

A new species of *Cosmetocleithrum* (Monogenea, Dactylogyridae) from the gills of *Auchenipterichthys coracoideus* (Siluriformes, Auchenipteridae) from the Peruvian Amazonia

Una nueva especie de *Cosmetocleithrum* (Monogenea, Dactylogyridae) de las branquias de *Auchenipterichthys coracoideus* (Siluriformes, Auchenipteridae) de la Amazonía peruana

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Abstract

In this study, a new species of Monogenea, *Cosmetocleithrum amazonensis* n. sp., parasitizing the gills of the silurid *Auchenipterichthys coracoideus* (Eigenmann & Allen, 1942), is documented. *Cosmetocleithrum amazonensis* n. sp. is distinguished from all other congeners by possessing an elongated, sclerotized, and sinuous male copulatory organ (MCO) with poorly defined spirals, a sclerotized border at the base, and the distal region supported by the accessory piece. The accessory piece is a single, robust, and non-articulated plate with the MCO. This study presents the third record of a Monogenea species in an Auchenipteridae (Siluriformes) host from Peru.

Resumen

En este trabajo se registra una nueva especie de Monogenea, *Cosmetocleithrum amazonensis* n. sp., parasitando las branquias del silurido *Auchenipterichthys coracoideus* (Eigenmann & Allen, 1942). *Cosmetocleithrum amazonensis* n. sp. se distingue de todas las demás especies congéneres por poseer un órgano copulador masculino (OCM) tubo alargado, esclerotizado y sinuoso, con espirales poco definidos, base con borde esclerotizado y con la región distal apoyada sobre la pieza accesoria. La pieza accesoria es una placa única, robusta y no articulada con el OCM. En este estudio se presenta el tercer registro de una especie de Monogenea en un hospedero Auchenipteridae (Siluriformes) del Perú.

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Keywords:

Auchenipterid; Ectoparasite; Iquitos; Monogenea; Taxonomy; nueva especie.

Introduction

In South American fishes, fourteen species of Monogenea have been documented parasitizing the Auchenipteridae (Siluriformes) family. These parasites are attributed to the genera *Demidospermus* Suriano, 1983, and *Cosmetocleithrum* Kritsky, Thatcher, and Boeger, 1986. The reported occurrences are primarily concentrated in Brazil, they are: *Demidospermus bidiverticulatum* Suriano & Incorvaia, 1995, and *D. osteomystax* Tavernari, Takemoto, Lacerda & Pavanelli, 2011 were found parasitizing *Auchenipterus osteomystax* (Miranda-Ribeiro, 1918) (Cohen et al., 2013); *D. tocantinensis* Cohen, Justo, Gen & Boeger, 2000, and *D. osteomystax* Cohen, Justo, Gen & Boeger, 2000

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parasitized *A. nuchalis* (Spix & Agassiz, 1829) (Cohen et al. 2020). Additionally, *Cosmetocleithrum striatuli* Abdallah, Azevedo & Luque, 2012 in *Trachelyopterus striatulus* Steindachner, 1877 (Cohen et al. 2013); *C. bulbocirrus* Kritsky, Thatcher & Boeger, 1986 in *Ageneiosus ucayalensis* Castelnau, 1855 (Soares et al., 2018); *C. laciniatum* Yamada, Yamada, Da Silva & Dos Anjos, 2017 in *T. galeatus* (Yamada et al., 2017); *C. berecae* Cohen, Justo, Gen & Boeger, 2020, and *C. nunani* Cohen, Justo, Gen & Boeger, 2020 in *A. nuchalis*; *C. spathulatum* Yamada, Yamada & da Silva, 2020; *C. baculum* Yamada, Yamada & da Silva, 2020, and *C. galeatum* Yamada, Yamada & da Silva, 2020 in *T. galeatus* (Yamada et al., 2020). In Argentina, *D. uncusvalidus* Gutiérrez & Suriano, 1992 in *T. galeatus* (Linnaeus, 1766) has been reported, and in Peru, *D. centromochli* Mendoza-Franco & Scholz, 2009 in *Centromochlus heckeliim* (DeFilippi, 1853) has been reported. Until now, in Peru, only one species of Auchenipteridae (*C. heckeliim*) has been recognized as a host for monogenoideans. During a study on monogenoideans infecting fishes from the Pintuyacu stream, Loreto, a novel species belonging to *Cosmetocleithrum* was discovered parasitizing the gills of *Auchenipterichthys coracoideus* Eigenmann and Allen, 1942. The new species is described herein based on morphological characteristics (Mendoza-Palmero et al. 2019).

