



“Out of the Shield”: the Discovery of *Platyparnus* Shepard and Barr, 2018 (Coleoptera: Dryopidae) in Brazil with New Species

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Abstract

The Neotropical Dryopidae genus *Platyparnus* Shepard and Barr, 2018 was recently established based on three species originally described in *Helichus* Erichson, 1847: *Platyparnus bollowi* (Hinton, 1939), *Platyparnus frater* (Hinton, 1939) and *Platyparnus gibbicollis* (Hinton, 1939). Until now, the genus and its species have been reported solely in the Guiana Shield area (in French Guiana and Guyana). Based on the examination of material from several localities in Brazil, we report *Platyparnus* for the first time in the country and describe two new species based on males and females: *Platyparnus beatriceae* sp. nov. and *Platyparnus glaucoi* sp. nov. We also propose an amendment to the original diagnosis of *Platyparnus*, present an updated key to the species, and provide new records for *P. frater*. Since the new species described here and *P. frater* were found to occur below the Equator and far south the Amazon River, the geographic distribution of the genus is extended to outside the Guiana Shield.

Keywords Long-toed water beetle · Aquatic insects · Neotropics · South America · Taxonomy

Introduction

Dryopidae is a small cosmopolitan family with about 280 species distributed in 36 genera, mainly composed of aquatic and semiaquatic species but also including terrestrial representatives (Brown 1981; Kodada et al. 2016; Shepard 2020). The family is particularly diverse in tropical regions, the three most-recently described genera from the Neotropics being *Platyparnus* Shepard and Barr, 2018; *Microparnus* Shepard, 2019; and *Novopelmus* Shepard, 2020.

Currently, the Neotropical region has 15 genera with 68 species; six of these genera occur in Brazil: *Dryops* Olivier,

1791; *Helichus* Erichson, 1847; *Onopelmus* Spangler, 1980; *Parygrus* Erichson, 1847; *Pelonomus* Erichson, 1847; and *Sostea* Pascoe, 1860, with 26 valid species (Kodada et al. 2016; Shepard 2020; Sampaio et al. 2021). Study of the dryopid fauna has been neglected in Brazil, and the last species was described more than 20 years ago (Vanin et al. 1997). Despite being commonly found throughout the country, the lack of reviews for most Neotropical genera has created a strong barrier to reliable identification of species and even genera. Kodada et al. (2016) addressed a huge gap in the literature, updating and summarizing the status of all known Dryopidae genera worldwide. The recent taxonomic contributions of Barr and Shepard (2020), Shepard (2019, 2020) and Shepard and Barr (2018) brought clarity to the status of many taxa by splitting genera, redescribing species, and publishing updated keys. However, there is a long road ahead to achieving a comprehensive knowledge of the Neotropical Dryopidae, since species-rich genera like *Dryops* (20 spp.) and *Pelonomus* (12 spp.) still lack revision (Kodada et al. 2016).

Hinton (1939b) grouped four distinctive Neotropical species of *Helichus* Erichson, 1847 in a taxonomic key, mainly for having short basal sublateral carinae on the pronotum. All of these species have undergone combinations in subsequent revisions, giving rise to two recently described genera: *Platyparnus* Shepard and Barr, 2018 and *Microparnus*

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Shepard, 2019 (Shepard and Barr 2018; Shepard 2019). The genus *Platyparnus* was created to encompass three of these species: *Platyparnus bowlii* (Hinton, 1939), *Platyparnus frater* (Hinton, 1939), and *Platyparnus gibbicollis* (Hinton, 1939). Until now, *Platyparnus* was represented only by species found in French Guiana and Guyana and was believed to be endemic to the Guiana Shield (Shepard and Barr 2018).

Based on the examination of material from several localities in Brazil, we report *Platyparnus* for the first time in the country and describe two new species, *Platyparnus beatriceae* sp. nov. from Amazonas and Pará States, and *Platyparnus glaucoi* sp. nov. from Tocantins State. Both new species were found below the Equator and outside of the Guiana Shield. We also record *P. frater* in Brazil from localities within and outside the Guiana Shield (Amapá, Roraima, and Pará States). Finally, we provide an amendment to the generic diagnosis and update the taxonomic key of Shepard and Barr (2018) to the known species of *Platyparnus*.

Material and methods

Species-level identifications were made using the species descriptions by Hinton (1939a, 1939b) and the review by Shepard and Barr (2018). For the study of male genitalia, the aedeagi were detached from the specimens and cleared in heated 10% KOH (Brown 1972). The genitalia were observed, photographed, stored in microvials containing glycerin, and attached to the same pin as the specimen. A Leica MS5 stereoscopic microscope was used for morphological studies. A Canon EOS550D camera attached to a Leica N205A stereoscopic microscope, and a Leica MC120HD camera attached to a Leica M165C stereoscopic microscope were used for photographing the specimens. Photographs were edited using Adobe Photoshop® CC and Adobe Illustrator® CC.

The general morphological terminology follows Kodada et al. (2016) and Shepard and Barr (2018). Measurement of body length was from the anterior margin of pronotum to the elytral apex, and the greatest width was measured at the apical 3/4 of the elytra.

The specimen labels have been quoted verbatim. Change of lines is indicated by “/” and the labels are separated by “|”. The specimens from Canaã dos Carajás were collected in an unknown cave area by Carste Ciência e Meio Ambiente Enterprise. Detailed collection information was not provided by the company and coded instead (coded information provided in the specimen's labels). The holotypes and paratypes of the new species and all the material studied are deposited in the collections listed below (curator in parenthesis):

CEUFT – Coleção de Entomologia da Universidade Federal do Tocantins, Laboratório de Entomologia – Porto Nacional, Tocantins, Brazil. (Tiago Kutter Krolow);

INPA – Coleção de Invertebrados, Instituto Nacional de Pesquisas da Amazônia, - Manaus, Amazonas, Brazil. (Márcio Oliveira).

MZSP – Museu de Zoologia da Universidade de São Paulo - São Paulo, São Paulo, Brazil. (Sônia Casari).

Results

Taxonomy

Platyparnus Shepard and Barr, 2018

Amended diagnosis. In order to facilitate identification of the two new Brazilian *Platyparnus* species, the following amendment to the original Shepard and Barr (2018) diagnosis is presented: “The flattened, heavily setose tarsomeres of the pro- and mesothoracic legs of the males...” is now replaced by “The flattened, heavily setose tarsomeres of the prothoracic legs and, in some species, also the mesothoracic legs of the males...”. The remainder of the original diagnosis still suits all the known species in the genus well.

Geographic distribution. French Guiana, Guyana, and Brazil* (Amapá, Roraima, Pará, Amazonas and Tocantins states) (Figure 30). * = new record.

Platyparnus beatriceae sp. nov.

Type locality. Presidente Figueiredo, Amazonas State, BRAZIL.

Male holotype: ♂ | Holo- / type | BRASIL. Amazonas. Presidente / Figueiredo. Ramal Km 24 / Sítio Sr. José. 20.IV.2008 / 02°01'13.2"S 59°49'29.1"W. / Neusa Hamada et al. leg. (INPA).

Paratypes: A female with the same data as the holotype. (MZSP 32461). BRASIL. Pará. Canaã dos Carajás / (Cave S11-28) -6.411355, -50.352192, / 24.ii-4.iii.2010, Andrade et al. leg. / Carste(Coleo) 4930-832 | Instituto / Tecnológico / Vale / ITV 37496. (1♀ in MZSP 48253). BRASIL. Pará. Paragominas. / 01.VII.2011. Janaina Brito leg. / 03°18'19.9"S 47°37'19.9"W (1 ♂ in INPA, 1 ♂ in MZSP 32460). [the male paratype housed in MZSP is “crushed” damaged].

Diagnosis. Male prothoracic leg with only tarsomeres I–II flattened and heavily setose; tibia elongate, covered with long golden setae (longer than the width of the tibia); protibia with an apical sulcus in lateral view and a deep apical groove in ventral view; metacoxa with the posterior margin sinuous, deeply excavated in the middle, forming a well-developed medial projection; male genitalia with phallobase shorter than parameres and penis lanceolate, slightly falcate in lateral view.

