

Taxonomic key for the genera of Elmidae (Coleoptera, Byrrhoidea) occurring in Goiás State, Brazil, including new records and distributional notes

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ABSTRACT. A taxonomic key for the genera of Elmidae (Coleoptera, Byrrhoidea) occurring in Goiás State, Brazil, including new records and distributional notes. Despite their great diversity and high abundance in Neotropical aquatic environments, the fauna of Elmidae remains practically unknown in some areas and even entire biomes in this region. In this work we bring, for the first time, faunistic data for the Elmidae of central Brazil. The aim of this work was to inventory the Elmidae fauna in central, southwestern and southeastern Goiás State, Brazil and to produce a taxonomic key, at genus level, for adults from the studied region. The taxonomic key presented herein offers means for the identification of all the 13 genera known to occur in Goiás, 11 of them being new records for the State. Moreover, the number of named species registered for Goiás increased from one to nine.

KEYWORDS. Cerrado biome; Insecta; Neotropics; Riffle beetles.

The family Elmidae Curtis, 1830 has a cosmopolitan distribution, with about 1,500 species in 149 genera (Slipinski *et al.* 2011), with two subfamilies: Larainae (LeConte, 1861) and Elminae Curtis, 1830 (Jäch & Balke 2008). Among the water beetle families, Elmidae corresponds to the fourth most speciose one (Jäch & Balke 2008).

For South America, more than 250 species are known, distributed in 39 genera (Manzo 2005; Manzo & Archangelsky 2008; Maier & Spangler 2011; Segura *et al.* 2011a), and of these, 29 are Elminae and ten are Larainae. Of the 39 genera, 15 have no larva described (Manzo 2005; Manzo & Archangelsky 2008; Vanin & Costa 2011; Kodada *et al.* 2012).

Until now, the Brazilian fauna comprises 148 described species of Elmidae and 24 genera (Segura *et al.* 2011b), with only three genera belonging to Larainae. In Goiás State, only two genera, *Hexacylloepus* Hinton, 1940 and *Austrolimnius* Carter & Zeck, 1929, and one species, *Austrolimnius* (*Helonoma*) *eris* Hinton, 1971, had been reported previously to this present study, however, the exact locations of collection sites are uncertain (Brown 1973; Hinton 1971).

Although riffle beetles are recognized in the scientific literature as effective bioindicators of water quality (Brown 1972a; Garcia-Criado & Fernández-Aláez 2001; Elliot 2008), there is a large limitation of knowledge about the family in Brazil, as well as information on biology and its importance in dynamics of aquatic ecosystems (Vanin & Ide 2002; Passos *et al.* 2007).

The main barrier to study this family in the Neotropics is the outdated taxonomy, with few specialists, besides, the small body size and the environment in which they live (Passos *et al.* 2007). The lack of taxonomic keys for all regions of Brazil, species lists and current reviews make more complicate

an adequate identification of specimens. In addition, there is probably a large number of species not yet known in Brazil (Vanin & Ide 2002; Passos *et al.* 2007).

The State of Goiás is located in the central zone of Brazil and its predominant biome is the Cerrado, the Brazilian Savanna, and represents the second largest Brazilian biome in terms of area (IBGE 2004; Mittermeier *et al.* 2004). It is considered one of the 34 world biodiversity hotspots; such classification includes the most threatened and diverse biomes. In the case of the Cerrado, it is estimated that no more than 21.3% of primary vegetation remains, and protected areas correspond to only 5.5% of the total area occupied by the biome (Mittermeier *et al.* 2004).

With the aim to improve the knowledge concerning the family Elmidae in Brazil, this work provides the first species inventory for central Brazil, based on collections held in central, southwestern and southeastern Goiás State; and a taxonomic key for the identification of adults of the genera occurring in Goiás State, Brazil.

MATERIAL AND METHODS

The collecting was carried out in 43 first to fourth order streams (Strahler 1957) in three different regions of Goiás State; corresponding to the central region, the southwestern region and one stream in southeastern Goiás State (Fig. 1). The first region was sampled from August to October/2008 and June/2010, the second in April/2010 and the third in September/2010.

All samples were fixed with 80% ethanol and stored in microvials in the entomological collection of the Laboratório de Meio Ambiente e Recursos Hídricos (CELAMARH), of the Universidade Federal de Goiás.

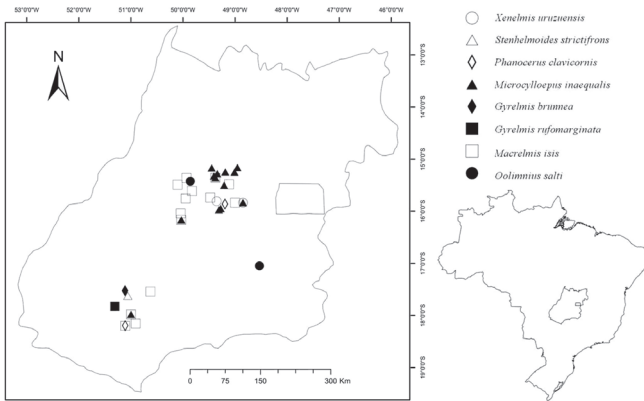


Fig. 1. Distribution of Elmidae species surveyed in central and southwestern Goiás State, Brazil.