Material and methods

Thirteen specimens of *A. coracoideus*, with 7.1 ± 0.5 cm of standard length and 3.2 ± 0.9 g of weight, were obtained in July 2019, from the Pintuyacu stream, which is a tributary of the Itaya River, in Iquitos, Loreto, Peru ($04^{\circ}05'59.4''S$, $073^{\circ}27'13.8''W$).

The identification of fish hosts was conducted based on morphological characteristics following the methodology outlined by Carl et al. (2005). Live fish specimens were temporarily stored in plastic bags containing water and oxygen and transported to the "Laboratorio de Parasitología y Sanidad Acuicola" at the "Instituto de Investigaciones de la Amazonía Peruana" for parasitological examination. Gill arches were carefully removed and placed in vials filled with hot water ($65^{\circ}C$).

Subsequently, each vial was vigorously shaken, and 96% ethanol was added to preserve the samples. In the laboratory, the contents of each vial were examined under a stereomicroscope, and helminths were extracted from the gills or sediment using dissection needles. Some specimens were mounted on slides using Hoyer's medium to enhance visualization of soft tissues and sclerotized pieces. Additionally, other specimens were stained with Gomori's trichrome (Humason 1979, Boeger & Vianna 2006) and mounted in Canada balsam to facilitate observation of internal structures. Selected specimens were preserved in 96% ethanol for future DNA analyses. All procedures were conducted at the "Laboratorio de Parasitología y Sanidad Acuicola" of the "Instituto de Investigaciones de la Amazonía Peruana" (IIAP) in Iquitos, Peru.

Measurements of the monogenoideans were recorded in micrometers following the methodologies propo-

sed by Mizelle and Klucka (1953). Dimensions of organs and other structures represent the maximum measurement in dorso-ventral view; lengths of curved or bent structures (anchors, bars, male copulatory organ [MCO], and accessory piece) denote straight-line distances between extreme ends. Mean values are presented alongside the range and the number (n) of specimens measured, in parentheses. Illustrations were prepared with the assistance of a microprojector.

Type specimens and vouchers were deposited in the Helminthological Collection of the Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos (MUSM), Lima, Peru. Ethical approval from an ethics committee and relevant licenses for working with fish species were obtained in accordance with the following resolutions: Resolution No132-2014-GRL-DIREPRO; Resolution No21-2016 GRL-DIREPRO; and PTH-068-16-PEC-SANIPES.

Taxonomy

CLASS MONOGENEA VAN BENEDEN, 1858

SUBCLASS MONOPISTHOCOTYLEA, ODHNER, 1912

ORDER DACTYLOGYRIDEA BYCHOWSKY, 1937

DACTYLOGYRIDAE BYCHOWSKY, 1933

COSMETOCLEITHRUM KRITSKY, THATCHER & BOEGER, 1986

Cosmetocleithrum amazonensis n. sp.

(Figures 1–10)

Type-host. *Auchenipterichthys coracoideus* (Eigenmann & Allen, 1942), (Siluriformes: Auchenipteridae).

Type-locality. Pintuyacu stream, Iquitos, Peru, July 2019 ($04^{\circ}05'59.4''S$, $073^{\circ}27'13.8''W$).

Type-material. The holotype (MUSM-HEL 4423), 3 paratypes (MUSM-HEL 4422a-c) and 2 vouchers (MUSM-HEL 4422 d-e). The remaining 6 specimens were deposited in the collection of the "Laboratorio de Parasitología y Sanidad Acuicola" of the "Instituto de Investigaciones de la Amazonía Peruana" 6 voucher specimens (LPYSA M009a-f).

Site of infestation: Gill filaments.

Etymology. The specific name refers to the locality where the host and parasite were collected (Peruvian Amazon).

