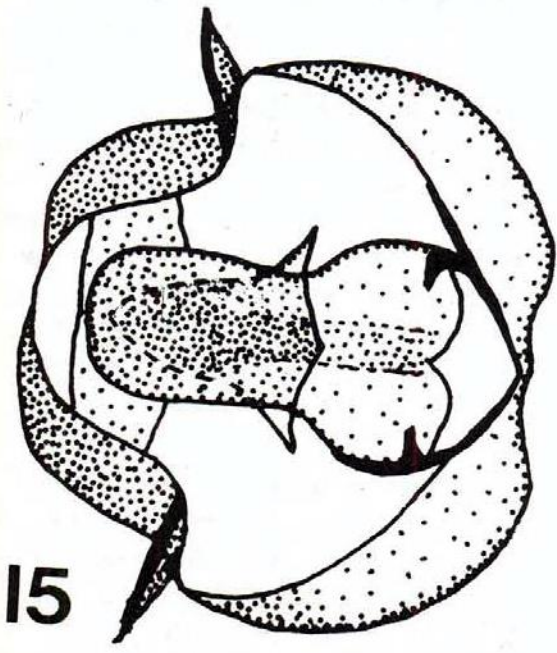
Figs. 8-10. Right forewings of: 8) *Nusalala reticulata* (Navás), 9) *Megalomus rafaelli*, n. sp., 10) *Hemerobius hageni* Navás. (drawings by Artêmio Coelho da Silva)



Figs. 11 — 13. *Notiobiella maculata* Monserrat & Penny, 11) male terminalia, lateral view, 12) aedeagal complex, lateral view, 13) aedeagal complex, caudal view,

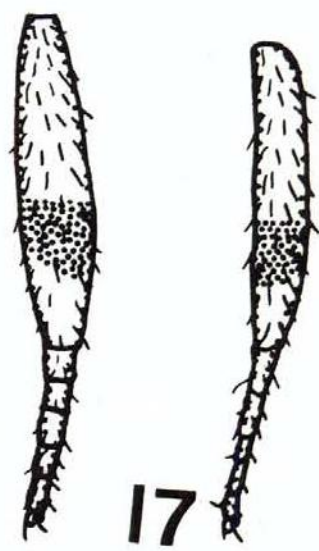


14



15

1MM



16

17

1MM

Figs. 14—17. *Notibiella maculata*. Monserrat & Penny, 14) male terminalia, ventral view, 15) aedeagal complex, ventral view, 16) left foreleg, 17) left midleg.

Forewing Length: male, 5.1 – 5.7 mm; female, 5.0 – 6.0 mm.

Geographical Distribution: Holotype from PARAGUAY, and has been recorded from VENEZUELA (Montserrat & Penny, 1983).

Material Examined: Within the Amazon Basin this species is known from BRAZIL: Amazonas, Manaus, INPA campus, 11–X–1979, eq. J.R. Arias, 1 female, Malaise trap (INPA); Manaus, University campus, 30–VII–1982, J.A. Rafael, 1 female, Malaise trap (INPA); Amazonas, Reserva Ducke, AM–010, km 26, 24–IX–1981, J.A. Rafael, 1 female, Malaise trap (INPA); Manaus, Parque das Laranjeiras, 28–I–1981, 13–VI–1981, 29–VII–1981, 30–VII–1981, 1–VIII–1981 1 male and 4 females, all collected by personnel of J.R. Arias (INPA); Amazonas, AM–010, km 246, 16–VII–1979, eq. J.R. Arias, 1 male, light trap (INPA); Amazonas, Rio Japura, Lake Amanã, VII–IX–1982, R. Best, 1 female, Malaise trap (INPA); Rondonia, Vilhena, 8–XI–1979, eq. J.R. Arias, 1 female, miniature light trap at 1 m height (INPA); Acre, 11 km NE of Rio Branco, 10–V–1981, eq. J.R. Arias, 1 male, light trap (INPA); Pará, Rio Trombetas, Cruz Alta mining area, 14–X–1982, J. Vidal, 1 female (INPA); Cruz Alta, 17–25–XI–1982, J. Vidal, 1 female (INPA); Cruz Alta, 25–XI–1982, N.D. Penny, 1 female (INPA); Pará, Serra Norte, near Marabá, VIII–IX–1982, P. Ready, 1 male (INPA). This species has been collected principally during the dry season

Habitat: This species has only been collected in primary and secondary upland forest.

Species Relationships: Of the three Amazonian species, *N. paddiae* has the shortest male parameres, and is the only one to have red on the pterostigma. Unlike *N. maculata*, the legs are uniformly pa-

le, and unlike *N. brasiliensis*, the wings are pale. Both *N. paddiae* and *N. maculata* can have a pigment spot along the anal margin of the forewing, but this is found much more frequently among individuals of *N. maculata*.

Symphorobius Banks, 1904

Symphorobius Banks, 1904, *Proc. ent. Soc. Wash.*, 6: 209.

Palmobius Needham, 1905, *Bull. N. Y. St. Mus.*, 86: 17.

Spadobius Needham, 1905, *Bull. N. Y. St. Mus.*, 86: 16

Nefasitus Navás, 1916a, *Mems R. Acad. Cienc. Artes Barcelona*, 12(7):131.

Coloma Navás, 1916a, *Mems R. Acad. Cienc. Artes Barcelona*, 12(7):129.

Eurobius Krüger, 1922, *Stett. ent. Ztg.*, 83: 171.

Lachlanius Krüger, 1922, *Stett. ent. Ztg.*, 83: 171.

Type Species: *Hemerobius amicus* Fitch 1855, by original designation.

Symphorobius are among the smallest hemerobiids (forewing length 3.5 – 6.5 mm), normally with very little dark pigmentation pattern on wings or body. There can be two (subgenus *Symphorobius*) or three (subgenus *Niremberge*) radial sectors, with the first sector branched near the base in the former case. The male ectoprocts have caudal projections, which are quite characteristic for this genus.

Symphorobius is known from all regions of the world, except Australia and tropical Asia, with 51 described species. Eleven species have been described from South America (Penny, 1977).

The genera *Palmobius* and *Spadobius* were synonymized with *Symphorobius* by Banks (1906), *Coloma* by Carpenter (1940), and *Nefasitus*, *Eurobius*, and *Lachlanius* by Nakahara (1960). The generic name *Niremberge* was synonymized with *Symphorobius* by Carpenter (1940),

but the most recent study of the group by Aspöck *et al.* (1980) indicates that this name is valid at subgeneric level, with *Symphorobius* (*Niremberge*) having three radial sectors, and *Symphorobius* (*Symphorobius*) having only two. Only the subgenus *S.* (*Symphorobius*) has been collected in the Amazon Basin, although *S.* (*Niremberge*) *miranda* Navás has been collected as far north as Brasilia. The two new species of *Symphorobius* found in the Amazon Basin can be separated using the following key:

**KEY TO SPECIES OF SYMPHEROBIUS
IN THE AMAZON BASIN**

- 1a. Four outer gradate crossveins; basal sc-r crossvein heavily margined; male ectoproct projections extending only as far as apex of ninth sternite, apically swollen and slightly bifurcate, straight. **S. ariasi**
- 1b. Three outer gradate crossveins; basal sc-r crossvein not margined; male ectoproct projections extending well beyond apex of ninth sternite, apically not swollen, nor bifurcate, and apically inwardly curved . . . **S. amazonica**

Symphorobius (*Symphorobius*)
amazonica Penny & Monserrat, new species
(Figs. 2, 18–22, Map 2)

Holotype male in the INPA Systematic Entomology Collection, Manaus.

Head: Occiput pale brown, without markings; setae short, pale. Frons and clypeus pale brown, without markings; setae short, pale. Frons and clypeus pale brown without markings. Maxillary and labial palpi pale brown. Antennae broken off after first two segments; scape and pedicel pale brown.

Thorax: Pro-, meso- and metanota pale yellow medially, dark brown late-

rally; pilosity long, numerous, and mixed dark and pale. Pleural areas pale brown.

Legs: Pale yellow, with indistinct longitudinal brown mark on all tibiae.

Wings: Forewing longitudinal veins dark brown. Wing membrane uniformly pale brown, except dark brown margining of first sc-r crossvein. Costal area narrow, without recurrent humeral vein. Pterostigma indistinct, pale brown. Two radial sectors in basal part of wing, and one, twice-branched radial sector originating beyond pterostigma. Six inner gradate crossveins and three outer gradates, both in irregular series. Three m-cua crossveins.

Hindwing pale brown, without markings.

Abdomen: Pale brown, without markings. Ninth tergite and ectoprocts separate. Ninth tergite short, caudally truncate. Ectoprocts ventral to ninth tergite, medially forming flat plates, with narrow fissure between the two plates and two pairs of small medioapical points laterally bearing one elongate, digitiform projection, apically incurved and acutely pointed; apical point darkly pigmented, extending well beyond ninth sternite. Ninth sternite evenly tapering to rounded apex. Aedeagal complex consisting of U-shaped, relatively narrow gonarcus, with small, rounded, sclerotized plate caudally. Parameres consisting of elongate, fused, medial shaft and two broad, recurved, apical plates.