The adult specimens were identified to genus level with the aid of the works of Hinton (1940a), Brown (1972a), White & Brigham (1996), Manzo (2005) and Passos *et al.* (2007). Species identification was based mainly in the works of Hinton (1939, 1940a, 1940b, 1940c, 1940d, 1941, 1945a, 1945b, 1946, 1971, 1972), Brown (1972b), Bug (1973), Spangler & Perkins (1989), Spangler (1990), Spangler & Santiago-Fragoso (1992) and Manzo (2006). For most of the species we were not able to confirm the identifications by checking type material. The main structures observed for the identification and for the development of taxonomic keys are illustrated in Fig. 2.

To obtain the images we used a camera attached to a stereomicroscope, photographs were taken focusing on different levels of the body of the specimens, and overlapped using the software Combine ZP. Measurements were taken with the aid of an ocular micrometer.

RESULTS

A total of 255 adults belonging to 13 genera, *Austrolimnius* Carter & Zeck, 1929, *Cylloepus* Erichson, 1847, *Gyrelmis* Hinton, 1940, *Heterelmis* Sharp, 1882, *Hexacylloepus* Hinton, 1940, *Macrelmis* Motschulsky, 1859, *Microcyloopus* Hinton, 1935, *Neoelmis* Musgrave, 1935, *Oolimnius* Hinton, 1939, *Stegoelmis* Hinton, 1939, *Stenhelmoides* Grouvelle, 1908, *Xenelmis* Hinton, 1936 and *Phanocerus* Sharp, 1882, were examined. From these, 85 adults in seven genera (*Gyrelmis*, *Macrelmis*, *Microcyloopus*, *Oolimnius*, *Stenhelmoides*, *Xenelmis* and *Phanocerus*) belong to eight already known species. With the exception of *Phanocerus clavicornis* Sharp, 1882, all species collected belong to the subfamily Elminae Curtis, 1830.

Taxonomic key for adults of the Elmidae genera from Goiás State, Brazil

Note. Plastron on the Elmidae genera *Stenhelmoides* and *Stegoelmis* differs in general aspect from that of the remaining genera recorded for Goiás. The plastron in both genera confers to the cuticle a grayish and opaque look, very noticeable

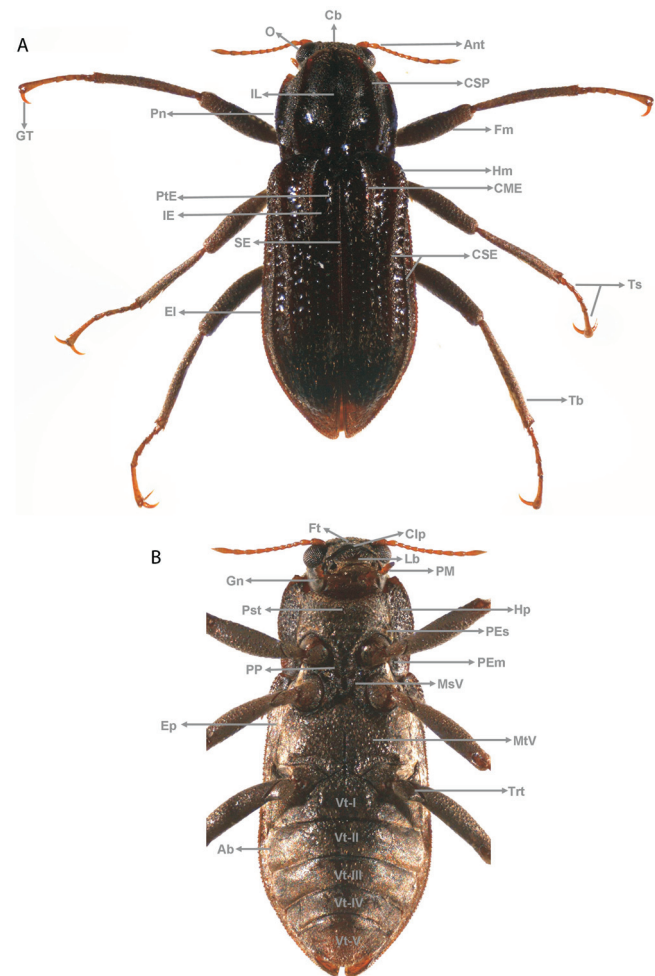


Fig. 2. Scheme showing main external structures of adult Elmidae of the genus *Cylloepus*: A) dorsal view; B) ventral view. Cb – Head, O – Eye, Ant – Antenna, Pn – Pronotum, IL – Median Longitudinal Impression, CSP – Pronotum Sublateral Carinae, Fm – Femur, El – Elytra, Hm – Elytral Humerus, CME – Elytral Median Carinae; PtE – Elytral Punctures, IE – Elytral Intervals, SE – Elytral suture, CSE – Elytral Sublateral Carinae, Tb – Tibia, Ts – Tarsus, GT – Tarsal Claw, Ft – Frons, Clp – Clypeus, Lb – Labrum, PM – Maxillary Palp, Gn – Gena, Pst – Prosternum, Hp – Hypomeron, PEs – Proepisternum, PP – Prosternal Process, PEm – Proepimerum, MsV – Mesenterite, MtV – Metaventricle, Ep – Epipleura, Trt – Trochanter, Ab – Abdomen, Vt-I – First Abdominal Ventrite, Vt-II – Second Abdominal Ventrite, Vt-III – Third Abdominal Ventrite, Vt-IV – Fourth Abdominal Ventrite, Vt-V – Fifth Abdominal Ventrite.

