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# Identification key to the Gerridae (Insecta: Heteroptera: Gerromorpha) from the Amazon River floodplain, Brazil, with new records for the Brazilian Amazon

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ABSTRACT. Eighteen species from seven genera are recorded from the Amazon River floodplain, Brazil. An identification key, diagnoses, drawings, and taxonomic and biological notes are given for these species. The main features used in the identification key and diagnoses are: body and leg segments proportions, coloration patterns, presence and distribution of setae, and modifications of the apical abdominal segments and external genitalia of the male. Based on material collected in the floodplain streams and lakes, *Cylindrostethus bassleri* Drake, 1952 is recorded for the first time from Brazil, and new municipality records are presented for *Brachymetra lata* Shaw, 1933, *B. shawi* Hungerford & Matsuda, 1957, *C. erythropus* (Herrich-Schäffer, 1850), *C. linearis* (Erichson, 1848), *C. Palmaris* Drake & Harris, 1934, *C. regulus* (White, 1879), *Neogerris lotus* (White, 1879), *N. lubricus* (White, 1879), *N. visendus* (Drake & Harris, 1934), *Ovatametra obese* Kenaga, 1942, *Rheumatobates crassifemur esakii* Schroeder, 1931, *R. klagei* Schroeder, 1931, and *Trepobates taylori* (Kirkaldy, 1899). Additional new records from the Brazilian Amazon are presented for *B. lata* and *O. obesa*.

KEY WORDS. Aquatic insects; Hemiptera; Neotropics.

The Amazon River floodplain is one of the most important Amazonian ecosystems in terms of biodiversity, and the most productive Amazonian environment, occupying an area of more than 100,000 km². It includes small tributaries, open water lakes, floating meadows and a great extension of seasonally flooded forests. Among the aquatic insect fauna in floodplains, several aquatic heteropteran species are present, but the knowledge on their distribution is scarce (Goulding *et al.* 2003, Nessimian *et al.* 2008).

Gerridae comprise a group of semi-aquatic bugs that spend almost their entire lives skating above the water surface of lentic and lotic environments, and even on open ocean, as it is the case in some genera (Andersen 1982, Schuh & Slater 1995). Approximately 750 species are distributed among sixty genera and eight subfamilies of Gerridae, out of which only Eotrechinae Andersen, 1975 and Ptilomerinae Esaki, 1927 do not occur in South America (Andersen 1982, Polhemus & Polhemus 2008).

Representatives of 16 species and seven genera of Gerridae have already been collected in the Amazon River floodplain, mainly in localities near major cities (Drake & Harris 1930, 1934, 1935, Shaw 1933, Kuitert 1942, Kenaga 1942, Hungerford 1954, Hungerford & Matsuda 1957, Nieser 1970). In the present paper, a survey of the gerrids found in the Amazon River floodplain is presented, including an identification key, drawings, diagnoses, and new records of represented species.

## MATERIAL AND METHODS

The study area included twenty-six localities in the floodplain of the Amazon River in Brazilian territory, between the municipalities of Tabatinga, state of Amazonas, and Afuá, state of Pará (Fig. 1). The examined material was collected from floating plants of the genus *Eichhornia* or on U.V. light traps positioned near water, and additional qualitative collections were conducted in streams (*igarapés*) and lakes near the sampling sites. Even with the additional collections, no Gerridae specimens have been found in some of the localities.

Specimens were deposited in the Instituto Nacional de Pesquisas da Amazônia (INPA) and Coleção Entomológica Professor José Alfredo Pinheiro Dutra, Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro (DZRJ). Additional material from other regions of the Brazilian Amazon deposited in the INPA collection has been examined.

Identification of specimens was based mainly on Drake & Harris (1934), Kuitert (1942) and Nieser (1970, 1994). Illustrations were made with the help of a stereoscopic microscope

with *camera lucida*. All distributional records are given from north to south. New records are followed by an exclamation mark. Abbreviations for Brazilian states are as follows: Roraima (RR), Pará (PA), Amazonas (AM), Mato Grosso (MT), Rondônia (RO), Distrito Federal (DF), Minas Gerais (MG), Espírito Santo (ES), São Paulo (SP), Rio de Janeiro (RJ).

No specimens of *Limnogonus recurvus* Drake & Harris, 1930, *Ovatametra fusca* Kenaga, 1942 or *Rheumatobates minutus flavidus* Drake & Harris, 1942 were observed by us, but they occur in the study area and have been included in the present study.

## TAXONOMY

### Key to the adult Gerridae from the Amazon River floodplain, Brazil

1a. Eyes reniform; inner eye margin concave (Fig. 2) ..... 2

1b. Eyes not reniform; inner eye margin convex or straight (Fig. 3) ..... 11

2a (1a). Body cylindrical and elongated, longer than four times its width; antennae short in relation to body length; antennomere IV short and curved; rostrum short, not passing posterior margin of prosternum ..... [*Cylindrostethus*] 3

2b. Body more robust, shorter than four times its width; antennae and antennomere IV longer; rostrum longer, at least passing posterior margin of prosternum ..... 7

3a (2a). Mesonotum uniformly colored, longitudinally impressed on sides; male last abdominal sternite deeply centrally notched (Fig. 4); basal portion of male genital segment II with a pair of long, anterolaterally directed projections (Figs 4 and 5) ..... 4

3b. Mesonotum with a conspicuous dark stripe on each side; male last abdominal sternite concavous on posterior margin, not deeply notched (Fig. 6); basal portion of male genital segment II with a pair of short plate-like projections (Figs 6 and 7) ..... 6

4a (3a). General color fuscous to black; last abdominal sternite of male with a distinct, wide spine on center of posterior margin (Fig. 4); male connexival spines long and wide, slightly curved outward (Figs 4 and 5); male genital segment II with wide basal projections (Figs 4 and 5) ..... *Cylindrostethus erythropus*

4b. General color brown; last abdominal sternite with spine, if present, smaller (Fig. 8); male connexival spines shorter and narrower (Fig. 9); male genital segment II with narrower basal projections (Figs 8 and 9) ..... 5

5a (4b). General color dark ferrugineous brown; last abdominal sternite of male without spine on posterior margin (Fig. 10) ..... *C. bassleri*

