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# *Bicentenariella* n. g. (Monogenea: Dactylogyridae) including descriptions of three new species and two new combinations from serranid fishes (Actinopterygii: Serranidae: Anthiinae) in the South American Pacific Ocean

**Celso L. Cruces · Jhon D. Chero · Gloria Sáez · José L. Luque**

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**Abstract** *Bicentenariella* **n. g.** is proposed to accommodate three new species of dactylogyrid monogeneans found on the gills of the threadfin bass *Pronotogrammus multifasciatus* Gill (Perciformes: Serranidae) from the Southeastern Pacific Ocean off Peru: *Bicentenariella claudiae* **n. sp.** (type-species), *B. sinuosa* **n. sp.** and *B. puertopizarroensis* **n. sp.** *Bicentenariella* **n. g.** is mainly characterised by possessing a broadly X-shaped dorsal bar, which has the anterior arms longer than posterior ones and by having a ventral bar with two medial projections. *Bicentenariella* **n. g.** is also characterised by having: (i) anchors equal, each with elongate superficial root and short deep root; (ii) an haptor with bilaterally paired lobes, lacking haptoral reservoirs; (iii) hooks with protruded obtuse thumb and undilated shank; (iv) a tubular tapered-shaped male copulatory organ with basal flap bifurcated or not (MCO), lacking accessory piece; (v) a delicate membrane associated with the shaft of the MCO present or absent; (vi) a muscular trumpet-shaped vagina, vaginal aperture dextrolateral; (vii) eyespots absent, accessory chromatic granules present; and (viii) a not lobulated testis. *Bicentenariella claudiae* **n. sp.** is characterised by having a MCO with whip-shaped distal end and a rod-shaped ventral bar with hatchet-shaped lateral ends. *Bicentenariella sinuosa* **n. sp.** is typified by possessing a MCO with an irregular filamentous membrane surrounding its shaft and a dumbbell-shaped ventral bar. *Bicentenariella puertopizarroensis* **n. sp.** can be differentiated from its congeners by having a tubular-shaped MCO with twisted distal end and a narrow W-shaped ventral bar. *Parancylodiscoides peruensis* Cruces, Chero, Sáez & Luque, 2017 from *Hemanthias peruanus* (Steindachner) and *P. signiferi* Cruces, Chero, Sáez & Luque, 2017 from *H. signifer* (Garman), are transferred to *Bicentenariella* **n. g.** as *B. peruensis* **n. comb** and *B. signiferi* **n. comb.**, respectively.

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## Introduction

The Serranidae includes 556 species of marine fishes occurring in tropical and temperate oceans. Commonly known as sea basses (groupers and fairy basslets), the family currently contains 75 genera.

Despite the Serranidae are relatively common and have relatively wide geographic distributions, the diversity of the dactylogyrid fauna infecting them is comparatively poorly known (Cruces et al., 2017a, 2020). To date, members of four dactylogyrid genera have been reported from serranid hosts; these are *Dactylogyrus* Diesing, 1850, *Haliotrema* Johnston & Tiegs, 1922, *Parancylodiscoides* Caballero y Caballero & Bravo-Hollis, 1961, and *Pronotogrammella* Cruces, Chero, Sáez & Luque, 2020 (Monaco & Mizelle, 1955; Young, 1968; Justine, 2007a, b; Justine & Sigura, 2007; Justine & Vignon, 2009; Dang et al., 2010; Kritsky & Bakenhaster, 2016; Nitta & Nagasawa, 2018; Cruces et al., 2017a, 2020).

During a parasitological survey of helminths infecting marine fishes from northern Peru, three new species of a new genus of the Dactylogyridae, *Bicentenariella* **n. gen.**., were found infecting the gills of the threadfin bass, *Pronotogrammus multifasciatus* Gill (Actinopterygii: Serranidae), a demersal actinopterygian endemic to Eastern Pacific, which inhabits rough bottom and feeds on small planktonic crustaceans (Eschmeyer et al. 1983; Froese & Pauly, 2021). These three new species are described herein. In addition, *Parancylodiscoides peruensis* Cruces, Chero, Sáez & Luque, 2017 and *P. signiferi* Cruces, Chero, Sáez & Luque, 2017 were transferred to the new genus as *Bicentenariella peruensis* **n. comb.** and *B. signiferi* **n. comb.**, respectively.