Description

Holotype male. Cuticle dark to reddish brown, legs, antennae, and mouthparts lighter; slightly elongate oval body; length 6.15 mm, width 2.7 mm; body densely covered with long, golden erect and semi-erect setae and much

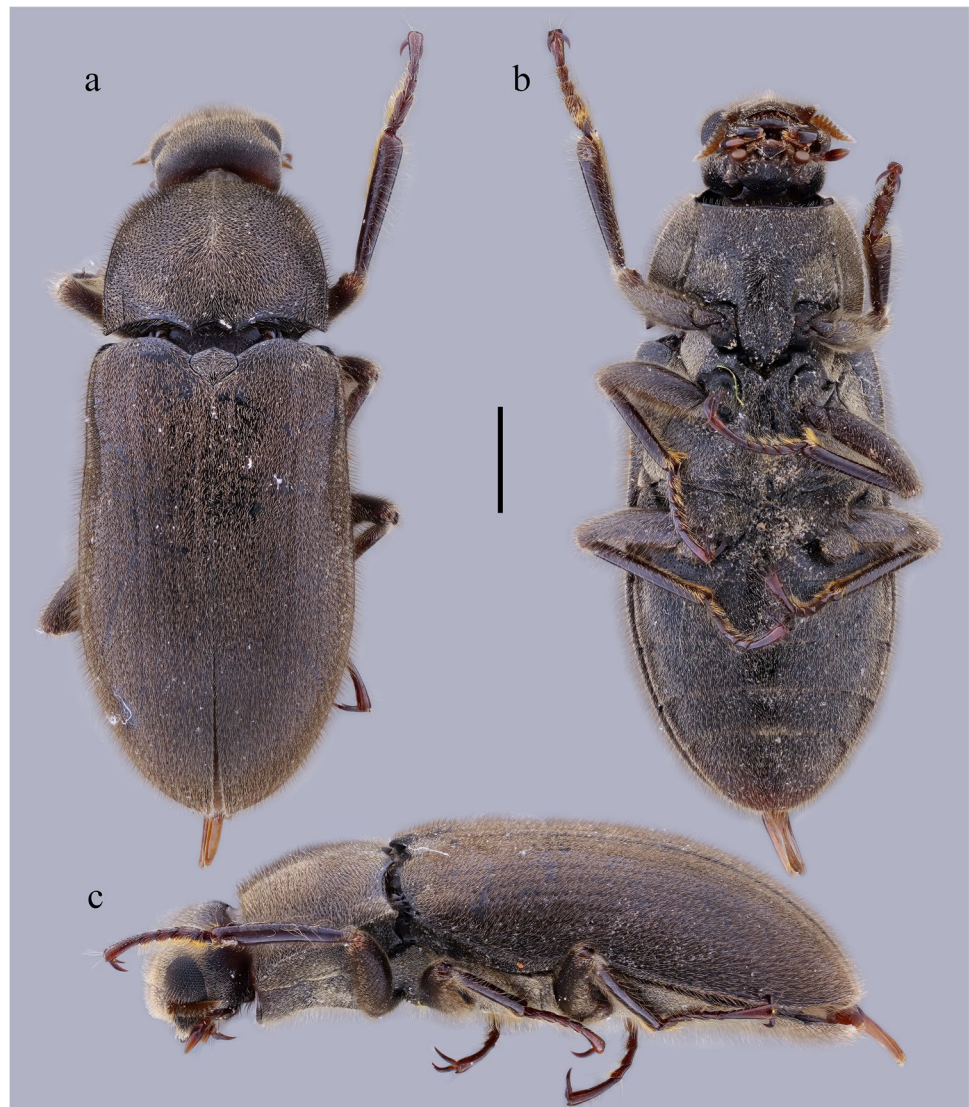
shorter recumbent setae, except for the tibia and tarsus, which are sparsely covered by long setae.

Head: (Figs. 1 and 3a, c) with fine punctures separated by a distance about equal to their diameters; densely covered by recumbent setae. Antenna with 11 antennomeres covered by setae; antennomeres 1 and 2 densely covered with long setae; antennomeres 3 to 11 densely covered with shorter setae; antennomere 1 elongate, as long as the width of antennomere 2; antennomere 2 enlarged, projected anterolaterally, covering antennomere 3 and reaching antennomere 4; antennomeres 3 to 10 shortened and pectinate; antennomere 11 elongate, narrower and 2× longer than antennomere 10. Clypeus (Fig. 3a), 2× longer than wide, with anterior margin feebly rounded in the middle and broadly arcuate and slightly emarginate on each side; anterolateral angles broadly rounded; surface similar to the head. Labrum (Fig. 3a), with sinuous anterior margin; anterolateral angles broadly rounded; surface similar to the clypeus, except for

glabrous and very finely punctuated anteromedial portion. Mandibles symmetrical (Fig. 3a), subtriangular; apex gradually curved mesad, with four apical teeth. Maxilla: cardo elongate; stipes subtriangular, covered by setae; maxillary palpus with terminal palpomere fusiform (Figs. 1 and 3a, c), about as long as remaining palpomeres combined; lacinia with fringes of setae on apex. Labium (Figs. 1 and 3a); gula wider than submentum and mentum posteriorly, glabrous, covered by punctures; mentum covered by punctures and setae; labial palpus with the apical palpomere subrectangular, truncated on apex, shorter than remaining palpomeres combined.

Thorax: Pronotum (Figs. 1a, c and 3c) weakly convex; length 1.42 mm, width 2.20 mm, widest posteriorly. Anterior and lateral margins arcuate, posterior border trisinate. Two sublateral carinae reaching the posterior quarter. Integument densely covered with punctures, separated by a distance about equal to their diameters, from which arise long,

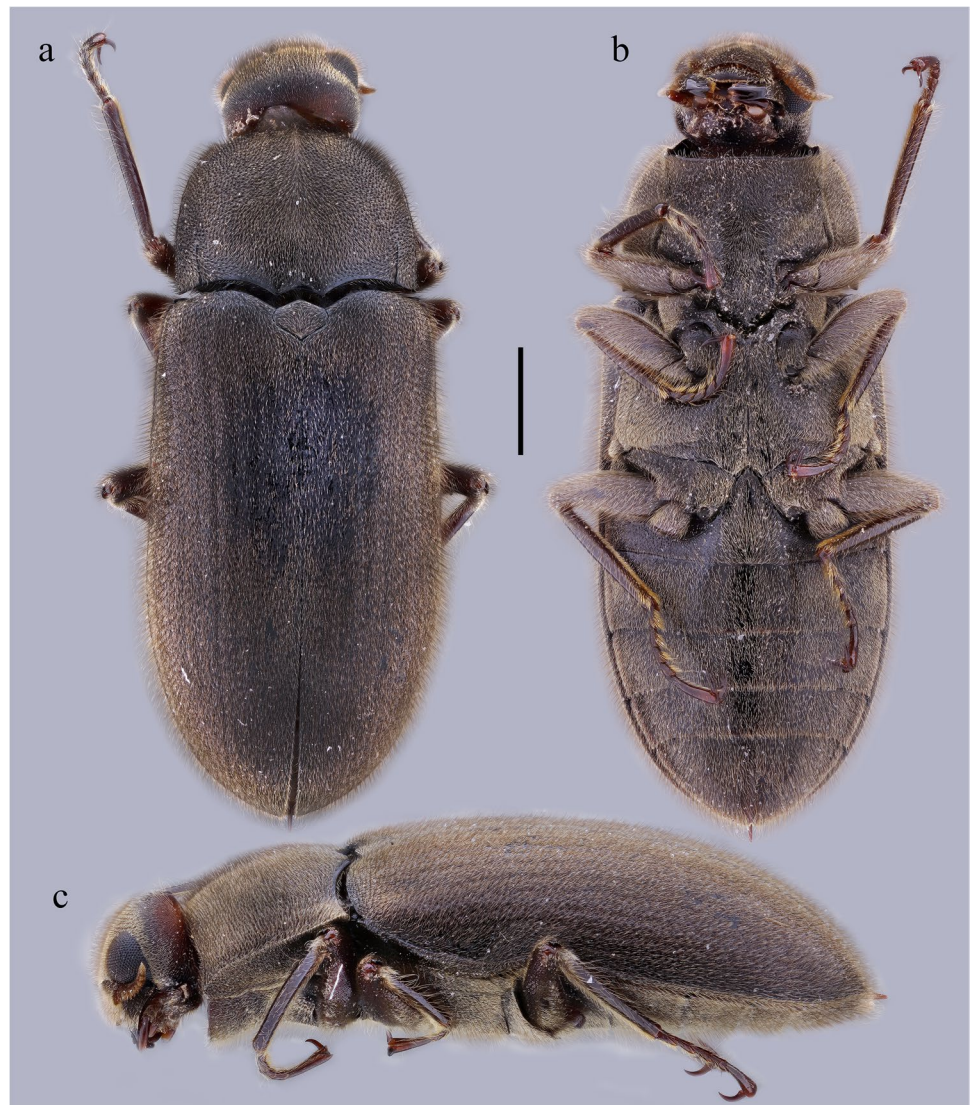
Fig. 1 *Platyparnus beatriceae* sp. nov. (Dryopidae). Holotype. Male. *Habitus*. **a** Dorsal view; **b** ventral view; **c** lateral view. Scale bar = 1 mm



