

**A NEW SPECIES OF *Cosmetocleithrum* FROM THE GILLS OF
Auchenipterichthys coracoideus FROM THE PERUVIAN AMAZONIA**

(Uma nova espécie de *Cosmetocleithrum* das brânquias de *Auchenipterichthys coracoideus* da Amazônia peruana)

Germán Augusto Murrieta MOREY*; Carlos Alfredo Tuesta ROJAS; Luciano Alfredo Rodríguez CHU; Jorge Armando Ayarza RENGIFO

Instituto de Investigaciones de la Amazonía Peruana, Laboratorio de Parasitología y Sanidad Acuícola,
Av. José A. Quiñones, Km 2.5 – San Juan Bautista, Iquitos, Loreto, Peru. 0784.

*E-mail: germantiss1106@gmail.com

ABSTRACT

Among the fish species belonging to Auchenipteridae, fourteen species of monogenoids were reported. To date, one species of auchenipterid has been reported in Peru as a monogenoid host. Fish were obtained in July 2019 from the, the Pintuyacu stream, which is an affluent of the Itaya River, in Iquitos, Peru. Specimens were prepared on slides using Hoyer's medium to clarify soft tissues and allows better visualization of the sclerotized pieces. Other specimens were stained with Gomori's trichrome and prepared in Canada balsam to determine internal structures. A new species of Cosmetocleithrum Kritsky, was found parasitizing the gills of Auchenipterichthys coracoideu. Cosmetocleithrum amazonensis n. sp. can be distinguished from all other congeneric species by possessing an elongated and sclerotized male copulatory organ (MCO), and sinuous tube with poorly defined coils, base with a sclerotized border, and distal region lying on the accessory piece. The accessory piece is a single and robust plate, which is not articulated with the MCO. Thus, this study presents the second record of a species of monogenoid in an auchenipterid host from Peru.

Keywords: Auchenipterid, ectoparasite, Iquitos, monogenoids, taxonomy.

RESUMO

Dentre as espécies de peixes pertencentes a Auchenipteridae, foram relatadas quatorze espécies monogenóides. Até o momento, uma espécie de auchenipterídeo foi relatada no Peru como hospedeiro de monogenóides. Os peixes foram obtidos em julho de 2019, no riacho Pintuyacu, afluente do rio Itaya, em Iquitos, Peru. Os espécimes foram preparados em lâminas em meio de Hoyer para clarificar os tecidos moles e permitir melhor visualização dos espécimes esclerotizados. Outros espécimes foram corados com tricrômio de Gomori e montados em bálsamo do Canadá para determinação de estruturas internas. Uma nova espécie de Cosmetocleithrum Kritsky, foi encontrada parasitando as brânquias de Auchenipterichthys coracoideus. Cosmetocleithrum amazonensis n. sp. distingue-se de todas as outras espécies congêneres por possuir órgão copulador masculino (MCO) alongado e esclerotizado e tubo sinuoso, com verticilos mal definidos, base com borda esclerotizada e região distal apoiada na peça acessória. A peça acessória é uma placa única e robusta, que não é articulada com o MCO. Desta forma, este estudo apresenta o segundo registro de uma espécie de monogenóide em um hospedeiro auquenipterídeo do Peru.

Palabras clave: Auquenipterídeo, ectoparasito, Iquitos, monogenoides, taxonomia.

INTRODUCTION

Concerning Auchenipteridae species from South America, fourteen species of Monogenoidea were reported, belonging to the genera *Demidospermus* Suriano (1983) and *Cosmetocleithrum* Kritsky, Thatcher & Boeger, 1986. The reports are concentrated in Brazil: *D. bidiverticulatum* (SURIANO and INCORVAIA, 1995) and *D. osteomystax* Tavernari, Takemoto, Lacerda & Pavanelli (2011) from *Auchenipterus osteomystax* (MIRANDA-

