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Identification Key

A picture key for semiaquatic and aquatic adults of Curculionoidea (Insecta, Coleoptera) from Brazil

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Abstract: A pictorial key for the identification of aquatic and semiaquatic adults of Curculionidae associated with aquatic macrophytes from the Pantanal of Mato Grosso and the Amazon is presented for the first time based on the study of 13,252 specimens belonging to the two families of Curculionoidea (Brentidae and Curculionidae), six subfamilies, eight tribes, 22 genera and 24 species, most belonging to Tanysphyrini (Curculionidae, Brachycerinae). This key can be extrapolated to the Neotropical Region fauna due to the wide distribution of the included species, which is discussed in relation to taxonomic, biogeographical, and ecological studies.
Keywords: *Curculionoidea; Flood plains; Aquatic plants; Neotropical region.*

Chave pictórica para identificação de adultos de Curculionoidea semiaquáticos e aquáticos do Brasil

Resumo: Apresenta-se pela primeira vez uma chave pictórica para identificação dos adultos aquáticos e semiaquáticos de Curculionidae associados às macrófitas aquáticas do Pantanal mato-grossense e da Amazônia, baseada no estudo de 13.252 exemplares pertencentes a duas famílias de Curculionoidea (Brentidae e Curculionidae), seis subfamílias, oito tribos, 22 gêneros e 24 espécies, a maioria pertencente a Tanysphyrini (Curculionidae, Brachycerinae). A chave proposta pode ser extrapolada para a fauna da Região Neotropical devido a ampla distribuição das espécies incluídas, as quais são discutidas em relação aos estudos taxonômicos, biogeográficos e ecológicos.
Palavras-chave: *Curculionoidea; Planícies de inundação; Plantas aquáticas; Região Neotropical.*

Introduction

Brazil has a rich fauna of aquatic and semiaquatic weevils associated with aquatic macrophytes (De Sousa 2008); however, the taxonomy, biology and ecology of many of these weevils are poorly known (De Sousa et al. 2007, 2009, 2011, 2012, 2022). For the suprageneric taxa of Curculionoidea, aquatic and semiaquatic from South America, only one identification key is available (Morrone & O'Brien 1999), and others are specific for some genera (Hustache 1926, 1929, Kuschel 1952, 1956, O'Brien & Wibmer 1989a, b, c, Wibmer 1989, Wibmer & O'Brien 1989).

Among the humid areas of Brazil, the Pantanal of Mato Grosso and the Amazon are home to a great diversity of aquatic macrophytes. In the Pantanal, 280 species typical of aquatic environments were recorded (Pott & Pott 2000, Pott et al. 2011), and 388 species were recorded in the floodplain areas of the Amazon (Junk & Piedade 1997), with 85% typical of terrestrial environments and 25% aquatic and semiaquatic.

Based on studies of Curculionidae associated with aquatic macrophytes from the Pantanal of Mato Grosso and Central Amazonia, a pictorial key for the identification of adults belonging to the genera and species of aquatic and semiaquatic Curculionidae in these two humid areas is presented for the first time, with updated classification for suprageneric taxa, genera and species, thus expanding knowledge about the biodiversity of this group.

Materials and Methods

The specimens of Curculionoidea studied were collected from banks of aquatic macrophytes in the Pantanal of Mato Grosso and the Central Amazon between 2005 and 2009 using an aluminum cage 0.5 m square × 0.5 m high with an area of 0.25 m^2, screened on the sides, with an open bottom and a lid on the top (Vieira & Adis 1992). The cage was placed on a bank of macrophytes, with the upper lid closed, trapping the insects and macrophyte community inside. The lid was then opened, and the macrophytes were manually removed, stored in 20 × 20 cm labeled plastic bags and transported to the laboratory, where they were fixed in 98% ethanol for later sorting and identification of insects.

Weevils were identified based on specific literature (e.g., Hustache 1926, Viana 1951, Kuschel 1952, 1956, White et al. 1984, Calder & Sands 1985, Vanin 1986, Wibmer & O'Brien 1986, O'Brien 1976, 1997, O'Brien & Wibmer 1989a, b, c, Wibmer 1989, Morrone & O'Brien 1999, Colonnelli 2004) and confirmed based on the Curculionoidea deposited in the following collections: Laboratory of Ecology and Taxonomy of Arthropods (LETA), of the Biosciences Institute of the Federal University of Mato Grosso (UFMT); Invertebrates Collection of the National Institute for Research in the Amazon (INPA); and Entomological Collection Pe. J. S. Moure, from the Department of Zoology at the Federal University of Paraná (DZUP).

For suprageneric classification of Curculionoidea groups, Oberprieler (2014) and Prena et al. (2014) were followed, and for the genera and species, the keys of Hustache (1926), Kuschel (1952, 1956), Calder & Sands (1985), O'Brien (1976), O'Brien & Wibmer (1989a, b, c), Viana (1951), Vanin (1986), Wibmer (1989), Wibmer & O'Brien (1989), and Colonnelli (2004) were used. For the terminology of external morphology, Oberprieler et al. (2014), O'Brien (1976), and De Sousa et al. (2012) describe the vestiture.

Table 1. Taxa and abundance of aquatic and semiaquatic weevils collected in the Pantanal and Central Amazon. NI – Not identified.

Brentidae	
Apioninae	
Stenapion sp.	**48**
Curculionidae	**13,204**
Brachycerinae	**13,057**
Argentinorhynchus	11
Argentinorhynchus breyeri	6
Argentinorhynchus minimus	3
Argentinorhynchus squamosus	2
Cyrtobagous	1,736
Cyrtobagous salviniae	1,285
Cyrtobagous singularis	451
Helodytes	
Helodytes nodulosus	3
Hydrotimetes	
Hydrotimetes sp.	1
Hypselus	
Hypselus ater	4
Lissorhoptrus	
Lissorhoptrus sp.	6
Neochetina	8,472
Neochetina brucchi	1,442
Neochetina confusor	1
Neochetina eichhorniae	6,816
Neochetina neoaffinis	213
Neohydronomus	14
Neohydronomus affinis	12
Neohydronomus pulchellus	2
Notiodes	
Notiodes sp.	17
Ochetina	36
Ochetina brucchi	13
Ochetina uniformis	23
Oryzophagous	
...Continuation	
Curculionidae	
Oryzophagous sp.	18
Pistiacola	6
Pistiacola cretatus	3
Pistiacola fasciatus	3
Pistiacoloides	
Pistiacoloides sp.	1
Stenopelmus	
Stenopelmus sp.	1
Tanysphiroideus	
Tanysphiroideus sp.	2731
Conoderinae	**6**
Hustacheauleutes	
Hustacheauleutes sp.	3
Sudauleutes	3
Baridini NI	**23**
Curculioninae	
Ludovix	
Ludovix fasciatus	42
Cyclominae	
Listronotus	
Listronotus sp.	12
Lixinae	
Lixus	
Lixus sp.	8
Molytinae	**65**
Amalactus	4
Amalactus carbonarius	3
Amalactus nigritus	1
Tyloderma	61
Tyloderma affine	4
Tyloderma brevisquameum	5
Tyloderma frontale	50
Tyloderma innotatum	2
Total	**13,252**

Continue...

The drawings of the structures were made with the aid of a WILD TYP–308700 stereomicroscope with an attached camera lucida. Photographs were obtained using Leica CH-94335 equipment, with a camera coupled to a Leica L2 stereomicroscope (Leica Microsystems) and Leica Application Suite v. 3.8 software.

Results

A total of 13,252 individuals were examined and identified, 48 of which were representatives of *Stenapion* sp. (Brentidae, Apioninae, Apionini) and 13,204 representatives of Curculionidae, distributed in six subfamilies, eight tribes, 22 genera and 24 species, the majority belonging to Brachycerinae, tribe Tanysphyrini, with 14 genera and 15 species. *Neochetina* Hustache, 1926 the most abundant genus, represented by 4 species, *Neochetina eichhorniae* Warner, 1970 and *Neochetina bruchi* Hustache, 1926 the most abundant, followed by an unidentified species of the monotypic genus *Tanysphyroideus* Hustache, 1926, and *Cyrtobagous* Hustache, 1929 with two species, *Cyrtobagous salviniae* Calder & Sands, 1985 the most abundant. *Argentinorhynchus* Brèthes, 1910 with three species, *Neohydronomus* Hustache, 1926, *Ochetina* Pascoe, 1881, *Pistiacola* Wibmer & O'Brien, 1989 with two species, *Helodytes* Kuschel, 1952 with one species, *Hydrotimetes* Kolbe, 1911, *Lissorhoptrus* LeConte, 1876, *Notiodes* Schoenherr, 1838, *Oryzophagous* Kuschel, 1952, *Pistiacoloides* Wibmer & O'Brien, 1989 and *Stenopelmus* Schoenherr, 1836, with unidentified species, together showed lower abundance. Erirhinini (Brachycerinae) with only one species, *Hypselus ater* Boheman, 1843. Erodiscini (Curculioninae) represented by one species. Cryptorrhynchini (Molytinae) by one genus and four species, with *Tyloderma frontale* Wibmer, 1989 being the most abundant. Amalactini have two species of *Amalactus* Schoenherr, 1835. Baridini (Conoderinae) have unidentified individuals, Listroderini (Cyclominae) also have unidentified species of *Listronotus*, Lixini (Lixinae) by unidentified species of *Lixus* Fabricius, 1801 and Cnemogonini (Conoderinae) by unidentified species of *Hustacheuleutes* Colonnelli, 2004 and *Sudauleutes* Colonnelli, 2004 (Table 1).