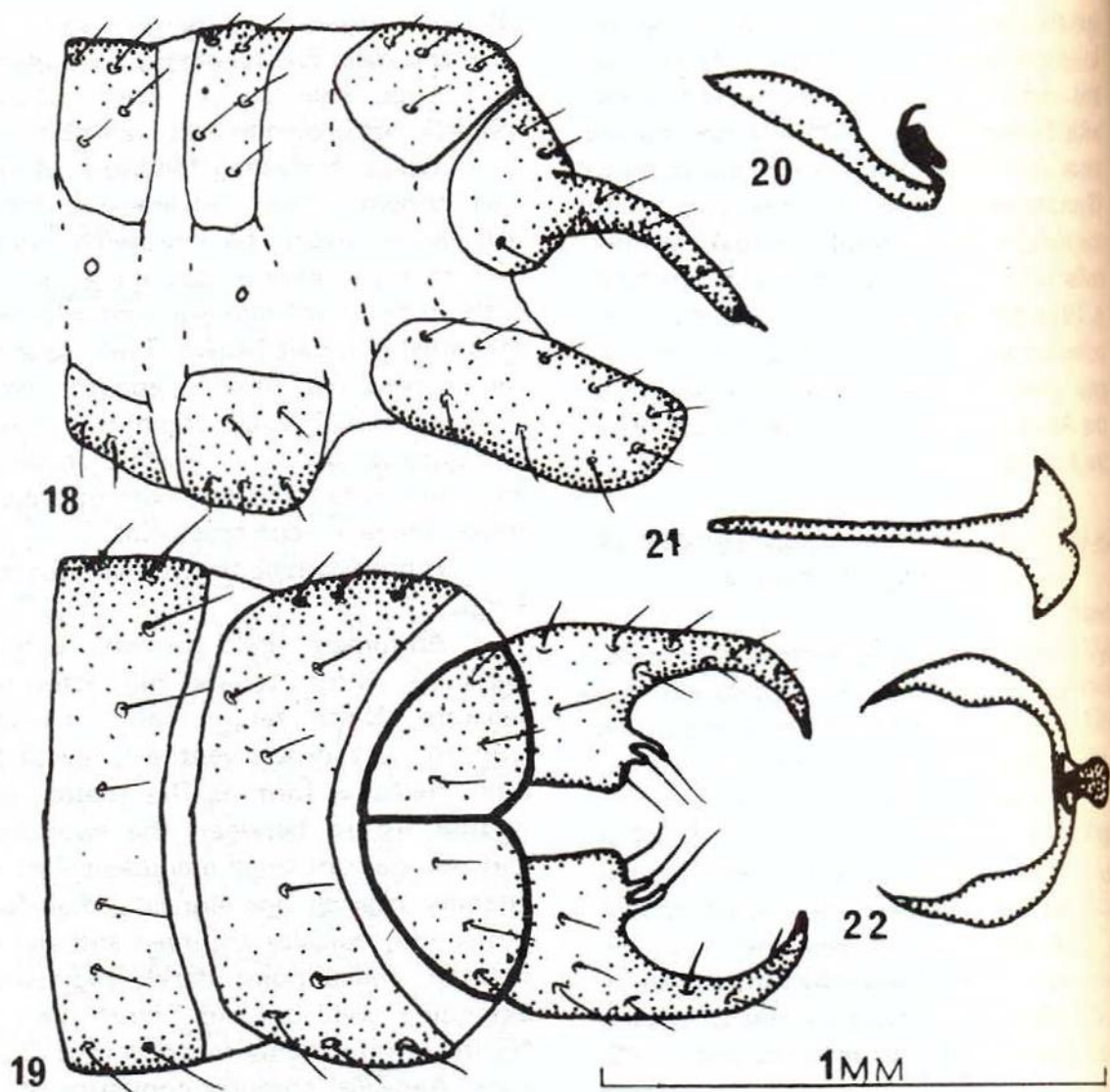
Female unknown.

Forewing Length: male, 3.1 mm.

Series Examined: Holotype, BRAZIL: Amazonas, Reserva Ducke, AM-010, km 26, IX-1981, J.A. Rafael, in Malaise trap (INPA).

Habitat: This species was collected in upland, primary forest.

Species Relationships: Many of the South American species of this genus are still poorly known, but of the nine *Symphorobius* species previously described from this continent, *S. miranda* Navás is in the subgenus *Niremberge*; *S. maculi-*



Figs. 18–22. *Sympherobius amazonicus* n. sp., 18) male terminalia, lateral view, 19) male terminalia, dorsal view, 20) aedeagal complex, lateral view, 21) male parameres, dorsal view, 22) aedeagal complex, dorsal view.

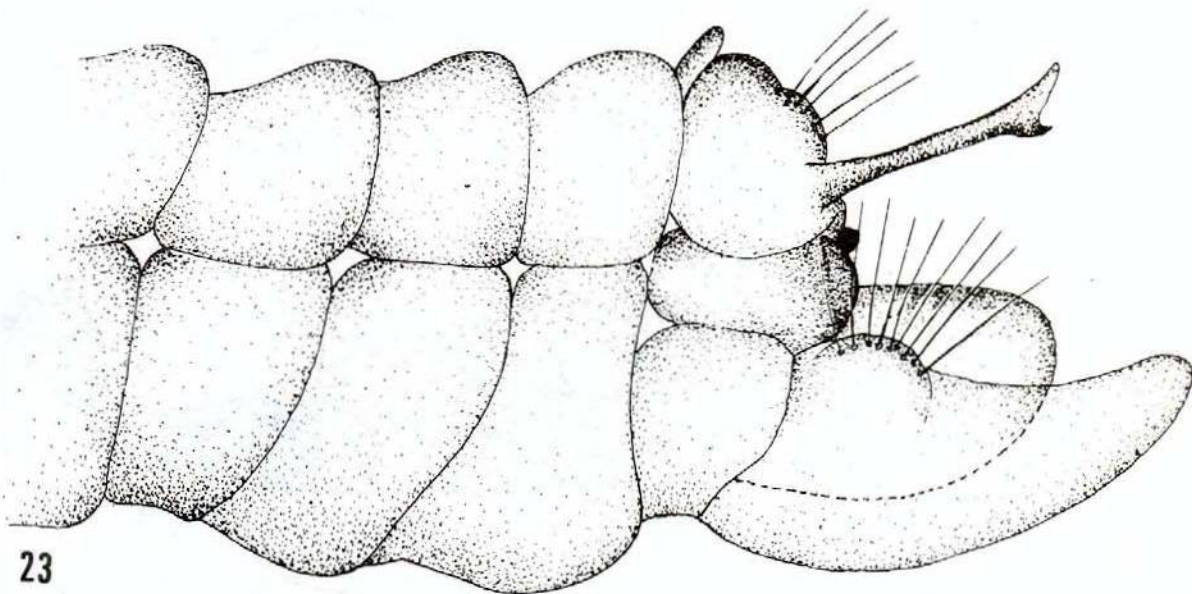
pennis Kimmins, *S. barberi* (Banks), and *S. marmoratipennis* (Blanchard) all have more than one large projection from the ectoprocts. *S. intervenalis* Banks, *S. blanchardi* (Navás), *S. humilis* Navás, and *S. scriptus* (Navás) all have pigment patterns on the wings. *S. gayi*, from Chile is a greyish insect with rather iridescent wings. The other new species from Amazonia, *S. ariasi*, although also with only one projection of the ectoprocts, has a pattern to the wings, and other differences mentioned in the key.

This species is named for the river basin where it has been found.

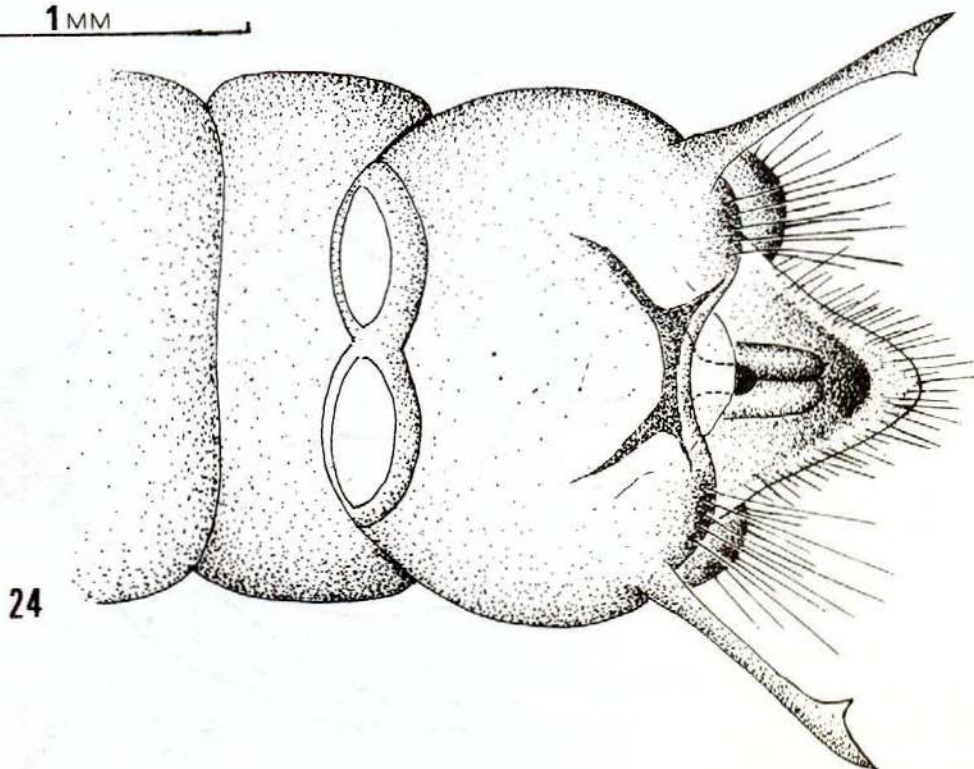
Sympherobius (Sympherobius) ariasi,
Penny & Monserrat, new species
(Figs. 3, 23–26, Map 2)

Holotype male in the INPA Systematic Entomology Collection, Manaus.