on dried specimens, distributed both on ventral and dorsal surfaces. In other genera (*e.g.* *Macrelmis*, *Xenelmis*, *Gyrelmis*, *Neoelmis*, *Microcyloopus*, *Heterelmis*, *Hexacylloepus*, *Cylloepus*), the plastron confers a shiny, golden or silver, velvet aspect, and is distributed only on the ventral surface. This difference is due to the microsculpture variation of the plastron among the different genera. The need of SEM micrographs for adequate visualization of the plastron, results in the lack of plastron structure descriptions for many genera. According to Kodada & Jäch (2005), until now, plastron on Elmidae can be classified as being composed by scale-like setae (*e.g.* *Macronychus* Müller, 1806, *Stegoelmis*), flattened hair-like

setae (e.g. *Elmis* Latreille, 1798, *Graphelmis* Delève, 1968, *Vietelmis* Delève, 1968, *Podonychus* Jäch & Kodada, 1997), microtrichial mesh (e.g. *Stenhelmoides*), porous sheet-like layer (*Pagelmis* Spangler, 1981, *Stegoelmis*, *Stenhelmoides*) and radial spiculate setae (*Anommatelmis* Spangler, 1981).

1. Microplastron absent. Body densely pubescent (subfamily Larainae). Antennae clavate. Pronotum with a median longitudinal impression and a lateral longitudinal impression extending from the posterior margin until middle length, where it bends toward the lateral margin of (Fig. 3A). 2.0–4.5 mm long *Phanocerus* Sharp, 1882
- 1'. Microplastron present. Body not pubescent, except for tomentum on legs or small isolated areas (subfamily Elminae). Antennae filiform. Pronotum may have variable impressions, but not with pattern described above 2
2. (1') Pronotum and elytra covered with plastron (confers to cuticle a grayish and opaque look, very noticeable on dried specimens). Elytra without carinae 3
- 2'. Pronotum and elytra without plastron (cuticle shiny, very noticeable on dried specimens). Elytra with or without carinae 4
3. (2) Pronotum without plastron on the median area, forming a shiny longitudinal band of variable size; without protuberances or gibbosities. Elytra without protuberances, with punctures usually indistinct (Fig. 3B). 2.0–4.5 mm long *Stenhelmoides* Grouvelle, 1908
- 3'. Pronotum entirely covered with plastron; pronotum with protuberances and gibbosities on basal 1/2, usually four, distributed in a transverse row. Elytra with a robust and short spine-like protuberance, near the posterolateral margin; with distinct punctures (Fig. 3C). 3.8–5.6 mm long *Stegoelmis* Hinton, 1939
4. (2') Elytra with a short accessory stria at base, between the first and second stria (Figs. 3D, E). 2.8–6.0 mm long *Macrelmis* Motschulsky, 1859
- 4'. Elytra without accessory stria 5
5. (4') Epipleura with granules arranged in one or two well defined lines (Fig. 3F). Pronotum without transverse impression (Fig. 3G). 1.0–2.0 mm long *Austrolimnius* Carter & Zeck, 1929
- 5'. Epipleura with or without granules, if present, arranged randomly, not forming definite lines 6
6. (5') Pronotum without impressions 7
- 6'. Pronotum with impressions 9
7. (6) Pronotum generally without sublateral carinae and, if present, composed of line of granules, extending from base to about apical 1/4 (Fig. 3H). 1.2–2.2 mm long *Xenelmis* Hinton, 1936
- 7'. Pronotum always with sublateral carinae, never composed of line of granules 8
- 8 (7') Pronotal disc without granules. Elytra with two sublateral carinae in the fifth and seventh intervals, never