RIBEIRO, 1918) (COHEN *et al.*, 2013); *D. tocantinensis* Cohen, Justo, Gen & Boeger, 2000 and *D. osteomystax* Cohen, Justo, Gen & Boeger, 2000 from *A. nuchalis* (SPIX and AGASSIZ, 1829) (Cohen *et al.*, 2020). *Cosmetocleithrum striatuli* Abdallah, Azevedo & Luque, 2012 from *Trachelyopterus striatulus* (STEINDACHNER, 1877) (COHEN *et al.*, 2013); *C. bulbocirrus* Kritsky, Thatcher & Boeger, 1986 from *Ageneiosus ucayalensis* Castelnau, 1855 (SOARES *et al.*, 2018); *C. laciniatum* Yamada, Yamada, Da Silva & Dos Anjos, 2017 from *T. galeatus* (YAMADA *et al.*, 2017); *C. berecae* Cohen, Justo, Gen & Boeger, 2020 and *C. nunani* Cohen, Justo, Gen & Boeger, 2020 from *A. nuchalis*; *C. spathulatum* Yamada, Yamada & da Silva, 2020; *C. baculum* Yamada, Yamada & da Silva, 2020 and *C. galeatum* Yamada, Yamada & da Silva, 2020 from *T. galeatus* (YAMADA *et al.*, 2020); in Argentina: *Demidospermus uncusvalidus* Gutiérrez & Suriano, 1992 from *T. galeatus* (LINNAEUS, 1766), and in Peru: *D. centromochli* Mendoza-Franco & Scholz, 2009 from *Centromochlus heckeliim* (DEFILIPPI, 1853).

To date, one species of Auchenipteridae (*C. heckeliim*) was reported as a monogenoid host in Peru s. During a study on infections caused by monogenoids in fish from the Pintuyacu stream, a new species belonging to *Cosmetocleithrum* was found parasitizing the gills of *Auchenipterichthys coracoideus* (EIGENMANN and ALLEN, 1942), (Siluriformes: Auchenipteridae). The new species is described herein based on morphological features.

MATERIAL AND METHODS

Collection of fish and parasites

Thirteen specimens of *A. coracoideus*, with 7.1 ± 0.5 cm standard length and 3.2 ± 0.9 g of weight, were obtained in July 2019 from the Pintuyacu stream, which is an affluent of the Itaya River, in Iquitos, Peru ($04^{\circ}05'59.4''$ S, $073^{\circ}27'13.8''$ W). Fish hosts were identified based on morphological characters according to Carl *et al.* (2005). Fish were kept alive in plastic bags with water and oxygen and transported to the “Laboratorio de Parasitología y Sanidad Acuicola” of the “Instituto de Investigaciones de la Amazonía Peruana”, where they were maintained until their parasitological examination. Gill archers were removed and placed in vials containing hot water (65°C). Each vial was vigorously shaken and 96% ethanol was added to conserve the samples.

Parasite processing

In the laboratory, the content of each vial was examined using an estereomicroscope and helminthes were removed from the gills or sedimented using dissection needles. Some specimens were prepared on slides using Hoyer’s medium to clarify soft tissues and allows better visualization of the sclerotized pieces. Other specimens were stained with Gomori’s trichrome (HUMASON and FREEMAN, 1979; BOEGER and VIANNA, 2006), and prepared in Canada balsam to observe internal structures.

Some specimens were preserved in ethanol 96% for future DNA analyses. All procedures were conducted in the “Laboratorio de Parasitología y Sanidad Acuicola” of the “Instituto de Investigaciones de la Amazonía Peruana” (IIAP) located in Iquitos, Peru. Measurements of the monogenoids are presented in micrometers and were obtained according

to the procedures proposed by Mizelle and Klucka (1953). Dimensions of organs and other structures represent the greatest measurement in dorso-ventral view. Lengths of curved or bent structures (anchors, bars, male copulatory organ [MCO], and accessory piece) represent straight-line distances between extreme ends.