## Materials and methods

Fish were collected from January 2018 through February 2019 from the coastal zone of Puerto Pizarro, Tumbes, Peru (3°29'S, 80°24'W), using gillnets and were dissected immediately after capture. Gill arches were immediately removed and placed in vials containing heated sea water (60°C). Each vial was vigorously shaken, and formalin was added to obtain a 4% solution. In the laboratory, the contents of each vial were examined under a dissecting microscope and monogeneans were removed from the gills or sediment using small probes. Some specimens were stained with Gomori's trichrome, clarified in eugenol, and mounted in Canada balsam. Other specimens were mounted in Gray & Wess medium (Humason 1979) for the study of sclerotised structures. Specimens were examined and photographed using a compound Olympus™ BX51 photomicroscope equipped with normal light and differential interference contrast microscopy (DIC) optics and drawings were made with the aid of a drawing tube. Measurements are in micrometres, unless otherwise indicated, using straight-line distances between extreme points of the structures measured and are expressed as the range followed by the mean and number (n) of structures measured in parentheses. Body length represents the length of the body proper with the haptor. The numbering of hook pairs follows that recommended by Mizelle (1936) and Mizelle & Price (1963). Fishes were identified employing the keys of Peruvian marine fishes of Chirichigno & Vélez (1998) and Chirichigno & Cornejo (2001). The abbreviations *P.* and *Pr.* for the parasites (*Parancylodiscoides* and *Pronotogrammella*) and *Po.* for the host (*Pronotogrammus*) are used to avoid doubt as to the genera.

For comparison, the following types and vouchers of dactylogyrids deposited in the Nacional Collection of Helminths, Institute of Biology, National Autonomous University of Mexico (CNHE), Mexico, in the Helminthological Collection of the National Museum of Natural History, Smithsonian Institution (USNM), USA and in the Helminthological Collection of the Museum of Natural History at the San Marcos University (MUSM), Peru, were studied: *Haliotrema cromileptis* Young, 1968 (USNM 1357003, holotype; USNM 1357004, paratype); *H. epinepheli* Young, 1968 (USNM 1357005, holotype; USNM 1357006, paratype); *P. peruensis* (MUSM 3480, holotype; MUSM 3481–3507, paratypes); *P. signiferi* (MUSM 3508, holotype; MUSM 3509–3539, paratypes); *P. chaetodipteri* Caballero & Bravo-Hollis, 1961 (MUSM 3247, voucher); *Pronotogrammella boegeri* Cruces, Chero, Sáez & Luque, 2020 (MUSM 4430, holotype; MUSM 4431a-j, paratypes); *Pr. multifasciatus* Cruces, Chero, Sáez & Luque, 2020 (MUSM 4434, holotype; MUSM 4435a-b, paratypes); and *Pr. scholzi* Cruces, Chero, Sáez & Luque, 2020 (MUSM 4432, holotype; MUSM 4433a-f, paratypes). The type-material was deposited in the MUSM.

To comply with the regulations set out in article 8.5 of the amended 2012 version of the *International Code of Zoological Nomenclature* (ICZN, 2012), details of all new taxa have been submitted to ZooBank. For each new taxon, the Life Science Identifier (LSID) is reported in the taxonomic summary.

**Order Dactylogyridea Bychowsky, 1937**

**Family Dactylogyridae Bychowsky, 1933**

***Bicentenariella* n. g.**

Diagnosis

Body fusiform, slightly flattened dorsoventrally, comprising body proper (cephalic region, trunk, and peduncle) and haptor. Tegument thin, surface smooth. One inconspicuous terminal and 2 bilateral cephalic lobes; 3 pairs of bilateral head organs. Cephalic glands unicellular, anterior and posterolateral to pharynx. Eyespots absent; accessory chromatic granules present. Mouth subterminal, midventral; pharynx muscular, glandular; oesophagus short. Common genital pore midventral, near level of intestinal bifurcation. Gonads intercaecal. Testis dorsal and posterior to ovary; seminal vesicle a dilation of vas deferens; one or two prostatic reservoirs. Male copulatory organ (MCO) tubular, sclerotized, with basal flap bifurcated or not, lacking accessory piece. Delicate membrane associated with shaft of MCO present or absent. Ovary entire, dextral to anterior portion of testis; oviduct, uterus not observed. Vaginal aperture dextrolateral; vagina muscular, trumpet-shaped, emptying to seminal receptacle. Vitelline follicles dense, coextensive with intestinal caeca. Haptor with bilaterally paired lobes, lacking haptoral reservoirs, armed with 2 pairs of anchor-bar complexes and 7 pairs of hooks with ancyrocephaline distribution *sensu* Mizelle (1936). Anchors equal; each with elongate superficial root and short deep root. Ventral bar elongate with two medial projections (mp); dorsal bar with broadly X-shaped, with anterior arms longer than posterior arms. Hooks with undilated shanks and protruded obtuse thumb. Parasites of gills of serranid fish species.

