ZOOLOGIA 39: e22024
ISSN 1984-4689 (online)
scielo.br/zool

RESEARCH ARTICLE

New records of Monogenoidea (Platyhelminthes) from three marine fish species from the coast of Angra dos Reis, Rio de Janeiro, Brazil

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https://zoobank.org/2AF00088-9AC6-4626-81B8-7A24787937DE

ABSTRACT. During a survey of helminth parasites, five monogenoid species were reported from marine fishes from the coast of Angra dos Reis, littoral of Rio de Janeiro State, Atlantic Ocean. A total of 810 monogenoids were collected: *Pseudotagia pomadasys* Hernández-Vale, Bunkley-Williams & Williams Jr, 2016, *Pseudoeurysorchis travassosi* Caballero & Bravo-Hollis, 1962 in *Haemulopsis corvinaeformis* (Steindachner, 1868) (=*Pomadasys corvinaeformis*), *Neodiplectanum mexicanum* (Mendoza-Franco, Roche & Torchin, 2008) Domingues, Diamanka & Pariselle, 2011 and *Aristocleidus hastatus* Mueller, 1936 in *Diapterus rhombeus* (Cuvier, 1829) and *Acanthocercodes bullardi* Kritsky & Diggles, 2015 in *Polydactylus virginicus* (Linnaeus, 1758). The presence of *P. pomadasys*, *P. travassosi* and *A. hastatus* in the Southwest Atlantic Ocean represents a new geographical distribution for these species. *Haemulopsis corvinaeformis* represents a new host record for *P. travassosi* and *A. bullardi* is reported in the present paper for the first time parasitizing the gills of a polynemid in South Atlantic Ocean. The findings show that they belong to species previously recorded from the same or congeneric hosts from Central America and Mexico, representing new data on hosts and geographical records.

KEY WORDS. *Acanthocercodes*, *Aristocleidus*, fish parasites, monogenoideans, *Neodiplectanum*, *Pseudoeurysorchis*, *Pseudotagia*.

INTRODUCTION

Diapterus rhombeus (Cuvier, 1829) (Eupercaria: Gerreidae) is a marine and estuarine fish that may enter freshwater, distributed from Florida to Brazil (Gilmore et al. 2002). This species is one of the most abundant demersal fishes in Central and South America and its populations are usually found aggregated in small groups (Reis-Filho and Leduc 2018). They feed mainly on plants and microbenthic crustaceans, pelecypods, and polychaete worms (Gilmore et al. 2002). The species is common in mangrove-lined lagoons; also found over shallow mud and sand grounds in marine areas (Froese and Pauly 2022). *Diapterus rhombeus* is a species widely studied for parasites and all groups of helminths have been reported in this host: *Homalometron longulum* Travassos, Freitas & Buhrnheim, 1965 (Trematoda); *Neodiplectanum mexicanum* (Mendoza-Franco, Roche & Torchin, 2008) Domingues, Diamanka & Pariselle, 2011, *Aristocleidus lamothei* Kritsky & Mendoza-Franco, 2008 and *Aristocleidus hastatus* Mueller, 1936 (Monogenoidea); *Contracaecum* sp. and *Raphidascaris* sp. (Nematoda); *Nybelinia* sp. (Cestoda) and *Corynosoma australe* Johnston, 1937 and *Caballerorhynchus lamothei* Salgado-Maldonado, 1977 (Acanthocephala) (Travassos et al. 1965, 1967, Vicente and Santos 1973, Escobar-Briones et al. 1999, Luque and Poulin 2004, Mendoza-Franco et al. 2008, 2009, Domingues et al. 2011).

The Roughneck grunt *Haemulopsis corvinaeformis* (Steindachner, 1868) (=*Pomadasys corvinaeformis*) (Eupercaria: Haemulidae) is distributed from Mexico to the Caribbean coasts, both continental and insular to the Antilles, and Brazil (Smith 1997, Froese and Pauly 2022) and is a common species on the Brazilian coast (Menezes and Figueiredo 1980). Individuals are small, reaching a maximum size of 25 cm and usually form small aggregates, being a migratory species and estuarine dependent. It feeds mainly on crustaceans and small fish and has commercial value (Menezes and Figueiredo 1980). Until now, only two helminth species have been reported in this host: an unidentified species of trematode, *Stephanostomum* sp. in Puerto Rico and the monogenoid *Pseudotagia pomadasys* Hernández-Vale,

Bunkley-Williams &Williams Jr, 2016, described from Mexico (Bunkley-Williams et al. 1996, Hernández-Vale et al. 2016).

Polydactylus virginicus (Linnaeus, 1758) (Carangaria: Polynemidae) is found on sandy and muddy bottoms of coastal waters, mangroves and commonly enters estuaries. Small specimens are caught in large numbers at the mouths of rivers (Feltes 2002). This fish is a nocturnal feeder, taking crustaceans, chaetognaths, plant material, and polychaetes, and may have a prolonged spawning season. They have been reported in the Western Atlantic ranging from New Jersey to Uruguay (Feltes 2002, Motomura 2004, Froese and Pauly 2022). The only helminth species described in this host is *Procamallanus* (*Spirocamallanus*) *cruzi* Guimarães, Cristofaro & Rodrigues, 1976 (Nematoda) from Pituba, Salvador, state of Bahia, Brazil (Guimarães et al. 1976), considered 'species inquirenda' by Sardella et al. (2017). Lopes et al. (2009), in a survey on feeding of this species, observed the presence of Acanthocephala and Nematoda in the digestive system of *P. virginicus* collected from Ilhéus, state of Bahia, with no specific identification.

During a survey on marine fishes from the littoral of Angra dos Reis, state of Rio de Janeiro, specimens of Monogenoidea were recovered from *D. rhombeus*, *P. virginicus*, and *H. corvinaeformis*. The findings show that they belong to species previously recorded from the same or congeneric hosts from Central America and Mexico, representing new data on hosts and geographical records.