Head: Occiput, frons, and clypeus pale brown, without markings; setae long, sparse, pale. Maxillary and labial palpi pale brown. Antennae consisting of pale



1 MM



Figs. 23—24. *Sympherobius ariasi*, n. sp., 23) male terminalia, lateral view, 24) male terminalia, dorsal view, (drawings by Alberto Coelho da Silva)

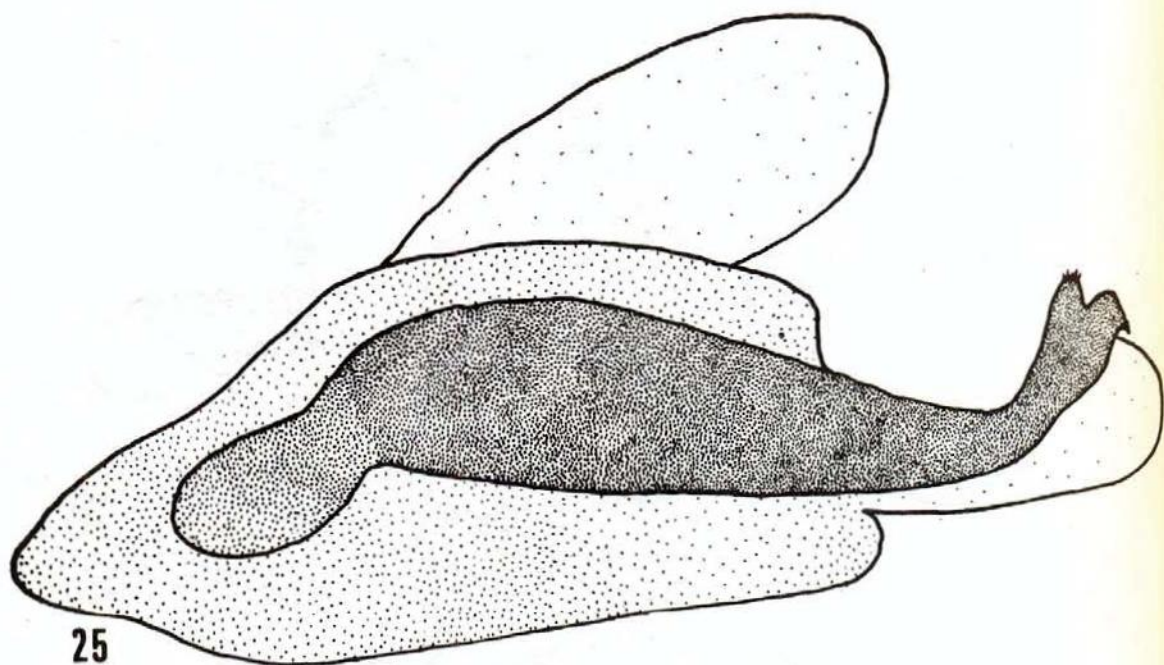
brown scape and pedicel, and 55 pilose, moniliform flagellomeres; about seven sub-basal and 12 apical flagellomeres dark brown, the rest pale brown.

Thorax: Pre-, meso-, and metanota pale yellow medially and dark brown

laterally; pilosity long, numerous, pale. Pleural areas pale brown.

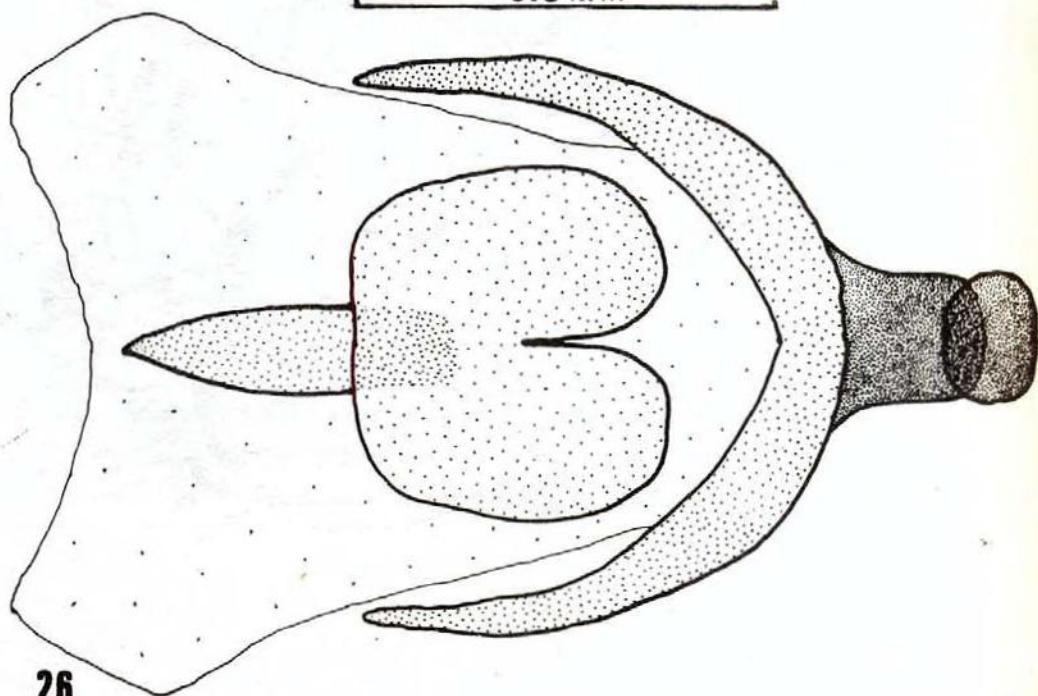
Legs: Completely pale yellow.

Wings: Forewing longitudinal veins banded yellow and brown. Wing membrane dark near base, margining crossveins,



25

0.5 MM



26

Figs. 25—26. *Sympherobius ariasi*: 25) aedeagal complex, lateral view, 26) aedeagal complex, dorsal view (with parameres attached).

and at vein forks; the rest of membrane pale brown. Costal area relatively wide (about 1/4 width of wing), with recurrent humeral crossvein. Pterostigma indistinct,

yellowish-brown. Two radial sectors in basal part of forewing, and one, twice-forked radial sector beyond pterostigma. Four inner gradate crossveins and four



Map 2. Geographical distribution of Amazonian species of *Symphorobius* and *No-merobius*.

outer gradate veins, both in irregular series. Three m—cua crossveins.

Hindwing pale brown, without markings.

Abdomen: Pale brown, without markings. Ninth tergite short, caudally truncate. Ectoprocts ventral to ninth tergites, medially forming flat plates, with relatively wide fissure between them; four long setae at apex of flat plate. Laterally, ectoprocts bearing a single long, digitiform projection, apically straight and slightly expanded; apical point darkly pigmented, extending well beyond ninth sternite. Ninth sternite evenly tapering to rounded apex, with basal tuft of seven to nine long setae on each side. Aedeagal complex consisting of U-shaped gonarcus, with relatively broad lateral arms. Arcessus a caudo-medial lobe which apically is recurved dorsally into anterior spinny lobe and posterior curved plate. Parameres forming central shaft and two, broad, apical plates.

Forewing Length: male, 4.2 – 5.0 mm; female, 4.0 – 4.5 mm.

Series Examined: Holotype, BRAZIL: Amazonas, Reserva Ducke, AM-010 km 26, 9—X—1981, J.A. Rafael, Malaise trap, 1 male (INPA). Allotype, same locality as holotype, 27—XII—1977, J.R. Arias, miniature light trap at 1 m height, 1 female (INPA). Paratypes, BRAZIL: Amazonas, Reserva Ducke, 16—VIII—1977, J. R. Arias, 1 male, miniature light trap at 1 m height (MPEG); Reserva Ducke, 13-IX-1977, J.R. Arias, 1 male, miniature light trap at 1 m height (MZUSP); Reserva Ducke, 6-IX-1978, J.R. Arias, 1 male, miniature light trap at 15 m height (UPR); Reserva Ducke, 13-IX-1978, J.R. Arias, 1 male, miniature light trap at 1 m height (USNM); Amazonas, mid Rio Purus (7° 2'S, 65° 4'W), 26—31—VIII—1983, S. Campbell, 1 female, miniature light trap at 1 m height (INPA); Pará, Rio Trombetas, Cruz Alta, XI—1982, J. Vidal, 1 female, miniature light trap at 1 m height (BMNH). This species

appears to have a dry season emergence in Reserva Ducke, as continual collecting over 13 months (Penny & Arias, 1982) yielded only the five specimens collected between mid-August and late-December.

Species Relationships: As with *S. amazonica*, various of the nine described South American species can be separated on the basis of number of radial sectors (*S. miranda*), number of male ectoproct projections (*S. maculipennis*, *S. barberi*, and *S. marmoratipennis*), and lack of forewing markings (*S. gayi*). *Symphorobius intervenalis* and *S. blanchardi* have a different pattern to the gradate veins, *S. humilis* has densely speckled wings, and *S. scriptus* is a much darker species with pale margining along longitudinal veins. Although the placement of gradate veins is different, *S. ariasi* seems to be similar to *S. intervenalis*, but a definite relationship awaits more knowledge of the male genitalia of the various species.

This species is named for Jorge R. Arias, a sand-fly specialist, who has collected many Amazonian neuropterans while conducting a research program on leishmaniasis.

Nomerobius Navás, 1916

Nomerobius Navás, 1916a, *Mems R.Acad. Cienc. Artes Barcelona*, 12(7): 130.

Type Species: *Megalomus psychoides* Blanchard, 1851, by original designation.

This genus was originally described by Navás to include those species with six outer gradate veins, the genus *Symphorobius* having been described by Banks as having four. There has been great hesitation in using this generic name because the original characteristic was so weak—the number of outer gradate veins being quite variable among individuals of the same species. Furthermore, it seems likely that Navás and Banks were using different

definitions of "gradate veins". As most frequently defined, the gradate series of crossveins lie in the radial area only. In the type species of *Nomerobius*, there are four crossveins in series in the radial area, and a further two crossveins in an extension of the same series in the medial area, or a total of six crossveins in the series. Nakahara (1960) maintained *Nomerobius* as a valid genus on the basis of two unique characteristics of the aedeagal complex. There appear to be other characteristics as well. In male *Nomerobius*, the ectoprocts appear to always bear a dorsally projecting spine, and may or may not have acute, digitiform processes of *Sympherobius*, and the ninth sternite is much narrower, and apically upturned in *Nomerobius*, while wider and not apically upturned in *Sympherobius*. The specimens of *Nomerobius* that we have seen also have "beading" along forewing longitudinal veins, while this is not present in *Sympherobius*.