*Type-species*: *Bicentenariella claudiae* **n. sp.**

*Other species*: *Bicentenariella sinuosa* **n. sp.**; *Bicentenariella puertopizarroensis* **n. sp.**; *Bicentenariella peruensis* (Cruces, Chero, Sáez & Luque, 2017) **n. comb.** and *Bicentenariella signiferi* (Cruces, Chero, Sáez & Luque, 2017) **n. comb.**

*ZooBank registration*: The Life Science Identifier (LSID) for *Bicentenariella* **n. g.** is urn:lsid:zoobank.org:act: B44F36FB-0278-47EC-8BA7-EE6EED23032B

*Etymology*: The genus name refers to commemoration of the 200th anniversary of the Independence of the Republic of Peru (South America). The name is appended to the diminutive *-ella* and should be treated as feminine.

Remarks

*Bicentenariella* **n. g.** differs from all other dactylogyrid genera mainly by the possession of a broadly X-shaped dorsal bar, which has the anterior arms longer than posterior arms and by having a ventral bar with two medial projections. In addition, *Bicentenariella* **n. g.** is also characterised by the following features: (i) anchors equal, each with elongate superficial root and short deep root; (ii) an haptor with bilaterally paired lobes, lacking haptoral reservoirs; (iii) hooks with protruded obtuse thumb and undilated shank; (iv) an intestinal ceca confluent posteriorly; (v) a tubular tapered-shaped MCO with basal flap bifurcated or not, lacking accessory piece, with delicate membrane associated with the shaft of the MCO present or absent; (vi) a muscular trumpet-shaped vagina, vaginal aperture dextrolateral; (vii) eye-spots absent, accessory chromatic granules present; and (viii) a non-lobulated testis. *Bicentenariella* **n. g.** most closely resembles *Parancylodiscoides* Caballero y Caballero & Bravo-Hollis, 1961, which includes three species parasitizing ephippid fishes and a species that infect serranid fishes. Members of both genera share the following features: (i) a copulatory complex without accessory piece; (ii) dissimilar dorsal and ventral bars; and (iii) anchors equal. However, and in addition to the aforementioned distinguishing features (broadly X-shaped dorsal bar with the anterior arms longer than posterior arms and a ventral bar with two medial projections), *Bicentenariella* **n. g.** differs from *Parancylodiscoides* by its species usually having a haptor lacking haptoral reservoirs (two pairs of haptoral reservoirs present in *Parancylodiscoides* spp.); a trumpet-shaped vagina (fusiform in *Parancylodiscoides* spp.); a dextrolateral vaginal aperture (a dextroventral vaginal aperture in *Parancylodiscoides* spp.); a tubular MCO (J-shaped in *Parancylodiscoides* spp.); a base of the MCO with bifurcated or not flap directed posteriorly (bifurcated or not flap directed anteriorly in *Parancylodiscoides* spp.); and a non-lobulated testis (testis lobulated in *Parancylodiscoides* spp.).

Species of *Bicentenariella* **n. gen.** slightly resemble *Pronotogrammella* spp. by having a MCO without an accessory piece, hooks with protruding thumbs and undilated shank, dissimilar dorsal and ventral bars, a dextral vaginal pore, two intestinal caeca lacking diverticula and united posteriorly to the gonads, and an ovary dextral to the testis (Cruces et al. 2020). However, *Bicentenariella* **n. g.** differs from *Pronotogrammella* by its species having anchors equal (rather than dissimilar as in *Pronotogrammella* spp.); ventral anchors without an accessory anchor sclerite articulated to the tip of the superficial roots (present in in *Pronotogrammella* spp.); and accessory chromatic granules at cephalic area (absent in *Pronotogrammella* spp.).