dark setae; region between the punctures densely covered by short, fine, golden recumbent setae. Prosternum (Figs. 1b, c and 3a, c) anterior border with narrow margins; prosternal process wide between procoxae, parallel-sided with thick margins; covered by punctures and long, golden recumbent setae; with short, rounded callosity near apex; apex partly concealed by metaventricle, visible portion very narrow and acuminate. Hypomeron 3× longer than wide, surface similar to the pronotum. Scutellum (Fig. 1a) sub-rhomboid, around 1.2× wider than long; disc weakly convex; covered by punctures and long setae. Elytron (Figs. 1a, c): length 4.38 mm, width 2.65 mm, convex, almost 2× longer than wide; humeral angle rounded; lateral margins parallel-sided on basal 2/3; apex rounded. Surface similar to the pronotum. Hindwing macropterous. Mesoventrite (Fig. 1b) with mesal cavity to receive prosternal process; covered by recumbent setae. Metaventricle (Fig. 1b), broad, integument similar to the pronotum; disc weakly depressed at junction

of sulcate metakatepisternal suture and metathoracic discrimen, covered by recumbent setae. Legs densely and uniformly covered by setae, except tibiae and tarsus (Figs. 1b, c). Metacoxa (Figs. 1b and 3d) trapezoidal; distinctly wider than long; posterior margin sinuous, deeply excavated in the middle, forming a well-developed medial projection. Femur around 3.5× longer than wide. Pro- and mesocoxa (Figs. 1b and 3d) globose. Tibia elongate (Figs. 1 and 3a, b, c), widest at the apex, densely covered by punctures and setae ventrally, glabrous with a few, very long golden setae (longer than tibial width) laterally and dorsally; protibia with a deep apical groove in ventral view (Fig. 3a), which forms an apical sulcus in lateral view (Fig. 3c); mesotibia with a dense, hook-shaped, apical fringe of setae on apex (Fig. 1b). Tarsus (Figs. 1b, c and 3a, c) slightly shorter than tibiae, covered by long spine-like setae ventrally and long, thin, golden setae dorsally. Prothoracic leg with tarsomeres I–II flattened, 2× wider at base than the following

Fig. 2 *Platyparnus beatriceae* sp. nov. (Dryopidae). Paratype (MZSP 32461). Female. *Habitus*. **a** Dorsal view; **b** ventral view; **c** lateral view. Scale bar = 1 mm



tarsomeres, and heavily setose ventrally (Fig. 3a, c). Claws long and stout.

Abdomen: (Fig. 1b, c) with five ventrites densely covered by recumbent setae; ventrite 1 with triangular intercoxal process weakly depressed between metacoxae; ventrite 2 longer than 3; ventrite 3 longer than 4; ventrite 5 the longest, covered with long setae prominent at margins.

Genitalia: Aedeagus (Fig. 4). Phallobase, in dorsal/ventral views, shorter than parameres; strongly curved laterally. Parameres spatulate, in dorsal/ventral views, reaching the apex of the penis; inner margin sinuous, widest at the base; in lateral view, each paramere almost straight, narrower than penis; apex rounded. Penis, in dorsal/ventral views lanceolate; slightly falcate in lateral view; fibula long, extending basally beyond parameres and onto phallobase, broader basally.

Female: (Fig. 2) externally similar to the male except for the absence of an apical sulcus on protibiae; fringe of

long setae on apex of mesotibiae; prothoracic legs with tarsomeres I–II not flattened.

Intraspecific variation. Color may vary from testaceous to very dark brown, with the two specimens from Pará State much paler than those from Amazonas State. Besides size and color tonality, no major morphological variation was observed. Females are slightly larger than males: females 6.68–6.72 mm long (n=2); males 6.08–6.15 mm long (n=3).

Geographic distribution. Brazil, Amazonas and Pará States (Fig. 10).

Etymology. The specific epithet *beatriceae* is a tribute to the teacher Beatrice J. P. Vasconcelos, who passed away in September 2019. Beatrice was an enthusiast in the study and teaching of biology. She was the biology teacher of Thiago Polizei during his high-school years (2008–2010) and was one of those responsible for advising Thiago and supporting his decision to become a biologist. “Bea” had a short life but left a great legacy.

Fig. 3 *Platyparnus beatriceae* sp. nov. (Dryopidae). Holotype. Male. **a** Frontal view; **b** proleg, dorsal view; **c** left lateral view of head, pronotum, and proleg; **d** metacoxa, ventral view. Scale bar = 1 mm