Navás placed two species, *N. psychodoides* (Blanchard) from Chile, Peru, and Argentina and *N. annulicornis* Navás from Colombia in *Nomerobius*, and Nakahara (1965) transferred the species *Sympherobius marmoratus* Navás from Argentina to *Nomerobius*. Thus, the genus has consisted of three species found in the Andes and southern parts of South America. Thus, it was with some surprise that a specimen of *N. psychodoides* was recently collected in the low mountains of southern Pará state in eastern Amazonia.

Nomerobius psychodoides (Blanchard, 1851)

(Fig. 4, 27-30, Map 2)

Megalomus psychoc Des Blanchard 1851, In Gay's, *Historia fisica de Chile*, 5: 127.

Sympherobius psychodoides (Blanchard) Navás, 1910a, *Revta chil. Hist. nat.*, 14: 237.

Nomerobius psychodoides (Blanchard) Navás, 1916a, *Mems R. Acad. Ci-*

enc. Artes Barcelona, 12(7): 131.

Sympherobius modestus Banks, 1910, *Proc. ent. Soc. Wash.*, 12: 158.

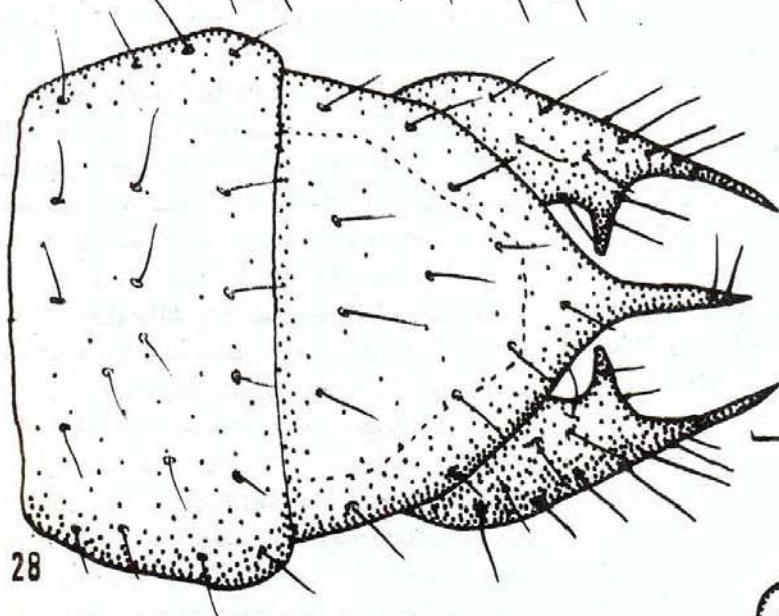
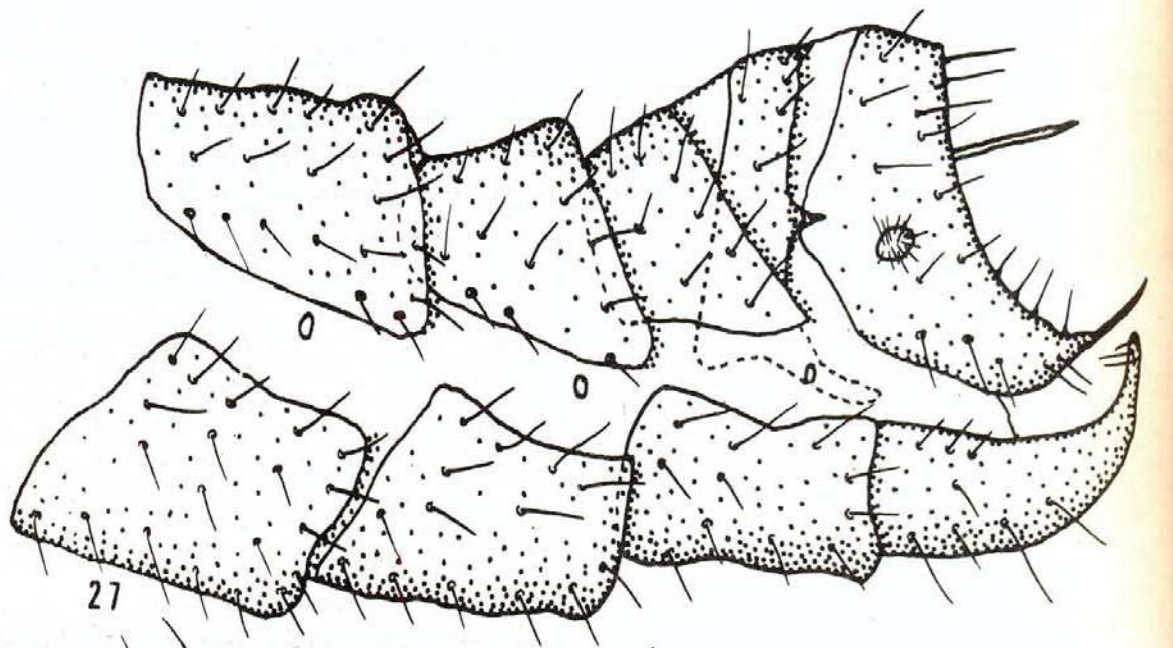
Sympherobius marmoratus Navás, 1910b, *Broteria*, 9: 70. **new synonymy** Holotype male of *S. marmoratus* in Paris Museum; syntypes of *S. modestus* in Museum of Comparative Zoology, Harvard University; type of *M. psychodoides* not located in Paris Museum, but one specimen without type label collected by Gay in Chile placed under this name in collection.

Head: Occiput pale yellow with numerous raised, dark brown spots; pilosity sparse, short, pale. Frons and clypeus pale yellow, with small dark brown spot at margin of eyes; devoid of pilosity. Gena dark brown. Maxillary and labial palpi dark brown. Antenna consisting of pale yellow scape, with lateral and medial longitudinal stripe or small dark spots; pedicel basally pale yellow, apically with dark brown ring; 61 to 65 flagellomeres, basally pale yellow and apically dark brown. Antennal pilosity abundant, but very short (not longer than flagellar segment).

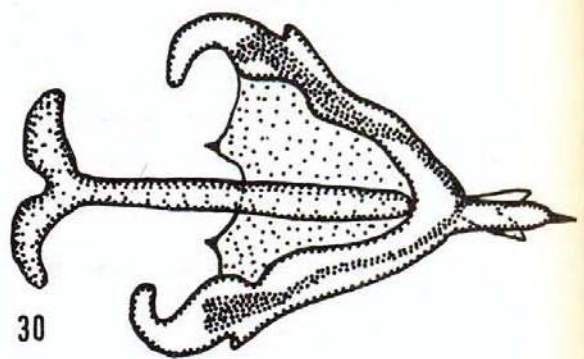
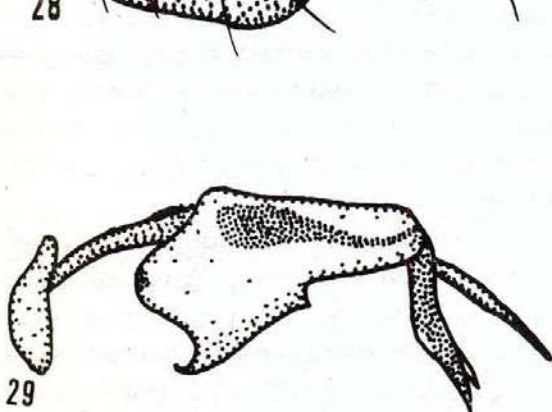
Thorax: Pro-, meso-, and metanota pale yellow medially, and dark brown laterally, with numerous raised, dark spots. Pilosity long, sparse, pale. Pleural areas pale brown.

Legs: Coxae dark brown, other segments pale brown to yellow. Small, raised dark spots on fore- and mid-femora; small dark spot at apex of fore- and mid-tibiae.

Wings: Forewing longitudinal veins irrorate pale and dark. Wing membrane brown, being darker at margins of crossveins. Costal area relatively narrow (about 1/6 maximum width of forewing), with recurrent humeral crossvein. Pterostigma indistinct, dark brown. Two radial sectors in basal part of forewing, and one, twice-forked radial sector beyond pterostigma. Four outer, two inner, and two basal gradate crossveins; outer gradates in regular series. Four m-cua crossveins.



1MM



1MM

Figs. 27-30. *Nomerobius psychodoides* (Blanchard), 27) male terminalia, lateral view, 28) male terminalia, ventral view, 29) aedeagal complex, with parameres, lateral view, 30) aedeagal complex, with parameres, dorsal view.

Hindwing pale brown, without irrorate markings.

Abdomen: Dark brown dorsally, pale yellow ventrally. Ninth tergite elongate, narrow, extending ventrally much farther than anterior tergites; with two acute caudal projections, one short projection at mid-length, and much larger one at ventral base extending caudally below ectoprocts. Ectoprocts dorsally rounded and ventrally extending caudally well beyond ninth sternite as broad lobe, apically bifurcate; dorsal bifurcation terminating with stout spine on elongate base, while medio-apical bifurcation terminating in acute point. Ninth sternite abruptly narrowed apically, and upturned; terminating in an acute point. Aedeagus consisting of V-shaped dorsal gonarcus and ventral endoprocessus hinged together laterally. Arcessus a single acute dorsal point and slightly smaller apically bifurcate ventral point. Parameres consisting of fused elongate anterior shaft, and two cupshaped apical lobes.