Pictorial key for identification of aquatic and semiaquatic adults of Curculionoidea from Brazil

1\. Antennae straight (Figure 1A); trochanter cylindrical and elongated (Figure 1B), completely separating the femur from the coxae.. *Stenapion* Wagner, 1912 (Brentidae, Apioninae, Apionini)

1'. Antennae geniculate (Figure 1C); trochanter short, remaining femur close to coxae (Figure 1D)...Curculionidae…...............2

2 (1'). Terrestrial or semiaquatic weevils, with a glabrous body or with scales and scales of different shapes and densities (Figures 1E-1H)………...3

2'. Aquatic weevils with a body covered by scales of the agglutinated type (Figure 1L) and/or plumose (Figure 1J)... Tanysphyrini (Brachycerinae).....15

3 (2). Mesepimera ascending, visible in dorsal view (Figures 2A-2B). 4

3'. Mesepimera not ascending and not visible in dorsal view (Figure 2C). 6

4 (3). Integument glabrous, shiny, with few scales; postocular lobes often absent; pygidium exposed or covered by elytra; prosternum not canaliculate; posterior tibiae often with well-developed *uncus*..Baridini (Conoderinae)

4'. Integument opaque or shiny, with many scales (Figure 1G); postocular lobes often present, partially covering the eyes when the rostrum is resting on the prosternum (Figure 2B); pygidium exposed, never covered by the elytra (Figure 2A); prosternum canaliculate (Figure 2D); posterior tibiae with rudimentary or absent *uncus*.. Cnemogonini (Conoderinae)........................5

5 (4'). Integument brown and shiny; deep rostral canal; vertex of head not carinate; pronotum rounded, with lateral tubercles; elytral suture with a row of white scales (Figure 1G) .... *Hustacheauleutes* Colonnelli, 2004

5'. Integument ferruginous and opaque; rostral channel; vertex of the head carinate; pronotum with acuminate lateral tubercles (Figure 2F); elytral suture without row of white scales (Figure 1H)..................... *Sudauleutes* Colonnelli, 2004

6 (3'). Rostrum thin and elongated, longer than the length of the body; pronotum longer than wide, strangulate at base; toothed femora (Figure 2E); tarsal claws appendiculate (Figure 2G)........................ *Ludovix fasciatus* (Gyllenhal, 1836) (Curculioninae, Erodiscini)

6'. Rostrum broad and short, shorter than the body; pronotum wider than long, not strangulate at base; non toothed femora; tarsal claws simple...7

7 (6'). Prosternum canaliculate (Figure 2D)........................ ....*Tyloderma* (Molytinae, Cryptorhynchini)...8

7'. Prosternum not canaliculate.................................11

8 (7). Antennal funicle with five segments; front without fovea; anterior margin of the pronotum, above the postocular lobes, with a V-shaped impression (Figure 2H).................. .... *Tyloderma brevisquameum* Wibmer, 1989

8'. Antennal funicle with six segments; front with fovea (Figure 3A); anterior margin of pronotum, above postocular lobes, with a U-shaped impression (Figure 3B)............................9

9 (8'). Postocular lobes tightly-projected toward the eyes (Figure 3B); metasternum moderately projecting toward posterior coxae.. *Tyloderma affine* Wibmer, 1989

9'. Postocular lobes slightly projected toward the eyes (Figure 3C); metasternum not projecting toward the posterior coxae...10

10(9'). Thick and dense punctuation on the head, similar to those on the basal half of the rostrum (Figure 3D); median area of the abdominal sternite I plane with thick punctuations (Figure 3E) ……... *Tyloderma frontale* Wibmer, 1989

10'. Thin and sparse head punctuation, similar to those in the basal half of the rostrum (Figure 3F); median area of abdominal sternite I depressed and weakly punctuated (Figure 3G).. .... *Tyloderma innotatum* Hustache, 1939

11 (7'). Postocular lobe present; rostrum robust; at least one pair of unarmed tibiae, or with uncus on hind tibiae, with a row of apical scales oriented transversely in relation to the tibial axis (Figure 3I).................. *Listronotus* (Cyclominae, Listroderini)

11'. Postocular lobe absent; rostrum and tibiae otherwise 12

12 (11'). Eyes protruding; femora and tibiae denticulated; tarsal claws simple (Figure 4A)... *Hypselus ater* Boheman, 1843 (Brachycerinae, Erirhinini)

12'. Eyes never protruding; femora and tibiae unarmed/undenticulated; tarsal claws simple or connate.......................................13

13 (12'). Integument black, matte, body elongated, elytral apices acute and separated (Figure 4B); metepimeron strongly visible in lateral view (Figure 4C); tarsal claws connate at the base (Figure 4D) .... *Lixus* Fabricius, 1801 (Lixinae, Lixini)

13'. Integument black, shiny, body oval-elongated, elytral apices united and rounded (Figure 4E); metepimeron barely visible in lateral view (Figure 4F); tarsal claws separate, abdominal sternites I, II much larger than sternits III–V (Figure 4G)...14

14 (13'). Size between 9-11 mm; pro-, meso- and metasternum punctuations sparse and thick; abdominal sternite I with thick and sparse punctuations, sternites II–V finely punctuated (Figures 4E-4G).............. *Amalactus nigritus* Gyllenhal, 1836

14'. Size between 6-8 mm (Figure 4H); pro-, meso- and metasternum with thick punctuations; abdominal sternite I with thick punctuations, other segments finely punctuated (Figure 4H-4I).......................... *Amalactus carbonarius* Faust, 1888

15 (2'). Tibiae median with natatorial hairs on the inner and outer margins or at least on one of the margins (Figure 5A)...........................16

15'. Tibiae median without natatorial hairs on inner and outer margins..19

16 (15). Pronotum and elytral striae with thick and deep punctuation (Figure 5B)………………………………………………17

16'. Pronotum and elytral striae with fine or obsolete punctuation (Figure 5C)...18

17 (16). Elytra weakly convex in lateral view (Figure 5D); tibiae with premucro...........................*Helodytes* Kuschel, 1952.

17'. Elytra strongly convex in lateral view (Figure 5E); tibiae without premucro......................*Hydrotimetes* Kolbe, 1911

18 (16'). Front plane, without median depression; prothorax slightly narrow anteriorly, pronotum without lateral callosity (Figures 5C, 5F); prosternum with elevation posterior to the coxae; vestiture with strongly agglutinated scales distributed on the external and internal margins of the tibiae, prosternum and abdominal sternites III–V (Figures 5F-5G).......................... ....*Lissorhoptrus* LeConte, 1876

18'. Front plane with median depression (Figure 6A); prothorax strongly narrowed anteriorly, with lateral callosity (Figure 6B); prosternum without elevation anterior and posterior to the coxae; vestiture with strongly agglutinated scales distributed on the external and internal margins of the tibiae, prosternum and abdominal sternites (Figure 6C) ....*Oryzophagus* Kuschel, 1952

19 (15'). Scales agglutinated and/or plumose covering the integument (Figure 6D)..20

19'. Scales agglutinated and/or plumose with another pattern of distribution, leaving parts of the integument exposed..........33

20 (19). Antennal scape surpassing the anterior margin of the eye, funicle with seven segments (Figure 6E)......................... .... *Stenopelmus* Schoenherr, 1836

20'. Antennal scape not extending beyond the anterior margin of the eye, funicle with six segments..................................21

21 (20'). Antennal club with first article long and glabrous; elytral callosities in the posterior third of the interstriae; apex of tibiae without uncus and/or premucro (Figure 6F).................. ....……………… *Tanysphiroideus* Hustache, 1926

21'. Antennal club with first article short and hairy; elytral callosities absent or indicated; apex of tibiae with uncus and/ or premucro (Figure 6G)..22

22 (21'). Setae suberect, decumbent and distributed on the rostrum, pronotum, elytra, femora and tibias..23

22'. Setae with other shapes, not as above....................................24

23 (22). Prosternum, metasternum, coxae and tibiae with agglutinated scales; abdominal sternites III-V with plumose scales (Figures 6G, 7A)..... *Pistiacola* Wibmer & O'Brien, 1989..................25