MATERIAL AND METHODS

Fifty-two specimens of *H. corvinaeformis*, 32 specimens of *P. virginicus*, and 201 of *D. rhombeus* were collected in "Saco Piraraquara de Dentro", coast of Angra dos Reis, state of Rio de Janeiro, Brazil (23°00'24"S, 44°19'05"W) (Fig. 1), and examined between August 2007 and February 2013. The fishes were captured by fishermen with the aid of gill nets and examined in the laboratory. The gill arches were separated and the monogenoids collected were fixed in 5% formaldehyde. Mazocraeidae and Diclidophoridae specimens were stained with Langeron's alcoholic acid carmine, dehydrated by means of an ethyl alcohol series, cleared using beechwood creosote and mounted in Canada balsam as permanent slides (Eiras et al. 2006) and Dactylogyridae and Diplectanidae specimens were mounted in Hoyer's medium (Humason 1979). The specimens were observed using a Zeiss Axioskop 2 Plus microscope and digital images were captured with a SONY MPEG Movie EX DSC-S75 digital camera. The measurements are given in micrometers unless otherwise stated, and the range is presented followed by the mean and the numbers of structures measured in parentheses. The parasitological index was calculated as proposed by Bush et al. (1997), followed by the standard deviation. Representative specimens were deposited in the Helminthological Collection of the Oswaldo Cruz Institute (CHIOC), Rio de Janeiro, Brazil.

TAXONOMY

In the present study, a total of 810 monogenoids were collected, comprising seven specimens of *P. pomadasys*, eight of *Pseudoeurysorchis travassosi* Caballero & Bravo-Hollis, 1962 parasitizing *H. corvinaeformis* (6–23 cm in total body length and 10–205 g in weight); 546 specimens of *N. mexicanum* and 186 of *A. hastatus* parasitizing *D. rhombeus* (7–26 cm in total body length and 10–200 g) and 63 *Acanthocercodes bullardi* Kritsky & Diggles, 2015 from *P. virginicus* (20–26 cm in total body length and 75–250 g in weight). Parasitological indices are presented in Table 1.

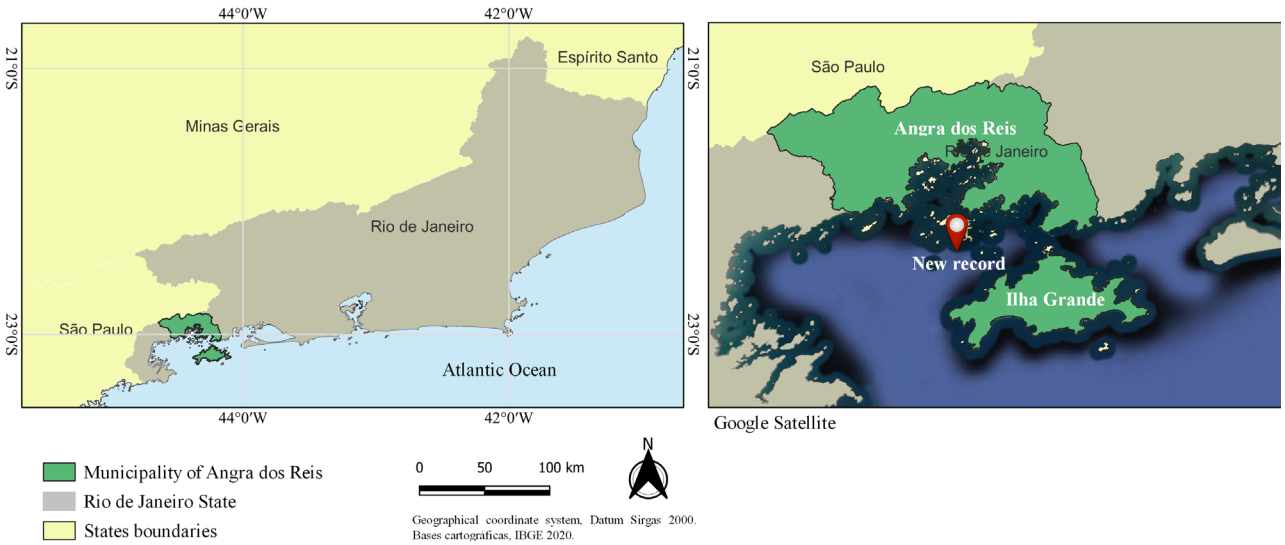

Figure 1. Map of the area of new geographical records.

Table 1. Prevalence (P), mean intensity (MI), mean abundance (MA) and range of infection (R) of monogenoideans from *D. rhombeus*, *P. virginicus*, and *H. corvinaeformis* from "Saco Piraraquara de Dentro", coast of Angra dos Reis, littoral of Rio de Janeiro State, Brazil. Data presented as Mean (±) Standard deviation.

Monogenoidea	*Diapterus rhombeus*				*Polydactylus virginicus*				*Haemulopsis corvinaeformis*			
	P(%)	MI	MA	R	P(%)	MI	MA	R	P(%)	MI	MA	R
Neodiplectanum mexicanum	55.7	4.9 ±5.7	2.72±4.9	1–37	–	–	–	–	–	–	–	–
Aristocleidus hastatus	30.8	3.0±2.6	0.92±2.0	1–14	–	–	–	–	–	–	–	–
Acanthocercodes bullardi	–	–	–	–	62.5	3.2±3.7	1.97±3.3	1–16	–	–	–	–
Pseudoeurysorchis travassosi	–	–	–	–	–	–	–	–	11.5	1.3±0.5	0.2±0.5	1–2
Pseudotagia pomadasys	–	–	–	–	–	–	–	–	7.7	1.8±0.96	0.13±0.53	1–3

Mazocraeidae

Pseudotagia pomadasys Hernández-Vale, Bunkley-Williams & Williams Jr, 2016

Fig. 2A-D

Host: *Haemulopsis corvinaeformis* (Steindachner, 1868) (Haemulidae).