Intraspecific Variation: There is a considerable amount of variation in the spotting of the frons, with the Pará specimen almost devoid of spots, while some Chilean specimens have a row of four lateral spots, or maximally a transverse stripe. There can also be a dark longitudinal stripe between the antennae. The antennal scape is spotted in the Pará specimen and a few Chilean specimens, but with lateral stripes in the majority of Chilean specimens. Wing pigmentation can be pale brown, to dark brown, to pale brown with large triangular dark brown spot along anal margin. The Amazonian specimen is among the darkest. However, the genitalia are consistently the same.

Geographical Distribution: Originally described from CHILE, it was again described by Banks (as *S. modestus*) and Navás (as *S. marmoratus*) in 1910 from ARGENTINA. Banks (1915) mentions

the variety *connexus* from near Lima in PERU at 860 m. Nakahara (1960) mentioned this species from URUGUAY. This is apparently the first record of this species in Brazil, and this record is about 3000 km from localities in Peru. The Carajás record seems to indicate one of the widest distributions among South American Hemerobiidae.

Material Examined: Type of *M. marmoratus*; 16 males, 10 females, pinned, from various localities in Chile, collected by L. Peña; BRAZIL, Pará, Serra Norte — Carajás, 5—15—IV—1983. M. Miles, 1 male (INPA).

Species Relationships: The holotype of *S. marmoratus* and identified specimens (including the possible type) of *M. psychodoides* in the Paris Museum show almost no variation, and what variation does exist easily falls within the normal variation for this species, and thus the names are herein being synonymized. *S. modestus* Banks was synonymized with *S. psychodoides* by Navás (1916a) and this synonymy has been accepted by subsequent specialists (Nakahara, 1960, 1965; Stange, 1967). The only other species within this genus, *N. annulicornis* Navás, is not well known and until the male genitalia is described, comparisons will be difficult. We have seen one other undescribed species from Chile, which has paler wings and one additional acute projection on male ectoprocts. This latter species and *N. psychodoides* both have the dorsal spine on the elongate base.

Hemerobius Linnaeus, 1758

Hemerobius Linnaeus, 1758, *Systemae Naturae*, 10th edition, p. 549.

Mucropalpus Rambur, 1842, *Roret's Suite à Buffon, Névropt.*, p. 420.

Stenolomus Navás, 1906, *Revta R. Acad. Cienc. exact. fís. nat. Madr.*, 4 : 687—706.

Hemerodomia Navás, 1909, *Ann. Soc. sci. Bruxelles*, 33: 217.

Schneiderobius Krüger, 1922, *Stett. ent. Ztg.*, 83: 171.

Hagenobius Krüger, 1922, *Stett. ent. Ztg.*, 83: 171.

Reuterobius Krüger, 1922, *Stett. ent. Ztg.*, 83: 171.

Type Species: of **Hemerobius** is **Hemerobius humulinus** Linnaeus; of **Mucropalpus** is **Hemerobius lutescens** Fabricius; of **Stenolomus** is **Stenolomus cabrerai** Navás; of **Hemerodomia** is **Hemerodomia buyssoni** Navás; of **Schneiderobius** is **Hemerobius nitidulus** Fabricius; of **Hagenobius** is **Hemerobius citrinus** Hagen; of **Reuterobius** is **Hemerobius pini** Stephens.

Hemerobius are medium-sized insects (5 to 10 mm forewing length) with three (or rarely four or five) sectors of the radius. Male ectoprocts are generally elongate, with apical branches, and not as **Symphorobius**, with short ectoprocts and digitiform extensions.

Hemerobius is known from all major regions of the world, except Australia and the Pacific Islands. There are presently about 122 described species, with Penny (1977) listing 25 species for the Neotropical Region, and 15 for South America.

Mucropalpus was synonymized with **Hemerobius** by Costa (1855); **Stenolomus** with **Hemerobius** by Navás (1916b); **Hemerodomia** with **Hemerobius** by Navás (1917a); **Schneiderobius Hagenobius** and **Reuterobius** with **Hemerobius** by Carpenter (1940).

Aspöck, et al. (1980) have divided **Hemerobius** into two subgenera, with the subgenus **Brauerobius** having branched veins between the humeral vein and costal margin, and male ectoprocts without acute distal lobes. So far only the subgenus **Hemerobius** has been collected in South America, and within the Amazon Basin only a single species, **Hemerobius hageni**, is known.

Hemerobius (Hemerobius) hageni

Navás, 1918

(Figs. 9, 31–34, Map 3)

Megalomus pallidus Blanchard, 1851, in Gay, *Historia física de Chile*, 6: 126.

Hemerobius pallidus (Blanchard) Navás, 1910, *Revta chil. Hist. nat.*, 14: 235. (preoccupied).

Schneiderobius pallidus (Blanchard) Krüger, 1922, *Stett. ent. Ztg.*, 83: 171.

Hemerobius pinnatus Navás, 1917b, *Revta R. Acad. Cienc. exact. fís. nat. Madr.*, 16: 496. (preoccupied).

Hemerobius hageni Navás, 1918, *Boln. Soc. aragon Cienc. nat.*, 17: 223.

Hemerobius brethesi Navás, 1929, *Butll. Inst. catal. Hist. nat.*, 9: 115.

Hemerobius pinnatulus Navás, 1935 *Mems R. Acad. Cienc. Artes Barcelona*, 25: 58.

Hemerobius blanchardi Nakahara, 1960, *Mushi*, 34: 48.

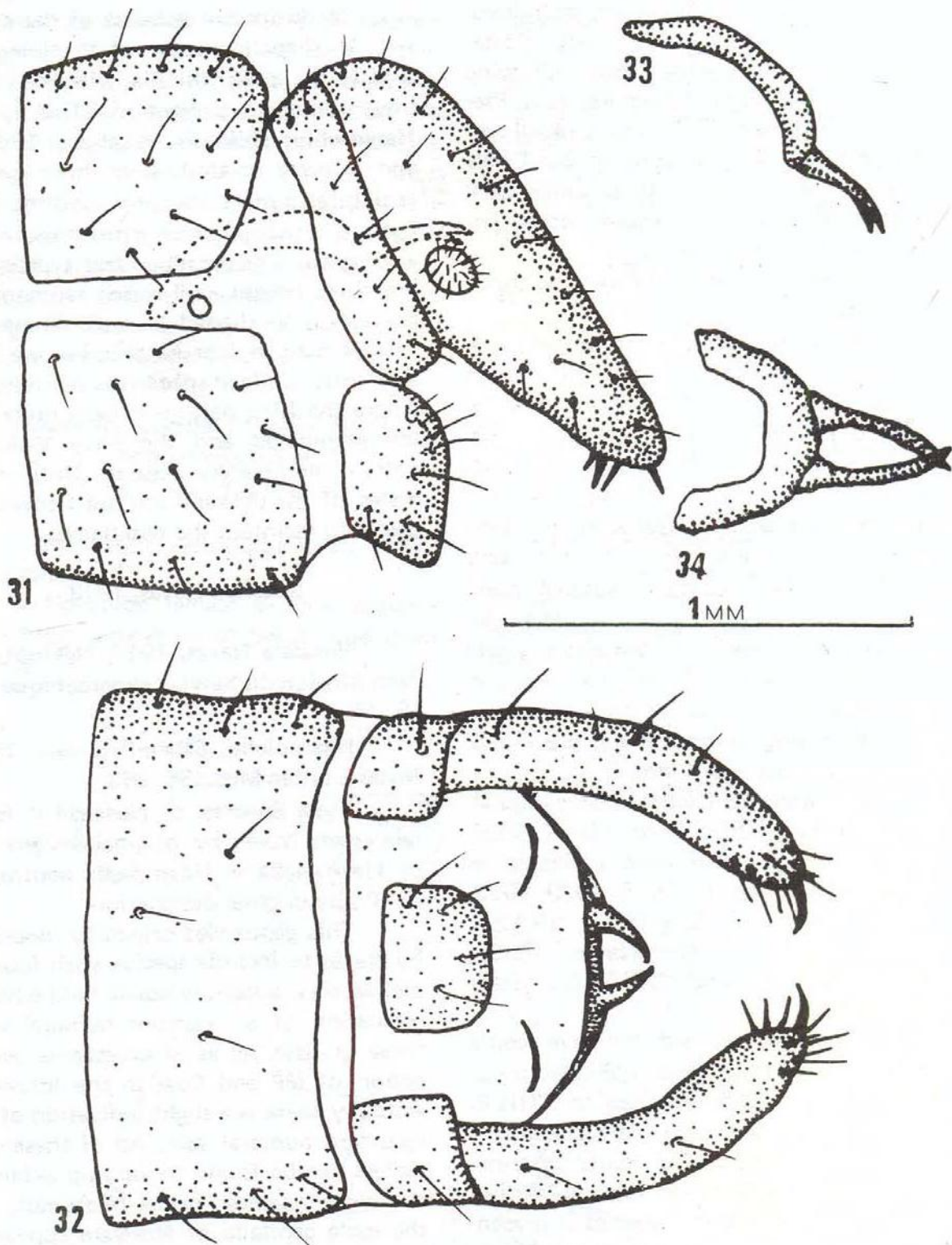
Type of **Megalomus pallidus** Blanchard not encountered at Paris Museum. Holotype female of **H. pinnatus** Navás, 1917 in La Plata Museum, Argentina. Holotype female of **H. hageni** in the Navás Collection, Barcelona.

Head: Occiput pale yellow, without markings, with abundant pale pilosity. Frons and clypeus pale yellow, without markings, and without pilosity. Maxillary and labial palpi pale brown to dark brown. Antennae consisting of pale yellow scape, pedicel, and 51 to 55 moniliform flagellomeres; flagellar segments bearing abundant pale pilosity longer than segment.

Thorax: Pro-, meso-, and metanota pale yellow medially and dark brown laterally, with long, pale, sparse pilosity. Pleural areas pale yellow.

Legs: All leg segments pale yellow to pale yellowish-brown.