5b. General color orange brown or reddish-brown; last abdominal sternite of male with a short, downward reflexed spine on center of posterior margin (Fig. 8) ..... *C. linearis*

6a (3b). Antennomeres I-II black; male connexival spines reaching middle of genital segment I (Fig. 7); female connexival spines long and curved, reaching apex of genital segments ..... *C. palmaris*

6b. Antennomeres I-II brown; male connexival spines not reaching middle of genital segment I (Fig. 11); female connexival spines short, not reaching apex of genital segments ..... *C. regulus*

7a (2b). Pronotum dark brown to black, with a pair of elongated light maculae centrally; middle tarsi with claws; connexival spines present ..... [*Limnogonus*] 8

7b. Pronotum dark brown to black, with an oval central light macula; middle tarsi without claws; connexival spines absent ..... [*Neogerris*] 9

8a (7a). Male genital segment I with a single spine-like projection (Fig. 24) ..... *Limnogonus aduncus aduncus*

8b. Male genital segment I with a rounded gibbosity in front of the posterior spine-like projection ..... *L. recurvus*

9a (7b). Pronotum of apterous forms wider than long, exposing most of mesonotum (Fig. 12); male genital segment II with a tuft of setae on each side (Fig. 13) ..... *Neogerris visendus*

9b. Pronotum of apterous forms longer than wide, reaching at least the middle of mesonotum (Fig. 14); male genital segment II without tuft of setae ..... 10

10a (9b). Eyes short and globose (Fig. 15); pronotum of apterous forms usually reaching only the middle of mesonotum (Fig. 14), rarely longer; fore femur with an ovate black spot on distal third of outer surface; posterior margin of male genital segment I with a distinct central notch ..... *N. lotus*

10b. Eyes longer, not globose, pronotum of apterous forms always covering most of mesonotum, almost reaching metanotum (Fig. 16); fore femur with a brown macula occupying most of distal half; posterior margin of male genital segment I not or hardly notched ..... *N. lubricus*

11a (1b). Pronotum generally uniformly orange brown; tarsomere II of fore leg shorter than twice the length of tarsomere I ..... [*Brachymetra*] 12

11b. Pronotum yellow to black, generally with distinct marks; tarsomere II of fore leg longer than twice the length of tarsomere I ..... 13

12a (11a). Eyes relatively short (Fig. 3); fore femur without black pegs; male genital segment II with a distinct notch on posterior margin ..... *Brachymetra shawi*

12b. Eyes long, with posterior portion well developed (Fig. 17); fore femur with numerous black pegs on venter (Fig. 18); male genital segment II without notch on posterior margin ..... *B. lata*

13a (11b). Middle femur longer than middle tibia or posterior femur; antennae and hind legs bent or strongly modified in males of some species (Figs 19 and 20) ..... [*Rheumatobates*] 14


Figure 1. Map showing the location of the Amazon River floodplain and the collecting localities along the river course.

13b. Middle femur shorter than middle tibia or posterior femur; antennae and legs cylindrical, never modified ..... 16

14a (13a). Thorax mostly flavous, contrasting with black body; male hind legs unmodified ... *Rheumatobates minutus flavidus*

14b. Thorax dark brown to black, with lighter spots near anterior margin; male hind legs strongly modified (Fig. 20) ..... 15

15a (14b). Male antennomere I thickened (Fig. 19); dorsoapical surface of male antennomere IV with a tuft of long, thick black setae (Fig. 21); male hind femur without basal tuft of anteriorly directed setae, with apical fringe of long setae (Fig. 20) ..... *R. crassifemur esakii*

15b. Male antennomere I long and thin (Fig. 22); dorsoapical surface of male antennomere IV without tuft of setae (Fig. 22); male hind femur with basal tuft of anteriorly directed setae, without apical fringe of long setae (Fig. 23) ..... ..... *R. klagei*

16a (13b). Middle tibia as long as or longer than body ..... ..... *Trepobates taylori*

16b. Middle tibia shorter than body ..... [*Ovatametra*] 17

17a (16b). Posterior margin of abdominal tergite VII with tuft of short black setae ..... *O. obesa*

17b. Posterior margin of abdominal tergite VII without tuft of black setae ..... *O. fusca*

## Species studied and their distribution

### *Brachymetra lata* Shaw, 1933

General color of specimens is reddish-brown, with some dark-brown areas, usually more distinct in males than in females. Macropterous individuals display forewings reddish-brown to dark-brown with yellow veins. Diagnostic features include eyes with posterior part well developed (Fig. 17), and fore femur only slightly wider than middle femur, with black peg on venter (Fig. 18). It can also be distinguished from *B. shawi* Hungerford & Matsuda, 1957 by the shorter pronotum of macropterous forms, which has a blunt apex (Fig. 17), and venter of male genital segment II without a notch on posterior margin.

*Brachymetra lata* is common in northern Brazil (PA, AM) and in Suriname, living preferably on streams (Nieser 1970). No specimen from the Amazon River floodplain was examined,

but the species was recorded from the area by Shaw (1933). Several individuals from INPA were seen, most of which collected in streams and rivers. They tend to be gregarious and can be the most abundant gerrid species in lowland forest streams in Brazilian Amazon (F. F. F. Moreira personal observations), although a specimen from higher altitudes near Pico da Neblina was observed. Both apterous and macropterous forms might occur within a single population.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Coari! (Urucu, igarapé, -4.86894/-65.11222), 1 apterous male, 04.II.2006, S.R.M. Couceiros *leg.*, INPA.