composed of line of granules (Fig. 3I). 1.4–2.9 mm long *Gyrelmis* Hinton, 1940

- 8' Pronotal disc with granules. Elytra with two sublateral carinae in the fifth and seventh intervals, composed of line of granules (Fig. 3J). 2.2–2.7 mm long *Oolimnius* Hinton, 1939
9. (6') Pronotum with complete transverse impression or restricted to the laterals of the pronotum 10
- 9'. Pronotum with or without transverse impression, if present, restricted to median region 11
10. (9) Pronotum without median longitudinal impression; often with complete transverse impression. Elytra generally with one sublateral carinae (Fig. 4A). Epipleura with plastron (Fig. 4B). 1.3–2.7 mm long *Neoelmis* Musgrave, 1935
- 10'. Pronotum with median longitudinal impression, U-shaped on posterior 4/5; with oblique impression on each side. Elytra with two sublateral carinae, rarely with one (Fig. 4C). Epipleura without plastron (Fig. 4D). 0.6–2.3 mm long *Microcylloepus* Hinton, 1935
11. (9') Pronotum with transverse impression on median region, and oblique impression on basal 1/3 (Fig. 4E). 1.8–4.0 mm long *Heterelmis* Sharp, 1882
- 11'. Pronotum without transverse or oblique impressions 12
- 12 (11'). Hypomeron with at least one narrow band of plastron (Fig. 4G). 1.5–2.3 mm long *Hexacylloepus* Hinton, 1940 (Fig. 4F)
- 12'. Hypomeron generally without plastron, if present, restricted to a small area adjacent to anterior coxa, but never forming a band (Fig. 4H). 2.3–4.6 mm long *Cylloepus* Erichson, 1847 (Figs. 2A, B)

Checklist of species of Elmidae in Goiás State, Brazil

Elminae Curtis, 1830

Austrolimnius Carter & Zeck, 1929 (Figs. 3F, G)

Two unidentified morphospecies collected: One in Goiás: Jaraguá, 1 ex. One in Goiás: Rio Verde, 1 ex.

Austrolimnius (Helonoma) eris Hinton, 1971

BRAZIL: Goiás: Rio Chim; Goiás: Mosquito, Retiro (Hinton 1971). Distribution. Known from Argentina, Brazil, Guatemala, Mexico and Panama (Hinton 1971; Manzo 2007). This species was not found in the present study, its presence in Goiás being known only from previous records by Hinton (1971).

Cylloepus Erichson, 1847 (Figs. 2A, 2B, 4H)

Two unidentified morphospecies collected. One in Goiás: Jaraguá, 2 ex. and Goiás: Morro Agudo de Goiás, 1 ex. One in Goiás: São Francisco de Goiás, 5 ex., Goiás: Jaraguá, 1 ex., Goiás: Itapuranga, 6 ex., Goiás: Morro Agudo de Goiás, 1 ex. and Goiás: Rio Verde, 1 ex.

Gyrelmis Hinton, 1940 (Fig. 3I)

One unidentified morphospecies collected. Goiás: Rio Verde, 1 ex.