New record. Brazil, Atlantic Ocean – Rio de Janeiro State • coast of Angra dos Reis, "Saco Piraraquara de Dentro"; 23°00'24"S, 44°19'05"W; CHIOC 39729.

Type-host: *Haemulopsis corvinaeformis* [=*Pomadasys corvinaeformis* (Steindachner, 1868)]

Type-locality: Guanajibo and Boquilla, Mayaguez, Puerto Rico (Caribbean) and Loíza, Puerto Rico (Atlantic Ocean).

Description (based on six specimens). Body 2,750–3,550 (3,079; n = 6) long by 480–550 (513; n = 6) wide. Anterior end with a pair of oval buccal suckers, 80–105 (93; n = 12) long by 75–110 (95; n = 12) wide. Pharynx 62–87 (79; n = 5) long by 70–77 (74; n = 5) wide. Oesophagus short. Intestinal caeca bifurcate at level of genital atrium and extend to posterior region of body proper, joining in one and reaching the haptor. Genital atrium 42–55 (47; n=5) long by 47–50 (47; n=5) wide, with eight to nine spines. Haptor composed of four pairs of pedunculated clamps. Each clamp is formed by two plate-like valves and sclerites: central sclerite with bifurcated base and lateral sclerites. Clamps: pair 1, 80–92 (84; n = 12), pair 2, 85–97 (90; n = 11), pair 3, 80–97 (90; n = 12), pair 4, 77–100 (85; n = 11). Testes 12 in number, post ovarian. Ovary large, inverted J shaped, located immediately anterior to testes. Genito-intestinal canal observed at mid level of testes. Eggs not observed.

Diclidophoridae

Pseudoeurysorchis travassosi Caballero & Bravo-Hollis, 1962

Fig. 3A-C

Host: *Haemulopsis corvinaeformis* (Steindachner, 1868)

New record. Brazil, Atlantic Ocean – Rio de Janeiro State • coast of Angra dos Reis, "Saco Piraraquara de Dentro"; 23°00'24"S, 44°19'05"W; CHIOC 39730.

Type-host: *Microlepidotus inornatus* Gill, 1862 (Haemulidae).

Type-locality: California Gulf, San Carlos Bay, Guaymas, Sonora, Mexico.

Other hosts: *Microlepidotus brevipinnis* (Steindachner, 1869) (Haemulidae), and *Isacia conceptionis* (Cuvier, 1830) (Haemulidae).

Other localities: Mexico and Puerto del Callao, Peru.

Description (based on six specimens). Large monogenoids, easily distinguished on the gills. Body, not including haptor 3,325–3,750 (3,483; n = 3) long by 1,625–1,925 (1,817; n = 3) wide. Buccal suckers 67–105 (90; n = 10) long by 80–100 (89; n = 10) wide, muscular, septate. Pharynx 82–150 (130; n = 5) long by 75–107 (91; n = 5) wide. Genital atrium 45–57 (51; n = 6) long by 40–55 (50; n = 6) wide with 10 to 11 spines, which bears long point curved towards the center of the crown and bifurcated extremity toward the margin. Testes numerous, posterior to ovary, reaching the haptor. Ovary located immediately anterior to haptor, irregular shaped. Vitelline glands distributed throughout the body, including the haptor. Haptor 3,250–4,375 (3,687; n = 4) long by 2,125 –2,575 (2,350; n = 4) wide, robust, occupying most part of the body of the parasite, composed of four pairs of sessile clamps. Clamps similar in size and shape, 480–810 (675; n = 24) long by 540–800 (644; n = 24) wide, constituted by two reinforced valves, ventral and dorsal, heavily sclerotized and articulated, supported by a median and marginal sclerites in the borders.

Diplectanidae

Acanthocercodes bullardi Kritsky & Diggles, 2015

Fig. 4A-C

Host: *Polydactylus virginicus* (Linnaeus, 1758) (Polynemidae).

New record. Brazil, Atlantic Ocean – Rio de Janeiro State • coast of Angra dos Reis, "Saco Piraraquara de Dentro"; 23°00'24"S, 44°19'05"W; CHIOC 39724.

Type-host: *Polydactylus octonemus* (Girard, 1858) (Polynemidae).

Type-locality: Gulf of Mexico, approximately 2 miles south of Cameron (Davis Road), south-west corner of Cameron Parish, Louisiana.

Description (based on 15 specimens). Body with cephalic region, trunk and elongate peduncle, 356–530 (425; n = 10)

Figure 2. *Pseudotagia pomadasys*: (A) whole mount; (B) anterior region with buccal suckers; (C) genital atrium; (D) clamp. Scale bars: A = 500 µm, B = 100 µm, C, D = 50 µm.

long by 80–170 (113; n = 10) wide. Four eye-spots. Tegument with scales extending from the eyespots region to the peduncle. Pharynx subspherical, 18–27 (22; n = 10) long by 20–27 (23; n = 10) wide. Intestinal caeca extending posteriorly to level of peduncle. Peduncle tapered and elongate with spines, peduncular spines 16–25 (20; n = 12) long by 16–25 (23; n = 12) wide. Dorsal and ventral squamodiscs with 10 rows of rodlets. Diplectanid haptor composed of ventral bar, paired dorsal bars and marginal hooks, ventral anchor with perpendicular superficial root, long deep root, elongate shaft, and short recurved point, 59–68 (63; n = 22) by 19–25 (22; n = 22) at base; dorsal anchor with short superficial root and inconspicuous deep root, straight shaft and recurved point, 54–62 (58; n = 23) by 17–25 (21; n = 23) at base. Ventral bar broadly U-shaped 75–103 (89; n = 13) long. Paired dorsal bar with tapered ends, 35–51(44; n = 25) long. Hooks 9–13 (11; n = 36). Male copulatory organ a short and broad tube, 34–52 (44; n = 10) long. Testes 60–90 (75; n = 10) long by 50–82 (66; n = 10) wide.