Additional material. Brazil, *Amazonas*, São Gabriel da Cachoeira! (Pico da Neblina, 0°40'N/66°0'W), 1 apterous male, 05-12.XI.1977, R. Best *leg.*, INPA. Presidente Figueiredo (AM-240, km 60, Sítio do Rodrigo, igarapé II, 01°59'27"S/59°31'35"W), 3 apterous males, 2 apterous females, 14.IX.2002, D.L.V. Pereira *leg.*, INPA. Manaus, 1 apterous female, 07.V.1976, A.P.A. Luna Dias *leg.*, INPA. Manaus (Cuieiras River, -2.070534/-60.38371), 1 apterous male, 1 macropterous female, B.S. Godoy *leg.*, INPA; (-2.458650/-60.34600), 1 macropterous male, 1 macropterous female, INPA; (-2.523500/-60.33480), 1 macropterous female, INPA; (-2.536120/-60.31720), 1 macropterous male, INPA; (-2.562880/-60.31760), 6 apterous males, 1 macropterous male, 7 macropterous females, INPA; (-2.695930/-60.29520), 15 apterous males, 16 apterous females, 1 macropterous female, INPA; (-2.707920/-60.36618), 1 apterous female, 1 macropterous female, INPA. Manaus (Urubu River, -2.115444/-59.98908), 1 apterous female, B.S. Godoy *leg.*, INPA; (-2.161000/-60.09822), 1 apterous female, INPA; (-2.209806/-59.81064), 1 macropterous male, 1 apterous female, INPA; (-2.309111/-59.67281), 4 apterous males, 6 apterous females, INPA; (-2.445389/-59.53792), 7 apterous males, 13 apterous females, INPA; (-2.517028/-59.72047), 3 apterous males, 9 apterous females, INPA; (-2.580444/-59.43950), 1 apterous male, INPA. Manaus (Tarumã River, -2.566833/-60.09831), 3 apterous males, 9 macropterous males, 4 apterous females, 11 macropterous females, B.S. Godoy *leg.*, INPA; (-2.587222/-60.11972), 2 apterous males, 3 macropterous males, 9 apterous females, INPA; (-2.610528/-59.99069), 2 apterous males, 5 macropterous males, 6 apterous females, 3 macropterous females, INPA; (-2.638028/-60.15450, 11 apterous males, 3 macropterous males, 6 apterous females, 1 macropterous female, INPA; (-2.667028/-59.89036), 4 apterous males, 8 apterous females, INPA. Manaus (Reserva Florestal Adolpho Ducke, Igarapé Tinga), 7 apterous males, 8 apterous females, B.S. Godoy *leg.*, INPA. Manaus (Reserva Florestal Adolpho Ducke, Igarapé Acará), 22 apterous males, 25 apterous females, B.S. Godoy *leg.*, INPA. Manaus (Reserva Florestal Adolpho Ducke, Igarapé Ipiranga), 6 apterous males, 13 apterous females, B.S. Godoy *leg.*, INPA. Manaus (Reserva Florestal Adolpho Ducke, Igarapé Bolívia), 27 apterous males, 18 apterous females, B.S. Godoy *leg.*, INPA. Manaus (Reserva Florestal Adolpho Ducke, Igarapé Barro Branco), 5 apterous males, 6 apterous females, 15.IX.2008, F.F.F. Moreira *leg.*, INPA. Manaus (Reserva Florestal Adolpho Ducke, tributary of Igarapé Acará), 1 macropterous male, 3 apterous females, F.F.F. Moreira *leg.*, INPA. Rio Preto da Eva! (Preto da Eva River, -2.531139/-59.73667), 1 apterous female, B.S. Godoy *leg.*, INPA; (-2.637389/-59.73667), 1 macropterous male, 2 apterous females, B.S. Godoy *leg.*, INPA.

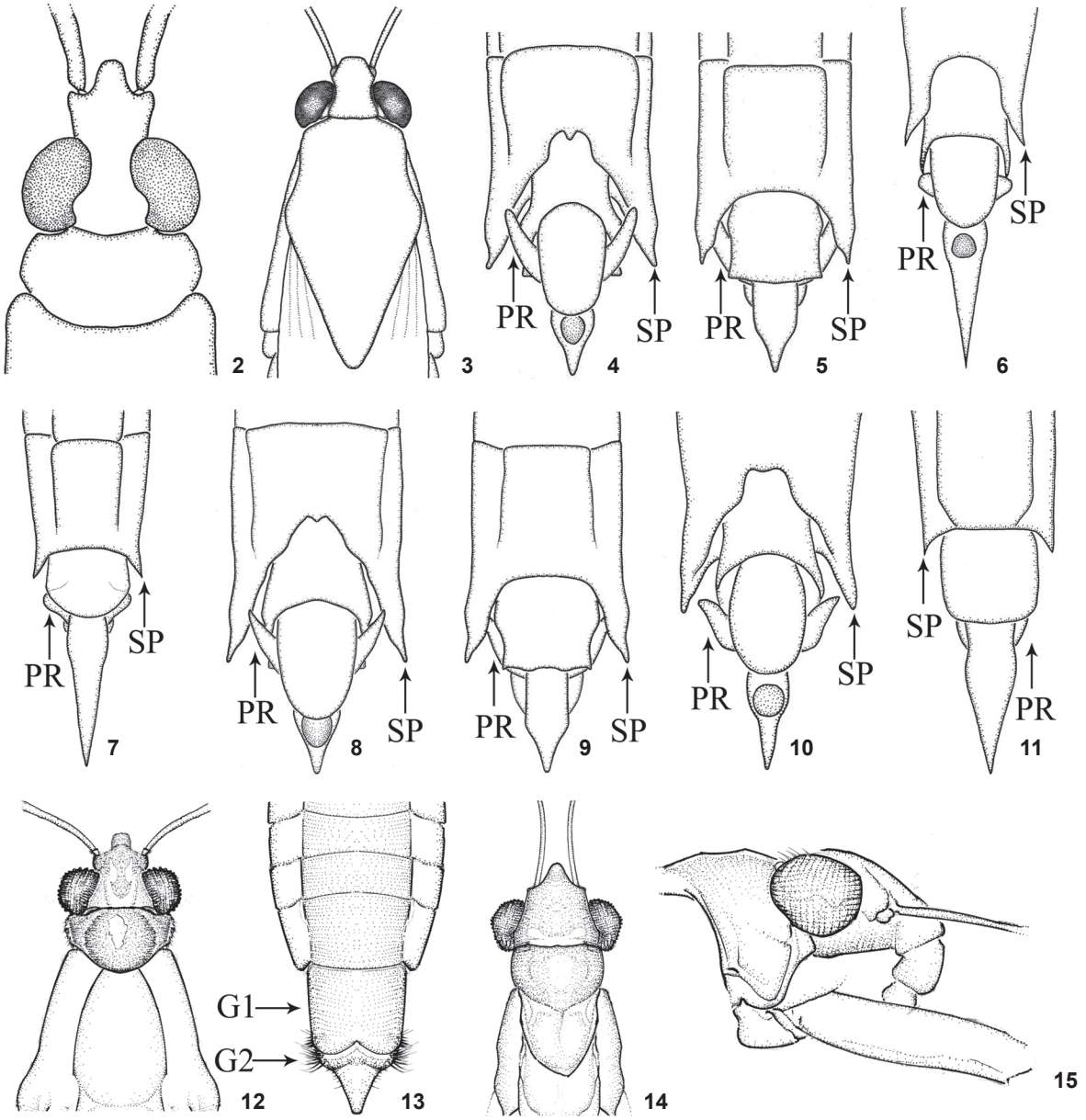
### *Brachymetra shawi* Hungerford & Matsuda, 1957