23'. Prosternum with plumose scales, metasternum with plumose scales in the center and agglutinated on the sides; coxae covered with plumose scales; tibiae with plumose scales on the inner margin; sternites I and II with plumose scales in the center and agglutinated on the sides, abdominal sternites III–V with plumose scales (Figure 7B) ….........................….. *Pistiacoloides* Wibmer & O'Brien, 1989

24 (22'). Ventral surface of the rostrum, in lateral view, weakly curved in comparison with the dorsal surface (Figure 7C); mesosternal process projecting between the coxae....................... *Pistiacola cretatus* Champion, 1902

24'. Ventral and dorsal surface of rostrum, in lateral view, moderately curved (Figure 6G); mesosternal process not previously projected............. *Pistiacola fasciatus* Wibmer & O'Brien, 1989

25 (23). Dorsal surface of body partially or completely covered by plumose scales; scutellum visible (Figure 7D)................. *Neohydronomus* Hustache, 1926...............................26

25'. Dorsal surface of body completely covered by strongly agglutinated scales, forming a single, indistinct layer; hidden scutellum (Figure 7E)..27

26 (25). Dorsal and ventral surface of the body completely covered by plumose scales (Figure 7F).. ....*Neohydronomus affinis* Hustache, 1926

26'. Dorsal surface of body covered by agglutinated scales, plumose scales restricted to the interstriae of the suture of the elytra (Figures 7D, 7G)................. *Neohydronomus pulchellus* Hustache, 1926

27 (25'). Rostrum thin (approximately 2/3 of the interorbital distance) and long (at least 1.4 times longer than the length of the pronotum) or short (subequal to the length of the pronotum), curved in lateral view (Figure 7H); tarsomere III of three pairs of legs not bilobed..................... *Ochetina* Pascoe, 1881......................... 28

27'. Rostrum generally wide (subequal to interorbital distance) and short (subequal to pronotum length), if thin (approximately 2/3 of interorbital distance) not as long as above, weakly curved (Figure 7I); tarsomere III of three pairs of legs bilobed 29

28 (27). Rostrum long and thin, at least 1.4 times longer than the length of the pronotum (Figure 7H). ....*Ochetina uniformis* Pascoe, 1881

28'. Rostrum short and widened at the apex, subequal to the length of the pronotum (Figure 8A). ....*Ochetina bruchi* Hustache, 1926

29 (27'). Postocular lobes absent or just indicated (Figure 7I); prosternum flat anteriorly to the coxae, posteriorly without tubercles (Figure 8B); inner margins of tibias without plumose scales; last tarsomere (*onychium*) of the three pairs of legs not extending beyond the lobes of the third (Figure 8C). ....*Notiodes* Schoenherr, 1838

29'. Postocular lobes well-developed (Figure 8D); prosternum excavated anteriorly to the tibiae, with a well-developed median tubercle (Figure 8E); internal margins of the tibiae with plumose scales (Figure 8D); last tarsomere (*onychium*) of the three pairs of legs surpassing the apex of the third (Figure 8F).... *Neochetina* Hustache, 1926...30

30 (29'). Odd interstriae with tubercles from posterior slope of elytra; sutural callosities absent (Figure 8D).......... .... *Neochetina neoaffinis* O'Brien, 1976

30'. Odd interstriae without tubercles from the posterior slope of the elytra (in *Neochetina bruchi* Figure 8I), small tubercles may be present in alternating interstriae; sutural callosity present or absent in the elytra..31

31 (30'). Elytra at least 1/3 longer than wide; absent sutural callosities (Figure 8G)........................*Neochetina confusor* O'Brien, 1976

31'. Elytra approximately ¼ or less longer than wide; sutural callosites presente (Figure 8H)....................................32

32. Elytral scales with dark and irregular coloration; sutural callosity elongated; distance between the callosity and the anterior margin of the elytra equivalent to ½ of the length of the pronotum (Figure 8H) .... *Neochetina eichhorniae* Warner, 1970

32'. Elytral scales with yellowish and uniform coloration; sutural callosity short; distance between the callosity and the anterior margin of the elytra equal to the length of the pronotum (Figure 8I)...................... *Neochetina bruchi* Hustache, 1926

33 (19'). Integument black and opaque, with yellowish circular scales widely distributed along the body; rostrum narrower at the base than at the apex; antennal scape not reaching the eye; first article of the antennal club glabrous; ventral margin of scrobe expanded laterally in dorsal view; femora and tibiae with an inner band of plumose scales; III tarsomere of the three pairs of legs not bilobed (Figure 9A) ....*Cyrtobagous* Hustache, 1929..............34

33'. Integument dark and shiny, without yellowish circular scales, plumose scales widely distributed in different ways along the body; rostrum thick in dorsal view; antennal scape reaching the eye; first antennal article hairy; ventral margin of scrobe not laterally expanded; without plumose scales on femurs and tibiae; tarsomere III of the three pairs of legs bilobed (Figure 9B) ....*Argentinorhynchus* Brèthes, 1910..............35

34. Yellowish circular scales extend from the dorsal surface of the rostrum to the front; ventral margin of scrobal sulcus straight (Figure 8A)............*Cyrtobagous salviniae* Calder & Sands, 1985

34'. Yellowish circular scales from the dorsal surface of the rostrum do not extend to the front; ventral margin of scrobal sulcus sinuous (Figure 9C)……..*Cyrtobagous singularis* Hustache, 1929

35 (33'). Lobes of the third tarsomere asymmetrical; last tarsomere not extending beyond the lobes of the third tarsomere....................... *Argentinorhynchus minimus* O'Brien & Wibmer, 1989

35'. Lobes of the third tarsomere symmetrical; last tarsomere extending beyond lobes of third tarsomere (Figure 9D).......36

36. Plumose scales sparsely distributed along the dorsal surface of the body (Figure 9B).. ....*Argentinorhynchus breyeri* Brèthes, 1910

36'. Plumose scales densely distributed along the dorsal surface of the body (Figure 9E)………….. ……………..*Argentinorhynchus squamosus* Hustache, 1926

Discussion

Some identification keys have been published for suprageneric taxa of Curculionoidea from South America (Costa-Lima 1956, Morrone 1996, Marvaldi & Lanteri 2005), and others are specific for aquatic and semiaquatic genera of Tanysphirini (Curculionidae, Brachycerinae) (e.g., Hustache 1926, 1929, Kuschel 1952, 1956, O'Brien & Wibmer 1989a, b, c, Wibmer 1989, Wibmer & O'Brien 1989). The present study expands knowledge about the diversity of aquatic and semiaquatic weevils distributed in the Neotropical region, gathering for the first time an identification key for taxa representatives of two families of Curculionoidea (Brentidae and Curculionidae), six subfamilies, ten tribes, 22 genera and 24 species, mostly belonging to Tanysphyrini (Brachycerinae), associated with aquatic macrophytes of the Pantanal of Mato Grosso and the Central Amazon.

Curculionoidea occupy the most varied types of habitats in which vascularized plants occur; therefore, it is common to also find groups associated with aquatic macrophytes distributed in humid areas (Crowson 1981, Oberprieler et al. 2014). The semiaquatic Curculionoidea (sensu Morrone & O'Brien 1999) occur in at least one subfamily of Brentidae (Apioninae) and in six subfamilies of Curculionidae (Cyclominae, Conoderinae, Curculioninae, Lixinae, Molytinae and Dryophthorinae). Adults, larvae and pupae of semiaquatic groups apparently do not have any adaptations for swimming or breathing underwater (Crowson 1981, Spangler 1981), and aquatic groups of the Neotropical Region are exclusive to the subfamily Brachycerinae, tribe Tanysphyrini (Spangler 1981, Morrone & O'Brien 1999, Oberprieler 2014).

The taxonomic, biological, ecological and biogeographic knowledge of terrestrial, aquatic or semiaquatic Curculionoidea associated with semiaquatic and aquatic macrophytes that occur in Brazil is preliminary (De Sousa et al. 2007, 2009, 2011, 2012, 2022). Several studies include Brazilian species of Tanysphyrini as potentially and/or introduced as controlling agents of aquatic macrophytes considered invasive in other biogeographic regions (Warner 1970, DeLoach, 1975a, b, 1976, DeLoach & Cordo 1976a, b, 1983, Wright & Center 1984, Center 1987, Center & Dray 1992, Center et al. 1999, Hill & Cilliers 1999, Heard & Winterton 2000, Hongo & Mjema 2002, De Sousa et al. 2009, 2011).