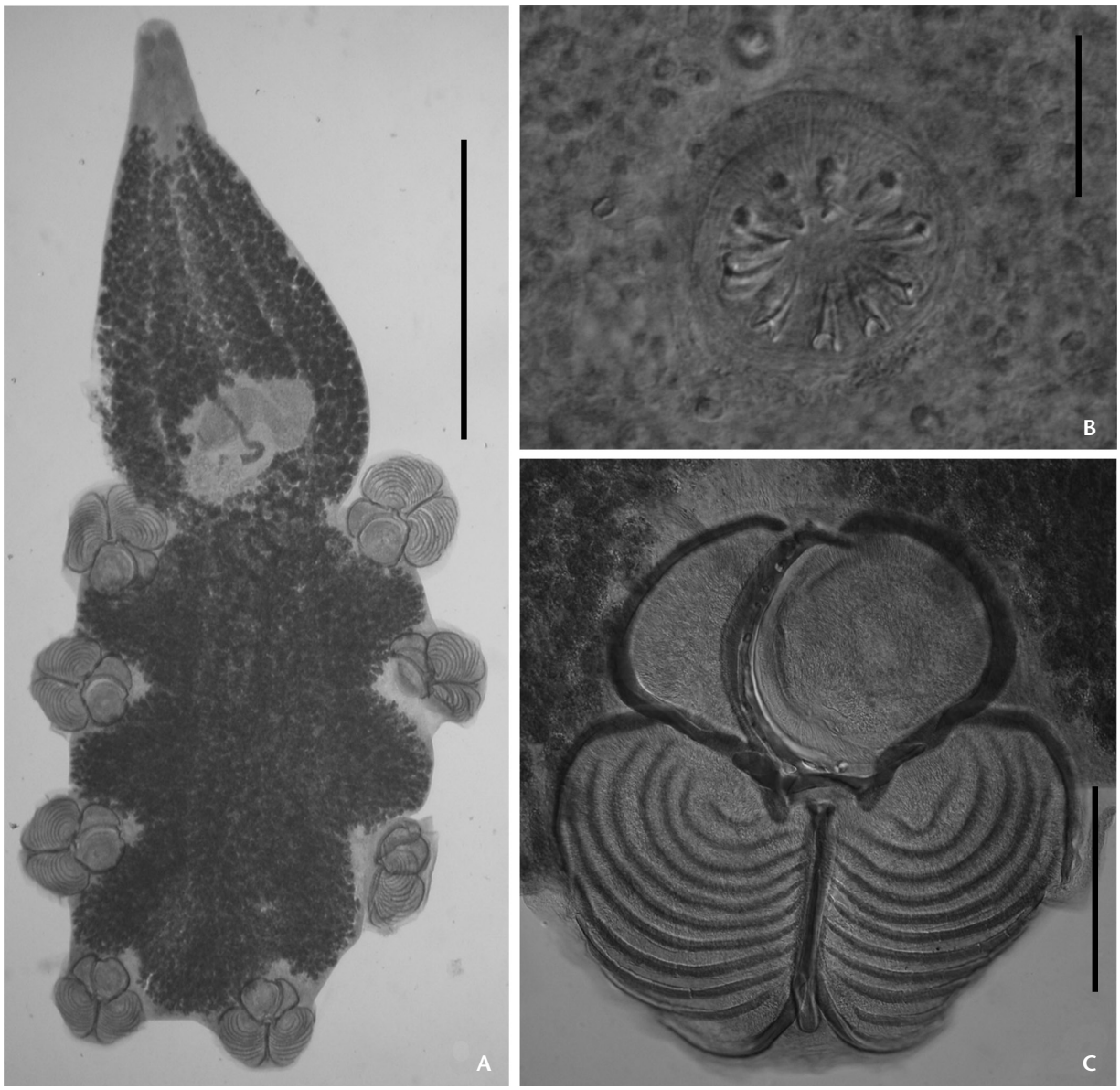

Figure 3. *Pseudoeurysorchis travassosi*: (A) whole mount; (B) genital atrium; (C) clamp. Scale bars: A = 1 mm, B = 30 µm, C = 250 µm.

Diplectanidae

Neodiplectanum mexicanum (Mendoza-Franco, Roche & Torchin, 2008) Domingues, Diamanka & Pariselle, 2011

Fig. 5A-C

Host: *Diapterus rhombeus* (Cuvier, 1829) (Gerreidae)

Locality: Brazil, Atlantic Ocean – Rio de Janeiro State • coast of Angra dos Reis, "Saco Piraraquara de Dentro"; 23°00'24"S, 44°19'05"W; CHIOC 39726a,b, 39727, 39728.

Type-host: *Diapterus rhombeus* (Cuvier, 1829)

Type-locality: Coast of Campeche State, Mexico (18°48'45"N, 92°03'45"W) in the Gulf of Mexico, Mexico

Other locality: Guaratuba Bay, Municipality of Guaratuba, Paraná, Brazil (25°52'19"S, 48°39'02"W).