*Brachymetra shawi* can be distinguished from other *Brachymetra* by the unmarked pronotum, which reaches at least the middle of metacetabula and is narrowly rounded at apex in winged forms; forewings reddish-brown, much darker than pronotum, with yellow veins; and venter of male genital segment II with a distinct notch at middle. Eyes (Fig. 3) are not strongly produced posteriorly as in *B. lata*, and there are no black pegs in fore femur. Representatives of *B. shawi* are usually found in streams and rivers, but can also be collected in lentic environments, such as ponds (Nieser 1970), in Trinidad & Tobago, the Guyanas, Brazil (PA, AM) and Bolivia. No further details on their biology are available in the literature, but they seem to be rarer than *B. lata*, sometimes being found in reduced numbers among larger agglomerations of individuals of the latter species (personal observations).

Examined material from the Amazon River floodplain. Brazil, *Pará*: Almeirim! (Nova Arumanduba, Grande Lake), 1 macropterous male, 07.X.2003, P. de Marco & N. Ferreira-Jr. *leg.*, DZRJ.

### *Cylindrostethus bassleri* Drake, 1952

This species is part of the group of Neotropical *Cylindrostethus* in which the mesonotum displays uniform coloration and is longitudinally impressed on sides. In addition, the last abdominal sternite of male has a deep central notch (Fig. 10), the genital segment I is dorsally large, not narrowed posteriorly, and the genital segment II bears a pair of long basal projections directed anterolaterally (Fig. 10). Individuals of *C. bassleri* can be differentiated from *C. erythropus* (Herrich-Schäffer, 1850) and *C. linearis* (Erichson, 1848) by the dark ferruginous brown color, and absence of a spine on posterior margin of last abdominal sternite of male (Fig. 10). Members of *C. bassleri* can also be separated from those species by their average larger size (15.8-18.8 mm against 12.8-17.6 in other species). The depressions of male last abdominal sternites were not described by Drake (1952). However, in specimens examined here, the abdominal sternites are depressed from the posterior margin of IV to the base of VI, and there is a distinct longitudinal median carina on the base of sternite VI. Drake (1952) also stated that female connexives and connexival spines were reflexed above abdomen, with apices touching each other. In females observed, these structures were reflexed above abdomen, but apices did not touch each other. This feature is quite variable in Neotropical species of the genus, and females of the same population of a given species can display different degrees of reflection of connexives.




Figures 2-15. (2) *Cylindrostethus bassleri*, head and part of thorax, dorsal view; (3) *Brachymetra shawi*, head and thorax, dorsal view; (4-5) *C. erythropus*, apex of abdomen, male: (4) ventral view; (5) dorsal view; (6-7) *C. palmaris*, apex of abdomen, male: (6) ventral view; (7) dorsal view; (8-9) *C. linearis*, apex of abdomen, male: (8) ventral view; (9) dorsal view; (10) *C. bassleri*, apex of abdomen, male, ventral view; (11) *C. regulus*, apex of abdomen, male, dorsal view; (12) *Neogerris visendus*, head and part of thorax, dorsal view; (13) *N. visendus*, apex of abdomen, male, dorsal view; (14-15) *N. lotus*, head and part of thorax: (14) dorsal view; (15) lateral view. (G1) Genital segment I, (G2) genital segment II, (PR) projection of genital segment II, (SP) connexival spine.

This is the first record of *C. bassleri* from Brazil, and the first record of the species after its description from Peru. Biological information about this water strider is unavailable, except for its occurrence in lotic environments. The specimens examined were collected in a small stream, tributary of the Sapó River, in coexistence with a larger population of *C. erythropus*. The stream is shallow and narrow, probably of first order, with bottom composed of sand and litter, and slow wa-

ter current. Primary and secondary forests are the dominant vegetation of the area, and canopy opening was only partial.

Examined material from the Amazon River floodplain. Brazil!, *Amazonas*: Jutaí (igarapé tributary of Sapó River, -2.76119°/-66.79997°), 1 apterous male, 3 apterous females, 06.IX.2003, N. Hamada & J. L. Nessimian *leg.*, INPA.

### *Cylindrostethus erythropus* (Herrich-Schäffer, 1850)

Differences in relation to other members of the same species group (*C. linearis*, *C. bilobatus* Kuitert, 1942, and *C. bassleri*) include color fuscous to black, male connexival spines large and long, slightly curved outward (Figs 4 and 5), last two or three male abdominal sternites longitudinally impressed on center, and projections of male genital segment II wide (Figs 4 and 5). Females display connexival spines much shorter than in males, last abdominal sternite with a triangular projection on middle of posterior margin, and genital segment I dorsally as long as wide, narrowed posteriorly, with rounded apex.

Most of the previous records of the species were made based on material collected from large rivers (Drake & Harris 1934, Kuitert 1942, Nieser 1970), at altitudes up to 350 m (Molano-Rendón *et al*. 2005) in Colombia, Brazil (PA, AM, RO), Ecuador and Peru. Molano-Rendón *et al.* (2008) stated that individuals prefer living on the margins of fast running, small streams in Colombia. On the water surface of the lakes and streams sampled, members of the species were found in large numbers, showing a tendency to gregarism. They also displayed the behavior of resting above the water line on tree trunks, as previously mentioned by Roback (1966).