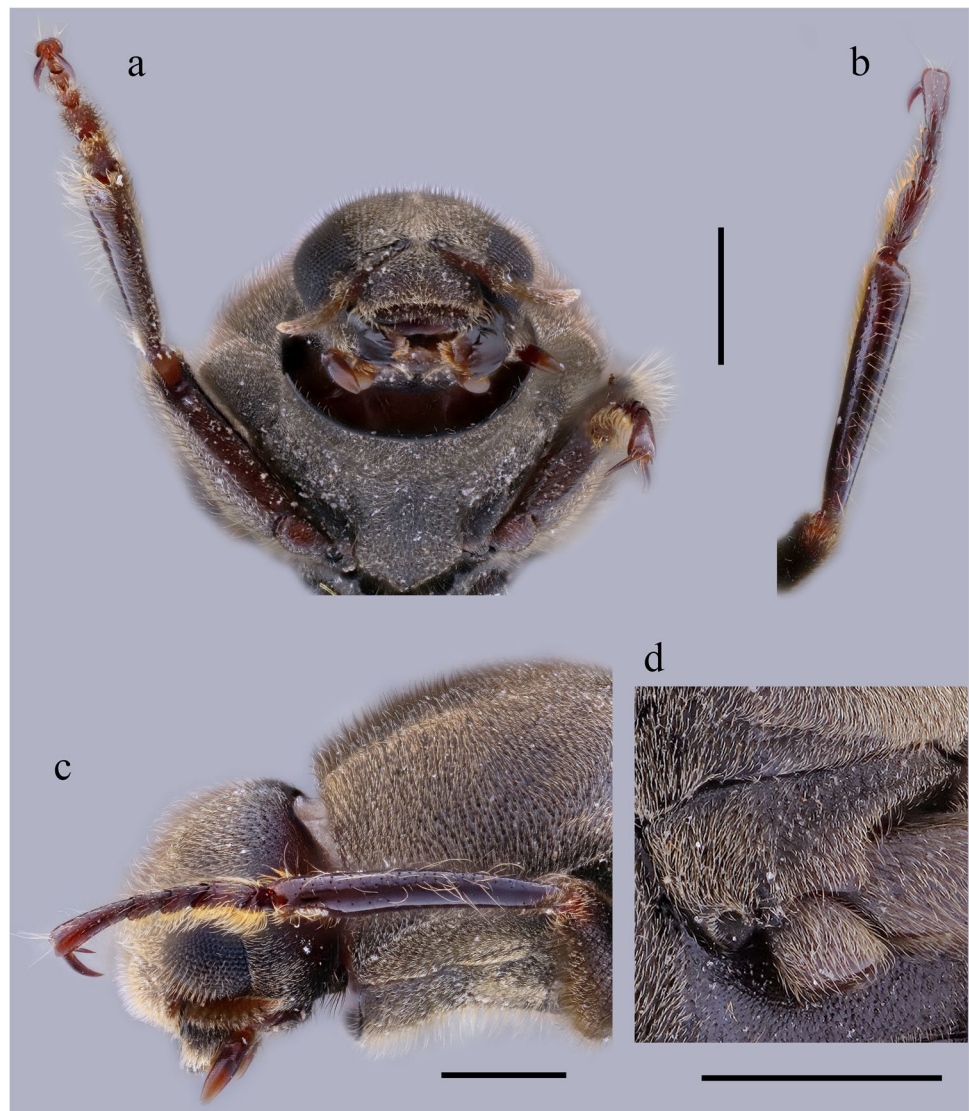


Fig. 4 *Platyparnus beatriceae* sp. nov. (Dryopidae). Paratype. Male genitalia. Line drawings: **a** Dorsal view; **b** ventral view. Photographs: **c** dorsal view; **d** ventral view; **e** lateral view. Scale bar = 0.5 mm

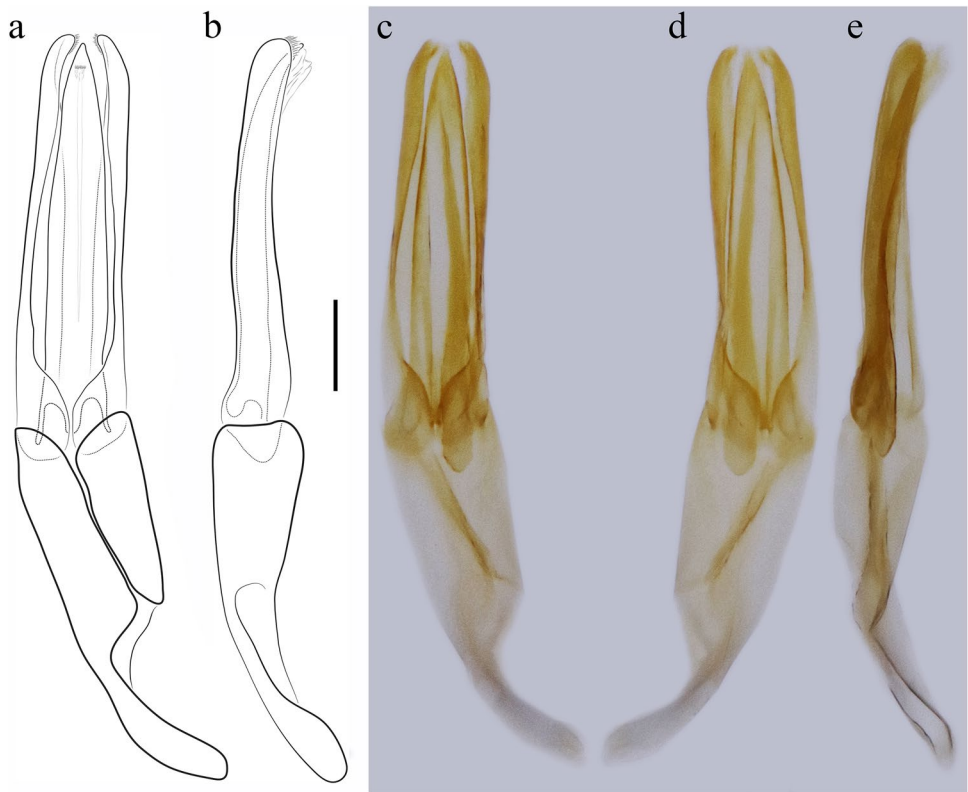
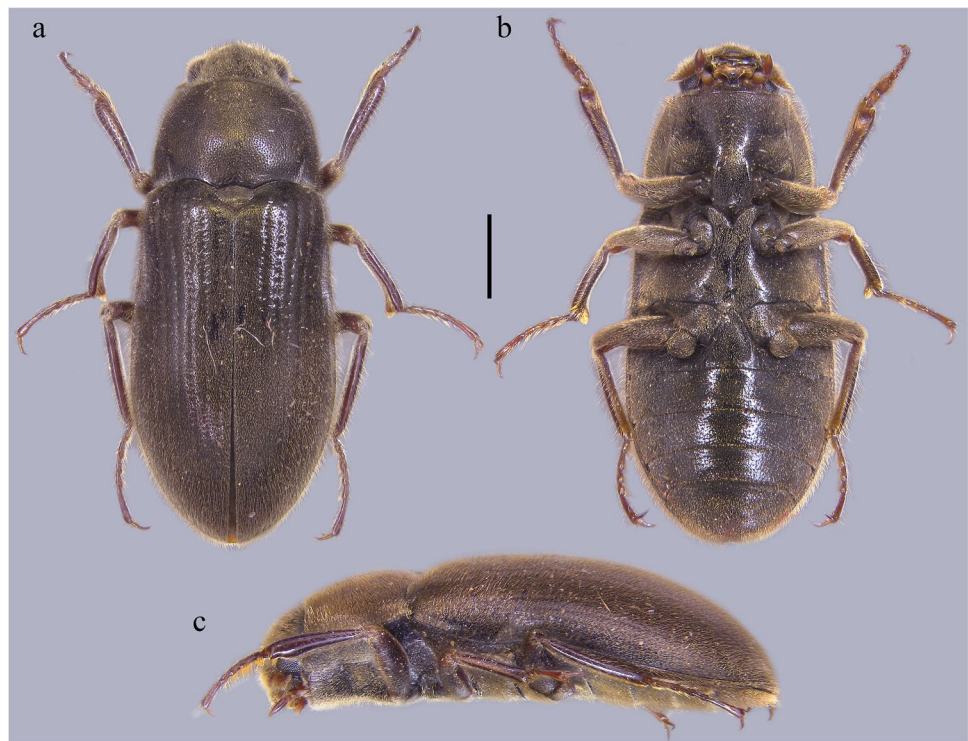


