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Anatomical deviation of male organs of land planarians from Rio de Janeiro, Brazil, with description of two new species of *Cratera* (Platyhelminthes, Tricladida)

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Abstract

Two new land planarian species, collected in the State of Rio de Janeiro, Brazil, are described. Their external aspect is similar to that of *Imbira marcusi* Carbayo *et al.*, 2013 and *Pseudogeoplana theresopolitana* (Schirch, 1929), respectively. The analysis of the internal organs, however, revealed they belong to the genus *Cratera*. The male copulatory organs of one species is very different from any other geoplaninid, for the penis papilla holds a large, distal cavity receiving the ejaculatory duct and, furthermore, the papilla projects vertically downwards from the roof of the male atrium. Thus we consider it as a new species, *Cratera cuarassu* **sp. nov.** The second species differs from its congeners in that the dorsal insertion of the penis papilla is anterior to the ventral one, and in that the female atrium is narrowed in the anterior portion. The species was found in the type locality of *Pseudogeoplana theresopolitana* (Schirch, 1929) and compares well with it in the external features. However, since its internal organs are unknown and the type material of the species is seemingly lost, we describe it as *Cratera anamariae* Carbayo, **sp. nov.**

Key words: Anatomy, Continenticola, flatworms, morphology, taxonomy

Introduction

The native Neotropical land planarians (Platyhelminthes, Tricladida, Geoplanidae) are nearly all Geoplaninae. In a recent article, a part of the Geoplaninae in-groups was revised and the species-rich genus *Geoplana* Stimpson, 1857, the type-genus of Geoplaninae, was split into six genera: *Geoplana* Stimpson, 1957; *Barreirana* Ogren & Kawakatsu, 1990 (formerly a subgenus); *Cratera* Carbayo *et al.,* 2013; *Matuxia* Carbayo *et al.*, 2013; *Obama* Carbayo *et al.*, 2013; and *Paraba* Carbayo *et al.*, 2013 (Carbayo *et al.*, 2013). Thus, the genus *Geoplana* went from including over 100 species to only three (plus 47 species considered *incertae sedis*).

Currently the genus *Cratera* includes five species transferred from *Geoplana* when the genus was proposed, plus a new one recently described (Rossi *et al.*, 2014). The main diagnostic feature of the genus is a cavity continued from the ejaculatory duct located at the tip of the protrusible penis papilla. Different from the eversible penis type, which lacks a permanent penis papilla (it is "mainly formed from the ejaculatory duct which is sheathed in the everted male atrium" (Winsor, 1998)), the protrusible penis is characterized by "a conspicuous, permanent papilla and muscular bulb which, through contraction of circular muscles with consequent narrowing of the bulb and extension of longitudinal muscles, is protruded through the gonopore" as defined by Winsor (1998). The six known species of the genus possess this type of penis papilla, in a similar horizontal position.

In samplings in the Brazilian Atlantic forest in the State of Rio de Janeiro we collected two species displaying the color patterns of *Imbira marcusi* Carbayo *et al.*, 2013, and *Pseudogeoplana theresopolitana* (Schirch, 1929), respectively. However, both species present the main diagnostic feature of *Cratera*, but the former deviates from its

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There are still 59 nominal species of Geoplaninae (Tyler *et al.*, 2006–2013), the internal anatomy of which remains unknown. These species are placed under the collective genus *Pseudogeoplana* Ogren & Kawakatsu, 1990. The genus was proposed for geoplaninid *species inquirendae* and *nomina dubia* (Ogren & Kawakatsu, 1990). Six species within this group show a body color pattern consisting of one or two pairs of dark stripes on a yellowish ground, namely *P. brittlebanki* (Von Graff, 1897), *P. nobilis* (Von Graff, 1899), *P. oerstedi* (Von Graff, 1899), *P. perspicillata* (Von Graff, 1899), *P. rostrata* (Von Graff, 1899) and *P. theresopolitana* (Schirch, 1929).

Pseudogeoplana brittlebanki, from Tigre (near Buenos Aires, Argentina), and *P. nobilis*, from nearby Corral (Chile), differ from the new species in that their paramedian black stripes are wider, 24% and 27% of the body width, respectively. Furthermore, in *P. nobilis* these stripes are more closely placed each other, the posterior end is red-brownish, and the ventral side presents a color pattern similar to that of the dorsum. *Pseudogeoplana oerstedi*, from Palermo (Buenos Aires, Argentina) differs from the new species in that its ventral body margins are brownish. *Pseudogeoplana perspicillata* and *P. rostrata*, both from Blumenau (Santa Catarina, Brazil), differ from the new species in that their lateralmost stripes are marginal and wider, and the ventral side displays a grayish lateral bands on each side of the body. Additionally, the ground color of the dorsum in *P. perspicillata* is dark brown-reddish, whereas in *P. rostrata* the pair of dark bands fades before reaching the anterior end of the body.