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Jutaí! (São Raimundo, Bosco Lake, -2.68867°/-66.87529°), 1 apterous male, 1 apterous female, 06.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA. Jutaí! (stream tributary of Sapó River, -2.76119°/-66.79997°), 15 apterous males, 29 apterous females, 06.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA. Codajás (Urucuruzinho, Urucuri Lake, -3.91960°/-62.04738°), 1 apterous male, 15.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA. Codajás (Cuxuará Lake, -3.97121°/-61.96065°), 54 apterous males, 41 apterous females, N. Hamada & J.L. Nessimian *leg.*, DZRJ. Coari! (Monte das Oliveiras, Quintino Lake, -3.89341°/-63.35261°), 1 apterous male, 12.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA.

### *Cylindrostethus linearis* (Erichson, 1848)

Members of this species share the uniformly colored mesonotum and general aspect of male external genitalia with *C. erythropus*, *C. bilobatus* and *C. bassleri*. *Cylindrostethus linearis*, and can be diagnosed by the orange-brown to reddish-brown color, relatively short and narrow male connexival spines (Figs 8 and 9), last male abdominal sternite depressed near anterior margin, with central spine on posterior margin short and reflexed downward (Fig. 8), and projections of male genital segment II curved and slender (Figs 8 and 9).

Considering the few records that provided habitat information, previous collections of *C. linearis* were made exclusively in rivers (Drake & Harris 1934, Kuitert 1942, Nieser 1970). Specimens examined here were collected in only two of the lakes studied, co-existing with *C. erythropus* in both cases. Drake & Harris (1941) mentioned that the species occurs in the state of Rio de Janeiro, but there is no evidence that its distribution extends that far south. The current distributional range of the species extends from Guyana to Peru and Bolivia, including the Brazilian states of Pará, Amazonas and Rondônia.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Codajás! (Urucuruzinho, Cuxuará Lake, -3.97121°/-61.96065°), 15 apterous males, 12 apterous females, 16.IX.2003, N. Hamada & J.L. Nessimian *leg.*, DZRJ. Coari! (Monte das Oliveiras, Quintino Lake, -3.89341°/-63.35261°), 3 apterous males, 3 apterous females, 12.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA.

### *Cylindrostethus palmaris* Drake & Harris, 1934

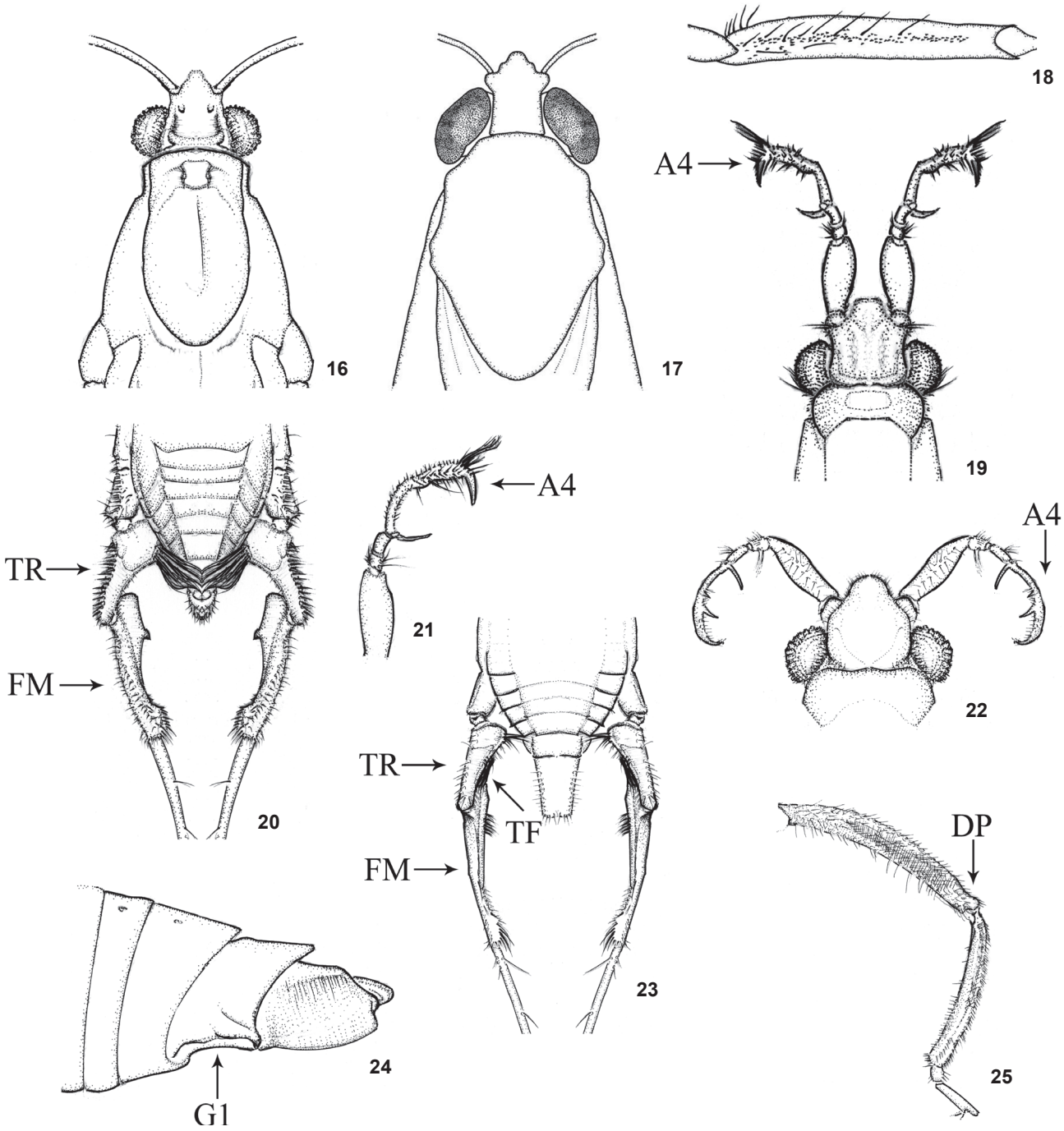
Specimens of *C. palmaris* display a conspicuous longitudinal dark stripe on each side of mesonotum, last male abdominal sternite concavous, without deep central notch (Fig. 6), male genital segment I dorsally narrowed posteriorly (Fig. 7), and base of male genital segment II with a pair of short plate-like projections (Figs 6 and 7). They can be separated from other Neotropical species with same features by antennomere I distinctly longer than head width across eyes, antennomeres I-II black, and male connexival spines reaching middle of genital segment I (Fig. 7). In females, connexival spines are long and genital segment I ends in an acute apex.