Behavioral and morphological adaptations observed in Tanysphyrini adults, such as the type of locomotion, behavior (e.g., when diving to escape predators or high temperatures), or in the respiratory system,

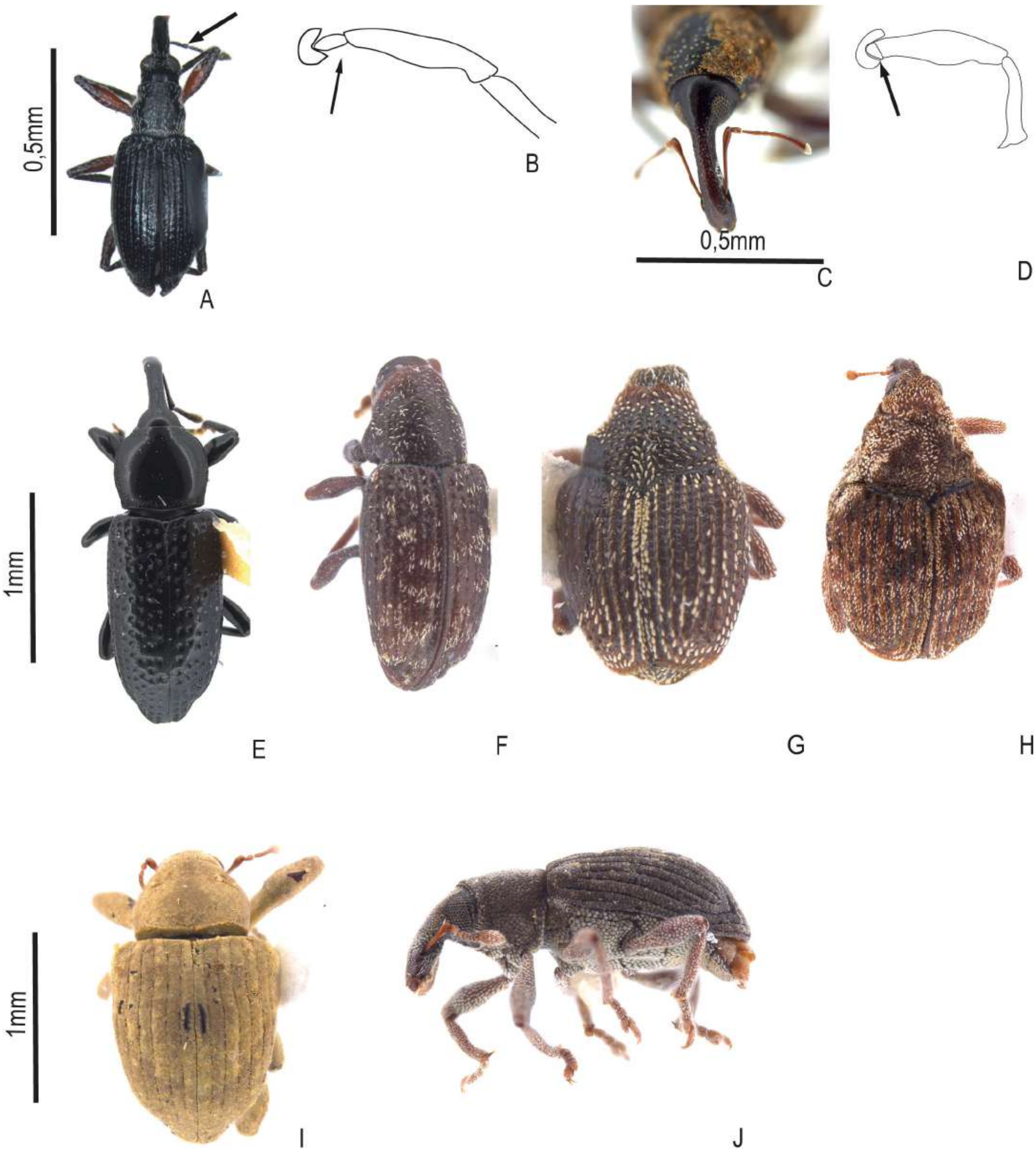

Figure 1: A) *Stenapion*, straight antenna; B) *Stenapion,* cylindrical and elongated trochanter; C) *Cyrtobagous singularis*, geniculate antennae; D) *Cyrtobagous singularis*, triangular and short trochanter; E) *Amalactus nigritus*, habitus, dorsal view; F) *Tyloderma frontale*, habitus, dorsal view; G) *Hustacheauleutes* sp., habitus, dorsal view; H) *Sudauleutes* sp., habitus, dorsal view; I) *Neochetina bruchi*, habitus, dorsal view; J) *Neohydronomus affinis*, habitus, lateral view. Scale bars: 1 = 1 mm, 2 = 0,5 mm, 3–10 = 1 mm.

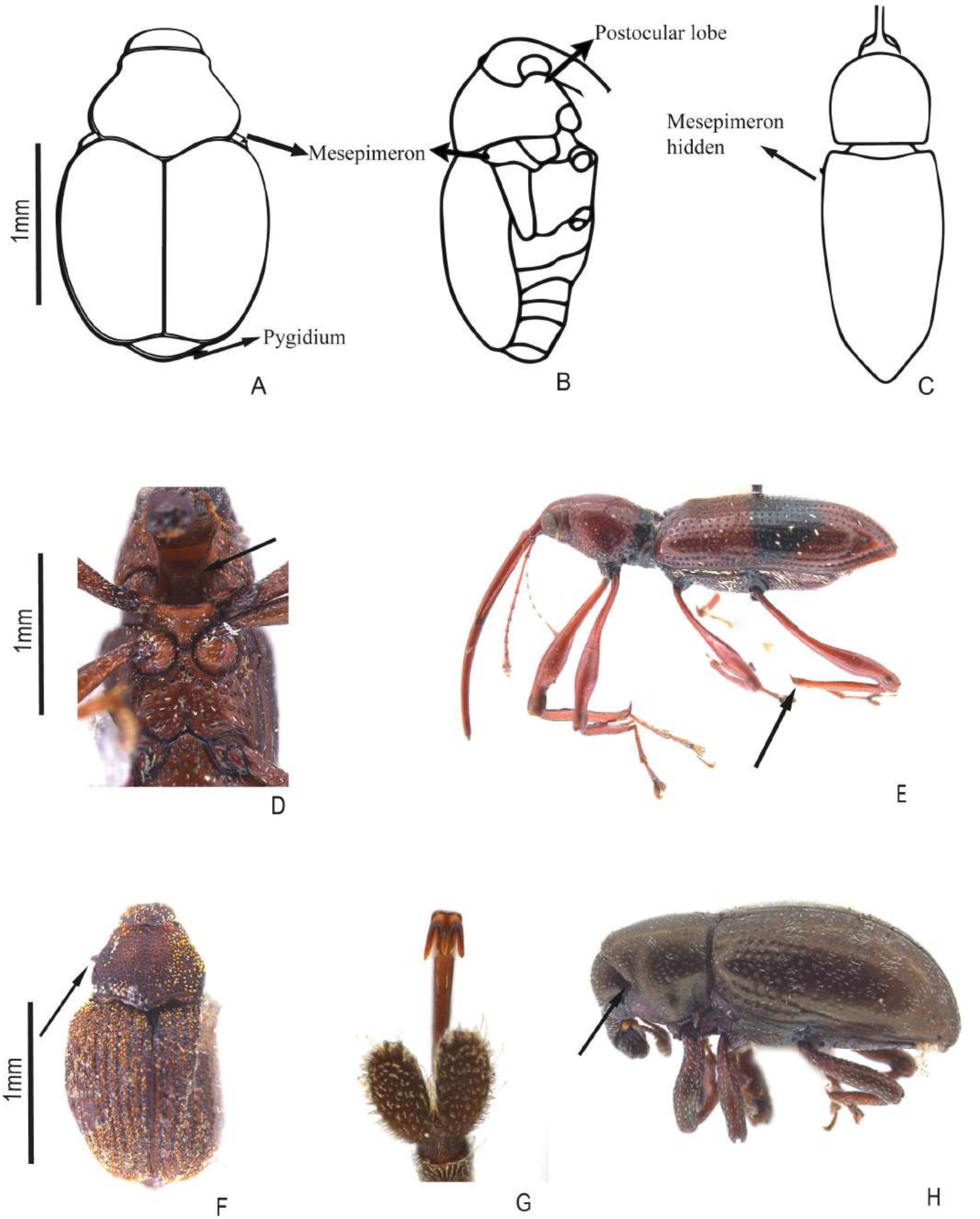

Figure 2: A) *Hustacheauleutes* sp., habitus, dorsal view; B) *Hustacheauleutes* sp., habitus, lateral view; C) *Amalactus* sp., habitus, dorsal view; D) *Tyloderma affine*, habitus, ventral view; E) *Ludovix fasciatus*, habitus, lateral view; F) *Sudauleutes* sp., habitus dorsal view; G) *Ludovix fasciatus*, tarsal claw; H) *Tyloderma brevisquameum*, habitus, lateral view. Scale bars: 11–18 = 1 mm.