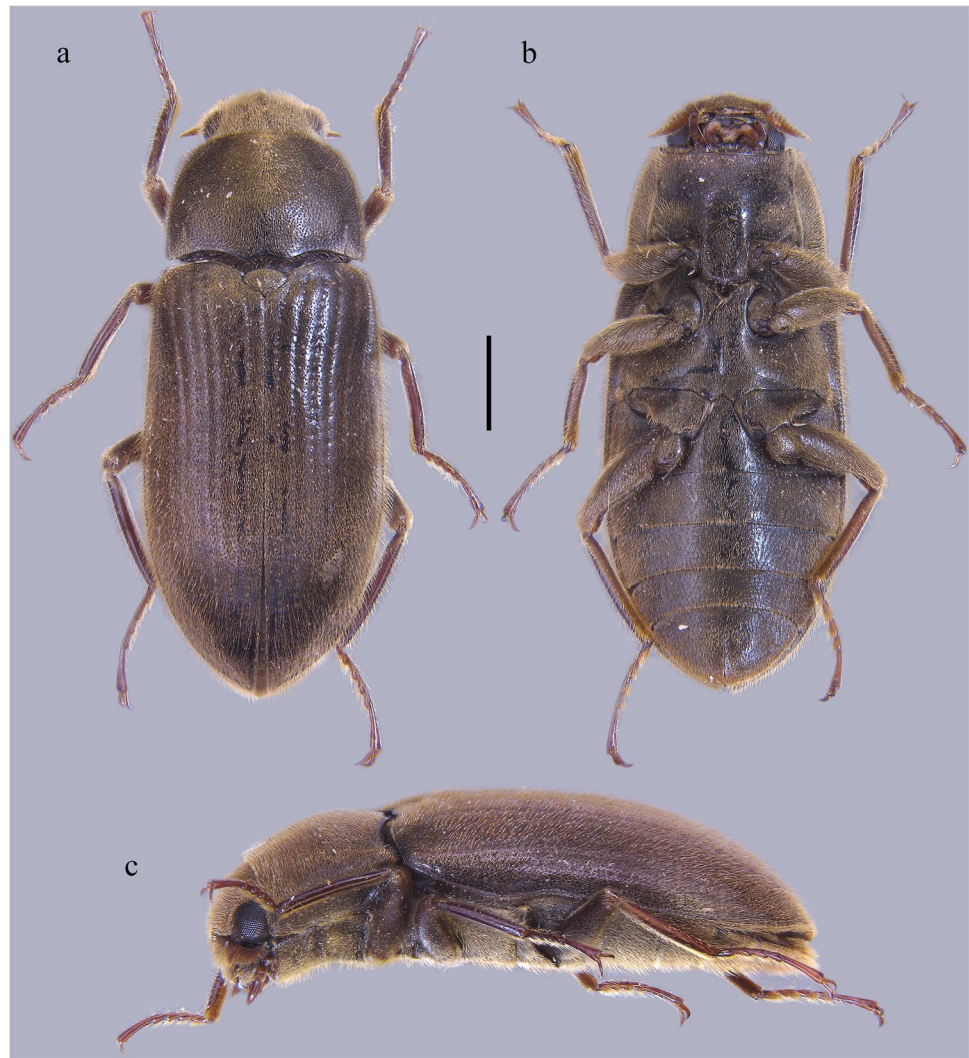
Fig. 5 *Platyparnus glaucoi* sp. nov. (Dryopidae). Holotype (MZSP 32459). Male. *Habitus*. **a** Dorsal view; **b** ventral view; **c** lateral view. Scale bar = 1 mm



Habitat notes. There is no information on the microhabitat where the specimens were collected. The female paratype from Canaã dos Carajás, Pará State, was collected in a cave

(S11-28); no other information is available. The other two localities (Paragominas, Pará State, and Presidente Figueiredo, Amazonas State) are small streams in the Amazon

Fig. 6 *Platyparnus glaucoi* sp. nov. (Dryopidae). Paratype. Female. *Habitus*. **a** Dorsal view; **b** ventral view; **c** lateral view. Scale bar = 1 mm



Forest biome, with riparian vegetation and leaf accumulations along their channels. The stream in Presidente Figueiredo Municipality (Fig. 11a, b), in Amazonas State, is in the Urubu River hydrographic basin, has a sandy and rocky bottom, width of 4.0 m, water temperature of 24.7° C, pH of 4.96 and electrical conductivity of 13.75 μScm^{-1} . The stream in Paragominas Municipality, Pará State, is in the Capim River hydrographic basin, has a sandy bottom, width of 3.2 m, water temperature of 24.5° C, pH 4.5, and electrical conductivity of 34.3 μScm^{-1} .

Comparative notes. *Platyparnus beatriceae* sp. nov. can easily be distinguished from all known species of the genus based on the aedeagus in dorsal/ventral views lanceolate, without any apical modification; in *P. gibbicollis* and *P. glaucoi* sp. nov. this structure has flared apical margins; in *P. frater* it has small dorsally projected apical teeth; in *P. bollowi* it has a pair of long, slender apical spines projected anteriorly. The new species can also be distinguished by the combination of the following characteristics: elytra

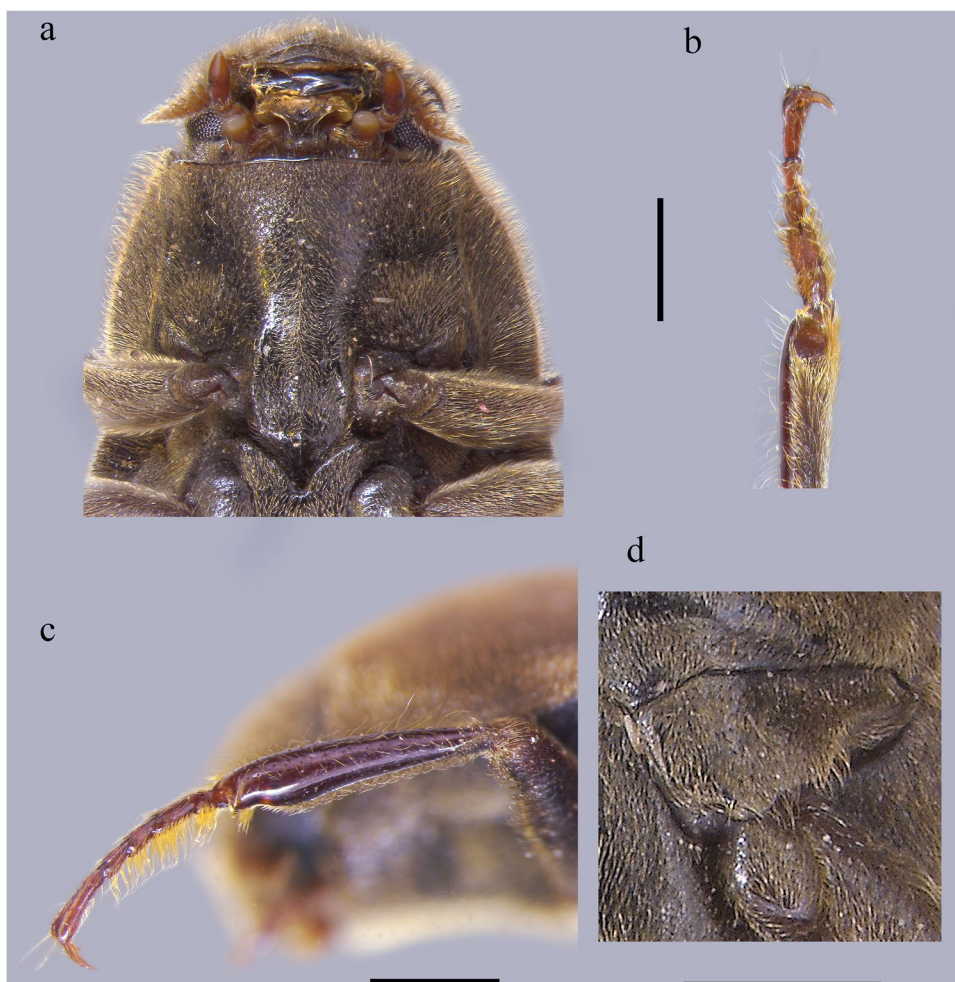
with distinct strial punctures extending to near elytral apex (Fig. 1a, c) (shared with *P. frater* and *P. glaucoi* sp. nov.; distinct punctures not extending beyond basal 1/3 of elytra in *P. bollowi* and *P. gibbicollis*); female elytra without oblique gibbosity on sides near elytral apex (shared with *P. glaucoi* sp. nov., *P. bollowi* and *P. frater*; oblique gibbosity present in *P. gibbicollis*); metatarsomeres I and II neither modified nor densely covered with very long golden setae (shared with in *P. glaucoi* sp. nov.; modified and densely covered with very long golden setae in *P. bollowi*, *P. frater* and *P. gibbicollis*).

Platyparnus glaucoi sp. nov.

Type locality. Cachoeira da Roncadeira Waterfall, Taquaruçu District, Palmas Municipality, Tocantins State, BRAZIL.

Male holotype: ♂ | Holo- / type | BRAZIL. Tocantins. Palmas. / Distrito de Taquaruçu. Igarapé Cachoeira / Roncadeira. 14.III.2018. / Fernandes, A. S. leg. Active collection. / 10°18'13.23"S 48°08'20.56"W | MZSP 32459. (MZSP).

