

**DESCRIPTION OF THE LARVAE OF TWO SPECIES OF
DASYTHEMIS KARSCH, WITH A KEY TO THE GENERA OF
LIBELLULIDAE OCCURRING IN THE STATES OF RIO DE
JANEIRO AND SÃO PAULO, BRAZIL (ANISOPTERA)**

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Received November 20, 2000 / Revised and Accepted June 4, 2001

The ultimate instar larvae of *D. mincki* and *D. venosa* are described and illustrated, based on material from SE Brazil, and general notes on the breeding habitats are provided. A preliminary key to the genera of Libellulidae larvae occurring in the region is appended.

INTRODUCTION

The South American genus *Dasythemis* Karsch, 1889 is composed of four species: *D. esmeralda* Ris, 1910, *D. essequiba* Ris, 1919, *D. mincki* (Karsch, 1890), and *D. venosa* (Burmeister, 1839) (DAVIES & TOBIN, 1985). Two subspecies are currently recognized for *D. mincki*: *D. m. mincki* and *D. m. clara* Ris, 1909. They are small to medium sized dragonflies, not well represented in Brazilian entomological collections. The existing knowledge about this genus is very scarce, almost entirely restricted to morphological descriptions of adults (SANTOS, 1988). The only reference to the larvae is found in ROLDÁN & ARANGO (1996), where an ultimate instar larva without specific identification is characterized and illustrated. Some information about the breeding habitat is also provided in that work. In this paper, the larvae of *D. mincki* and *D. venosa* are described, representing the first formal descriptions of immature forms for the genus. The examined material of *D. mincki* fits in the nominate subspecies.

METHODS

Part of the collected material was fixed in 80% ethanol, which was also used as a preservative. Some last instar larvae were bred in laboratory in styrofoam boxes, following procedures described in CARVALHO (1992). The emerged adults were identified using RIS (1910). The descriptions and illustrations were made with the aid of a stereoscopic microscope, equipped with a camera lucida and a micrometric ocular. Labium and mandibles were described following CORBET (1953) and WATSON (1956), respectively. The exuviae cited in the material have corresponding emerged adults. All specimens studied are deposited at the Departamento de Zoologia, Instituto de Biologia, UFRJ, Rio de Janeiro, Brazil.

DESCRIPTIONS OF THE LARVAE

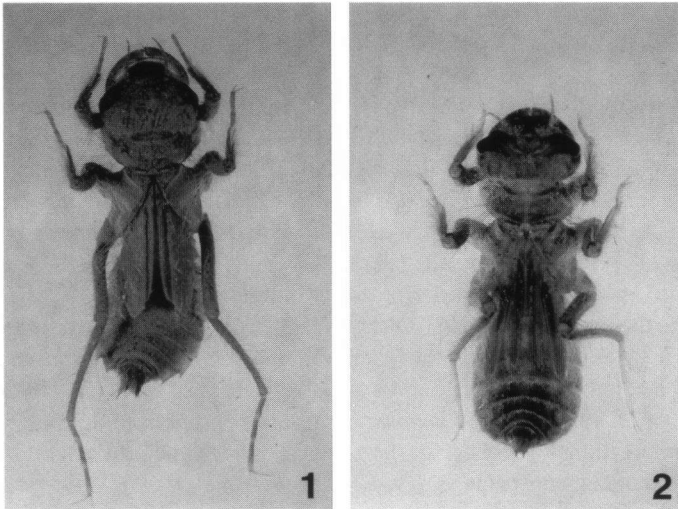
DASYTHEMIS VENOSA (BURMEISTER, 1839)

Figures 1, 3-7

Material. – BRAZIL, São Paulo, Araras, 28-I-1993, A.L. Carvalho leg., 5 larvae: 2 ♀ (F), 2 ? (F-1), 1 ? (F-2) (collected with a lost exuviae and teneral adult).