Wings: Forewing longitudinal veins alternating yellow and brown. Wing membrane pale yellow, with numerous V-sha-



Figs. 31–34. *Hemerobius hageni* Navás, 31) male terminalia, lateral view, 32) male terminalia, ventro-caudal view, 33) aedeagal complex, lateral view, 34) aedeagal complex, dorsal view.

ped darker markings in all wing cells. Second m-cua crossvein darkly margined, and fuscate area at apex of cup. Costal margin moderately wide (about 1/5 wing width) with recurrent humeral vein. Pterostigma indistinct, pale. Three radial sectors present, all originating in basal half of wing. Five outer and three inner, dark gradate crossveins in irregular series. Three dark m-cua crossveins.

Hindwing pale yellow, without markings.

Abdomen: Dark brown dorsally, pale yellow ventrally. Male ninth tergite narrow, extending ventrally only slightly more than eighth tergite, without caudal projections. Male ectoprocts elongate, gradually tapering to apical, inwardly-curved acute point; extending well beyond ninth sternite. Ninth sternite very short; apically truncate. Aedeagal complex simple, consisting of U-shaped gonarcus and arcessus of two short, acute projections. Parameres very narrow, lateral, unfused, semi-circular sclerites.

Forewing Length: male, 5.9 – 7.2 mm; female, 5.9 – 7.4 mm.

Geographical Distribution: Originally described by Blanchard from CHILE, this species has also been collected in ARGENTINA (Navás, 1918, 1920, 1922, 1933a; Nakahara, 1960, 1965), BRAZIL (Navás, 1934), PERU (Navás, 1933b; Nakahara, 1965), and URUGUAY (Stange, 1967).

Material Examined: We have seen a large series of this species collected by L. Peña from various localities in CHILE. Within Brazil we have seen specimens from Rio Grande do Sul, Santa Catarina, Paraná and the Distrito Federal. Within the Amazon Basin, this species is presently known only from the southwestern margin: BRAZIL: Rondonia, Vilhena, 6-XI-1977, J.R. Arias, light trap, 1 male (INPA).

Habitat: Specimens from the Distrito Federal were collected in open savannah.

Species Relationships: This species is quite distinctive because of the extensive V-shaped pattern of the wings, as well as the male genitalia, with the single, inwardpointing projection. The species *Hemerobius chilensis* Nakahara, 1965, is very closely related, with male genital structures almost identical, and the wing pattern, although bearing much more anal and apical pigmentation than typical *Hemerobius hageni*, still shows remnants of the wavy, V-shaped pattern. These two species may in fact be one, but we have seen other Chilean specimens (all females) where the wing pattern is even more darkly pigmented and the wavy V-shaped pattern completely absent. Until more males of the darker form are known, we prefer to maintain the two names.

Nusalala Navás, 1913

Nusalala Navás, 1913, *Névroptères. Paris Mission du Service géographique*... 10: 74.

Haarupiella Esben-Petersen, 1914, *Notes Leyden Mus.*, 36: 263.

Type Species: of *Nusalala* is *Nusalala erecta* Navás, by original designation; of *Haarupiella* is *Haarupiella neotropica* E.-P., by original designation.

This genus was originally described by Navás to include species with four radial sectors, a narrow costal field with no indication of a recurrent humeral vein, three gradate series of crossveins, and a fusion of MP and CuA in the forewing. Actually there is a slight indication of the recurrent humeral vein. All of these characters can be found to varying extent in the closely related genus *Micromus*, but the male genitalia of *Nusalala* appear to be somewhat different, with more complexity to the endoprocessus, a shorter projection of the ectoprocts, and an elongate central shaft of the parameres.

Nusalala appears to be a Neotropical replacement of *Micromus*, as species of *Micromus* described from South Ame-

rica actually pertain to *Nusalala*, and no species of *Nusalala* have yet been found outside of the Neotropical Region. Penny (1977) listed 20 species of *Micromus* and *Nusalala* from the Neotropical Region, ranging from Mexico to Argentina. Very little recent work has been done on the taxonomy of *Nusalala*, and thus the number of true species in the region could vary considerably from the number of names presently valid. Only one species has been collected in the Amazon Basin, which is described below.

***Nusalala reticulata* (Navás, 1910)
new combination
(Fig. 7, 35–40, Map 3)**

***Micromus reticulatus* Navás, 1910,
Broteria, 9: 75.**

Holotype female in Paris Museum (without indication of being type specimen).

Head: Occiput, frons, clypeus, and genae pale brown, without markings; with pilosity sparse, long, pale. Maxillary and labial palpi pale brown. Antenna consisting of pale brown scape, pedicel, and flagellum; with 61 to 62 moniliform flagellomeres.

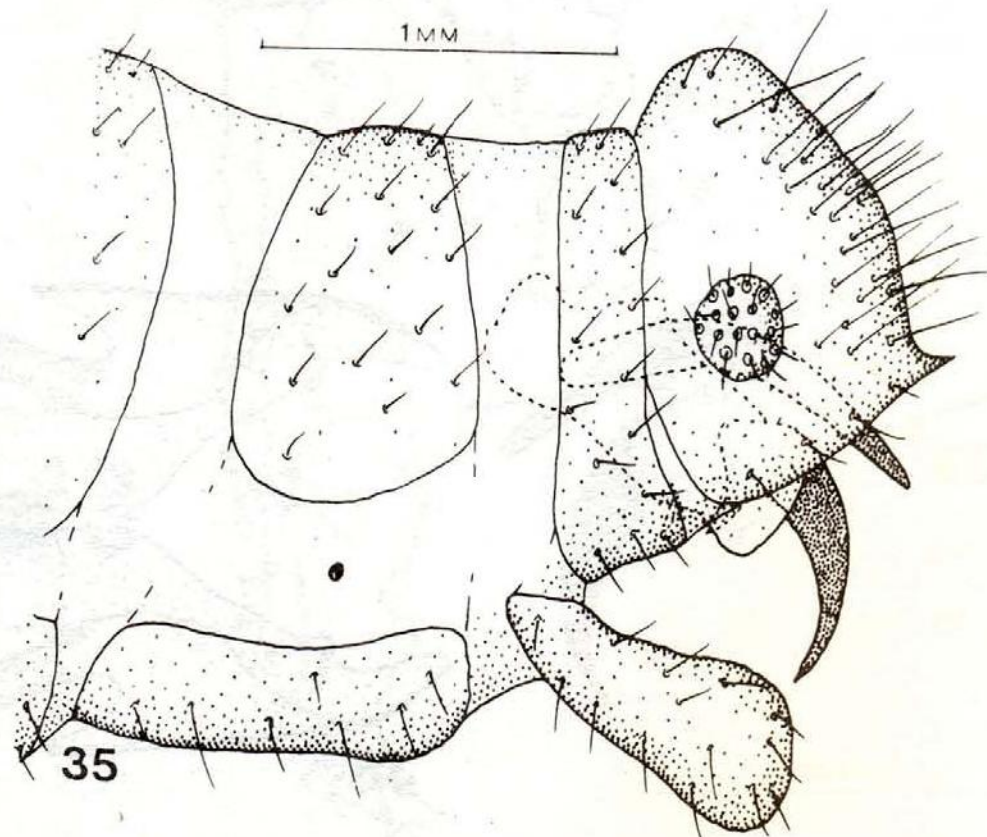
Flagellar pilosity short and abundant.

Thorax: Pro-, meso-, and metanota dark brown, with abundant long, pale pilosity.

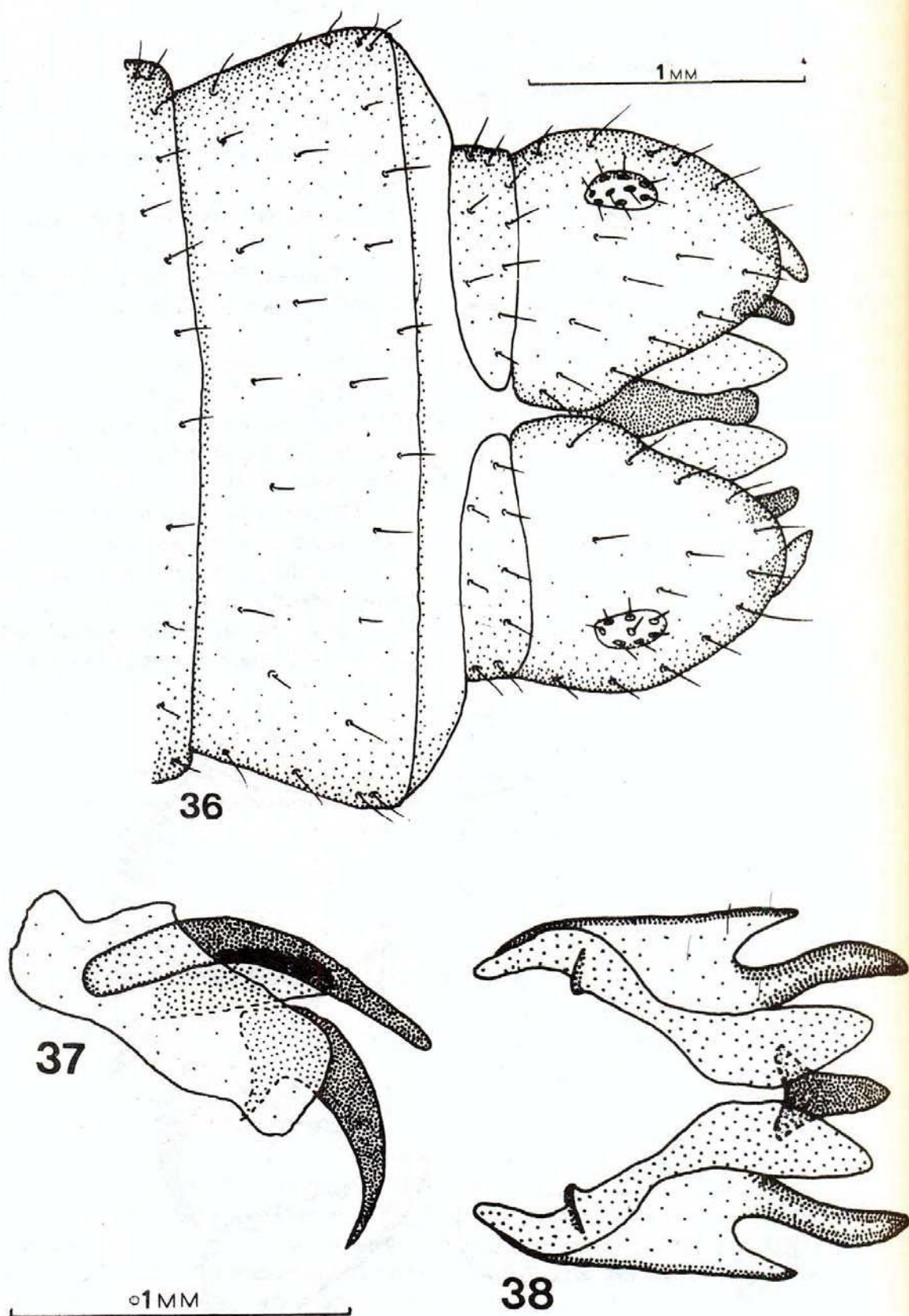
Pleural areas dark brown.