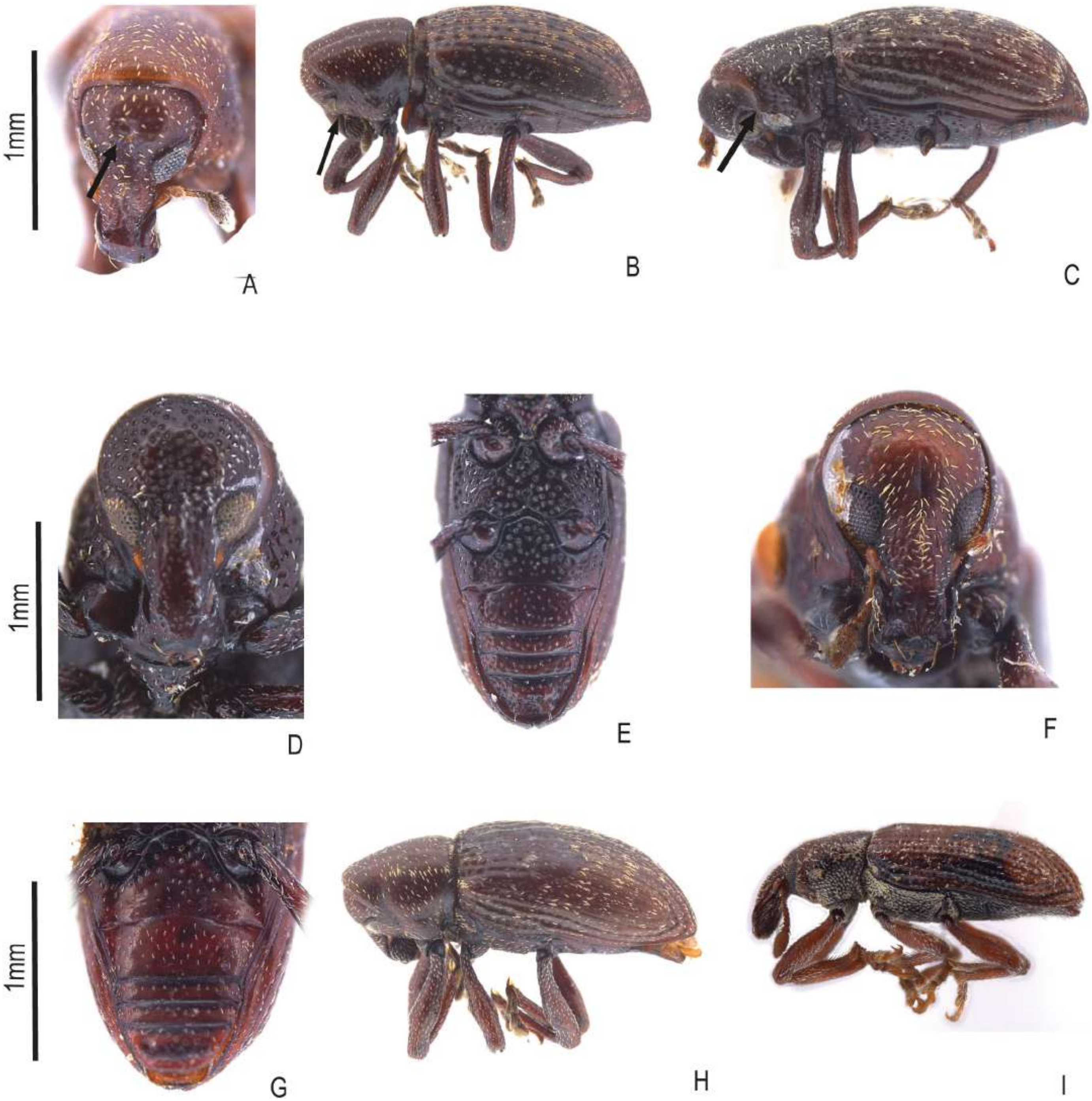

Figure 3: A) *Tyloderma affine*, front with fovea; B) *Tyloderma affine*, habitus, lateral view; C) *Tyloderma frontale*, habitus, lateral view; D) *Tyloderma frontale*, frontal head; E) *Tyloderma frontale*, habitus, ventral view; F) *Tyloderma innotatum*, frontal head; G) *Tyloderma innotatum*, habitus, ventral view; H) *Tyloderma innotatum*, habitus, lateral view; I) *Listronotus* sp., habitus, lateral view. Scale bars: 19–27 = 1 mm.

are used to classify them as aquatic (Spangler 1981, Chapman 1998, Morrone & O'Brien 1999, Hix et al. 2000, De Sousa et al. 2007, 2012). Tanysphyrini adults may have mesotibiae bearing long hairs along the inner edge that help in swimming or coatings that help to remain immersed for a long period of time with the help of an air bubble under the elytra and/or through the plastron (Hinton 1976, De Sousa et al. 2012). The larvae are able to develop inside the roots, stems and sheath of the leaves of aquatic plants, obtaining oxygen from the aerenchyma through the perforations made with the help of the hook-shaped spiracular peritrema. Pupae breathe the oxygen stored in cocoons attached to the submerged parts of plants (O'Brien, 1977, Crowson 1981, Spangler 1981, May & Sands 1986, Cordo & Sosa 2000, De Sousa et al., 2007, 2012, Oberprieler 2014).

Tanysphyrini gathered 150 species distributed in 31 genera in all biogeographical regions, 22 in the Americas, with the greatest diversity in humid areas of the Neotropical Region. They are predominantly

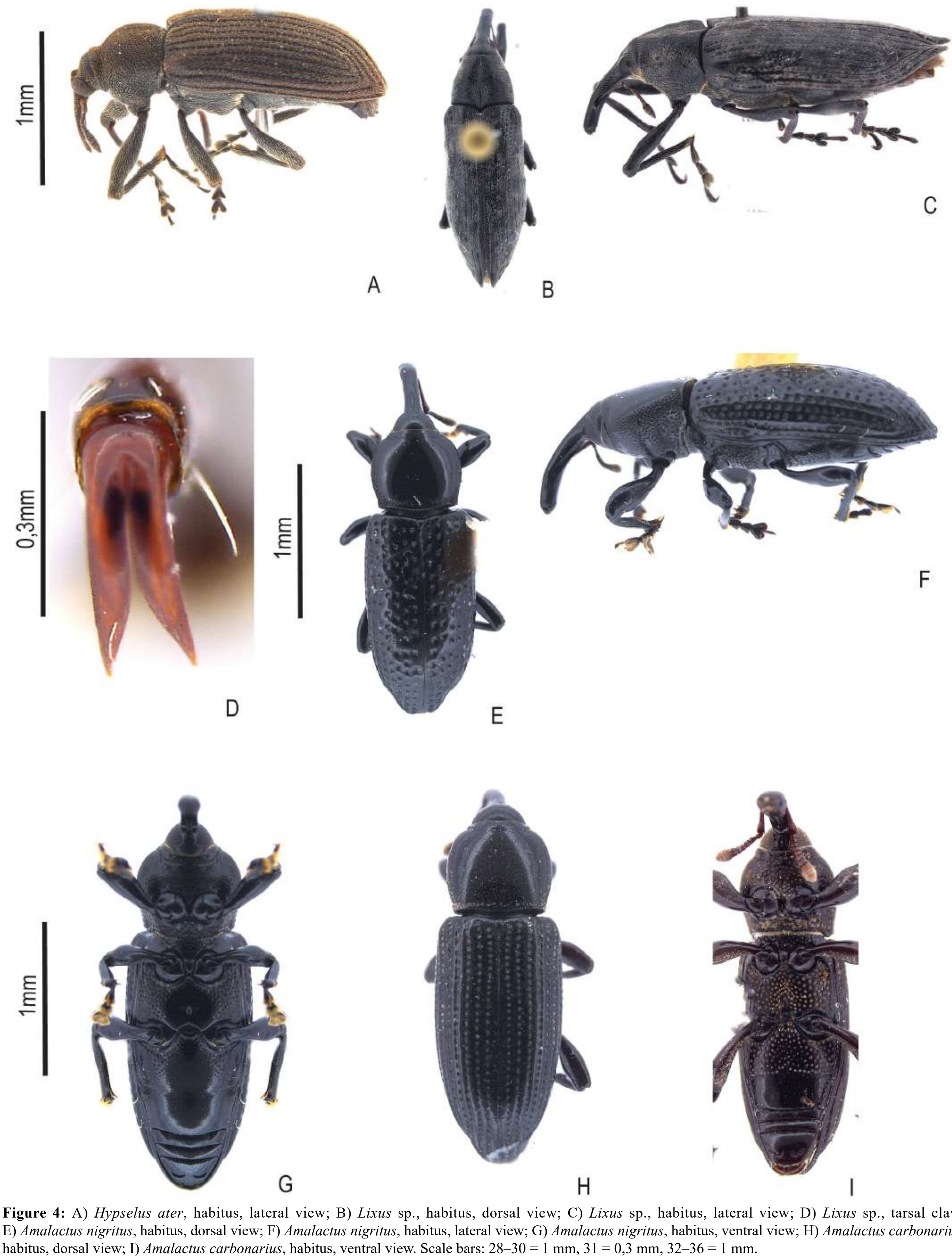

Figure 4: A) *Hypselus ater*, habitus, lateral view; B) *Lixus* sp., habitus, dorsal view; C) *Lixus* sp., habitus, lateral view; D) *Lixus* sp., tarsal claw; E) *Amalactus nigritus*, habitus, dorsal view; F) *Amalactus nigritus*, habitus, lateral view; G) *Amalactus nigritus*, habitus, ventral view; H) *Amalactus carbonarius*, habitus, dorsal view; I) *Amalactus carbonarius*, habitus, ventral view. Scale bars: 28–30 = 1 mm, 31 = 0,3 mm, 32–36 = 1 mm.