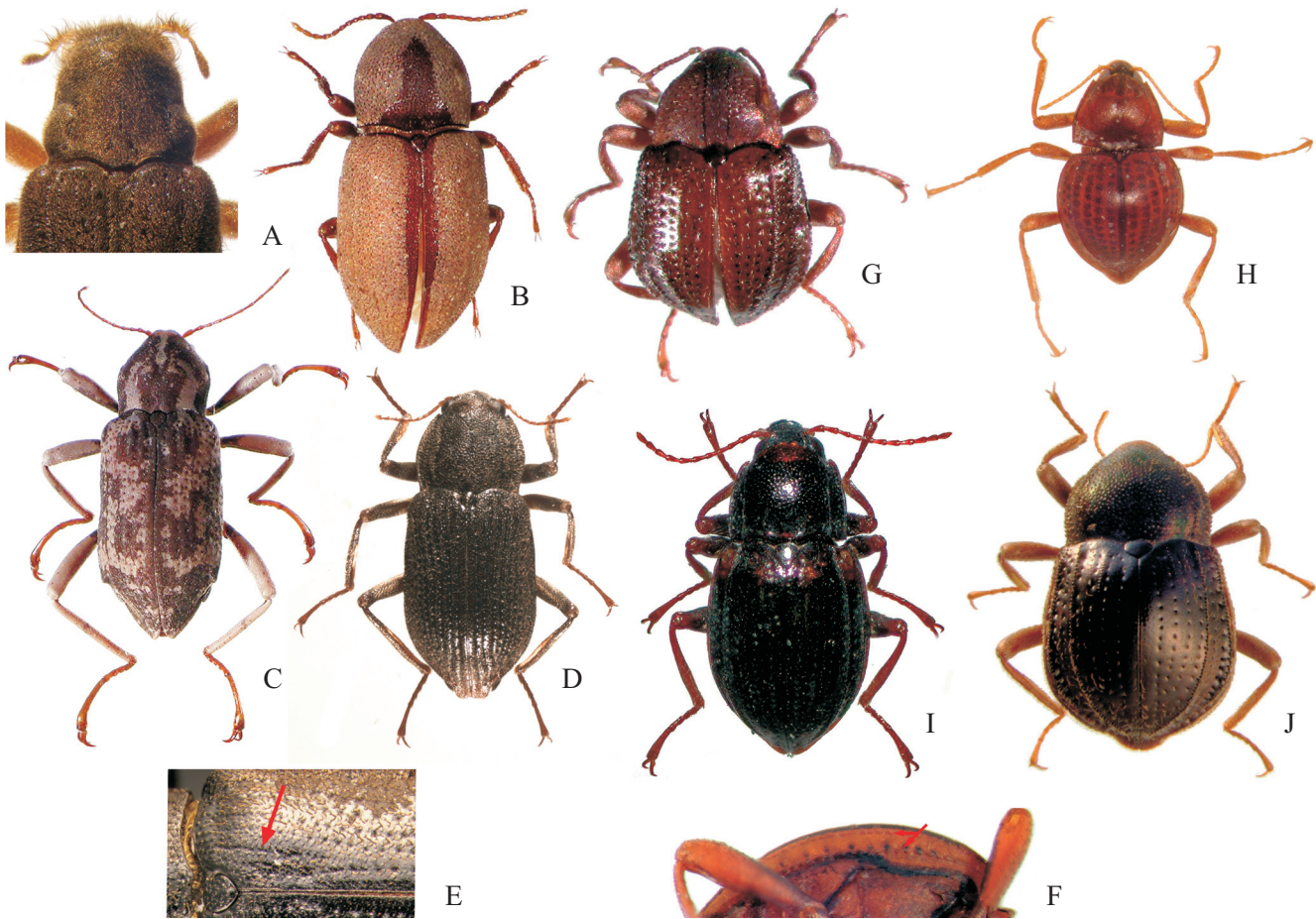


Fig. 3. Diagnostic characteristics for adults of the Elmidae genera. A, *Phanocerus* sp., dorsal view of pronotum and elytral base; B, *Stenhelmoides* sp., dorsal habitus; C, *Stegoelmis* sp., dorsal habitus; D, *Macrelmis* sp., dorsal habitus; E, *Macrelmis* sp., dorsal view of elytra (arrow: accessory stria); F, *Austrolimnius* sp., ventral view of abdomen (arrow: epipleura with two line of granules); G, *Austrolimnius* sp., dorsal habitus; H, *Xenelmis* sp., dorsal habitus; I, *Gyrelmis* sp., dorsal habitus; J, *Oolimnius* sp., dorsal habitus.

Gyrelmis brunnea Hinton, 1940

BRAZIL: Goiás: Rio Verde, 17°31'30.1"S, 51°6'49.6"W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda *leg.*

Other locations in Brazil. Pará: Belém, Estrada de Ferro de Bragança (Hinton 1940b, Passos *et al.* 2010).

Distribution. Known from Brazil and French Guiana (Hinton 1940b; Passos *et al.* 2010).

Gyrelmis rufomarginata (Grouvelle, 1888)

[= *Helmis rufo-marginata* Grouvelle, 1888]

[= *Heterelmis rufomarginata* Hinton, 1936]

[*Gyrelmis rufomarginata basalis* Hinton, 1940 – according to Delève (1970)]

[*Gyrelmis rufomarginata rufomarginata* (Grouvelle, 1888) – according to Delève (1970)]

[*Gyrelmis rufomarginata thoracica* Hinton, 1940 – according to Delève (1970)]

BRAZIL: Goiás: Rio Verde, 17°49'21.8"S, 51°18'34"W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda *leg.*

Other locations in Brazil. *Gyrelmis rufomarginata* (Grouvelle, 1888): Santa Catarina: Águas Mornas (cited as Theresopolis) (Hinton 1940b). *Gyrelmis thoracica basalis* Hinton, 1940: Amazonas: Manaus; Rondônia:

Porto Velho; Pará: Belém (Hinton 1940b).

Distribution. *Gyrelmis rufomarginata rufomarginata* (Grouvelle, 1888): Only known from Brazil (Hinton 1940b). *Gyrelmis thoracica thoracica* Hinton, 1940: Only known from French Guiana (Hinton 1940b). *Gyrelmis thoracica basalis* Hinton, 1940: Known from Brazil and French Guiana (Hinton 1940b).

Heterelmis Sharp, 1882 (Fig. 4E)

Two unidentified morphospecies collected. One in Goiás: Santa Isabel, 5 ex., Goiás: Itaberaí, 3 ex., Goiás: São Francisco de Goiás, 6 ex., Goiás: Jaraguá, 3 ex., Goiás: Itapuranga, 6 ex., Goiás: Goianésia, 4 ex., Goiás: Pirenópolis, 37 ex., Goiás: Rio Verde 24 ex. and Goiás: Santo Antônio da Barra, 1 ex. One in Goiás: Santa Isabel, 3 ex., Goiás: São Francisco de Goiás, 8 ex., Goiás: Jaraguá, 1 ex. and Goiás: Goianésia, 1 ex.

Hexacylloepus Hinton, 1940 (Figs. 4F, G)

Three unidentified morphospecies collected. One in Goiás: Santa Isabel, 2 ex. One in Goiás: São Francisco de Goiás, 1 ex., Goiás: Itapuranga, 3 ex. and Goiás: Morro Agudo de Goiás, 1 ex. One in Goiás: Rio Verde, 3 ex.