The mean is followed by the range and the number (n) of specimens measured, in parentheses. Illustrations were prepared with the aid of a microprojector. Specimens and vouchers were deposited in the Helminthological Collection of the Museum of Natural History at the San Marcos University (MUSM) located in Lima, Peru. Statement on ethical approval from an ethics committee and license for working with fish species were considered according to the following resolutions: Resolution n° 132-2014-GRL-DIREPRO; Resolution n° 21-2016 GRL-DIREPRO; and PTH-068-16-PEC-SANIPES.

Statistical Analysis

In the present study, descriptive statistics were used, represented in figures that describe the main morphological and anatomical characteristics, which allowed describing the new species of parasite collected from the gills of the fish species. The maximum and minimum range, as the average size of the sclerotized structures that characterized the described species, were also calculated by using Microsoft Excel spreadsheets.

RESULTS AND DISCUSSION

Class Monogenoidea Bychowsky, 1937

Subclass Polyonchoinea Bychowsky, 1937

Order Dactylogyridea Bychowsky, 1937

Dactylogyridae Bychowsky, 1933

***Cosmetocleithrum* Kritsky, Thatcher & Boeger, 1986**

***Cosmetocleithrum amazonensis* n. sp.**

Host type: *Auchenipterichthys coracoideus* (EIGENMANN and ALLEN, 1942), (Siluriformes: Auchenipteridae).

Locality type: Pintuyacu stream, Iquitos, Peru, July 2019 (04°05'59.4" S, 073°27'13.8" W).

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

Infestation site: Gill filaments.

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

Anatomic organs and sclerotized structures of *Cosmetocleithrum amazonensis* n. sp are presented in Fig. 01.

Description (Fig. 01)

[Based on 12 specimens: 4 stained with Gomori's trichrome and 8 prepared in Hoyer's medium.] Large and elongated body: 543 (488–706; n=12) long, greatest width 213 (119–301; n=12), cephalic lobes poorly developed. Four pairs of head organs; unicellular cephalic glands,

distributed lateral and posterolateral to the pharynx. Inconspicuous eyes; scarce accessory granules near to the pharynx.

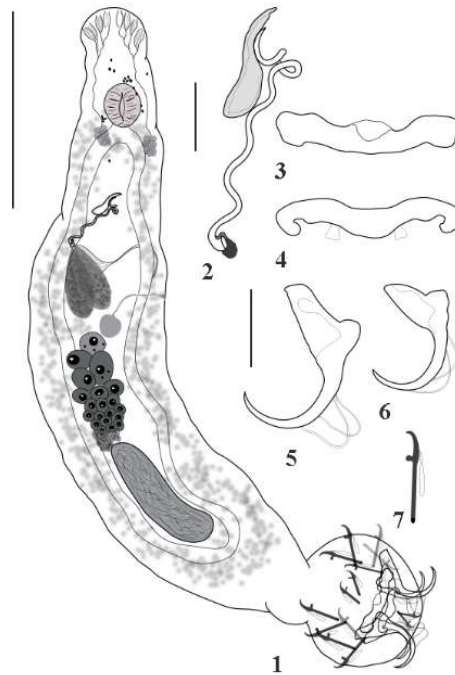


Figure 01: Ventral view of holotype of *Cosmetocleithrum amazonensis* n. sp. from the gills of *Auchenipterichthys coracoideus*.

Obs.: 1. Holotype, whole mount, ventral view; 2. Copulatory complex; 3. Ventral bar; 4. Dorsal bar; 5. Ventral anchor; 6. Dorsal anchor; 7. Hook pair. Scale bars: 1 = 150 μ m. 2 – 4 = 10 μ m; 5-7 = 15 μ m.

Pharynx muscular, subspherical, 39 (38–54; n=12) wide; short esophagus, two intestinal caeca, posterior confluent, lacking diverticula. Long and narrow peduncle; 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 the 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 the deep root; curved shaft and point. Ventral bar, 53 (43–55; n=10) long, 12 (8–13; n=10) wide, laterally expanded 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, postgerminal, ovate; germarium ovate; vas deferens looping left of intestinal caecum; elongated seminal vesicle; two elongated prostatic reservoirs. Long male copulatory organ 126 (82–132; n=10), elongated and sclerotized sinuous tube, with poorly defined coil, and base with sclerotized fringe. Sclerotized accessory piece, 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.