Description (based on 38 specimens). Body 300–670 (406; n = 20) long by 80–140 (107; n = 20) wide, fusiform. Four eye spots. Pharynx muscular, glandular. Intestinal caeca 2, non-confluent posteriorly, lacking diverticula. Genital pore opening midventral, posterior to copulatory complex. Male copulatory

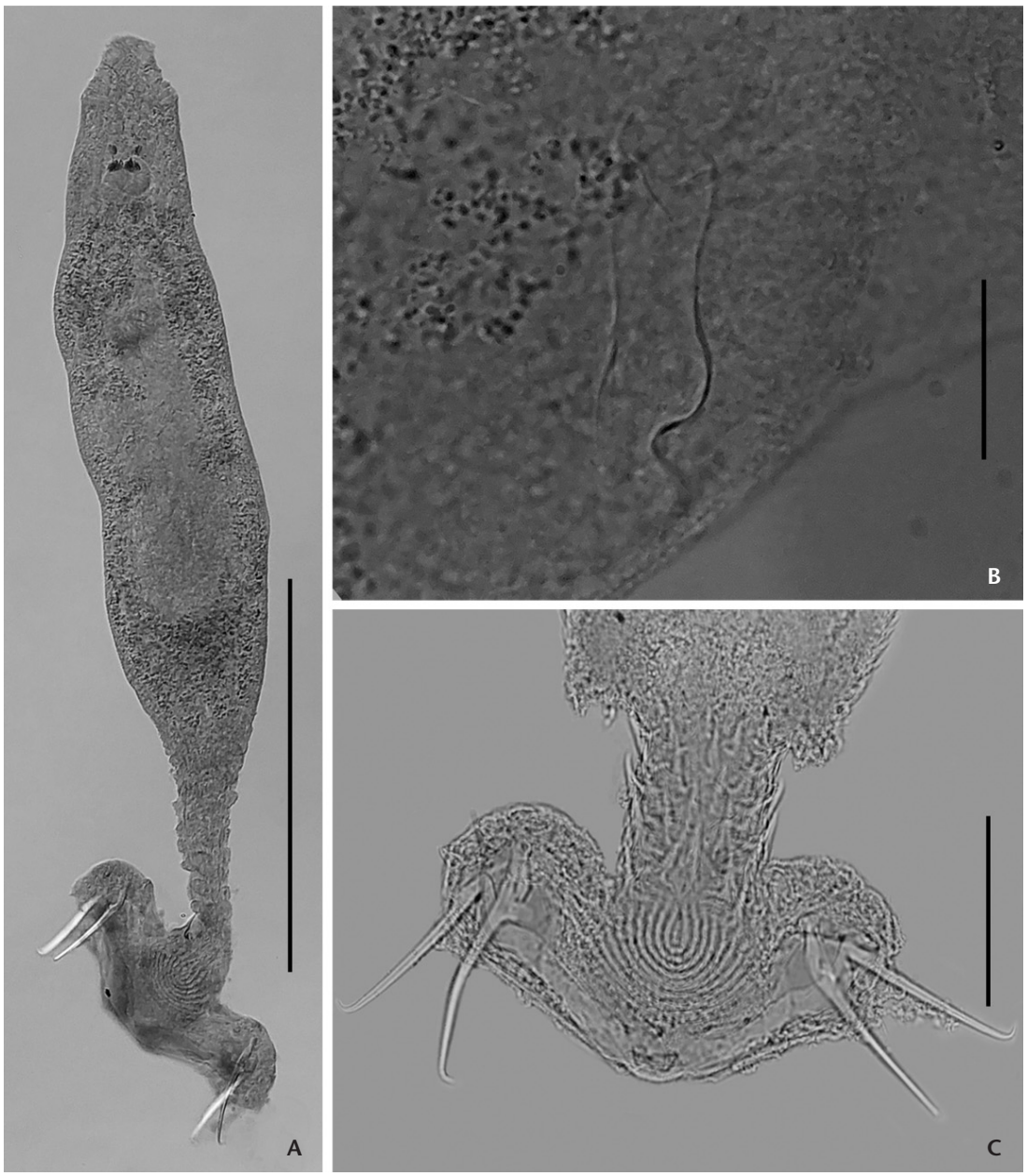

Figure 4. *Acanthocercodes bullardi*: (A) whole mount; (B) copulatory complex; (C) haptor. Scale bars: A = 150 µm, B = 20 µm, C = 50 µm.

organ 50–66 (58; n = 21) long, sclerotized, tubular, enlarging distally; accessory piece sclerotized, non-articulated with male copulatory organ, distally hooked. One testis, postgermarian. Vaginal opening sinistral, vaginal atrium 30–35 (32; n = 15) long by 18–37 (28; n = 15), heavily sclerotized. Seminal receptacle spherical. Haptor 112–167 (139; n = 22) wide. Two squamodiscs 50–125 (87; n = 13) long by 62–125 (95; n = 13), one ventral and one dorsal, with 15 to 20 rows of sclerites. Anterior rows concentric. Ventral bar 75–107 (88; n = 21) with longitudinal groove; paired dorsal bars 40–53 (46; n = 29) long, medially expanded. Ventral anchor with well-developed superficial root and deep root, twice as long as superficial root; outer 35–39 (37; n = 11), inner 20–27 (22; n = 11), base 7–11 (9; n = 11). Dorsal anchor with conspicuous superficial and deep roots; outer 35–39 (36; n = 7), inner 21–25 (23; n = 7), base 7–10 (8; n = 7). Hooks similar 12–15 (13; n = 40) long, with depressed thumb, straight shaft, short point, uniform shank; filamentous hooklet (FH) loop nearly shank length.