Macrelmis Motschulsky, 1859 (Figs. 3D, E)

Three unidentified morphospecies collected. One in Goiás: São Francisco de Goiás, 8 ex., Goiás: Morro Agudo de Goiás, 1 ex., Goiás: Goianésia,

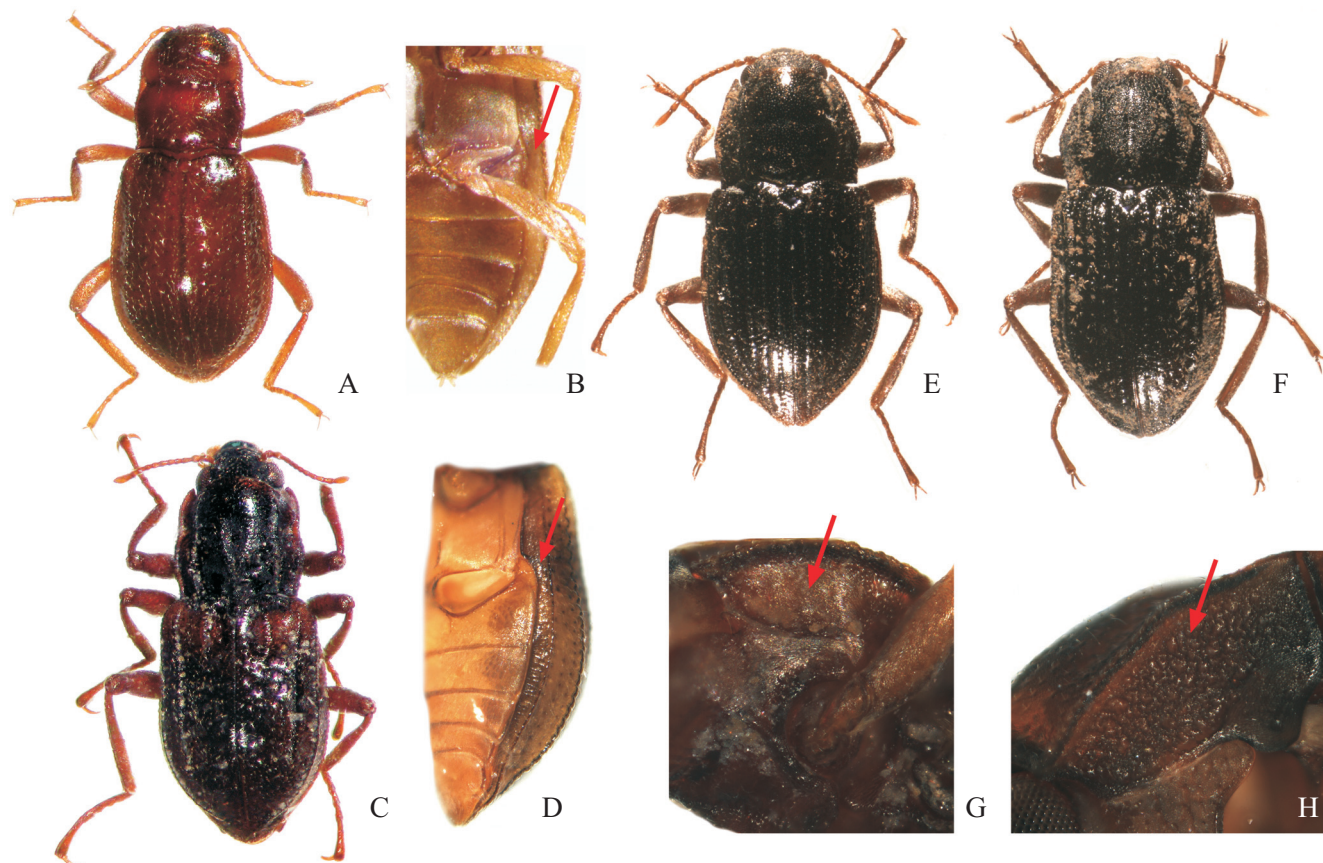


Fig. 4. Diagnostic characteristics for adults of the Elmidae genera. A, *Neoelmis* sp., dorsal habitus; B, *Neoelmis* sp., ventral view (arrow: epipleura); C, *Microcylloepus* sp., dorsal habitus; D, *Microcylloepus* sp., ventral view (arrow: epipleura); E, *Heterelmis* sp., dorsal habitus; F, *Hexacylloepus* sp., dorsal habitus; G, *Hexacylloepus* sp., lateral view of thorax (arrow: hypomeron); H, *Cylloepus* sp., lateral view of thorax (arrow: hypomeron).

1 ex. and Goiás: Rio Verde, 2 ex. One in Goiás: Jaraguá, 2 ex. and Goiás: Pirenópolis, 5 ex. One in Goiás: Jaraguá, 9 ex., Goiás: Itapuranga, 1 ex. and Goiás: Morro Agudo de Goiás, 1 ex.