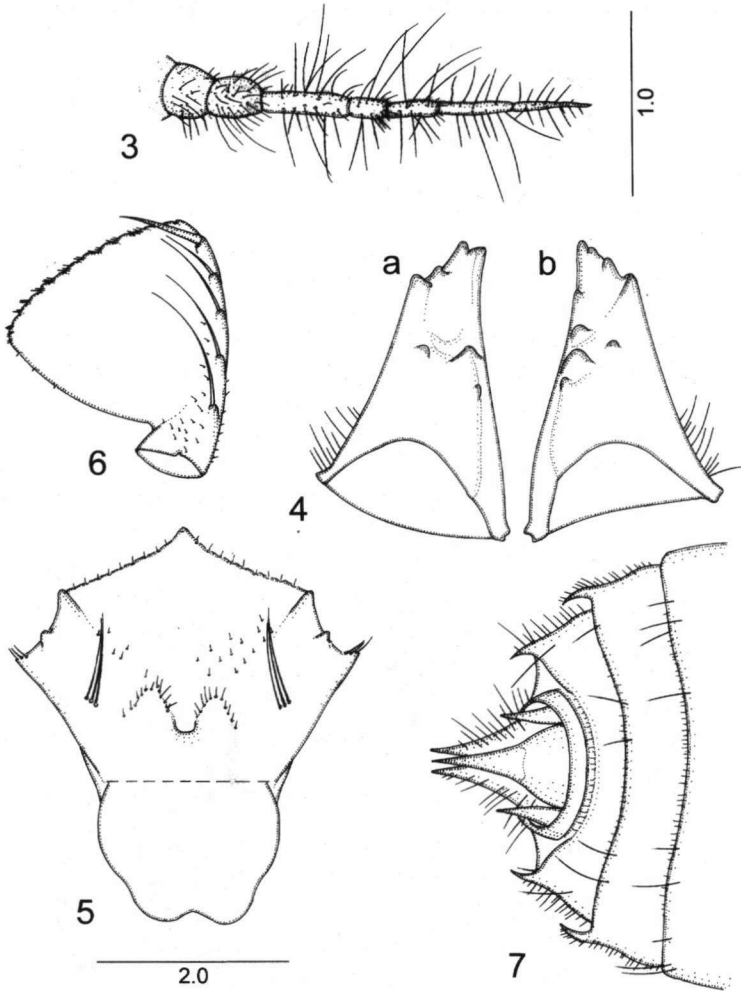
General shape of body typical of Libellulidae. Size small, general colour ochraceous. Head, thorax and legs with many setae; legs positioned very near to body in living larvae. Specimens collected in field entirely encrusted with mud, except for upper part of eyes.

Head. – General shape elipsoid, wider than long in dorsal view; occiput wider than anterior region of head, with posterior angles rounded; lateral portion of eyes