Representatives of *C. palmaris* are quite common and have been collected in streams, large rivers and lakes, up to 460 m above sea level (Kuitert 1942, Sampaio & Py-Daniel 1993, Molano-Rendón *et al*. 2005). They have gregarious behavior, living preferably in non-turbulent shaded areas of streams and rivers (Hynes 1948, Nieser & Melo 1997). In Brazil, they occur in the North, Central-West and Southeast regions (PA, AM, MT, RO, MG).

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Tefé! (Solimões River, Tefé Lake), 3 apterous females, 10.XII.1976, Eduardo *leg.*, INPA.

### *Cylindrostethus regulus* (White, 1879)

This species shares the mesonotum with lateral stripes and the structure of male genitalia with *C. palmaris*, *C. hungerfordi* and *C. podargus* Drake, 1958. Males of *C. regulus* can be separated from them by the antennomere I longer than width of head through eyes, antennomeres I-II brown, male connexival spines not reaching middle of genital segment I (Fig. 11), female connexival spines relatively short, and female genital segment I rounded on posterior margin. In the studied specimens, mesonotal stripes are brownish-black, lighter than those of *C. palmaris*, and slightly fainted before posterior third of segment. Stripes are wide and continue over metanotum, differently from *C. hungerfordi*, which possesses narrow stripes and only elongate spots on metanotum. Specimens of *C. regulus* have been collected only from rivers in the state of Amazonas (Drake & Harris 1930, Kuitert 1942), and only one male was collected in the lakes studied.




Figures 16-25. (16) *Neogerris lubricus*, head and part of thorax, dorsal view; (17) *Brachymetra lata*, head and part of thorax, dorsal view; (18) *B. lata*, fore femur, ventral view; (19) *Rheumatobates crassifemur esakii*, head and part of thorax, male, dorsal view; (20) *R. c. esakii*, abdomen and part of hind legs, male, dorsal view; (21) *R. c. esakii*, antenna, male; (22) *R. klagei*, head and part of thorax, dorsal view; (23) *R. klagei*, abdomen and part of hind legs, male, dorsal view; (24) *Limnogonus aduncus aduncus*, apex of abdomen, male, ventrolateral view; (25) *Trepobates taylori*, fore leg, male. (A4) Antennomere IV, (DP) femur depression, (FM) femur, (G1) genital segment I, (TF) anteriorly directed tuft of setae, (TR) trochanter.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Tefé! (São Francisco da Boca do Capivara, Botão Lake,-3.26539/-64.62745), 1 apterous male, 09.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA.

### *Limnogonus aduncus aduncus* Drake & Harris, 1933

Males of this species can be identified by the mesosternum with a shallow wide depression, and by the venter of genital segment I without keels or gibbosities, with a small curved spine on apex (Fig. 24). Females display connexival spines moderately long and last abdominal sternite sharply produced at middle behind. In both sexes antennomere I is longer than width of head through eyes and dorsalmost part of the mesopleura is dark-brown to black with a lighter central stripe of variable size.

Representatives of the species are common throughout South America, being found in streams and rivers, stagnant water bodies with emergent vegetation, and pools of various sizes (Roback 1966, Nieser 1970, Nieser & Melo 1997, Melo & Nieser 2004). In Argentina they generally inhabit the margins of small streams in forested mountain areas, but can also be found in dryer areas dominated by savannas on the Chaco Plain. In the last case, the species is uncommon and probably not gregarious, with few individuals obtained in each collection (Mazzucconi & Bachmann 1995). Even though we have found no specimens in the lakes sampled, *L. aduncus* had been previously recorded from the area by Drake & Harris (1935). In Brazil, the species is distributed through the North, Central-West and Southeast regions (PA, AM, MT, MG, ES, SP, RJ).

The first author of the present work recently went to INPA and had the opportunity to examine its dried Gerridae collection. He noticed that a long series collected by Dr. B.M. Mascarenhas at INPA, Manaus, and identified by him as *L. recurvus* Drake & Harris, 1930, like specimens cited in Mascarenhas (1979), were in fact representatives of *L. a. aduncus*. Some specimens had been identified and labeled as *L. aduncus* by Dr. J. T. Polhemus. Therefore, the records of *L. recurvus* in Mascarenhas (1979) should be instead referred to *L. a. aduncus*.

Additional material. Brazil, *Amazonas*: Manaus (INPA), 50 apterous males, 1 macropterous male, 32 apterous females, 4 macropterous females, 20-30.II.1978, B. Mascarenhas *leg.*, INPA.

### *Limnogonus recurvus* Drake & Harris, 1930

*Limnogonus recurvus* differs from *L. aduncus aduncus* by the presence of a rounded gibbosity on male genital segment I, besides the posterior spine-like curved projection. The two species can also be separated based on the color of the mesopleura, which is brown with a light transversal stripe in *L. recurvus*, and usually black with a transversal light stripe in *L. aduncus aduncus*.

No representatives of *L. recurvus* were examined in the present study, but the species had been recorded from the Amazon River floodplain by Kuitert (1942), specifically from Lago Grande [do Curuai], Santarém, Pará. *Limnogonus recurvus* is also known from Bolivia and the Brazilian states of Mato Grosso, Rondônia, Goiás and Minas Gerais. Another representative of the genus, *L. hyalinus* (Fabricius, 1803), had been recorded from Manaus by White (1879), but no records of the species specifically from the Amazon River have been found. For this reason, we have not included *L. hyalinus* in this study.