***Bicentenariella claudiae* n. sp.**

*Type-host*: *Pronotogrammus multifasciatus* Gill (Perciformes: Serranidae), threadfin bass.
*Type-locality*: Puerto Pizarro (3°29'S, 80°24'W), Tumbes, Peru, South America.
*Type-material*: Holotype (MUSM is 4715); 18 paratypes (MUSM is 4716a-r).
*Site in host*: Gill filaments.
*ZooBank registration*: The Life Science Identifier (LSID) for *Bicentenariella claudiae* **n. g., sp.** is urn:lsid:zoobank.org:act: 344B7340-C149-421E-BE80-1F9891D0B0D6
*Etymology*: This species is named in honor to Dr. Cláudia Portes Santos (Oswaldo Cruz Foundation, FIOCRUZ, Brazil) in recognition to her valuable contribution to the Neotropical Icthyioparasitology.

Description (Fig. 1A–H, Fig. 4A)

[Based on 8 specimens mounted in Gray and Wess medium and 11 stained with Gomori's trichrome.] Body elongate (Fig. 1A), 496–578 (528; n = 19) long; greatest width 108–127 (117; n = 19) usually at level of testis. Cephalic region slightly broad; cephalic lobes moderately developed; bilateral pair of cephalic glands at pre and postpharyngeal level. Pharynx spherical, in greatest width 28–35 (32; n = 11). Peduncle broad, short to elongate. Haptor subrectangular, 53–63 (56; n = 11) long; 80–96 (89; n = 11) wide; group of well-developed secretory gland-cells lying on peduncle; ventral extrinsic adductor muscle well developed, passing through of secretory gland-cells. Anchors with fine conspicuous alae, similar in shape; each with well-developed elongate superficial root, rounded and short deep root, slightly curved shaft, short curved point (Fig. 1B, C); ventral anchor 50–51 (51; n = 10) long, base 14–18 (16; n = 10) wide; dorsal anchor 50–53 (51; n = 10) long, base 14–17 (16; n = 10) wide. Ventral bar 37–50 (44; n = 12) long, rod-shaped, with hatchet-shaped lateral ends (Fig. 1D). Dorsal bar 51–64 (58; n = 12) long, with well-developed and robust anterior arms, short posterior arms (Fig. 1E, Fig. 4A). Fourteen similar hooks, 12–13 (13; n = 8) long, each with protruded obtuse thumb, uniform shank, and delicate point (Fig. 1F); filamentous hook (FH) loop about shank length. MCO 247–268 (256; n = 12) long, a sinuous sclerotized tube with whip-shaped distal end; base of MCO slightly expanded having a short and broad flap directed posteriorly; flap with rounded distal end. Testis large,

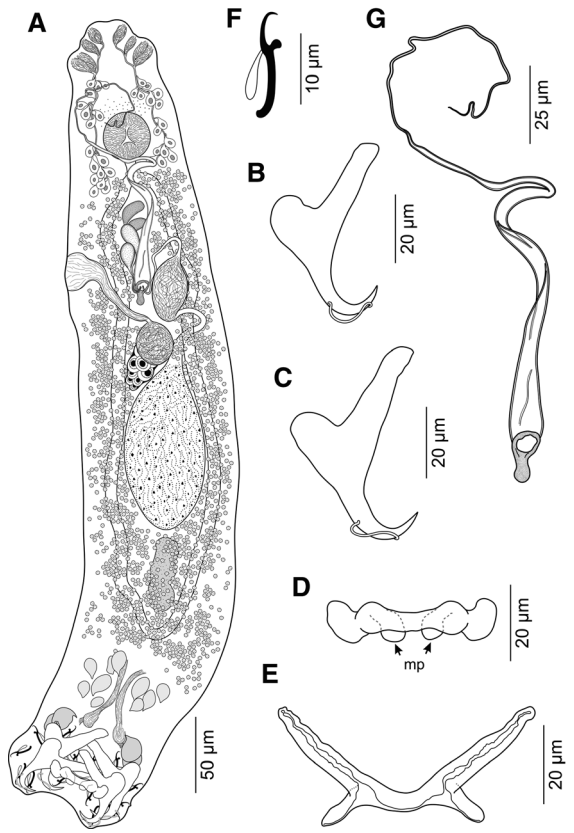


**Fig. 1** *Bicentenariella claudiae* **n. g., n. sp.** ex *Pronotogrammus multifasciatus*. A, Whole worm, ventral view; B, Ventral anchor; C, Dorsal anchor; D, Ventral bar; E, Dorsal bar; F, Hook; G, Male copulatory organ. *Abbreviations*: mp, medial projections