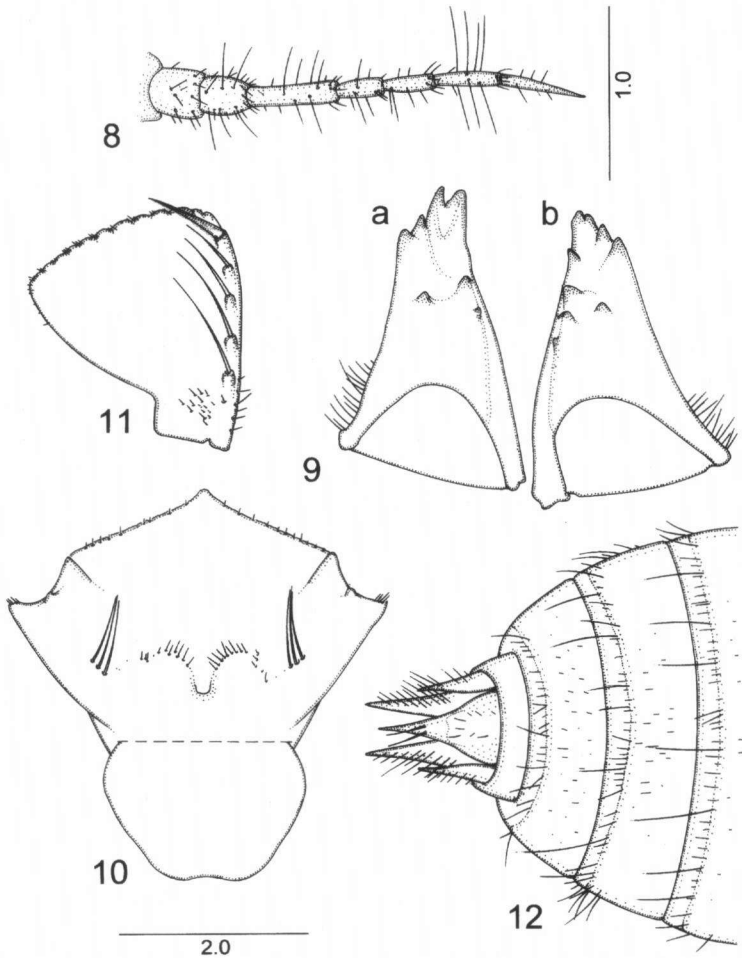
Figs 1-2. Ultimate instar larva, dorsal views (1) *Dasythemis venosa*; – (2) *D. mincki*.

pronounced laterally and dorsally; anterior region of frons between and below antennae with brush like group of setae directed forward. Antenna seven-segmented, 1st and 2nd segments wider than others; 1st, 2nd and 4th segments similar and shorter than remaining ones; 3rd and 7th segments similar and longer than remaining ones; setae occurring on all segments, some of them longer than corresponding segment. Mandibular formula: L 1234 0 abd / R 1234 y abcd; teeth "3" and "4" of right mandible very near each other, almost fused; tooth "d" of left



Figs 3-7. *Dasythemis venosa*, ultimate instar larva: (3) right antenna, dorsal view; - (4) mandibles, internal view: (a) left, (b) right; - (5) prementum, dorsal view; - (6) right labial palp, dorsal view; - (7). abdominal segments 8-10 and anal appendages, dorsal view.

mandible smaller and less sclerotized than that of right mandible; concavity between incisor and molar teeth of left mandible more accentuated than on right mandible. Hypopharynx bigger than in other Libellulidae, transversally elongated, with rounded angles, partially covering maxillae in ventral view when labium is removed; anterior portion covered by setae directed forward, those on border of glabrous region longer than remaining ones. Prementum concave, especially in its central area between two rows of premental setae, enlarged gradually from base to apex, a little longer than wider; when folded reaching posteriorly level of second coxae; distal margin



Figs 8-12. *Dasythemis mincki*, ultimate instar larva: (8) right antenna, dorsal view; – (9) Mandibles, internal view: (a) left, (b) right; – (10) prementum, dorsal view; – (11) right labial palp, dorsal view; – (12) abdominal segments 8-10 and anal appendages, dorsal view.

of prementum (ligula) pronounced with nine to eleven regularly disposed setae; space between setae finely serrate; external area close to palpal articulation with a group of setae, three or four of them visible in dorsal view; row of premental setae "S" shaped, separated in two distinct groups: external one formed by three long setae very close to each other, and internal one formed by eleven to thirteen short setae; setae of internal group increase in length toward central axis of prementum; area between row of premental setae and palpal articulation with very short and scattered setae in some specimens. Labial palp triangular; palp with four palpal setae, distal one smaller and similar in length to movable hook; base of row of palpal setae with group of fifteen to twenty short setae that may extend to level of third palpal seta; external margin with row of very short setae partially visible in dorsal view; distal margin composed of twelve shallow crenulations, with about three setae on each one; internal margin with smooth serrations, with about three setae on distal portion.

T h o r a x. – General shape of pronotum semicircular, with long setae especially numerous on lateral borders. Wing cases parallel; posterior pair reaching to abdominal segment 6. Legs with many setae, especially long and concentrated along carinae; tarsi with only simple setae on ventral region.