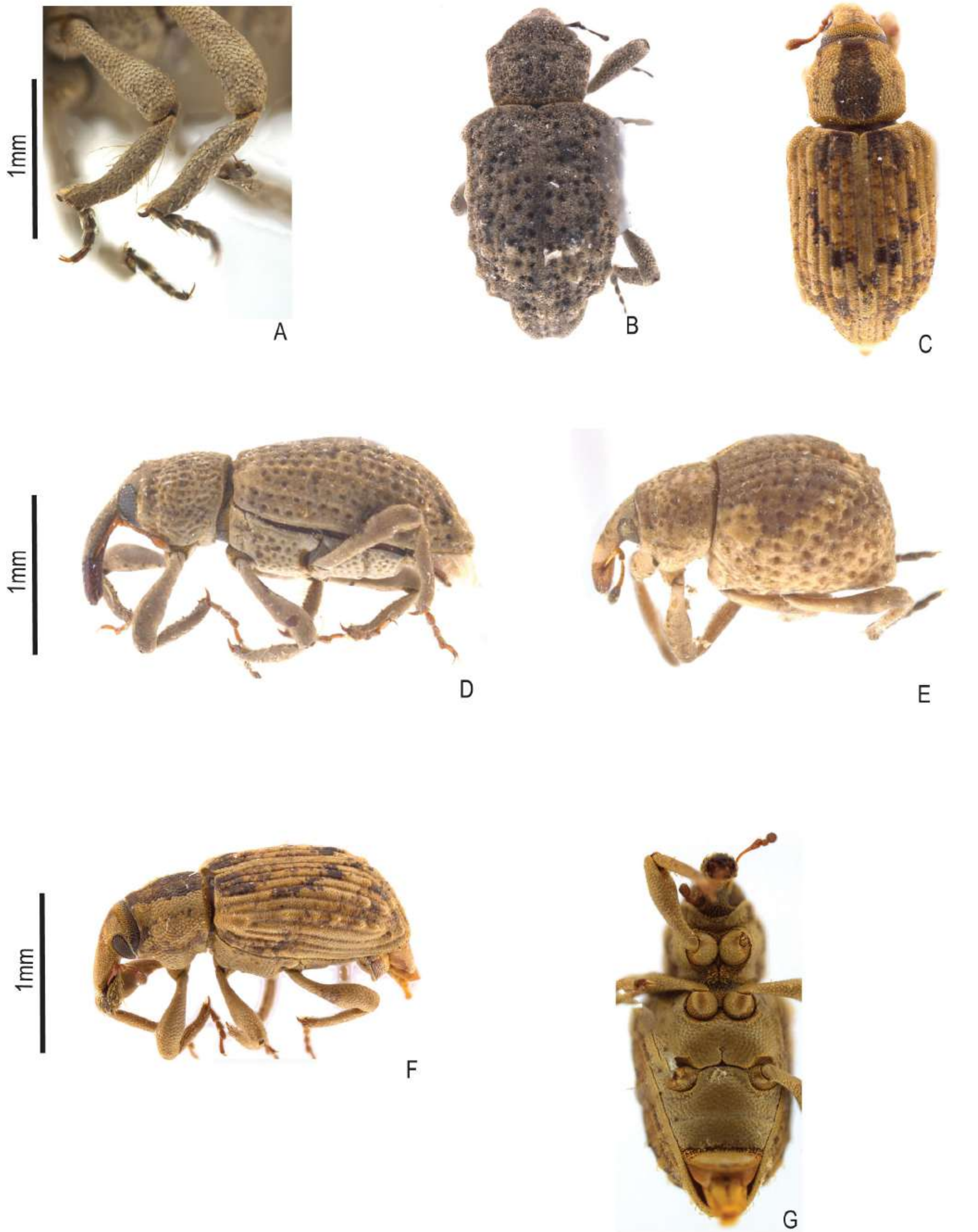

Figure 5: A) *Helodytes* sp., tibiae with natatorial hairs; B) *Helodytes nodulosus*, habitus, dorsal view; C) *Lissorhoptrus* sp., habitus, dorsal view; D) *Helodytes* sp., habitus, lateral view; E) *Hydrotimetes* sp., habitus, lateral view; F) *Lissorhoptrus* sp., habitus, lateral view; G) *Lissorhoptrus* sp.; habitus, ventral view. Scale bars: 37–43 = 1 mm.

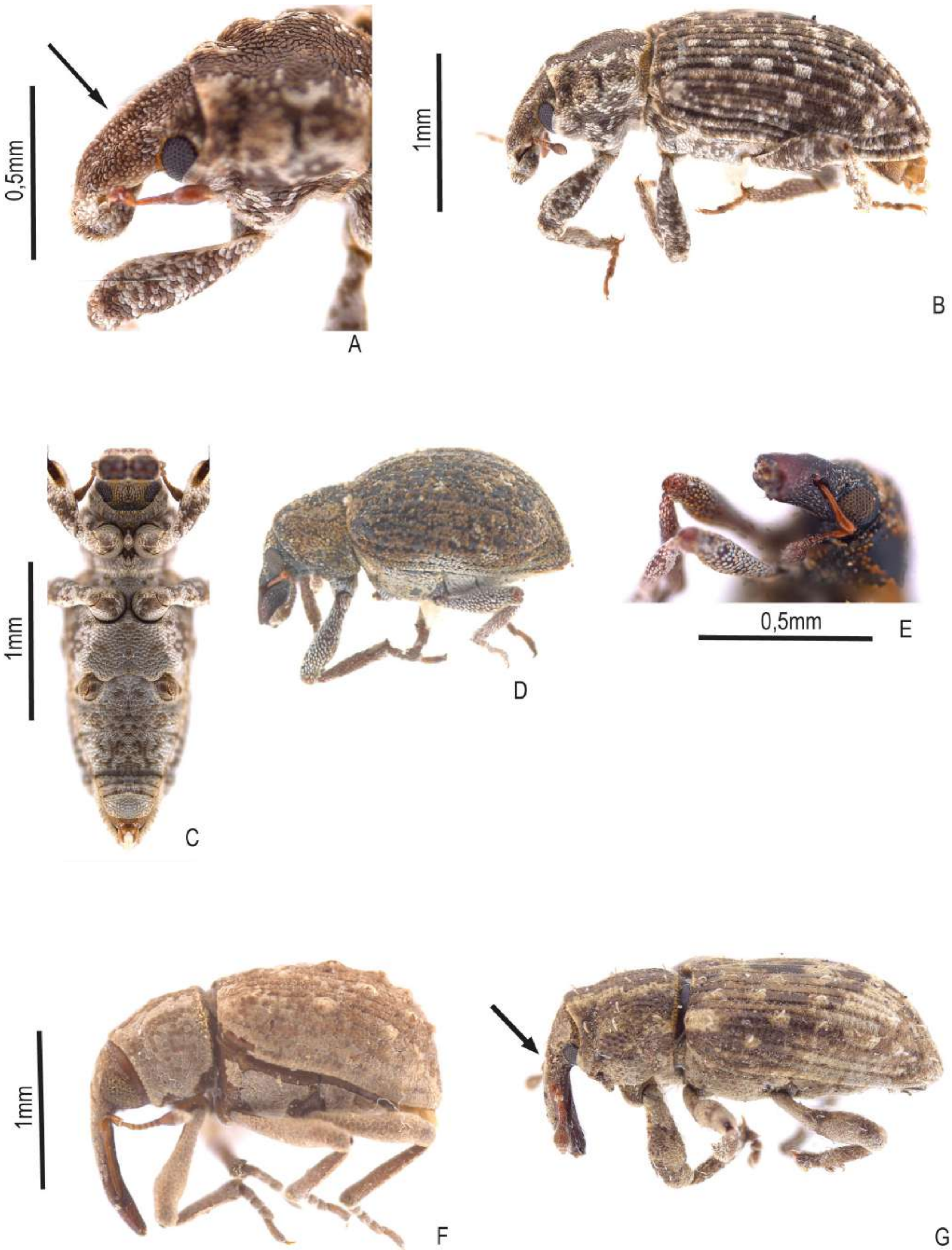

Figure 6: A) *Oryzophagus* sp., depressed front; B) *Oryzophagus* sp., habitus, lateral view; C) *Oryzophagus* sp., habitus, ventral view; D) *Stenopelmus* sp. Habitus, lateral view; E) *Stenopelmus* sp., head, lateral view; F) *Tanysphiroideus* sp., habitus, lateral view; G) *Pistiacola fasciatus*, habitus, lateral view. Scale bars: 44–50 = 1 mm.