Description

[Based on 12 specimens: 4 stained with Gomori's trichrome and 8 mounted in Hoyer's medium.] Body large and elongated, 543 (488–706; n = 12) long, greatest width 213 (119–301; n = 12), cephalic lobes poorly developed. Four pairs of head organs; cephalic glands unicellular, distributed lateral and posterolateral to the pharynx. Eyes inconspicuous; scarce accessory granules near the pharynx. Pharynx muscular, subspherical, 39 (38–54; n = 12) wide; esophagus short, two intestinal

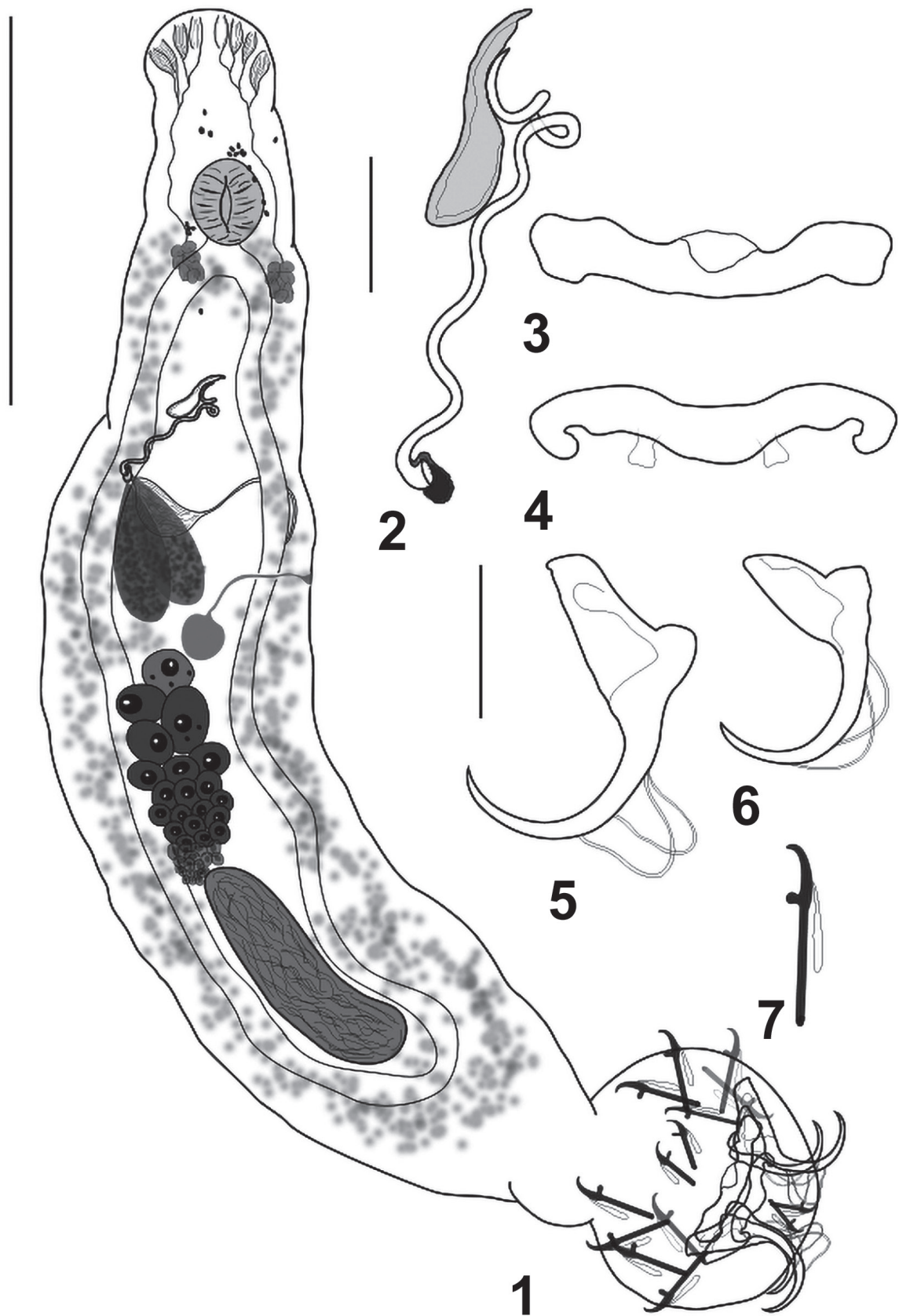


Figure 1 – 7. *Cosmetocleithrum amazonensis* n. sp. **1.** Holotype, whole mount, ventral view; **2.** Copulatory complex; **3.** Ventral bar; **4.** Dorsal bar; **5.** Ventral anchor; **6.** Dorsal anchor; **7.** Hook pair 4. Scale bars: 1 = 150 µm. 2 – 4 = 10 µm; 5 – 7 = 15 µm.