A b d o m e n. – General shape rounded, convex, with flattened borders; apex curved upward; intersegmental membranes almost invisible. Segments 8 and 9 with short lateral incurved spines, about half mid-dorsal length of segment 8. Abdominal tergites with rows of setae on lateral borders; lateral areas with some differentiated setae, shorter and wider than others. Anal appendages conic, sharply pointed; epiproct and paraprocts similar in length; cerci extending to half length of epiproct; epiproct and lateral area of paraprocts with uniformly developed setae on dorsal subapical regions.

M e a s u r e m e n t s (in mm; n = 2). – Total length 14.88 / 15.20; median length of head 3.26 / 3.26; maximum width of head 4.42 / 4.35; total length of right antenna 2.30 / 2.24; length of antennal segments 0.29-0.25-0.46-0.19-0.31-0.42-0.50 / 0.26-0.25-0.45-0.21-0.29-0.40-0.46; median length of prementum 4.16 / 4.03; maximum width of prementum 3.71 / 3.78; length of posterior right wing case 5.06 / 5.06; length of posterior right femur 4.93 / 4.93; length of posterior right tibia 5.25 / 4.93; maximum width of abdomen (seg. 6) 4.67 / 4.80; length of epiproct (dorsal view) 1.50 / 1.57; basal width of epiproct (dorsal view) 0.97 / 1.00; maximum length of right paraproct (dorsal view) 1.37 / 1.47; length of right cerci (dorsal view) 0.63 / 0.63.

DASYTHEMIS MINCKI (KARSCH, 1890)

Figures 2, 8-12

M a t e r i a l. – BRAZIL, Minas Gerais, Itamonte, 12-IX-1998, Lab. Entomologia UFRJ leg., 11 larvae: 1 ♂ (F / exuviae), 2 ♂ (F), 2 ♀ (F), 3 ? (F-1), 1 ? (F-2), 2 ? (F-?); 02-X-1999, Lab. Entomologia UFRJ leg., 11 larvae: 1 ♂ (F / exuviae), 1 ♀ (F / exuviae), 2 ♂ (F), 1 ♀ (F), 5 ? (F-1), 1 ? (?).

Larva very similar to that of *D. venosa*, described above, differing only in the features described below.

H e a d. – 3rd segment of antenna longer than 7th. Labial palp with four or five palpal setae.

A b d o m e n. – General shape semi-cylindric in dorsal view; apex slightly curved upward; intersegmental membranes visible. Lateral spines absent on all segments. Abdominal tergites with posterior margin of each segment with row of numerous setae irregularly developed, some of them very long; lateral areas without differentiated setae. Epiproct and lateral area of paraprocts with some differentiated setae on dorsal subapical regions.

M e a s u r e m e n t s (in mm, n = 5). – Total length 16.00-19.04; median length of head 2.82-3.14; maximum width of head 4.48-4.67; total length of right antenna 2.37-2.43; length of antennal segments 0.25-0.26 / 0.30-0.35 / 0.46-0.50 / 0.25-0.26 / 0.29-0.31 / 0.37-0.42 / 0.41-0.44; median length of prementum 3.84-4.29; maximum width of prementum 3.84-3.97; length of posterior right wing case 5.12-5.44; length of posterior right femur 3.71-3.97; length of posterior right tibia 4.67-5.12; maximum width of abdomen (seg. 6) 4.42-5.00; length of epiproct (dorsal view) 1.27-1.37; basal width of epiproct (dorsal view) 0.87-0.95; maximum length of right paraproct (dorsal view) 1.20-1.37; length of right cerci (dorsal view) 0.60-0.68.