Fig. 7 *Platyparnus glaucoi* sp. nov. (Dryopidae) (MZSP 32459). Holotype. Male. **a** Head and prosternum, ventral view; **b** proleg, ventral view; **c** proleg, lateral view; **d** metacoxa, ventral view. Scale bar = 1 mm



Paratypes: BRAZIL. Tocantins. Palmas. / Distrito de Taquaruçu. Igarapé Cachoeira / Roncadeira. 14.III.2018. / Fernandes, A. S. *leg.* Active collection. / 10°18'13,23"S 48°08'20.56"W (1 ♂ and 1 ♀ in CEUFT). BRAZIL. Tocantins. Palmas. / Cachoeira do Vão Grande. / 19.VI.2014. Fernandes, A. S. *leg.* / Active collection. / 10°09'53.0"S 48°14'08.8"W (1 ♂ in CEUFT, 1 ♂ and 1 ♀ in MZSP 32457, 32458).

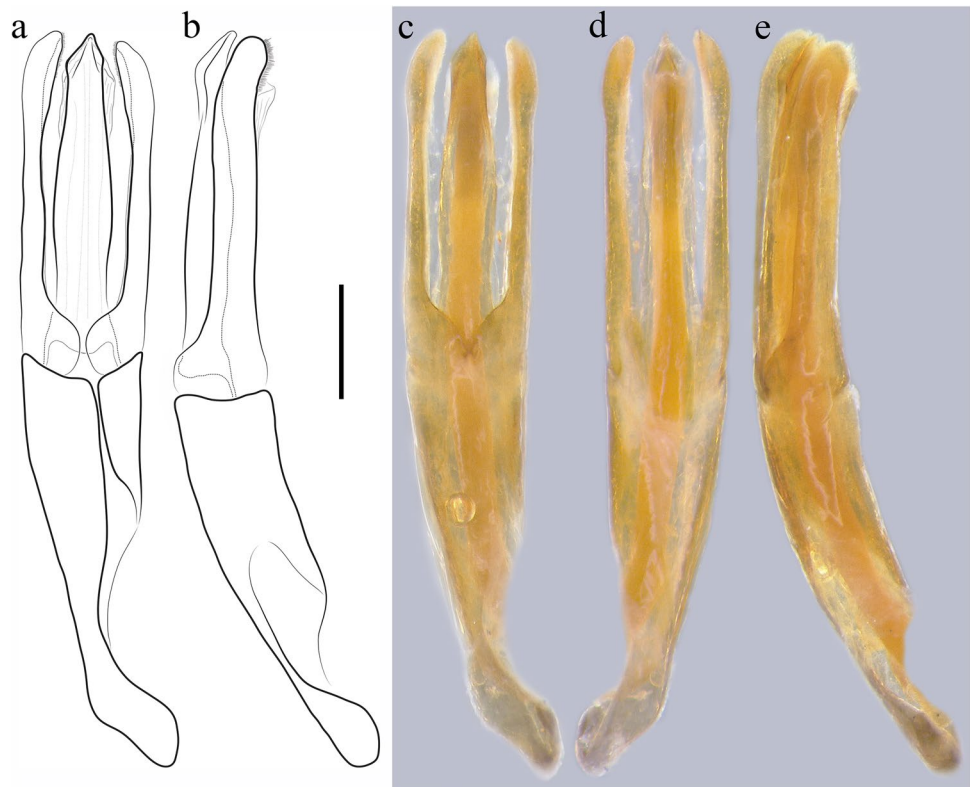
Diagnosis. Prothoracic legs with only tarsomeres I–II flattened and heavily setose; tibia elongate, covered by very long golden setae (longer than the width of the tibia); protibia with an apical sulcus in lateral view and a deep apical groove in ventral view; metacoxa with the posterior margin sinuous, shallowly excavated in the middle; male genitalia with the phallobase longer than parameres, and penis with apical margins sharp and flared dorsally.

Description.

Holotype male. Cuticle dark brown to testaceous, legs, antennae and mouthparts lighter; slightly elongate oval body; length 6.2 mm, width 2.65 mm; body covered with long, golden erect and semi-erect setae and much shorter recumbent setae, except tibia and tarsus sparsely covered by long setae.

Head: (Figs. 5 and 7a) with fine punctures separated by a distance about equal to their diameters, densely covered by recumbent setae. Antenna with 11 antennomeres covered by setae; antennomeres 1 and 2 densely covered with long setae; antennomeres 3 to 11 densely covered with shorter setae; antennomere 1 elongate, as long as the width of antennomere 2; antennomere 2 enlarged, projected anterolaterally, covering antennomere 3 and reaching antennomere 4; antennomeres 3 to 10 shortened and pectinate; antennomere 11 elongate, narrower and 2× longer than antennomere 10. Clypeus (Figs. 6a, b and 7a) 2× longer than wide, with anterior margin feebly rounded in the middle and broadly arcuate and slightly emarginate on each side; anterolateral angles broadly rounded; surface similar to the head. Labrum (Figs. 6a, b and 7a) with an almost straight anterior margin; anterolateral angles broadly rounded; surface setose and punctate like clypeus, except for glabrous and very finely punctate anteromedial portion. Mandibles symmetrical (Fig. 7a), subtriangular; apex gradually curved mesad, with four apical teeth. Maxilla with cardo elongate; stipes subtriangular, covered by setae; maxillary palpus (Figs. 5b, c and 7a) with terminal palpomere fusiform, about as long

Fig. 8 *Platyparnus glaucoi* sp. nov. (Dryopidae). Holotype (MZSP 32459). Male genitalia. Line drawings: **a** dorsal view; **b** ventral view. Photographs: **c** dorsal view; **d** ventral view; **e** lateral view. Scale bar = 0.5 mm



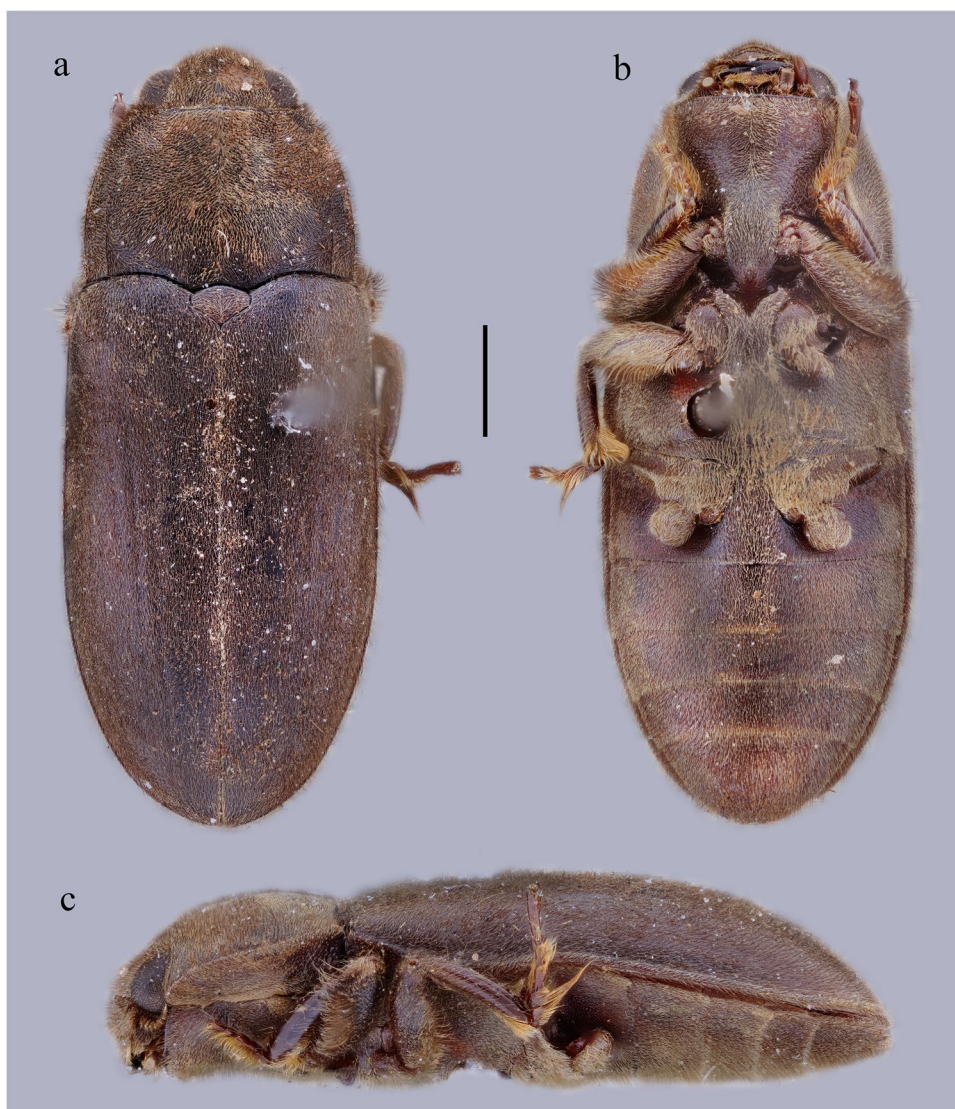
as remaining palpomeres combined; lacinia with fringes of setae on apex. Labium (Figs. 5b and 7a); gula wider than submentum and mentum posteriorly, glabrous, covered by punctures; mentum covered by punctures and setae; labial palpus with apical palpomere subrectangular, truncated on apex, shorter than remaining palpomeres combined.