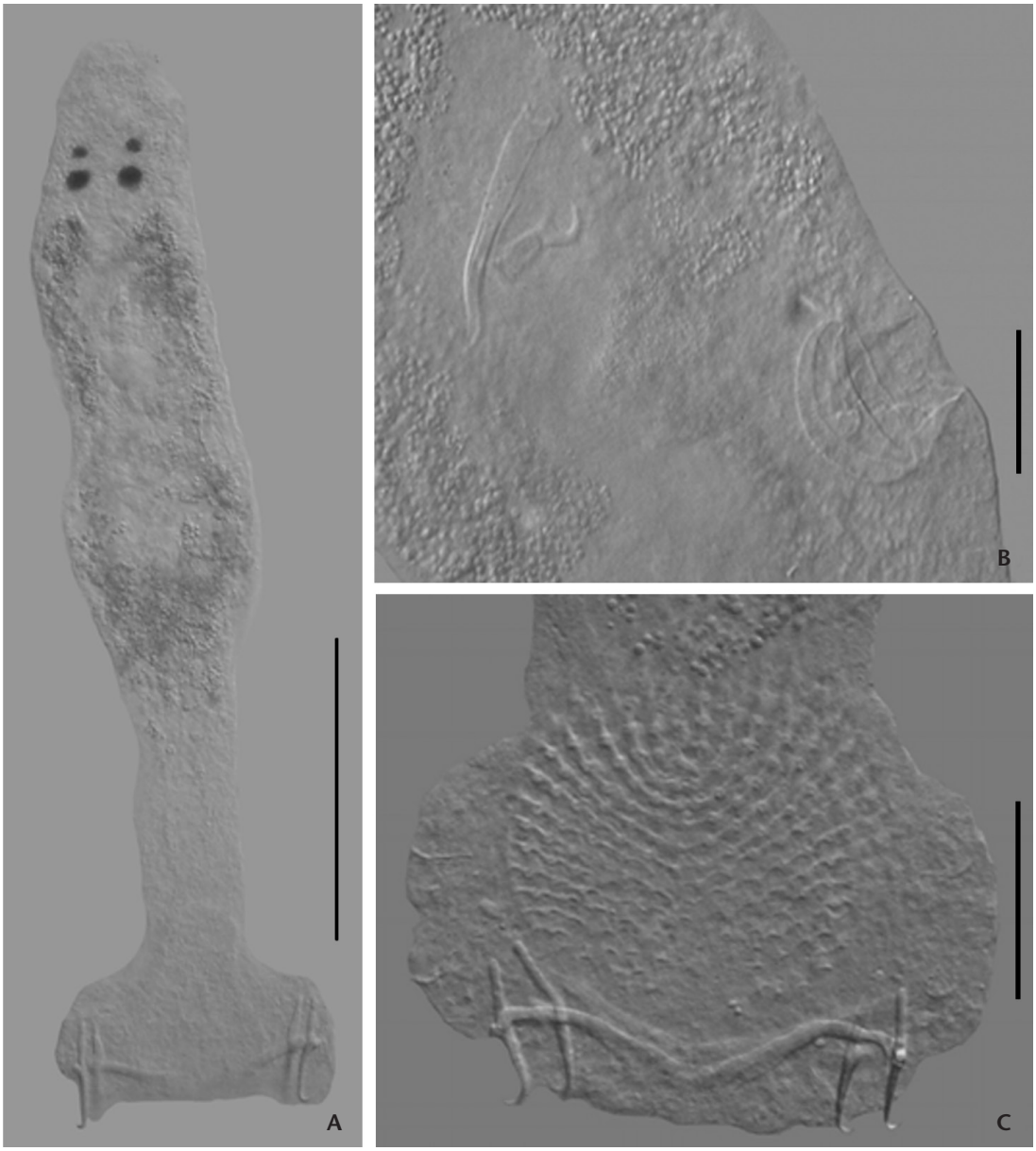

Figure 5. *Neodiplectanum mexicanum*: (A) whole mount; (B) detail of the anterior region, showing copulatory complex and vagina; (C) haptor, showing the anchor bars complex and squamodisc. Scale bars: A = 100 µm; B, C = 50 µm.

Dactylogyridae

Aristocleidus hastatus Mueller, 1936

Fig. 6A-C

Host: *Diapterus rhombeus* (Cuvier, 1829) (Gerreidae)

New record. Brazil, Atlantic Ocean – Rio de Janeiro State • coast of Angra dos Reis, "Saco Piraraquara de Dentro"; 23°00'24"S, 44°19'05"W; CHIOC 39723, 39725.

Type-host: *Morone saxatilis* (Walbaum, 1792) [as *Roccus lineatus* (Bloch, 1792)], Moronidae

Type-locality: Peace River near Fort Ogden, Florida.

Other hosts: *Diapterus auratus* Ranzani, 1842, *Diapterus peruvianus* (Cuvier, 1830), *D. rhombeus*, *Eugerres plumieri* (Cuvier, 1830), *Eugerres brasilianus* (Cuvier, 1830), *Gerres cireneus* (Walbaum, 1792) (Gerreidae).

Other localities: Lagartos and Celestun estuaries, Yucatán Peninsula, Las Barrancas and Maquinas River in the state of Veracruz, Lake Gatun, near Barro Colorado Island in Panama