NOTES ON BIOLOGY

Dasythemis mincki larvae were collected in small creeks on mountain areas at about 1500 m. The sampled stretches are situated in open areas, close to forested areas, with tangles of waterweeds. The most abundant are some Cyperaceae, and specially the Compositae *Senecio icoglossus* DC. (Fig. 13). The characteristic substrate of this place is mud. Other Odonata larvae found were *Aeshna punctata* Martin, *Neocordulia carlochagasi* Santos, *Macrothemis* sp., *Hetaerina* sp. and *Oxyagrion simile* Costa.

Dasythemis venosa larvae were collected in a small creek at a deforested area at the base of a small



Fig. 13. A view of the collecting site of larvae of *Dasythemis mincki*, Itamonte, Minas Gerais State, Brazil, in September 1999. Note the abundance of Cyperaceae and especially the Compositae *Senecio icoglossus* DC.

forested hill at about 600 m. This creek springs from a small area covered by dense vegetation. The bottom is composed of a reddish mud covered by Cyperaceae. The surrounding areas are urbanized, or used as sugar cane plantation. The larvae of this species were the only ones found. Deep ponds are formed some meters down the creek, with *Typha* sp. on their margins, and there larvae of *Aeshna cornigera planaltica* Calvert were found.

DISCUSSION

The most important diagnostic feature of *Dasythemis* larvae is the presence of a group of three long setae clearly more developed than the others, very close to each other, located externally on the rows of premental setae. The larva described by ROLDÁN & ARANGO (1996) as *Dasythemis* sp. has the same condition, thus agreeing with the generic identification.

D. mincki larvae can be easily distinguished from those of *D. venosa* by the absence of lateral spines on abdominal segments 8 and 9. Although very similar to *D. venosa*, the larva described by ROLDÁN & ARANGO (1996) differs by the number of palpal setae, four in *D. venosa* and five in *Dasythemis* sp, and by the apical direction of the paraprocts, straight to the back in *D. venosa* and curved to the sides in *Dasythemis* sp.

Dasythemis larvae fit in the Libellulinae by having the eyes dorsally projected, just like *Libellula herculea* Karsch (De MARMELS, 1982). This condition is very pronounced in the species of *Orthemis* (e.g. ROLDÁN & ARANGO, 1996).

The breeding habitats of the two *Dasythemis* larvae studied here are very similar, i.e. brooklets with little water flow, in open areas, close to their springs (crenon). The bottom is predominantly muddy, where aquatic plants are abundant. Information concerning the breeding environment of the larva described by ROLDÁN & ARANGO (1996) corroborates these data.

A PRELIMINARY KEY TO THE GENERA OF LIBELLULIDAE LARVAE OCCURRING IN THE STATES OF RIO DE JANEIRO AND SÃO PAULO, BRAZIL

The difficulty in identifying libellulid larvae occurring in Brazil is due to the lack of proper literature. The lack of adequate keys lead to the use of those constructed for the fauna of the United States of America (e.g. NEEDHAM & WESTFALL, 1955; GLOYD & WRIGHT, 1959; WESTFALL & TENNESSEN, 1996), or adapted for the fauna of some other countries of the neotropical region, which do not include many endemic groups (e.g. RODRIGUEZ-CAPITULO, 1992, for Argentina). Furthermore, the comparison of material with the descriptions and illustrations scattered in hundreds of articles is a very arduous procedure and not always successful.

The knowledge about the larvae of the family occurring in Brazil is concentrated in the representatives of the states of Rio de Janeiro and São Paulo, where the group has been regularly studied in the past fifty years (CARVALHO & NESSIMIAN,

1998; COSTA et al., 2000). Thus, a preliminary key to the Libellulidae genera occurring in these states is perfectly workable and represents the first step to a future key for the entire country. Reliable keys to the genera of other Anisoptera families have already been published (e.g. CARVALHO, 1989, for the Aeshnidae; BELLE, 1992, for the Gomphidae). Of the 56 anisopteran genera recorded for these states, 30 are Libellulidae (CARVALHO & NESSIMIAN, 1998; COSTA et al., 2000).

For the elaboration of the key presented below, in addition to the literature, we used material deposited in the entomological collection of the Departamento de Zoologia, Instituto de Biologia, UFRJ.