Thorax: Pronotum (Figs. 4c and 5b) weakly convex; length 1.48 mm, width 2.2 mm, widest posteriorly. Anterior and lateral margins arcuate, posterior border trisinuate. Two sublateral carinae reaching the posterior quarter. Integument densely covered with punctures, separated by a distance about equal to their diameters, from which arise long, dark setae; region between the punctures densely covered by short, fine, golden recumbent setae. Prosternum (Figs. 5b, c and 7a) with anterior border narrowly margined; prosternal process wide between procoxae, parallel-sided with thick margins; covered by punctures and long, golden recumbent setae; with short, rounded callosity near apex; apex partly concealed by metaventricle, visible portion very narrow and acuminate. Hypomerion 3× longer than wide, surface similar to the pronotum. Scutellum (Fig. 5a) sub-rhomboid; around 1.6× wider than long; disc weakly convex; covered by punctures and long setae. Elytron (Fig. 5a, c) length 4.8 mm, width 2.65 mm, convex, almost 2× longer than wide; humeral angle rounded; lateral margins parallel-sided on basal 2/3; apex rounded. Surface similar to the pronotum. Hindwing macropterous. Mesoventricle (Fig. 5b) with mesal

cavity to receive prosternal process; covered by recumbent setae. Metaventricle (Fig. 5b), broad, with integument similar to the pronotum; disc weakly depressed at junction of sulcate metakatepisternal suture and metathoracic discrimen, covered by recumbent setae. Legs densely and uniformly covered by setae except tibiae and tarsus (Fig. 5). Pro- and mesocoxa (Fig. 5b) globose. Metacoxa (Figs. 5b and 7d) trapezoidal; distinctly wider than long; posterior margin sinuous, shallowly excavated in the middle. Femur around 3.5× longer than wide. Tibia elongate (Figs. 5 and 7b, c), widest on apex, densely covered by punctures and setae ventrally, glabrous with a few, long golden setae (longer than the width of the tibia) laterally and dorsally; protibia with a deep, apical groove in ventral view (Figs. 5b and 7b), which forms an apical sulcus in lateral view (Fig. 7c); mesotibia with a dense, hook shaped, apical fringe of setae on apex (Fig. 5b). Tarsus (Figs. 5 and 7b, c) slightly shorter than tibiae, covered by long spine-like setae ventrally and long thin, golden setae dorsally. Prothoracic leg with the tarsomeres I–II flattened, around twice wider at base than the following tarsomeres, and heavily setose ventrally (Figs. 5b, c and 7b, c). Claws long and stout.

Abdomen: (Fig. 5b, c), five ventrites densely covered by recumbent setae; ventrite 1 with triangular intercoxal process weakly depressed between metacoxae; ventrite 2 longer than 3; ventrite 3 longer than 4; ventrite 5 the longest, covered with long setae prominent at margins.

Fig. 9 *Platyparnus frater* (Hinton, 1939) (Dryopidae) Male (MZSP 37738). *Habitus*. **a** Dorsal view; **b** ventral view; **c** lateral view. Scale bar = 1 mm



Genitalia: Aedeagus (Fig. 8). Phallobase longer than parameres, strongly curved in dorsal/ventral views. Parameres narrowly spatulated, in dorsal/ventral views, reaching the apex of the penis; inner margin almost straight, widened apically and widest at the base; in lateral view, each paramere almost straight, with almost the same width as penis, apex rounded and densely covered with short setae. Penis in ventral and dorsal views straight, feebly constricted basally and apically, apex acuminate; apical margins flared dorsally with sharp edges in lateral view; fibula tubular, very long, extending basally 2/3 onto phallobase.

Female: (Fig. 6) externally similar to male except for the absence of apical sulcus on protibiae; fringe of long setae on mesotibial apex; prothoracic legs with tarsomeres I–II not flattened.

Intraspecific variation. Color may vary from testaceous to very dark brown, the three specimens from the Vão Grande location being paler and more testaceous in color (perhaps due to environmental conditions detailed in the “habitat notes”). Aside from size and color tonality, no major morphological variation was observed. Females are slightly larger than males: females 6.5–6.9 mm long (n=2); males 6.1–6.6 mm long (n=4).

Geographic distribution. Brazil, Tocantins State (Figure 10).

Etymology. The specific epithet *glaucoi* is a tribute to Sr. Glauco F. P. Rodrigues, who passed away in July 2021. Glauco was a humble and very kind person who owned and managed the property where the Vão Grande area is located. He was always happy to welcome research expeditions to his land and was always willing to learn from

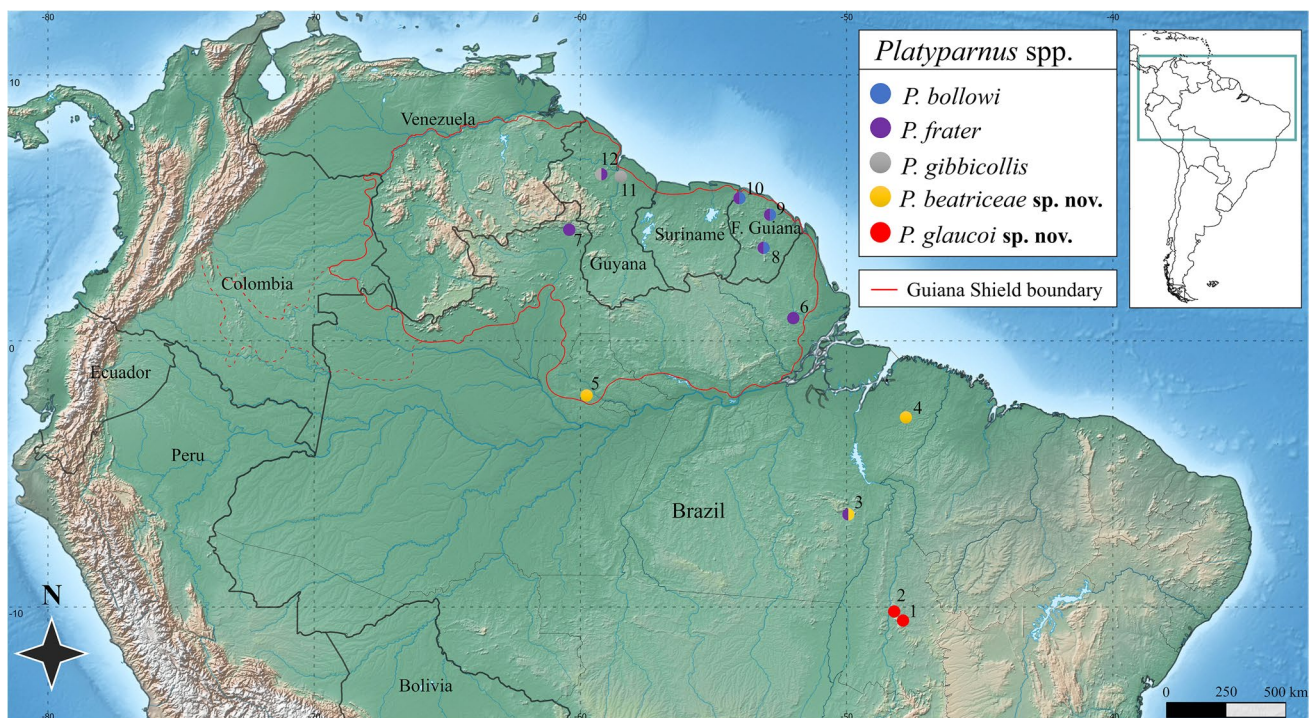


Fig. 10 Map showing the known distribution of *Platyparnus* Shepard and Barr, 2018 (Dryopidae). Colored circles indicate approximate location of species records, and numbers indicate localities as follows: 1 Taquaruçu District, Palmas, Tocantins State; 2 Palmas, Tocantins State; 3 Canaã dos Carajás, Pará State; 4 Paragominas,