Unlike the original descriptions of species of *Pseudogeoplana* discussed earlier, *P. theresopolitana* was only very briefly described (Schirch, 1929). Besides, it was described from a single specimen, the anterior end of which was lacking. The original description reads "*Geoplana theresopolitana* nov. spec. 30 mm in length, 4 mm in width. The cephalic end of the specimen here described is lacking. The dorsum is shiny yellow and with two black stripes with the same width. The eyes are arranged in a row, becoming scarce posteriorly. The ventral side is light, but with the help of a lens fine yellowish spots become visible. Species close to *G. rostrata*, even possibly identical. One specimen from Teresópolis" (original description is in Portuguese; Schirch, 1929). Schirch did not illustrate his species, but Graff did for *P. rostrata*. The dorsum of the latter is very similar to that of specimens of *C. anamariae* Carbayo, **sp. nov.** having a two-stripe color pattern. Thus, *C. anamariae* Carbayo, **sp. nov.** matches well the features of *P. theresopolitana* except for the yellowish spots on the ventral side, that are absent in the new species, and the distribution of the eyes. In regard to the latter, we are of the opinion that distribution of the eyes might not have been precisely outlined. Schirch's description subtly implied that the eyes are marginal ("arranged into a row"), but he also suggests conspecificity with *P. rostrata* (Von Graff, 1899), whose eyes are dorsal, as in the new species.

While the features of *P. theresopolitana* do not exclude conspecificity with *C. anamariae* **sp. nov.**, they do not confirm it, either. Further investigation of Schirch's species is impracticable as the type-specimen was not found in the Museu Nacional do Rio de Janeiro (MNRJ, Rio de Janeiro, Brazil), where he was employed. It is apparently lost (Guilherme Muricy, pers. comm.). Therefore, we here describe these specimens as a new species.

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References

Bois-Reymond Marcus, E. du (1951) On South American geoplanids. *Boletim da Faculdade de Filosofia, Ciências e Letras da Universidade de São Paulo, Série Zoologia,* 16, 217–255.
http://dx.doi.org/10.11606/issn.2318-5988

Bois-Reymond Marcus, E. du (1957) On Turbellaria. *Academia Brasileira de Ciências,* 29 (1), 153–159.

Carbayo, F., Álvarez-Presas, M., Olivares, C.T., Marques, F.P.L. Froehlich, E.M. & Riutort, M. (2013) Molecular phylogeny of Geoplaninae (Platyhelminthes) challenges current classification: Proposal of taxonomic actions. *Zoologica Scripta*, 42, 508–828.
http://dx.doi.org/10.1111/zsc.12019

Cason, J.E. (1950) A rapid one-step Mallory-Heidenhain stain for connective tissue. *Stain Technology*, 25 (4), 225–226.
http://dx.doi.org/10.3109/10520295009110996

Froehlich, C.G. (1956) Planárias terrestres do Paraná. *Dusenia,* 7 (4), 173–196.

Froehlich, E.M. (1955) Sôbre espécies brasileiras do gênero *Geoplana. Boletim da Faculdade de Filosofia, Ciências e Letras da Universidade de São Paulo,* Série Zoologia, 19, 289–369.
http://dx.doi.org/10.11606/issn.2318-5988.v2i0p3-10

Humason, G.L. (1967) *Animal tissue techniques*. W. H. Freeman and Company, San Francisco, 569 pp.

Jones, H.D. & Sterrer, W. (2005) Terrestrial planarians (Platyhelminthes, with three new species) and nemertines of Bermuda. *Zootaxa*, 1001, 31–58.

Kiernan, J.A. (1990) *Histological and histochemical methods: theory and practice*. *2nd Edition*. Pergamon Press, Oxford, 433 pp.

Marcus, E. (1951) Turbellaria brasileiros (9). *Boletim da Faculdade de Filosofia, Ciências e Letras da Universidade de São Paulo,* Série Zoologia, 16, 5–215.
http://dx.doi.org/10.11606/issn.2318-5988

Ogren, R.E. & Kawakatsu, M. (1990) Index to the species of the family Geoplanidae (Turbellaria, Tricladida, Terricola) Part I: Geoplaninae. *Bulletin of the Fuji Women's College*, Serie II, 28, 79–166.

Riester, A. (1938) Beiträge zur Geoplaniden-Fauna Brasiliens. *Abhandlungen der Senckenbergischen naturforschenden Gesellschaft*, 441, 1–88.

Rossi, I., Fontoura, M., Amaral, S. & Leal-Zanchet, A.M. (2014) A new species of land flatworm (Platyhelminthes: Continenticola) from areas of Araucaria Forest in southern Brazil. *Zootaxa*, 3794 (4), 514–524.
http://dx.doi.org/10.11646/zootaxa.3794.4.2

Schirch, P. (1929) Sobre as planarias terrestres do Brasil. *Boletim do Museu Nacional do Rio de Janeiro*, 5, 27–38.

Tibiriçá, L.C. (1984) *Dicionário Tupi-Português*. Traço ed., São Paulo, 200 pp.

Tyler, S., Schilling, S., Hooge, M. & Bush, L.F. (comp.) (2006–2013) Turbellarian taxonomic database. Version 1.7 Available from: http://turbellaria.umaine.edu/turbella.php (accessed 1 October 2014)

Von Graff, L. (1899) *Monographie der Turbellarien: II. Tricladida Terricola*. Engelmann, Leipzig, 575 pp.

Winsor, L. (1998) Aspects of taxonomy and functional histology in terrestrial flatworms (Tricladida, Terricola). *Pedobiologia*, 42, 412–432.