Among the genera included in the key, those asterisked are based on literature data only. Taxa based on supposition are marked with a question mark. In order to cover the genera containing unknown larvae of the species occurring in the states of Rio de Janeiro and São Paulo, representatives from other regions are considered. *Edonis*, *Ipirangathemis*, *Oligoclada*, *Tholymis* and *Uracis* are not included, since no larvae are described or known in collections.

This key presents an original structure, that tries to avoid problems caused by differences between representatives of the same genus from different regions. Whenever possible, easily visualized external morphology features are used. Characters' conditions that commonly vary interspecifically are avoided.

- 1 Mid-dorsal spines (hooks or knobs) present on some abdominal segments 2
- No mid-dorsal spines on any abdominal segment 16
- 2 Eyes with conic region expanded laterally; distal margin of labial palps with digitiform crenulations 3
- Eyes without conic region expanded laterally; distal margin of labial palps without digitiform crenulations 4
- 3 Distal margin of labial palps without digitiform crenulations on 1/3 adjacent to internal margin; length of lateral spines on abdominal segment 9 as long as or longer than four times the median-dorsal length of this segment *Diastatops* (*obscura*, *intensa*)
- Distal margin of labial palps with digitiform crenulations full length; length of lateral spines on abdominal segment 9 shorter than four times the median-dorsal length of this segment *Zenithoptera* (?)
- 4 No mid-dorsal spine on abdominal segment 9 5
- Mid-dorsal spine on abdominal segment 9 8
- 5 Distal margin of labial palps almost smooth, without distinct crenulations; lateral spines present on abdominal segments 6 and 7 *Elasmothemis* (*cannacrioides*, *constricta*)
- Distal margin of labial palps with distinct crenulations; no lateral spines on abdominal segments 6 and 7 6
- 6 Eyes slightly protuberant dorsally, restricted in dorsal view to anterior 2/3 of head; abdominal segment 9 with lateral spines distinctly shorter than paraprocts *Libellula* (*herculea*)
- Eyes not protuberant dorsally, commonly enlarged laterally, reaching in dorsal view to posterior 1/3 of head; abdominal segment 9 with lateral spines as long as paraprocts 7
- 7 Palpal setae eight or nine; epiproct in dorsal view shorter than half length of paraprocts *Tauriphila* (*argo*)
- Palpal setae six or seven; epiproct in dorsal view as long as 2/3 length of paraprocts