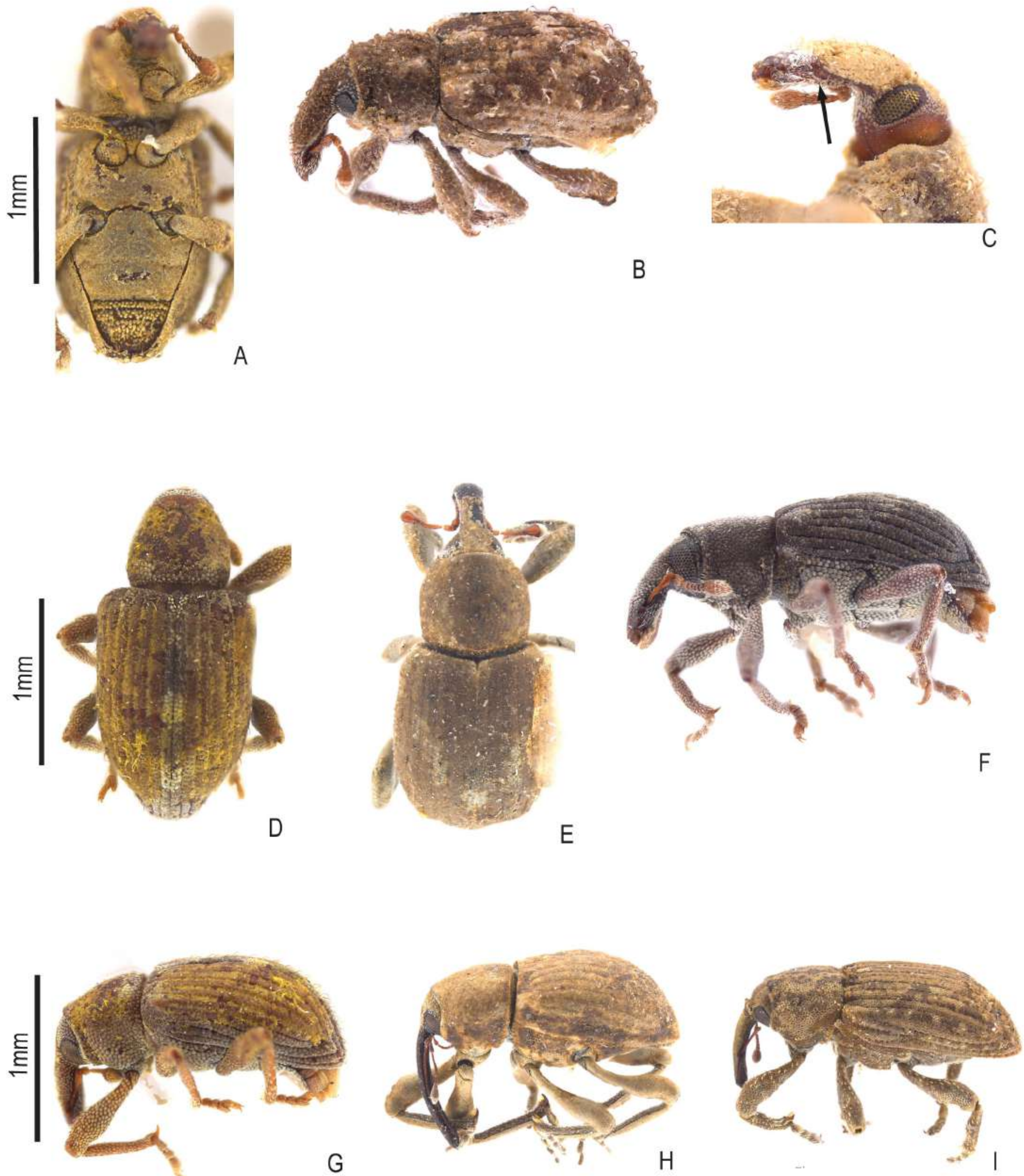

Figure 7: A) *Pistiacola fasciatus*, habitus, ventral view; B) *Pistiacoloides* sp., habitus, lateral view; C) *Pistiacola cretatus*, head, lateral view; D) *Neohydronomus pulchelus*, habitus, dorsal view; E) *Ochetina uniformis*, habitus, dorsal view; F) *Neohydronomus affinis*, habitus, lateral view; G) *Neohydronomus pulchelus*, habitus, lateral view; H) *Ochetina uniformis*, habitus, lateral view; I) *Notiodes inaequalis*, habitus, lateral view. Scale bars: 51–59 = 1 mm.

Figure 8: A) *Ochetina bruchi*, habitus, lateral view; B) *Notiodes inaequalis*, habitus, ventral view; C) *Notiodes inaequalis, onychium*; D) *Neochetina neoaffinis*, habitus, lateral view; E) *Neochetina neoaffinis*, habitus, ventral view; F) *Neochetina neoaffinis, onychium*; G) *Neochetina confusor*, habitus, lateral view; H) *Neochetina eichhorniae*, habitus, dorsal view; I) *Neochetina bruchi*, habitus, dorsal view. Scale bars: 60–68 = 1 mm.