intercaecal, ovate, not lobulated, 82–91 (86; n = 8) long, 38–42 (40; n = 8) wide; vas deferens dilating to form big fusiform seminal vesicle slightly in left side of trunk, lateral to MCO; two pyriform prostatic reservoirs, dextrolateral to MCO; prostatic glands inconspicuous, intercaecal. Ovary 22–31 (27; n = 8) long, 19–26 (22; n = 8) wide; pyriform; oviduct, oötype and uterus not observed. Vaginal aperture dextrolateral at level of seminal vesicle; vaginal vestibule elongate, not sclerotized, lying obliquely on right side of body anterior to ovary; vaginal duct running posteriorly to join big subspherical seminal receptacle; seminal receptacle overlapping the anterior end of ovary. Vitelline follicles throughout trunk, absent in regions of reproductive organs. Eggs not observed.

Remarks

*Bicentenariella claudiae* **n. sp.** is the type-species of the newly erected genus. The new species is characterized by its MCO, which is a sinuous sclerotized tube with whip-shaped distal end. In addition, *B. claudiae* **n. sp.** is typified by having a rod-shaped ventral bar whit hatchet-shaped lateral ends and two prostatic reservoirs.

***Bicentenariella sinuosa* n. sp.**

*Type-host*: *Pronotogrammus multifasciatus* Gill (Perciformes: Serranidae), threadfin bass.
*Type-locality*: Puerto Pizarro (3°29'S, 80°24'W), Tumbes, Peru, South America.
*Type-material*: Holotype (MUSM is 4717); 12 paratypes (MUSM is 4718a-l).
*Site in host*: Gill filaments.
*ZooBank registration*: The Life Science Identifier (LSID) for *Bicentenariella sinuosa* **n. sp.** is urn:lsid:zoobank.org:act: C041B32C-BBAB-42D8-813D-8DF61CF3DF24
*Etymology*: The specific name (an adjective) is from Latin (*sinuosa* = sinuous) and refers to the MCO.

Description (Fig. 2A–H, Fig. 4B)

[Based on 7 specimens mounted in Gray and Wess medium and 6 stained with Gomori's trichrome.] Body elongate (Fig. 2A), 490–512 (508; n = 11) long; greatest width 106–119 (112; n = 11) usually at level

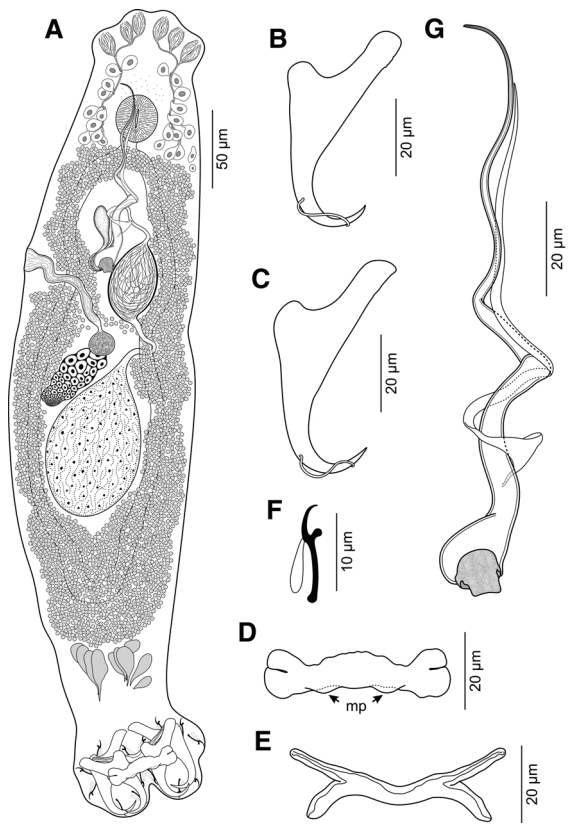


**Fig. 2** *Bicentenariella sinuosa* **n. g., n. sp.** ex *Pronotogrammus multifasciatus*. A, Whole worm, ventral view; B, Ventral anchor; C, Dorsal anchor; D, Ventral bar; E, Dorsal bar; F, Hook; G, Male copulatory organ. *Abbreviations*: mp, medial projections