- *Miathyria (marcella, simplex)*
- 8 Epiproct in dorsal view longer than twice width of its base 9
- Epiproct in dorsal view shorter than twice width of its base 10
- 9 Palpal setae five or six; small mid-dorsal spine on abdominal segment 10 *Idiataphe (cubensis ?)*
- Palpal setae nine to eleven; no mid-dorsal spine on abdominal segment 10
..... *Brachymesia (furcata, herbida)*
- 10 Third segment of antenna shorter than second; prementum enlarged abruptly in its distal half, its lateral margins in ventral view strongly concave *Elga* (leptostyla)*
- Third segment of antenna distinctly longer than second; prementum enlarged gradually from base to apex, its lateral margins in ventral view straight or slightly concave 11
- 11 Distal margin of labial palps with just one seta on each crenulation; lateral spines of abdominal segment 9 as long as median-dorsal length of this segment *Planiplax (erythrogyga)*
- Distal margin of labial palps with two or more setae on each crenulation; lateral spines of abdominal segment 9 shorter than median-dorsal length of this segment 12
- 12 Anterior region of occiput dark, forming stripe extended from eyes to centre of head, resembling a kind of “mask” *Perithemis (mooma, electra, icteroptera)*
- Anterior region of occiput not especially dark 13
- 13 Integument of body granulose dorsally; cerci in lateral view generally as long as or shorter than half length of epiproct *Brechmorhoga (nubecula, travassosi, Brechmorhoga spp.)*
- Integument of body smooth, setose or not distinctly granulose dorsally; cerci in lateral view distinctly longer than half length of epiproct 14
- 14 Crenulations on distal margin of labial palps not obsolete
..... *Macrothemis (declivata, hemichlora, musiva, tessellata)*
- Crenulations on distal margin of labial palps obsolete 15
- 15 Anterior margin of prementum and internal margin of labial palps armed with setae with apex flattened; occipital margin of head with claviform setae *Gynothemis (venipunctata)*
- Anterior margin of prementum and internal margin of labial palps armed with pointed setae; occipital margin of head with cylindrical setae *Dythemis (multipunctata)*
- 16 Eyes extended well above level of top of the head, directed more upward than laterally
..... *Orthemis (discolor, cultriformis)*
- Eyes not extended well above level of top of the head, directed upward and laterally 17
- 17 Eyes slightly protuberant dorsally; external group of premental setae composed of only three long setae very close to each other *Dasythemis (mincki, venosa)*
- Eyes not protuberant dorsally; external group of premental setae composed of four or more long setae 18
- 18 Lateral spines of abdominal segment 9 distinctly longer than median dorsal length of this segment 19
- Lateral spines of abdominal segment 9 distinctly shorter than median dorsal length of this segment 21
- 19 Distal margin of labial palps almost smooth, without distinct crenulations; abdominal segment 8 without lateral spines *Rhodopygia (cardinalis)*
- Distal margin of labial palps with distinct crenulations; abdominal segment 8 with lateral spines 20
- 20 Colour of anterior, median and hind tarsi similar, generally ochraceous; lateral spines of abdominal segments 8 and 9 similar in length *Tramea (abdominalis, binotata, cophysa)*
- Colour of median and hind tarsi distinctly darker than that of anterior one; lateral spines of abdominal segment 8 distinctly shorter than those of 9 *Pantala (flavescens, hymenaea)*
- 21 Body truncate, compressed laterally; dorsal surface of head slanted forward; apex of paraprocts in lateral view distinctly curved downward
..... *Erythemis (attala, credula, mithroides, plebeja, peruviana, vesiculosa)*
- Body not truncate, somewhat depressed dorsoventrally; dorsal surface of head not slanted forward; apex of paraprocts in lateral view straight or little curved downward 22

- 22 Paraprocts in lateral view longer than twice length of cerci, distinctly longer than epiproct 23
 – Paraprocts in lateral view shorter than twice length of cerci, nearly as long as or slightly longer than epiproct 24
- 23 Colour pattern of abdomen poorly defined dorsally, almost uniform; apical portion of femora with two to four conspicuous dark setae dorsally *Nephepeltia (phryne)*
 – Colour pattern of abdomen generally well defined dorsally, composed of dark and clear spots and scars; apical portion of femora without conspicuous dark setae dorsally *Micrathyria (artemis, atra, borgmeieri, didyma, hesperis, hypodidyma, mengeri, ocellata, pirassunungae, stawiarskii)*
- 24 Colour pattern of abdomen generally well defined dorsally, composed of dark and clear spots and scars; anal appendages in lateral view straight *Anatya (januaria)*
 – Colour pattern of abdomen poorly defined dorsally, almost uniform; anal appendages in lateral view somewhat curved downward
 *Erythrodiplax (anomala, fusca, hyalina, juliana, ochracea, paraguayensis, umbrata)*

ACKNOWLEDGEMENTS

Thanks to the colleagues of the Laboratório de Entomologia, Instituto de Biologia, UFRJ, for their great help during the identification of the material, especially to Professors JULIANA ASSIS and Dr JORGE NESSIMIAN. We are specially grateful to Professor Dr GABRIEL MEJDALANI (Museu Nacional, UFRJ), for critical reading the manuscript; to Professor ROBERTO L. ESTEVES (UERJ) for the identification of the Compositae, and to the supporting agencies CNPq-PIBIC-UFRJ, FAPERJ, and FUJB.

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