Macrelmis isis (Hinton, 1946)

[= *Elsianus isus* Hinton, 1946]

BRAZIL: Goiás: Santa Isabel, 15°21'24.1"S, 49°22'44"W, 1 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy leg.; Itaberaí, 16°9'44.8" S, 50°2'5.4" W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, August to October 2008, B. S. Godoy leg.; Itaberaí, 16°2'18.8"S, 50°2'48.3"W, 2 exs., sampling nets (2.0 mm mesh), rocks and submerged vegetation, August to October 2008, B. S. Godoy leg.; Jaraguá, 15°44'11.8"S, 49°28'38.4"W, 2 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy leg.; Itapuranga, 15°36'29.6"S, 49°49'41.6"W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, August to October 2008, B. S. Godoy leg.; Itapuranga, 15°45'16.5"S, 49°56'57.8"W, 1 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy leg.; Itapuranga, 15°29'20"S, 50°6'18.6"W, 11 exs., sampling nets (2.0 mm mesh), rocks and litter submerged, August to October 2008, B. S. Godoy leg.; Morro Agudo de Goiás, 15°21'33.3"S, 49°56'2.7"W, 1 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy leg.; Goianésia, 15°28'55.8"S, 49°7'2.6"W, 1 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy leg.; Pirenópolis, Córrego Vagafofo, 15°50'S, 49°0'W, 4 exs., sampling nets (2.0 mm mesh), 22 June 2010, A. S. Fernandes leg.; Rio Verde, 17°58'39.8"S, 51°0'W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda leg.; Rio Verde, 18°11'43.8"S, 51°6'40"W,

1 ex., sampling nets (2.0 mm mesh), rocks, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda leg.; Rio Verde, 18°9'16.3"S, 50°54'38.9"W, 1 ex., sampling nets (2.0 mm mesh), rocks, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda leg.; Santo Antônio da Barra, 17°32'25.51"S, 50°37'39.61"W, 1 ex., sampling nets (2.0 mm mesh), rocks, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda leg.

Other locations in Brazil. Santa Catarina: Nova Teutonia (Hinton 1946; Brown 1984).

Distribution. Known from Argentina, Bolivia, Brazil and Paraguay (Hinton 1946; Brown 1984; Manzo & Archangelsky 2001, 2008; Shepard & Aguilar 2010).

Microcylloepus Hinton, 1935 (Figs. 4C, D)

Two unidentified morphospecies collected. One in Goiás: Morro Agudo de Goiás, 1 ex. One in Goiás: Pirenópolis, 1 ex.

Microcylloepus inaequalis (Sharp, 1882)

[= *Elmis inaequalis* Sharp, 1882]

[= *Limnius mexicanus* Hinton, 1934]

[= *Microcylloepus mexicanus* Hinton, 1935]

BRAZIL: Goiás: Santa Isabel, 15°19'18.9"S, 49°24'29.2"W, 8 exs., sampling nets (2.0 mm mesh), rocks and litter submerged, August to October 2008, B. S. Godoy leg.; Santa Isabel, 15°21'24.1"S, 49°22'44"W, 2 exs., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy leg.; Santa Isabel, 15° 16' 38.5" S, 49° 20' 34.4" W, 2 exs., sampling nets (2.0 mm mesh), litter submerged, August to October 2008, B. S. Godoy leg.; Santa

Isabel, 15°10'6.7"S, 49°27'3"W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, August to October 2008, B. S. Godoy *leg.*; Itaberá, 16°9'44.8"S, 50°2'5.4"W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, August to October 2008, B. S. Godoy *leg.*; São Francisco de Goiás, 15°56'51.7"S, 49°16'38.5"W, 1 ex., sampling nets (2.0 mm mesh), submerged vegetation, August to October 2008, B. S. Godoy *leg.*; São Francisco de Goiás, 15°58'16.5"S, 49°18'39.8"W, 1 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy *leg.*; Goianésia, 15°30'4"S, 49°12'39.5"W, 2 exs., sampling nets (2.0 mm mesh), litter submerged, August to October 2008, B. S. Godoy *leg.*; Goianésia, 15°14'51.8"S, 49°0'45.5"W, 1 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy *leg.*; Goianésia, 15°9'36.1"S, 48°57'23.6"W, 4 exs., sampling nets (2.0 mm mesh), litter submerged and submerged vegetation, August to October 2008, B. S. Godoy *leg.*; Goianésia, 15°14'39.9"S, 49°11'21.9"W, 1 ex., sampling nets (2.0 mm mesh), litter submerged and submerged vegetation, August to October 2008, B. S. Godoy *leg.*; Pirenópolis, Córrego do Inferno, 15°50'S, 48°51'W, 6 exs., sampling nets (2.0 mm mesh), 22 June 2010, A. S. Fernandes *leg.*; Rio Verde, 17°58'39.8"S, 51°0'W, 7 exs., sampling nets (2.0 mm mesh), litter submerged, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda *leg.*

Other locations in Brazil. Santa Catarina: Nova Teutonia (Hinton 1940c).

Distribution. Known from Brazil, Guatemala, Mexico and Paraguay (Hinton 1934, 1935, 1940a, c; Sharp 1882; Shepard & Aguilar 2010).

Neoelmis Musgrave, 1935 (Figs. 4A, B)

Three unidentified morphospecies collected. One in Goiás: Rio Verde, 1 ex. One in Goiás: São Francisco de Goiás, 2 ex. One in Goiás: Itapuranga, 2 ex.