Legs: fore- and mid tibiae with sub-basal and sub-apical fuscous spot; remainder of tibiae and all other leg segments pale yellow.

Wings: Forewing longitudinal veins alternating dark brown and pale yellow. Wing membrane pale brown, except dark brown margining at juncture of MP and CuA, along outer gradate series, and at base of anal margin. Costal margin relative



Figs. 35– *Nusalala reticulata* (Navás), 35) male terminalia, lateral view.



Figs. 36—38. *Nusalala reticulata* (Navás), 36) male terminalia, dorsal view, 37) aedeagal complex, lateral view, 38) aedeagal complex, dorsal view.



Map 3. Geographical distribution of Amazonian species of *Hemerobius*, *Nusalala*, and *Megalomus*.

vely narrow (less than $1/6$ maximum width of forewing) with recurrent humeral vein only slightly indicated.

Pterostigma indistinct, pale brown. Four radial sectors. Four inner. Two medial, and seven outer gradate veins, most medial and outer gradates appearing interrupted medially; all series regular. Two $m-cua$ crossveins beyond fusion of MP with CuA. Hindwing uniformly pale brown with three inner and six outer gradates, with most gradates appearing interrupted medially.

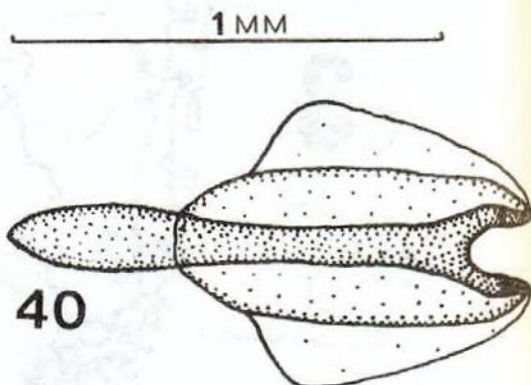
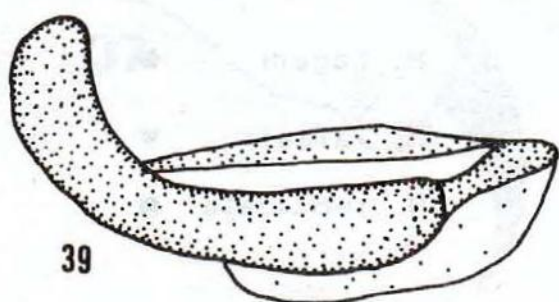
Abdomen: Uniformly pale brown, with sparse, long, pale pilosity. Male ninth tergite extending ventrally to base of ectoprocts; without caudal proections. Ectoprocts slightly expanded ventrally, with small, acute, caudo-ventral projection. Ninth sternite extending as far as ectoprocts; apically broadly rounded. Aedeagal complex consisting of elongate, ventrally curved arcessus; broad, flattened lateral plates of gonarcus, which do not quite fuse medially; and two pairs of endoprocesses, the lateral pair, acute and more than half as long as arcessus, while medial pair are apically rounded and half as long as lateral pair. Parameres consisting of elongate central shaft with terminal pair of curved flat plates dorsally and ventrally.

Forewing Length: male, 8.1 – 9.0 mm; female, 8.0 – 9.6 mm.

Geographical Distribution: This species was originally described from Minas Gerais State in east-central BRAZIL. *Nusalala reticulata* probably has a wide distribution south and west of the Amazon Basin, but until many types are examined, their true identity will remain in doubt.

Material Examined: One female in the Paris Museum is labelled Minas Gerais, Passa Quatro, Las Tronqueras, 1904, E.R. Wagner, and is almost certainly the type, although not presently labelled as such. Also in the Paris Museum is a second female, also collected by Wagner from Montanhas de Órgões, Rio de Janeiro. This species appears to be rather common in southern Brazil, and we have seen specimens from Santa Catarina and Paraná States. Specimens from the Amazon Basin are: BRAZIL: Rondonia, Vilhena, 23-VII-1983, N. D. Penny, 1 male (INPA); Rondonia, Vilhena, 26-VII-1983, J.E.B. Brasil and L. Pacheco, 1 female, Malaise trap (INPA); Rondonia, Vilhena, 28-VII-1983, N. D. Penny, 1 male, 1 female (INPA).

Habitat: The Vilhena specimens were caught at a light trap in savannah, in a Malaise trap in forest, and with a



Figs. 39—40. *Nusalala reticulata* (Navás), 39) parameres, lateral view, 40) parameres, dorsal view.

sweep net in tall grass in a disturbed, cultivated area, so that little can yet be said of habitat preferences.

Species Relationships: It is felt that several of the Navás species described from southern South America actually pertain to this species, probably including *Nusalala rhegmatica* Navás, 1914. Although the species was described from Paraguay, Kimmins (1936) drawing of male genitalia was of specimens from Central America.

Males of *N. reticulata* can generally be separated by the short, rounded shape of the medial pair of endoprocesses. In the field this species can be quickly separated from most other species by the dark margining of the outer gradates, which forms a thin, dark crescentic line across the apical third of the forewing. This, and the small dark area at the base of the anal margin are the only distinctively darkened areas of the forewing, although much of the rest of the wing is mottled with paler brown.

Megalomus Rambur, 1842

Megalomus Rambur, 1842, *Histoire naturelle des insectes*, Névroptères, p.418.

Spinomegalomus Nakahara, 1965, *Proc. U.S. natn. Mus.*, 117: 118.

Type Species: of *Megalomus* is *Megalomus tortricoides* Rambur, by original designation; of *Spinomegalomus* is *Spinomegalomus flinti* Nakahara, by original designation.

This genus is characterized as having medium to large size (4.5 to 13.5 mm forewing length) and five to six forewing radial sectors. Male genitalia normally consist of elongate ectoprocts with apical projections, and medial arcessus and endoprocessus.

This genus is known from 33 species distributed in North and South America, Europe, North Africa, India, Japan, and the Philippines. Only seven of these

species are known from South America, distributed principally in southern and Andean regions.

Olazo (1981) has recently reduced *Pirionus* to a subgenus of *Megalomus* and synonymized *Spinomegalomus* with *Pirionus*. The two subgenera can be quickly separated by the presence of a dorsal projection on the male seventh tergite of *Pirionus*.

Within the Amazon Basin only a single, new species has been collected, in the subgenus *Megalomus*.

Megalomus (Megalomus) rafaëli

Penny & Monserrat, new species
(Fig. 8, 41–44, Map 3)

Head: Occiput pale brown, without markings, with abundant pale pilosity. Frons and clypeus pale brown, without markings, and without pilosity. Maxillary and labial palpi pale yellowish-brown. Antennae consisting of pale brown scape, pedicel, and 40–41 moniliform flagellomeres; flagellar segments bearing abundant pale pilosity longer than segment.

Thorax: Dark brown, with abundant long, pale pilosity.

Legs: Completely pale yellow, except for some darkening at apex of fore tibia.

Wings: Forewing longitudinal veins alternating dark brown and pale yellow. Wing membrane pale brown, with dark brown margining of inner gradates and indistinct spot along anal margin. Costal area wide (about 1/4 width of forewing) with recurrent humeral vein. Pterostigma indistinct, pale yellow. Five radial sectors present. Six outer and four inner dark brown gradate veins in regular series. Four m-cua crossveins.

Hindwing pale yellow, with infuscation along costal margin, at base of radial area, and at wing apex.