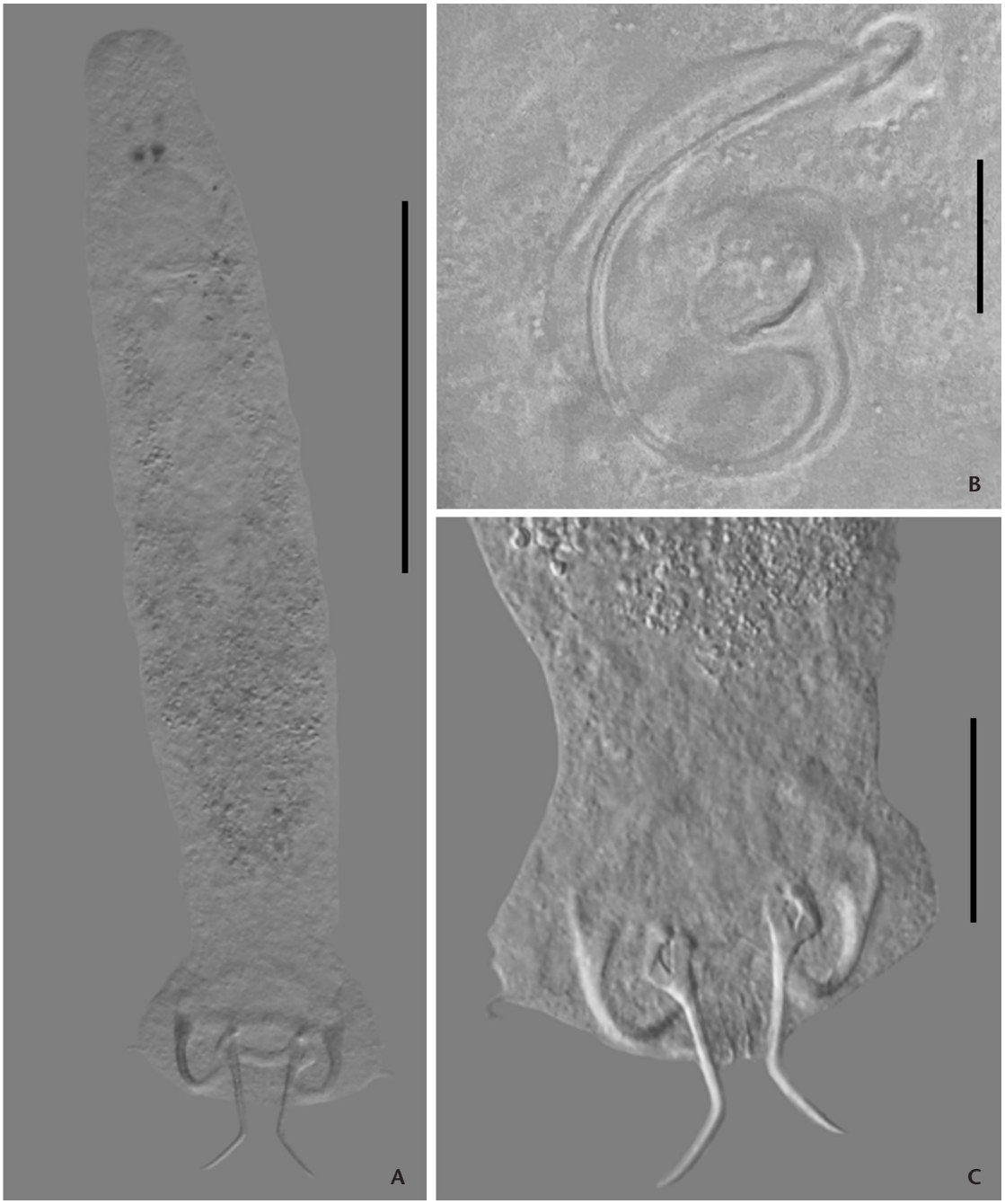

Figure 6. *Aristocleidus hastatus*: (A) whole mount; (B) copulatory complex; (C) haptor, with anchor bars complex. Scale bars: A, C = 50 µm, B = 20 µm.

and the Chautengo and Tres Palos Lagoon, Pacific Coast of Guerrero State, Mexico.

Description (based on 20 specimens). Body 220–325 (271; n = 12) long by 50–92 (71; n = 12) wide. Four eye-spots. Pharynx wide, spherical. Male copulatory organ 27–40 (32; n = 10) long, comprising proximal funnel-shape base, with well-developed flange, coiled thin tube with about one complete ring; accessory piece rod shaped. Vaginal pore sclerotized, dextral; vaginal tube delicate, extending to seminal receptacle. Haptor 55–82 (69; n = 12) wide. Ventral anchor 28–33 (30; n = 28) and point 12–17 (15;

n = 28) with deeply incised base forming deep and superficial roots, straight shaft and point forming an angle of 90º. Dorsal anchor 38–43 (40; n = 15) long, 20–24 (22; n = 15) base, elongated superficial root, short to nonexistent deep root, tapered shaft, elongated recurved point. Ventral bar 19–25 (22; n = 13) long, with elongated distally bifurcated anteromedian projection and bifurcated edges; dorsal bar 35–41 (38; n = 15) long, with slightly expanded ends, delicate anteromedian flange. Hooks similar in shape and size, 10–14 (12; n = 46) long, each with upright thumb, shank comprising a single subunit, filamentous hook (FH) loop about 80% shank.

DISCUSSION

The specimens reported herein are conspecific with *P. pomadasys* by the absence of serration of lateral sclerites and the relative size of the clamps, with the two larger pairs positioned centrally in the haptor and the two smaller pairs in the outer positions. The present material differs from *Pseudotagia cupida* (Hargis, 1956) Yamaguti, 1963, previously reported in Brazil from *Haemulon sciurus* (Shaw, 1803) by Kohn et al. (1984) by the relative size of the three first pairs of clamps that are larger than the fourth and by the serration of the two valves of the clamps and by the number of spines in the genital atrium (8 to 9 in *P. pomadasys* and 6 in *P. cupida*). The measurements of the present material agree with the original description (Hernández-Vale et al. 2016).

Pseudotagia pomadasys was described from *H. corvinaeformis* (=*Pomadasys corvinaeformis*) from Guanajibo and Boquilla, Mayaguez, Puerto Rico (Caribbean) and Loíza, Puerto Rico (Atlantic Ocean) by Hernández-Vale et al. (2016). Suriano (1975) argued that species of *Pseudotagia* Yamaguti, 1963 were the only macrovalvitrematids that do not parasitize the gills of a sciaenid fish, since they have been found parasitizing the families Haemulidae and Serranidae, with great abundance in the former. In Brazil, two other species of the genus were recorded: *P. cupida* from *H. sciurus* and in *Diplectrum* sp. (Serranidae) and *Pseudotagia rubri* Luque, Amato & Takemoto, 1993 from *Orthopristis ruber* (Cuvier, 1830), both in the littoral of the state of Rio de Janeiro (Kohn et al. 1984, 1992, Luque et al. 1993, Cohen et al. 2013). The presence of *P. pomadasys* in the Southwest Atlantic Ocean represents a new geographical distribution for this species.