Light photomicrographics of *Cosmetocleithrum amazonensis* n. sp. collected from the gills of *Auchenipterichthys coracoideus* are presented in Fig. 02.

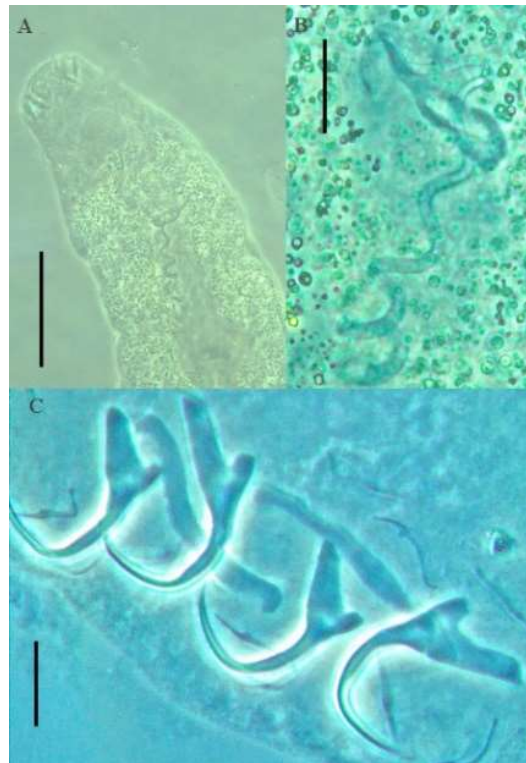


Figure 02. Light photomicrographic of *Cosmetocleithrum amazonensis* n. sp.

Obs.: A = Anterior part of *Cosmetocleithrum amazonensis* n. sp.; B = Copulatory complex; C = Structures of the haptor. Scale bars: A = 100µm; B = 10µm; C = 15µm.

Remarks

Cosmetocleithrum amazonensis n. sp. share some characters common to all previously described species of *Cosmetocleithrum*: absence of eyes, elaborate accessory piece not articulated to cirrus base, and dorsal bar with two submedial projections directed posteriorly arising from the bar anterodorsal surface. Although *Paracosmetocleithrum* Acosta, Scholz, Blasco-Costa, Alves e and 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 *Cosmetocleithrum rarum* Kritsky, Thatcher & Boeger, 1986 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 quite long and sinuous MCO with the proximal region lying on the accessory piece, and by presenting a ventral anchor with elongated superficial root.

Twenty-two species of monogenoids belonging to *Cosmetocleithrum* have been reported in siluriform fishes. From those, 11 were found in species of doradis, one in a species of erythrinid, one in a pimelodid host, and nine were exclusively described in auchenipterids (SOARES *et al.*, 2018; MOREY *et al.*, 2019 and YAMADA *et al.*, 2020). Therefore, with the results obtained in the present study, the number of species of *Cosmetocleithrum* increased from

twenty-two to twenty-three. Moreover, the number of species of monogenoids found in auchenipterids also is increased, from nine to ten species.

In Peru, 14 genera and 28 species of auchenipterids were reported (ORTEGA *et al.*, 2012). To date, just one species of monogenoid was found concerning a host belonging to Auchenipteridae collected in Peru. Thus, in the present study, we present the second record of a species of monogenoid in an auchenipterid host from Peru.

CONCLUSIONS

The Peruvian Amazonia is a territory that has been little explored compared to other countries like Brazil. However, in recent years, it has shown to host new species of monogenoids. The incidence of a new species of Monogenoidea (*Cosmetocleithrum amazonensis* n. sp.) from the gills of fish species belonging to a little explored Family indicates the need to continue taxonomic studies in the Peruvian Amazonia aiming at increasing the records of new occurrences of parasites in fish as the number of new species discovered and described increases.

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