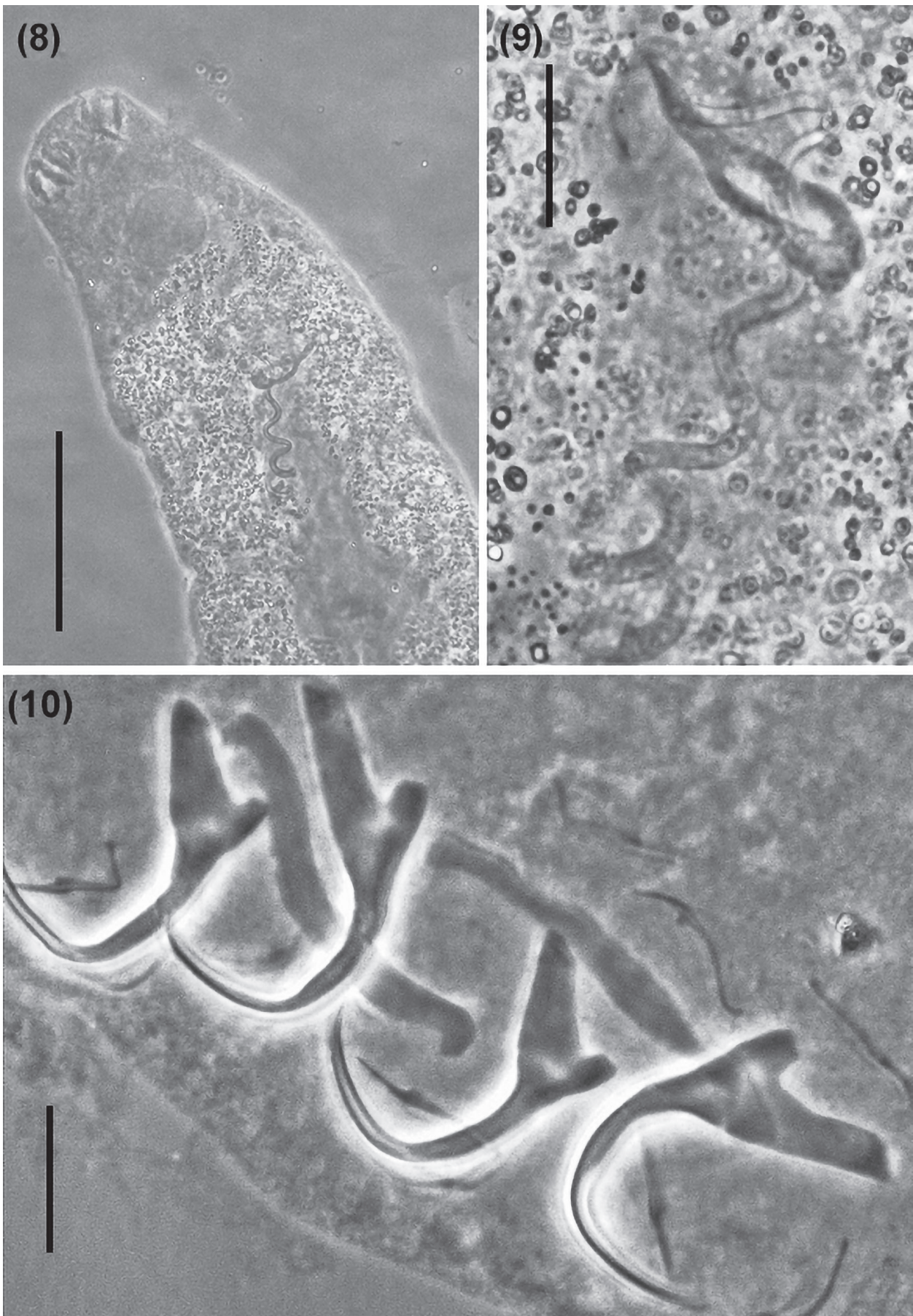


Figure 8 – 10. Light photomicrographic of *Cosmetocleithrum amazonensis* n. sp. **(8)**. Anterior part of *Cosmetocleithrum amazonensis* n. sp. **(9)**. Copulatory complex. **(10)**. Structures of the haptor. Scale bars: A = 100 μ m; B = 10 μ m; C = 15 μ m.