The monotypic *P. travassosi* is a remarkable diclidophorid due to the robustness of the body provided by the size of the haptor and its compounds. *Pseudoeurysorchis travassosi* was described by Caballero and Bravo-Hollis (1962) from the gills of *M. inornatus* from Sonora, Gulf of California, Mexico. Posteriorly, this species was reported from the gills of *I. conceptionis* in Peru, and *M. brevipinnis* from Mexico (Tantaleán et al. 1985, Pérez-Ponce de León et al. 1999, respectively). Our specimens are similar to *P. travassosi* based on its morphology and morphometry and the measurements of the present material agree with the type material collected in Mexico (Caballero and Bravo-Hollis 1962). *Haemulopsis corvinaeformis* represents a new host record for *P. travassosi*.

Acanthocercodes bullardi is reported in the present paper for the first time parasitizing the gills of a polynemid in South American waters. *Acanthocercodes* was proposed by Kritsky and Diggles (2015) for this species from Atlantic threadfin *P. octonemus* and is distinguished by the larger peduncular spines with a plate-like base. The distinguished feature of the species is the MCO as a broad tube with delicate walls, inconspicuous base and diagonal distal opening often with lateral spine-like projection. The three other species of the genus were also described from polynemid hosts.

Neodiplectanum mexicanum was found on the type host in the littoral of Rio de Janeiro and the morphology and morphometry of the present material are in agreement with previous descriptions (Mendoza-Franco et al. 2008, Domingues et al. 2011). The species is distinguished from other species of the genus by the morphology of the copulatory complex and the dorsal anchor. This species was originally described by Mendoza-Franco et al. (2008) in *Diplectanum* from *D. rhombeus* collected from the coast of Campeche State, Gulf of Mexico. Domingues et al. (2011) transferred it to *Neodiplectanum* as *N. mexicanum*, because it shows all diagnostic features so far proposed for *Neodiplectanum*, including non-articulated male copulatory organ and accessory piece, vaginal atrium heavily sclerotized, squamodiscs spinelike rodlets, and dorsal anchors with conspicuous superficial and deep roots. These features led the authors to resurrect the genus and include the material referred as *Diplectanum mexicanum* by Domingues and Boeger (2008). *Neodiplectanum mexicanum* was reported from Guaratuba Bay, Municipality of Guaratuba, Paraná, Brazil on *D. rhombeus*.

Aristocleidus Mueller, 1936 (Dactylogyridae) was proposed for *A. hastatus* from *M. saxatilis* from the Peace River near Fort Ogden, Florida, USA (Mueller 1936). The specimens collected from *D. rhombeus* from the littoral of state of Rio de Janeiro are easily identified as *A. hastatus* by the distinguished feature of the ventral anchor, with deeply incised base forming deep and superficial roots and straight shaft and point form an angle of 90º. Kritsky and Mendoza-Franco (2008) found *A. hastatus* on a new host, *Diapterus peruvianus* (Cuvier, 1830), and emended the diagnosis of *Aristocleidus* based on the newly collected material and the cotypes of *A. hastatus*. According to these authors, the possibility exists that *A. hastatus* was carried into the Peace River (type locality of the species) by its host from the marine environment and that the parasite species has marine rather than freshwater affinities. Kritsky and Mendoza-Franco (2008) and Mendoza-Franco et al. (2009) provided measurements of *A. hastatus* from different gerreid hosts, showing differences in the morphometry of the specimens collected in the Atlantic and Pacific Oceans, as well as in the Panama Canal (Mendoza-Franco et al. 2009, Table 1). They found differences in the length of the anchors between specimens of different host genus (35 to 39

in specimens from *Diapterus* spp. vs 40 to 48 in *Gerres* sp. and *Eugerres* sp.) The length of ventral anchor of the specimens collected from the littoral of Rio de Janeiro was smaller than those from Mexico, even in the same host (35 to 39 in specimens from Mexican *D. rhombeus* vs 28–33 in specimens from Brazilian *D. rhombeus*). Measurements of the bars in Brazilian material also show differences, with larger bars than Mexican and Panamanian material (Kritsky and Mendoza-Franco 2008, Mendoza-Franco et al. 2009, 2015). The finding of *A. hastatus* in the coast of Angra dos Reis, littoral of Rio de Janeiro confirms the adaptation of *Aristocleidus* spp. to different environments, considering the occurrence in marine, brackish and freshwater hosts (Kritsky and Mendoza-Franco, 2008, Mendoza-Franco et al. 2009, 2015).

ACKNOWLEDGEMENTS

The authors are grateful to Pedro José Diniz de Figueiredo from Central Nuclear Almirante Álvaro Alberto, Eletrobras, Eletronuclear, Angra dos Reis and Aderval Ferrari Vaz de Almeida from Laboratório de Monitoração Ambiental, Eletronuclear, Angra dos Reis, for the facilities and infrastructure offered to examine the fishes, and for the classification of the hosts and to Antonia Lucia dos Santos from FIOCRUZ for the assistance with the collection of parasites.

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Submitted: May 5, 2022
Accepted: October 26, 2022
Editorial responsibility: Antoine Pariselle

Author Contributions

SCC, MCNJ and MQC collected and prepared the parasite specimens. SCC performed morphometric analyses and identified the parasites. MQC analyzed the ecological parameters and contributed to the final manuscript. MCNJ and SCC discussed the results, co-wrote the text.

Competing Interests

The authors have declared that no competing interests exist.

How to cite this article

Cohen SC, Justo MCN, Cárdenas MQ (2022) New records of Monogenoidea (Platyhelminthes) from three marine fish species from the coast of Angra dos Reis, Rio de Janeiro, Brazil. Zoologia (Curitiba) 39: e22024. https://doi.org/10.1590/S1984-4689.v39.e22024

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