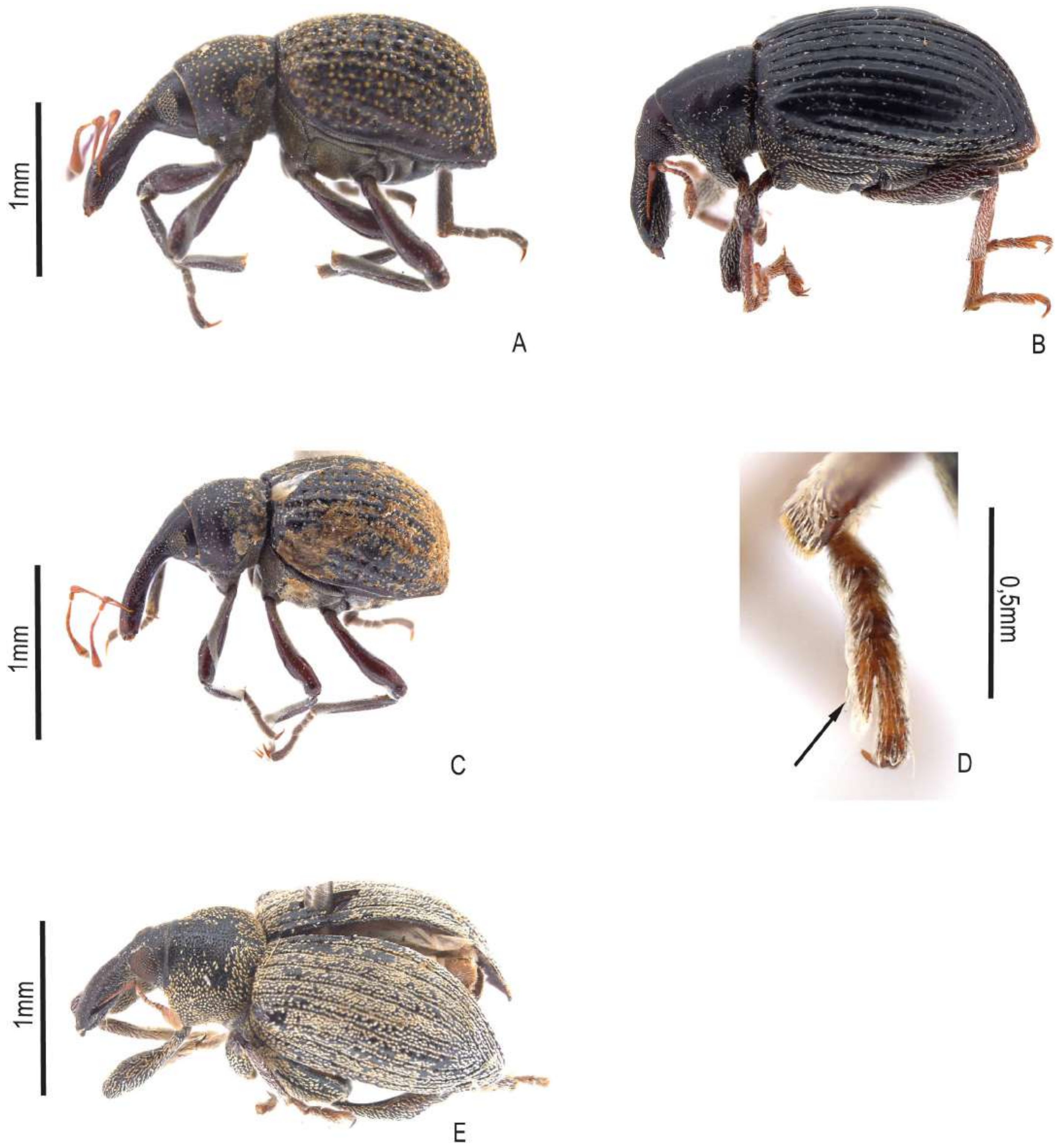

Figure 9: A) *Cyrtobagous salviniae*, habitus, lateral view; B) *Argentinorhynchus breyeri*, habitus, lateral view; C) *Cyrtobagous singularis*, habitus, lateral view; D) *Argentinorhynchus breyeri*, *onychium*; E) *Argentinorhynchus squamosus*, habitus, lateral view. Scale bars: 69–73 = 1 mm.

associated with monocots representing the families Alismataceae, Araceae (e.g., *Argentinorhynchus*, *Neohydronomus*, *Pistiacola* and *Neohydronomus*), Hydrocharitaceae (e.g., *Ochetina*), Hemodoraceae, Cyperaceae (e.g., *Notiodes*), Poaceae (e.g., *Helodytes*, *Lissorhoptrus* and *Oryzophagus*) and Pontederiaceae (e.g., *Neochetina* and *Onychylis*). Sporadic associations with bryophytes, pteridophytes and dicotyledonous angiosperms show no taxonomic or phylogenetic pattern, and all seem to represent host shifts from an apparent ancestral association with monocotyledons. In moist to aquatic southern hemisphere environments, some Tanysphyrini live on mosses of the families Dicranaceae and

Fissidentaceae (Dicranales) and Polytrichaceae (Polytrichales) and others on ferns of the families Marsileaceae and Salviniaceae (e.g., *Cyrtobagous*, *Stenopelmus* and *Tanysphiroideus*) and on dicotyledonous Cabombaceae (Nymphaeales) and Onagraceae (e.g., *Ochetina*) (O'Brien & Wibmer 1989a, b, O'Brien & Haseeb 2014, Wibmer & O'Brien 1989, Morrone & O'Brien 1999, De Sousa et al. 2009, Oberprieler 2014).

The Apionini (Brentidae, Apioninae) recorded in this study are representatives of the genus *Stenapion*, terrestrial insects associated with representatives of Polygonaceae. The genus has 19 species distributed from North America to South America. Five species are recorded for Brazil, with *Stenapion brevinasus* (Wagner 1912) being the only one recorded for the Amazon region. Unidentified specimens representing probable new species are present records for other areas of Brazil, such as the Pantanal of Mato Grosso (De Sousa et al. 2019).

Cryptorhynchini (Molytinae) is represented by 69 genera from the Americas, including *Tyloderma,* with four species collected in the Pantanal of Mato Grosso: *T. frontale*, *T. affine*, *T. brevisquameum* and *T. innotatum*. Species from South America are associated with semiaquatic plants of the genera *Ludwigia* (Onagraceae) and *Polygonum* (Polygonaceae) (Wibmer 1981, Morrone & O'Brien 1999), some of which are recognized as potential agents in the biological control of semiaquatic weeds, such as *Ludwigia* (Onagraceae) (Cordo & DeLoach 1982, Wibmer 1989). Biological information is scarce for most Neotropical species of *Tyloderma,* and the only biological information published for Neotropical species was recorded by Costa-Lima (1938), when he described *T. brassicae*. Wibmer (1981) provided host plant data for Central American species and noted that adults are primarily nocturnal, while larvae generally bore and pupate on host plant stems, although they may attack and pupate on aerial parts and even roots.

Amalactini are a small tribe comprising two genera, *Amalactus* Schoenherr, 1836 distributed in Central and South America and Afro-Oriental *Aorus* Schönherr, 1836, predominantly associated with monocots, mainly grasses and sedges in wetlands (Lyal 2014), ranging widely from Mexico to Argentina (O'Brien & Wibmer 1982, Wibmer & O'Brien 1986), with two species recorded for the Pantanal, *A. carbonarius* Faust, 1888 and *A. nigritus* Gyllenhal, 1836. Morrone & O'Brien (1999) list *Scirpus giganteus* (Cyperaceae) and *Thalia* spp. (Marantaceae) as host plants for Argentine species. In the Pantanal of Mato Grosso, they have been recorded in association with *Oxycaryum cubense* (Poepp. & Kunth) Lye (Cyperaceae) (De Sousa 2008). Recently Oliveira Jr. et. al. (2023) added a new record for *A. carbonarius*, the monocot *Typha domingensis* Pers, in the Atlantic Forest, Rio de Janeiro, Brazil.

Erodiscini (Curculioninae), represented by *Ludovix fasciatus* (Gyllenhal, 1836), is associated with *Eichhornia crassipes*, Pontederia spp. (Pontederiaceae), *Rhynchospora scaberrima*, *R. cyperoides* (Cyperaceae) and *Salvinia* spp. (Salviniaceae) (Morrone & O'brien 1999). Adults are found in the inflorescences of aquatic or semiaquatic plants, and larvae tunnel in the branches of various plants. Larvae and adults of *L. fasciatus* feed on *Cornops* (Acrididae) eggs deposited inside petiole stems of *Eichhornia crassipes* (Zwölfer & Bennett 1969, Vanin 1986, Anderson 1999).

Ceutorhynchini, with 84 genera and more than 900 described species (Prena et al. 2014), represents one of the most diverse tribes in Curculionidae. Two genera of Ceutorhynchini were sampled with unidentified species of *Hustacheauleutes* and *Sudauleutes*. *Sudauleutes*, a monotypic genus occurring exclusively in South America, in association with plants of the Onagraceae. The *Hustacheauleutes* genus was proposed to group two species from South America, *H. bruchi* da, Argentina and *H. muricatus*, occurring in Brazil (Colonnelli 2004).

Listroderini (Cyclominae) comprises 36 genera and 407 species, with 25 genera recorded in South America (Morrone, 2011). *Listronotus* Jekel, 1865, with 24 species distributed in South America and only two recorded in Brazil, presents endophytic boring larvae from the petiole of monocotyledons such as Alismataceae, mainly *Sagittaria*. Other species are associated with representatives of *Echinodorus* (Alismataceae), Cyperaceae (O'Brien 1981, 1997, Morrone 2011), Araceae (O'Brien 1997), Alismatales (Hydrocharitaceae), *Hydrocotele* (Araliaceae) and *Polygonum* (Polygonaceae) (Cordo et al. 1982, May 1993, O'Brien 1977, 1981, Oberprieler 2014, Wibmer & O'Brien 1986).

Erirhinini (Brachycerinae) comprises approximately 34 genera and 310 cosmopolitan species (Oberprieler 2014). In this study, only the genus *Hypselus*, represented by *H. ater*, is widely distributed in South America in association with *Echinodorus* and *Sagittaria* spp. (Alismataceae) (Oberprieler 2014, Morrone & O'brien 1999).

Lixini comprises approximately 700 species with 15 genera (Alonso-Zarazaga and Lyal 1999, Gültekin 2010), with *Lixus* Fabricius, 1801 having the greatest diversity. These weevils inhabit the stems, roots and petioles of representatives of Asteraceae, Apiaceae, Brassicaceae and Amaranthaceae (Gültekin 2010, Oberprieler 2014).

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Associate Editor

José Mermudes

Author Contributions

Wesley Oliveira de Sousa: Conceptual design of the study, specimen collection, data collection, data analysis and interpretation, manuscript preparation, critical revision, adding intellectual content.

Geane Brizzola dos Santos: Conceptual design of the study, data analysis and interpretation, manuscript preparation, critical revision, adding intellectual content.

Germano Henrique Rosado-Neto: Conceptual design of the study, critical revision, adding intellectual content.

Calleuyl Coelho Alves: Specimen collection, data collection, data analysis and interpretation, manuscript preparation.

Marinêz Isaac Marques: Conceptual design of the study, data analysis and interpretation, manuscript preparation, critical revision, adding intellectual content.

Conflicts of Interest

The authors declare they have no conflicts of interest.

Data Availability

The metadata used in this study are available at: https://doi.org/10.48331/scielodata.SN1VID.

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