Pará State; 5 Presidente Figueiredo, Amazonas State; 6 Serra Lombard, Amapá State; 7 Caracaraí, Roraima State; 8 Saül Commune; 9 Saint-Élie Commune; 10 Saint-Laurent-du-Maroni; 11 Moraballi Creek, Cuyuni-Mazaruni Region; 12 Takutu Mountains, Cuyuni-Mazaruni Region.

those who visited him, who, in turn, learned even more from him.

Habitat notes. The specimens were collected in submerged and partially submerged leaf accumulations underneath stones and logs in small (3–6 m in width) and shallow (10–60 cm in depth) streams well-covered by riparian forest (Fig. 11c–f). The streams are located in the Serra do Lajeado APA (Environmental Protection Area), a mountainous area in the Cerrado (central Brazilian savanna) Biome. The stream located in the Vão Grande has a noteworthy red surface film covering the rocks, logs and the stream bottom (Fig. 11e, f), which probably indicates a high concentration of iron-oxidizing bacteria in the water.

Comparative notes. *Platyparnus glaucoi* sp. nov. can be distinguished from all *Platyparnus* species except for *P. beatriceae* by the combination of the characteristics listed in the *P. beatriceae* diagnosis presented above. The male genitalia can easily distinguish *P. glaucoi* sp. nov. from all known species of *Platyparnus*: aedeagus in dorsal/ventral views sinuous, with apical margins dorsally flared, apex and flared margins sharp, without teeth or spines; in *P. gibbicollis* this structure also has dorsally flared apical

margins, but apex and flared margins are rounded, with anteriorly directed teeth; in *P. bowlii* and *P. frater* this structure does not have apical margins dorsally flared and has apical teeth or spines.

Platyparnus frater (Hinton, 1939)

Diagnosis. See Shepard and Barr (2018)

Material examined. Rio Regina / Serra Lombard, AP [Amapá] / 5.IX.1961 / J. Bechyné col. | Convênio / DZSP-Goeldi | Dryopidae / Bilberg, 1820 / T.T.S. Polizei det. 2018 / MSZP 37738 | *Platyparnus frater* / T.T.S. Polizei det. 2021. (1♂ in MZSP). BRASIL. Roraima. Caracaraí / Serra da Mocidade. Base II. / Córrego III. Jeane Cavalcante leg. / 27.I.2016 01°42'28"S 61°47'04"W. | *Platyparnus frater* / T.T.S. Polizei det. 2021. (1♀ in INPA). BRASIL. Pará. Canaã dos Carajás / (Cave S11-28) -6.411355, -50.352192, / 24.ii-4.iii.2010, Andrade et al. leg. / Carste(Coleo) 4930-832 | Instituto / Tecnológico / Vale / ITV 37495 | *Platyparnus frater* / T.T.S. Polizei det. 2021 | MSZP 48254. (1♀ in MZSP).

Geographic distribution. French Guiana, Guyana and Brazil* (Amapá, Roraima and Pará States) (Fig. 10). * = new record.

Fig. 11 Biotopes where the *Platyparnus* new species were collected. **a–b** Biotopes of *P. beatriceae* **sp. nov.** (Dryopidae) in Sítio Sr. José in Presidente Figueiredo Municipality, Amazonas State, Brazil. **c–f** Biotopes of *P. glaucoi* **sp. nov.** (Dryopidae) in Palmas Municipality, Tocantins State, Brazil. **c, d** Sites in Cachoeira da Roncadeira; **c** Riacho Brejo da Lagoa stream; **d** Cachoeira da Roncadeira waterfall; **e, f** sites in Vão Grande; **e** Córrego Vão Grande stream; **f** Cachoeira do Vão Grande waterfall



Key to identify adults of *Platyparnus* species (adapted from Shepard and Barr 2018)

For illustrations of some characters of species mentioned below, see Shepard and Barr (2018); the figure numbers in Shepard and Barr (2018) are indicated by an asterisk (*).

1 – Specimen size ranging from 7.0 to 10.2 mm long. Males having pro- and mesothoracic legs with first two tarsomeres distinctly flattened and heavily setose (Figs. 1–4*; 9b, c).....2
 1' Specimen size generally not reaching 7.0 mm long. Males with only prothoracic legs with the first two tarsomeres

distinctly flattened and heavily setose (Figs. 1b, c, 3, 4c, 5a, b, and 7).....4
 2 - Elytra with striae punctures distinct, deep, extending to apex (Fig. 9a). Males with penis having dorsally pointed tooth on each side below apex (Figure 15*).....*P. frater*
 2' - Elytra with striae punctures indistinct, shallow, obvious only basally (Figs. 9-10*; 17-18*). Males lacking dorsally pointed teeth below apex on penis (Figs. 11*, 19*).....3
 3 - Males having penis with a pair of anteriorly directed, long, acute spines at apex, without flared lateral margins below apex (Fig. 11*). Females with elytra lacking elongate gibbosities near apices (Fig. 10*).....*P. bowlii*

3' - Males having penis without a pair of anteriorly directed, long, acute spines at apex, with flared lateral margins below apex (Fig. 19*). Females with elytra having elongate gibbosities near apices (Figs. 18*, 20*).....*P. gibbicollis*

4 - Posterior margin of metacoxa deeply excavated in the middle, forming a well-developed medial projection (Fig. 3d). Males having penis in dorsal/ventral views lanceolate, without flared margins below apex; apex obtuse (Fig. 4)*P. beatriceae* **sp. nov.**

4' - Posterior margin of metacoxa shallowly excavated in the middle (Fig. 7d). Males having penis in dorsal/ventral views with lateral margins sinuous, not converging to apex, with flared margins projected dorsally below apex; apex acuminate (Fig. 8)..... *P. glaucoi* **sp. nov.**

Discussion

Platyparnus is now composed of five species and occurs in three South American countries: Brazil, French Guiana, and Guyana. Brazil has the greatest diversity, with three species recorded, two of them being only known from this country. The number of species for Brazil and South America will likely increase as new studies of the Dryopidae fauna in this region are carried out.

Of all currently known *Platyparnus* species, *P. beatriceae* **sp. nov.** and *P. glaucoi* **sp. nov.** are the most similar morphologically, and both are restricted to the area south of the Amazon River, outside the Guiana Shield. *Platyparnus frater* is the only species that occurs both inside and outside of the Guiana Shield. However, based on the original morphological description, *P. frater* shares some characters with the other two species (*P. bowli* and *P. gibbicollis*) that occur only inside the Guiana Shield: the long body (size longer than 7 mm) and the males with pro- and mesothoracic legs with the first two tarsomeres distinctly flattened and heavily setose. Although Shepard and Barr (2018) suggested that *Platyparnus* might be geographically restricted to the Guiana Shield, our results indicate that this geological formation does not influence the distribution of this genus. Only after increasing knowledge about the species in the genus will we be able to establish whether there are geographically restricted species or species groups.

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Declarations

Conflict of interest The authors declare no competing interests.

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