Abdomen: Dark brown. Male ninth tergite narrow, extending ventrally only

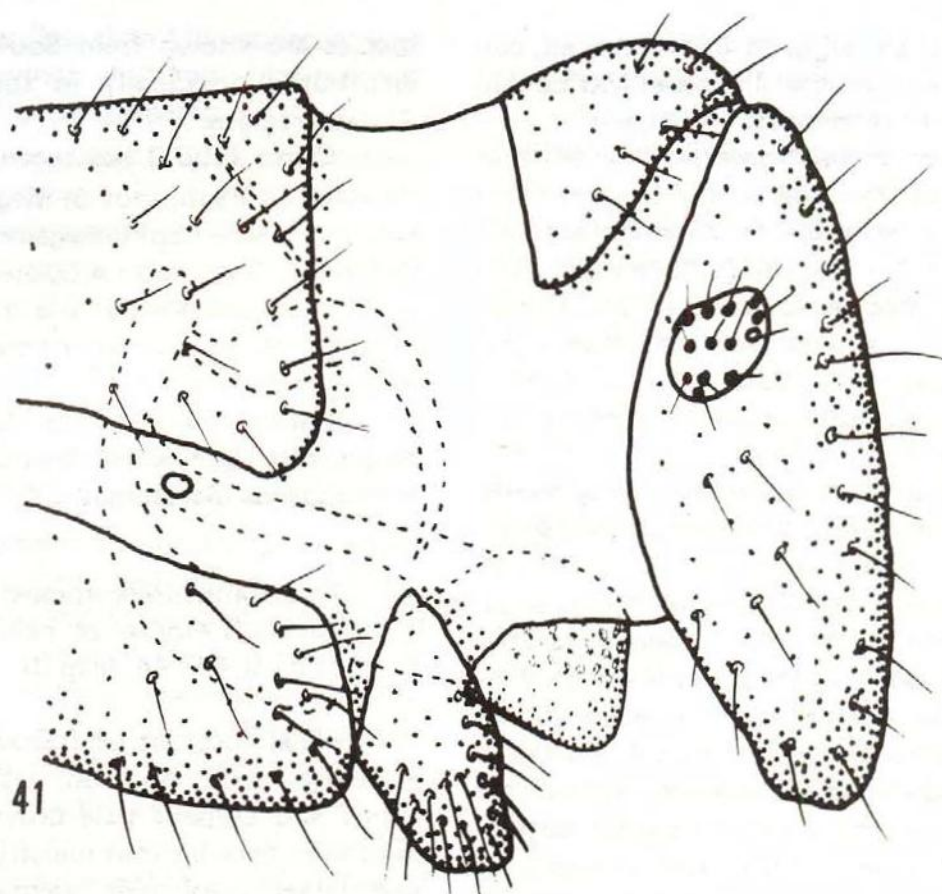


Fig. 41. *Megalomus rafaelli*, n. sp. male terminalia, lateral view.

slightly more than eighth tergite, without caudal projections. Male ectoprocts elongate, gradually tapering to rounded apex, without projections; extending well beyond ninth sternite. Ninth sternite very short, apically tapering rapidly to medial point. Aedeagal complex consisting of gonarcus with broad lateral plates and narrow dorsal connective; endoprocessus two very thin, dorsally-projecting points, and arcessus two down-curved acute points. Male parameres consisting of central shaft and two, flat, apical plates.

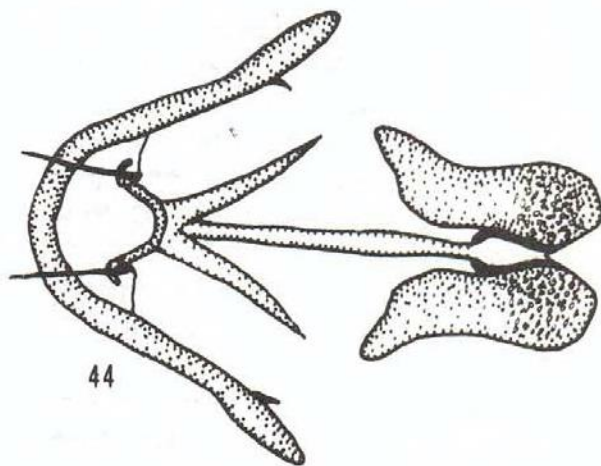
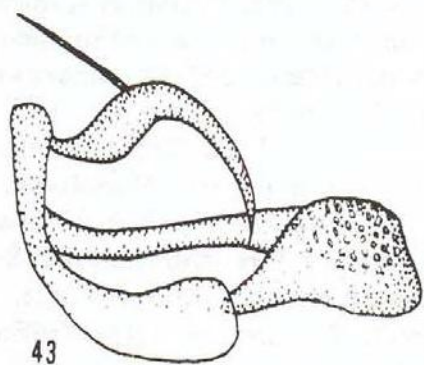
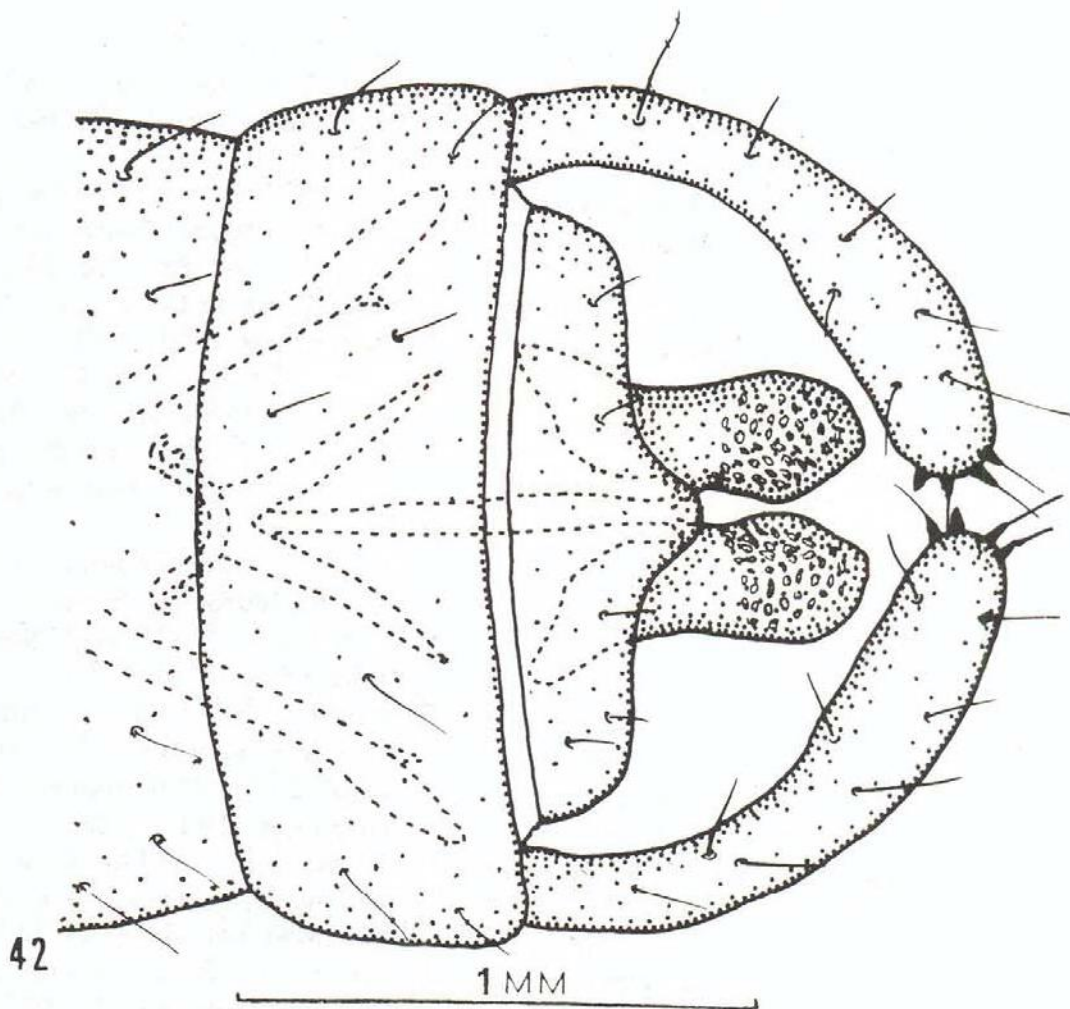
Forewing Length: male, 5.2 – 5.3 mm; female, 5.2 – 5.5 mm.

Type Series: Holotype male, BRAZIL: Amazonas, Manaus, INPA campus (V-8), 23-V-1983, N. D. Penny and J.E.B. Brasil, Malaise trap (INPA). Allotype female, same data as holotype, except 19-V-1982, J.A. Rafael (INPA). Paratypes are

from: Amazonas, Reserva Ducke, AM-010, km 26, I-II-1982, J.A. Rafael, 1 female, Malaise trap (MPEG); Amazonas, Manaus, INPA campus (V-8), 16-V-1983, N.D. Penny and J.E.B. Brasil, 1 female, Malaise trap (MZSP); Amazonas, Manaus, Conjunto Petro, 29-V-1982, L.R. Latorre, 1 female (UPR); Amazonas, Manaus, INPA campus (V-8), 13-V-1982, J. A. Rafael, 1 female, Malaise trap (MNRJ); Amazonas, Manaus, INPA campus (V-8), 23-V-1983, N.D. Penny and J.E.B. Brasil, 1 male, Malaise trap (USNM); Amazonas, Manaus, INPA campus (V-8), 19-V-1983, N.D. Penny and J.E.B. Brasil, 1 female, Malaise trap (BMNH).

Habitat: This species has so far only been collected in grassy, open, cutover areas.

Species Relationships: Of the seven known species from South America, the



Figs. 42–44. *Megalomus rafaëli*, n. sp., 42) male terminalia, ventral view, 43) aedeagal complex, with parameres, lateral view, 44) aedeagal complex, with parameres, dorsal view.

two species in the subgenus *Pirionus* are only distantly related. Of the other two Chilean species, *M. stangei* has falcate forewings, and *M. linguatus* has shorter male ectoprocts, narrower parameres, and much broader arcessus. *Megalomus minor*, known from Colombia and Brazil, has an expanded base to the male parameres. *Megalomus marginatus*, from the mountains of Colombia is a larger species, with more gradate crossveins and more pigmentation in the forewing. *Megalomus nebulosus*, known from high on the eastern slopes of the Peruvian Andes, is not well known, but the hindwing appears to have considerable pigmentation along the anal margin, which is lacking in *M. rafaelli*.

This species is named for José Albertino Rafael, a Diptera specialist who has collected many of the uncommon hemerobiid specimens used in this study.

Acknowledgments: We would like to thank CNPq's Trópico Úmido for grant no. 3224 and Polo Noroeste grant no. 3421-292 for financial assistance. Dr. Phillip A. Adams is specially acknowledged for his support.

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(Aceito para publicação em 29/12/83)