caeca, confluent posteriorly, lacking diverticula. Peduncle long, narrow; haptor, globose, 79 (53–115; n = 10) long, 115 (66–170; n = 12) wide. Ventral anchor 35 (23–38; n = 10) long, 36 (24–38; n = 10) wide, with well differentiated roots, superficial root much longer than deep root; curved shaft and point. Dorsal anchor 25 (20–27; n = 10) long, 27 (21–29; n = 10) wide, with robust roots. Superficial root longer than deep root; curved shaft and point. Ventral bar, 53 (43–55; n = 10) long, 12 (8–13; n = 10) wide, expanded laterally, with medial widening covered by a fold. Dorsal bar 44 (41–46; n = 10) long, 6 (4–8; n = 10) wide, with tapering ends and conspicuous widening along the shaft with two submedial short projections directed posteriorly, 4 (3–6; n = 10) long. Hooks 18 (15–19; n = 20) long, with Ancyrocephalinae distribution, similar in shape, erect thumb, straight shaft, short point; 5 ventral pairs, two dorsal pairs (hook pair 6 and 7). Testis dorsal, postgermarial, ovate; germarium ovate; vas deferens looping left of intestinal caecum; seminal vesicle elongate; two elongated prostatic reservoirs. Male copulatory organ 126 (82–132; n = 10) long, elongate sclerotized sinuous tube, with poorly defined coil, base with sclerotized fringe. Accessory piece sclerotized, 35 (25–54; n = 10) long, non-articulated to MCO, comprising a single plate. Seminal receptacle sac-like. Vagina sinistral, a thin and delicate elongated tube that joins the seminal receptacle. Eggs, ootype, uterus not observed. Vitellaria coextensive with caeca.

Remarks. *Cosmetocleithrum amazonensis* n. sp. share some characters common to all previously described species of *Cosmetocleithrum*: eyes absent, elaborate accessory piece not articulated to cirrus base and dorsal bar with two submedial projections directed posteriorly arising from anterodorsal surface of bar. Although *Paracosmetocleithrum* Acosta, Scholz, Blasco-Costa, Alves & Silva, 2018 also has these characteristics, species belonging to *Cosmetocleithrum* lack of a well-developed ornamentation in the middle portion of the ventral bar, and a sclerotized patch on the surface of the dorsal bar with an inconspicuous medial process. The new species resembles *C. rarum* Kritsky, Thatcher & Boeger, 1986 found in *Trachelyopterus galeatus* by presenting the MCO as an elongate sinuous tube and by the shape of the accessory piece that is a single plate. However, it can be distinguished from *C. rarum* and all other congeneric species by possessing a MCO quite long and sinuous, with the proximal region lying on the accessory piece and by presenting a ventral anchor with elongated superficial root.

Discussion

Twenty-two species of monogenoideans affiliated with *Cosmetocleithrum* have been documented in siluriform fishes, with 11 found in Doradidae species, one in Erythrinidae, one in Pimelodidae, and nine exclusively described in Auchenipteridae (Soares et al., 2018; Morey et al., 2019; Yamada et al., 2020). With the findings of our study, the tally of *Cosmetocleithrum* species increases to 23, and the count of monogenoidean species identified in auchenipterids rises from nine to ten.

In Peru, 14 genera and 28 species of Auchenipteridae have been documented (Ortega et al., 2012). To date, only one monogenoidean species has been recorded from an Auchenipteridae host collected in Peru. Our study presents the second documented instance of a monogenoidean species in an auchenipterid host from Peru.

The Peruvian Amazon remains relatively underexplored compared to countries like Brazil, but recent years have revealed it as a habitat for new monogenoidean species. Recent research, such as the description of five new species (Morey et al., 2019a; Morey et al., 2019b), including the most recent additions to the *Cosmetocleithrum* genus (Morey, Cachique & Babilonia, 2019), underscores this assertion. Given the substantial number of species yet to be investigated, the potential for discovering new monogenoideans is considerable.

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