### *Neogerris lotus* (White, 1879)

This species can be distinguished from other Neotropical *Neogerris* by the pronotum of apterous forms relatively short, usually reaching slightly beyond half length of mesonotum (Fig. 14), and the pronotum of alate forms constricted between anterior and posterior lobes. Other features that might allow its identification are the globose eyes (Fig. 15) and the fore femur displaying an ovate spot on its outer surface, just before the apical third. In some apterous specimens, the pronotum can be longer, leaving only a small strip of the mesonotum exposed or completely covering it, as was noticed by Nieser (1994) for specimens from Mato Grosso and Trinidad and Tobago.

Members of *N. lotus* are distributed in a wide area, occurring in lowlands (up to 200 m above sea level) from the Guyanas to North and Central-West Brazil (PA, AM, MT, DF) (Nieser 1970, Molano-Rendón *et al.* 2005). Its representatives have been recorded from pools, ponds, and low current streams and rivers (Nieser 1994), and not much is known about their biology. Only one specimen was collected in the lakes of the Amazon River we studied. Members of this species either have a preference for habitats different from those sampled, or are associated with other hydrophyte species.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Fonte Boa! (Fonte Boa, Ressaca Grande Lake, -2.47399/-66.15474), 1 apterous male, 08.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA.

### *Neogerris lubricus* (White, 1879)

The pronotum of apterous specimens of *N. lubricus* is always long, almost reaching the metanotum (Fig. 16), and that of alate forms does not show central constriction. Eyes are long, not globose; and the male abdominal tergite I is narrow, tapering to the apex, with posterior margin with very faint central notch or without notch.

Members of *N. lubricus* show the widest geographic distribution among Neotropical representatives of this genus, occurring in streams, rivers, permanent or semi-permanent pools and ponds, up to 400 m above sea level (Nieser 1970, Mazzucconi & Bachmann 1995, Nieser & Melo 1997, Molano-Rendón *et al.* 2005). In Brazil, the species occurs in the North, Central-West and Southeast regions (PA, AM, MT, RO, MG).

Macropterous and apterous individuals are equally common, and gregarism is not evident in the populations studied in Argentina (Mazzucconi & Bachmann 1995). According to Nieser (1994), representatives of the species occur in the same habitats as *N. lotus*, and both are more abundant in sites rich in emergent vegetation (Nieser 1970, Mazzucconi & Bachmann

1995). As cited above for *N. lotus*, only one specimen of *N. lubricus* has been collected in the lakes studied, confirming their presence in the Amazon River floodplain, but probably indicating preference for mesohabitats or hydrophytes different from those sampled. Based on literature data, *N. lubricus* is associated with hydrophyte species of *Salvinia*, *Azolla*, and *Equisetum*, among other genera (Melo & Nieser 2004), but not *Eichhornia*.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Itacoatiara! (Trindade Island, lake on Trindade Island), 1 apterous male, 22.IX.2003, P. de Marco & N. Ferreira-Jr. *leg.*, INPA.

### *Neogerris visendus* (Drake & Harris, 1934)

Males of this species can be readily identified by the genital segment II bearing a distinct pair of tufts of setae (Fig. 13) on each side. In addition, antennomere I is slightly longer than head width plus an eye, the pronotum of apterous forms has no posterior lobe, being larger than longer (Fig. 12), and the pronotum of alates has no central constriction.

This species ranges from Colombia to Peru, including the North Region of Brazil (RR, PA, AM). Its representatives are commonly recorded from streams and lakes. Previous records include localities shared with *N. lotus*, but they most likely inhabit distinct microhabitats (Nieser 1970, Molano-Rendón *et al.* 2005). Several specimens of *N. visendus* were collected in association with *Eichhornia* sp. in the lakes and nearby streams sampled, but only one exemplar of *N. lotus*. Our findings corroborate the hypothesis that the two species have different habitat preference. Another representative of the genus, *N. genticus* (Drake & Harris, 1934), was described from Santarém, but not specifically from the Amazon River floodplain. Since there have been no further records of *N. genticus* since its description, the species has not been included in the present study.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Fonte Boa! (Fonte Boa, Solimões River, Ressaca Grande Lake), 23 apterous males, 1 macropterous male, 31 apterous females, 08.IX.2003, N. Hamada & J.L. Nessimian *leg.*, DZRJ. Jutaí! (São Raimundo, Solimões River, Bosco Lake, UV light trap), 1 macropterous male, 06.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA. Jutaí! (igarapé tributary of Sapó River), 2 apterous males, 2 apterous females, 06.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA. Tefé! (São Francisco da Boca do Capivara, Solimões River, igarapé), 3 apterous males, 14 macropterous males, 2 apterous females, 20 apterous females, 09.IX.2003, N. Hamada & J.L. Nessimian *leg.*, DZRJ. Tefé! (São João do Catuaí, Arraia Lake), 2 apterous females, 11.IX.2003, N. Hamada & J.L. Nessimian *leg.*, INPA.

### *Ovatametra fusca* Kenaga, 1942

*Ovatametra fusca* differs from *O. minima* Kenaga, 1942 and *O. parvula* (Drake & Harris, 1935) by its length greater than 2.50 mm and by the color pattern of mesonotum. Specimens of *O. fusca* do not possess a tuft of black setae on the posterior margin of abdominal tergite VII, which is present in *O. obesa* Kenaga, 1942. The only information available on the biology of *O. fusca* is the occurrence in rivers. Just its type-series, from Solimões River (Manacapuru, Brazil) and Supuruni Creek (British Guiana) has been collected so far.

### *Ovatametra obesa* Kenaga, 1942

Representatives of *O. obesa* are known from the states of Pará and Amazonas. Individuals from different populations vary in coloration, but specimens from the same population are relatively uniform. Specimens examined from the Anavilhanas Archipelago have mesonotal markings similar to those of *O. parvula* and, according to Nieser (1970), the color pattern of some individuals is very similar to that of *O. fusca*. *Ovatametra obesa* can be separated from *O. fusca* by a tuft of black setae present on the posterior margin of abdominal tergite VII. Despite being cited only for females by Nieser (1970), this feature has also been observed in males.