Oolimnius salti Hinton, 1939 (Fig. 3J)

BRAZIL: Goiás: Itapuranga, 15°25'23"S, 49°51'41.5"W, 1 ex., sampling nets (2.0 mm mesh), submerged vegetation, August to October 2008, B. S. Godoy *leg.*; Orizona, Rio Mumbuca, 17°2'50.6"S, 48°31'58.9"W, 1 ex., sampling nets (2.0 mm mesh), 6 September 2010, A. S. Fernandes *leg.*

Other locations in Brazil. Santa Catarina: Nova Teutonia (Hinton 1939).

Distribution. Only known from Brazil (Hinton 1939).

Stegoelmis Hinton, 1939 (Fig. 3C)

One unidentified morphospecies collected. Goiás: Morro Agudo de Goiás, 1 ex.

Stenelmoides strictifrons Grouvelle, 1908 (Fig. 3B)

BRAZIL: Goiás: Rio Verde, 17°37'29.4"S, 51°3'44.5"W, 2 exs., sampling nets (2.0 mm mesh), rocks, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda *leg.*

Other locations in Brazil. Mato Grosso: Pará: Canindé, Rio Gurupi; São Paulo: Piracicaba (Spangler & Perkins 1989).

Distribution. Known from Brazil, French Guiana, Guyana, Peru and Venezuela (Grouvelle 1908; Spangler & Perkins 1989).

Xenelmis uruzuensis Manzo, 2006 (Fig. 3H)

BRAZIL: Goiás: Jaraguá, 15°48'16.7"S, 49°21'18.6"W, 1 ex., sampling nets (2.0 mm mesh), rocks, August to October 2008, B. S. Godoy *leg.*; Pirenópolis, Córrego do Inferno, 15°50'S, 48°51'W, 3 exs., sampling nets (2.0 mm mesh), 22 June 2010, A. S. Fernandes *leg.*

Distribution. First record for Brazil. Previously known only from Argentina and Paraguay (Manzo 2006; Shepard & Aguilar 2010).

Larinae (LeConte, 1861)

Phanocerus clavicornis Sharp, 1882 (Fig. 3A)

[= *Phanocerus hubbardi* Schaeffer, 1911]

[= *Phanocerus helmoides* Darlington, 1936]

BRAZIL: Goiás: Pirenópolis, 15°51'43"S, 49°11'41.2"W, 2 exs., sampling nets (2.0 mm mesh), litter submerged, August to October 2008, B. S. Godoy *leg.*; Rio Verde, 18°11'43.8"S, 51°6'40"W, 1 ex., sampling nets (2.0 mm mesh), litter submerged, 7–11 April 2010, A. S. Fernandes, F. F. Barbosa and L. F. R. Holanda *leg.*

Other locations in Brazil. Santa Catarina: Nova Teutonia (Hinton 1937, 1940a); Amazonas: Presidente Figueiredo, Igarapé da Onça, Recanto da Pantera; Sítio Sr. José (Passos *et al.* 2010); Rio de Janeiro: Angra dos Reis, Cachoeiras de Macacu, Guapimirim, Itatiaia, Macaé, Nova Friburgo, Parati, Rio de Janeiro, Teresópolis (Passos *et al.* 2009).

Distribution. Known from Belize, Brazil, Costa Rica, Cuba, Dominican Republic, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, Puerto Rico and USA (Darlington 1936; Hinton 1937, 1940a, Passos *et al.* 2009, 2010; Schaeffer 1911; Sharp 1882; Spangler 1973, 1981; Spangler & Santiago-Fragoso 1992).

DISCUSSION

This study provides, for the first time, information focusing in the taxonomy of Elmidae from the Goiás State, in Brazil. The number of recorded genera for Goiás state increased from two to 13. From the 24 known genera in Brazil, eleven of them remain unknown from Goiás (Segura *et al.* 2011b). The number of named species of Elmidae recorded for Goiás increased from one to nine (Brown 1973; Hinton 1971), and *Austrolimnius (Helonoma) eris* Hinton, 1971, the only previously recorded species in Goiás State (Hinton 1971), was not found in this study.

Four species (*Gyrelmis rufomarginata*, *Macrelmis isis*, *Microcylloepus inaequalis*, and *Oolimnius salti*) were reported previously for Santa Catarina (Hinton 1939, 1940b, 1940c, 1946), one (*Gyrelmis brunnea*), for Pará (Hinton 1940b), one (*Phanocerus clavicornis*) for Santa Catarina, Amazonas and Rio de Janeiro states (Hinton 1940a; Passos *et al.* 2010) and one (*Stenelmoides strictifrons*) for Mato Grosso, Pará and São Paulo states (Passos *et al.* 2010; Spangler & Perkins 1989).

Xenelmis uruzuensis, first described for Argentina and recorded also for Paraguay (Manzo 2006; Shepard & Aguilar 2010), is recorded in Brazil for the first time here. This record may indicate a very wide distributional range for the species, perhaps occurring in many localities and distributed along the entire southern half of South America.

It is essential that new taxonomic studies of Elmidae in other locations of Goiás State and Brazil, other drainage basins and aquatic habitats not yet explored, be performed, aimed at expanding our knowledge and understanding the geographical distribution status of this family in Brazil.

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