Nieser (1970) examined specimens collected both in lentic and lotic environments, but material studied here was collected exclusively from lakes. The alate form of *O. obesa* has not yet been recorded in the literature, and in the only macropterous specimen examined the wings were broken off along a suture line near base, a feature that was observed by Torre-Bueno (1908) in other Halobatinae. A third representative of the genus, *O. parvula* (Drake & Harris, 1935), was described from "Amazon, Manaos", without further details. As only the type-series of the species is known, and there is no evidence of its occurrence in the Amazon River floodplain, *O. parvula* was not included in the present study.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Parintins! (Menino Deus, Comprido Lake, -2.49865 S/-56.4908), 1 macropterous female, 25.IX.2003, P. de Marco & N. Ferreira-Jr. *leg.*, INPA. Tefé! (São João do Catuaí, Arraia Lake), 1 apterous male, 5 apterous females, 11.IX.2003, N. Hamada & J.L. Nessimian *leg.*, DZRJ.

Additional material. Brazil, *Amazonas*: Manaus! (Negro River, Anavilhanas Archipelago, Prato Lake), 1 apterous female, 12.VIII.1981, J.L. Nessimian *leg.*, DZRJ; (Siriri Lake), 1 apterous female, 10.VII.1981, J.L. Nessimian *leg.*, DZRJ; (Xidaua Lake), 1 apterous female, 23.V.1981, J.L. Nessimian *leg.*, DZRJ; 1 apterous female, 18.IX.1981, J.L. Nessimian *leg.*, DZRJ.

### *Rheumatobates crassifemur esakii* Schroeder, 1931

Males of the three subspecies of *Rheumatobates crassifemur* Esaki, 1926 have strongly modified antennae and legs, and the hind femur is connected subbasally to the trochanter, without basal anteriorly directed tuft of setae (Fig. 20). *Rheumatobates c. esakii* can be distinguished from *R. c. crassifemur* Esaki, 1926 and *R. c. schroederi* Hungerford, 1954 by the male antennomere IV with a tuft of about five long erect black setae (Fig. 21).

Both adults and nymphs of *R. c. esakii* are found in lentic environments in Northern South America, including the Brazilian states of Pará and Amazonas (Nieser 1970), and occasionally occur in sympatry with *R. klagei* Schroeder, 1931. In the present study, males and females were collected associated with *Eichhornia* sp. and by use of U.V. light traps, which

corresponds to the first record of capture of the species by this means. Specimens identified as *R. bonariensis* by Nessimian *et al*. (2008) are in fact females of *R. c. esakii*.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Urucará! (Lírio do Vale, Albano Lake, -2.41418 S/-57.49993, U.V. light trap), 24.IX.2003, 4 macropterous males, 4 macropterous females, P. de Marco & Nelson Ferreira-Jr. *leg*., DZRJ. Parintins! (Menino Deus, Comprido Lake, -2.49865/-56.4908), 25.IX.2003, 4 apterous males, 1 macropterous male, 4 apterous females, 7 macropterous females, P. de Marco & N. Ferreira-Jr. *leg*., DZRJ.

### *Rheumatobates klagei* Schroeder, 1931

This species can be diagnosed based on the following male features: shape of antenna (Fig. 22) and presence of anteriorly directed tuft of setae on basal portion of hind femur, which is connected sub-basally to hind trochanter (Fig. 23). Males are similar to those *R. c. esakii*, but the latter do not possess the basal anteriorly directed tuft of setae on hind femur. As *R. c. esakii*, *R. klagei* was recorded from lakes of northern South America, including Pará and Amazonas states. A few individuals from Lago Janauacá, a lake rich in hydrophytes, including *Eichhornia*, have been observed. However, the association of *R. klagei* with this plant is not certain.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Manaquiri! (Janauacá Lake), 1 apterous male, 9 apterous females, 01.IV.1994, T.R. Gasnier *leg*., INPA.

### *Rheumatobates minutus flavidus* Drake & Harris, 1942

Representatives of *R. m. flavidus* possess the most striking color pattern as compared to other species of the genus, with most of the thorax dorsally flavous, in contrast with the black body. Differently from *R. c. esakii* and *R. klagei*, male antennae and hind legs are unmodified. Besides the coloration, other diagnostic characters are antennomere III longer than others, fore femur just a little thicker than the middle one, and genital segments not distinctly hairy. *Rheumatobates m. flavidus* can be found in lentic environments, streams and rivers, sometimes on fast running areas (Mazzucconi 1999), and was recorded from the Amazon River (Itacoatiara) by Hungerford (1954). In Brazil, it can also be found in the states of Rondônia and Minas Gerais.

### *Trepobates taylori* (Kirkaldy, 1899)

Males of *T. taylori* are distinguished from other species of the genus by the fore femur with a distinct constriction near apex (Fig. 25), middle femur and base of middle tibia with fringes of setae almost as long as the article width, and genital segments without dense pilosity. Females can be identified by the antennomere II distinctly shorter than the III, apex of connexives not strongly projected posteriorly, and last abdominal sternite without distinct pilosity on apex. Apterous forms of both males and females are similar to macropterous ones, but somewhat smaller and with reduced pronotum.

In Argentina, members of *T. taylori* are found only in small mountainous rivers, being common and apparently not gregarious (Mazzucconi & Bachmann 1995). In other areas, by contrast, the species is as abundant in costal brackish lagoons and ponds as in freshwater bodies (Drake & Hottes 1952). These data suggest that *T. taylori* has the ability to colonize very different habitats, which might contribute to its wide geographical range. Both apterous and macropterous specimens are found in the same population, and the alate ones usually bear broken wings.

In Brazil, specimens have been recorded from the states of Pará and Amazonas. Only two specimens were collected in the lakes studied by us, one being fully-winged, with a fracture line on the posterior part of the corium, which is probably used by the animal when breaking off the wings.

Examined material from the Amazon River floodplain. Brazil, *Amazonas*: Parintins! (Menino Deus, Comprido Lake, -2.49865 S/-56.4908), 1 apterous male, 25.IX.2003, P. de Marco & N. Ferreira-Jr. *leg*., INPA. Itacoatiara! (Trindade Island, lake in Trindade Island), 1 macropterous male, 22.IX.2003, P. de Marco & N. Ferreira-Jr. *leg*., DZRJ.

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