of testis. Cephalic region broad; cephalic lobes moderately developed; bilateral pair of cephalic glands at pre and postpharyngeal level. Pharynx spherical, 30–34 (32; n = 6) in greatest width. Peduncle broad, elongate. Haptor almost subrectangular, differentiated from body proper, 59–62 (61; n = 6) long; 84–93 (88; n = 6) wide; group of few secretory gland-cells lying on peduncle. Anchors with fine conspicuous alae, similar in shape; each with well-developed elongate superficial root, rounded and short deep root, slightly curved shaft, short curved point (Fig. 2B, C); ventral anchor 49–53 (51; n = 7) long, base 16–18 (17; n = 7) wide; dorsal anchor 53–55 (54; n = 7) long, base 14–16 (15; n = 7) wide. Ventral bar 45–48 (46; n = 7) long, dumbbell-shaped with two poorly-developed medial projections, enlarged and bilobed lateral ends (Fig. 2D). Dorsal bar 55–61 (57; n = 7) long, with moderately-developed and narrow

anterior arms, posterior arms robust (Fig. 2E, Fig. 4B). Fourteen similar hooks, 12–13 (13; n = 7) long, each with protruded obtuse thumb, uniform shank and delicate point (Fig. 2F); filamentous hook (FH) loop about shank length. MCO 145–163 (152; n = 7) long, slightly tapered, sinuous shaft; base of MCO expanded having an inconspicuous and broad flap directed posteriorly; irregular filamentous membrane surrounding shaft of MCO. Testis large, intercaecal, ovate, not lobulated, 85–98 (86; n = 6) long, 45–59 (48; n = 4) wide; vas deferens dilating to form well-developed fusiform seminal vesicle slightly in left side of trunk, lateral to MCO; one pyriform prostatic reservoir, dextrolateral to MCO. Ovary 47–50 (49; n = 4) long, 22–28 (25; n = 3) wide; pyriform; oviduct, oötype and uterus not observed. Vaginal aperture dextrolateral at level of seminal vesicle; vaginal vestibule elongate, not sclerotized, lying obliquely on right side of body anterior to ovary; vaginal duct running posteriorly to join big subspherical seminal receptacle; seminal receptacle overlapping the anterior end of ovary. Vitelline follicles throughout trunk, absent in regions of reproductive organs. Eggs not observed.

Remarks

*Bicentenariella sinuosa* **n. sp.** is typified by having a slightly tapered and sinuous MCO with an irregular filamentous membrane surrounding its shaft and a base expanded having an inconspicuous flap. In addition, *B. sinuosa* **n. sp.** differs from *B. claudiae* **n. sp.** by having a dumbbell-shaped ventral bar with bilobed lateral ends (*vs* a rod-shaped ventral bar with hatchet-shaped lateral ends in *B. claudiae* **n. sp.**), a prostatic reservoir (*vs* two prostatic reservoirs in *B. claudiae* **n. sp.**) and a dorsal bar with moderately-developed and narrow anterior arms and posterior arms robust (*vs* a dorsal bar with well-developed and robust anterior arms and short posterior arms in *B. claudiae* **n. sp.**).

### *Bicentenariella puertopizarroensis* n. sp.

*Type-host*: *Pronotogrammus multifasciatus* Gill (Perciformes: Serranidae), threadfin bass.
*Type-locality*: Puerto Pizarro (3°29'S, 80°24'W), Tumbes, Peru, South America.
*Type-material*: Holotype (MUSM 4719); 14 paratypes (MUSM 4720a-n).
*Site in host*: Gill filaments.
*ZooBank registration*: The Life Science Identifier (LSID) for *Bicentenariella puertopizarroensis* **n. g., sp.** is urn:lsid:zoobank.org:act: 888B7AB5-83E5-4D07-AEBD-469C1293B29E
*Etymology*: The specific name refers to the type locality.

Description (Fig. 3A–H, Fig. 4C)

[Based on 8 specimens mounted in Gray and Wess medium and 7 stained with Gomori's trichrome] Body elongate (Fig. 3A), 702–757 (738; n = 15) long; greatest width 94–98 (96; n = 14) usually at level of testis. Cephalic region slightly broad; cephalic lobes not differentiated; bilateral pair of cephalic glands at pharyngeal level. Pharynx spherical, 26–30 (28; n = 7) in greatest width. Peduncle narrow, elongate. Haptor

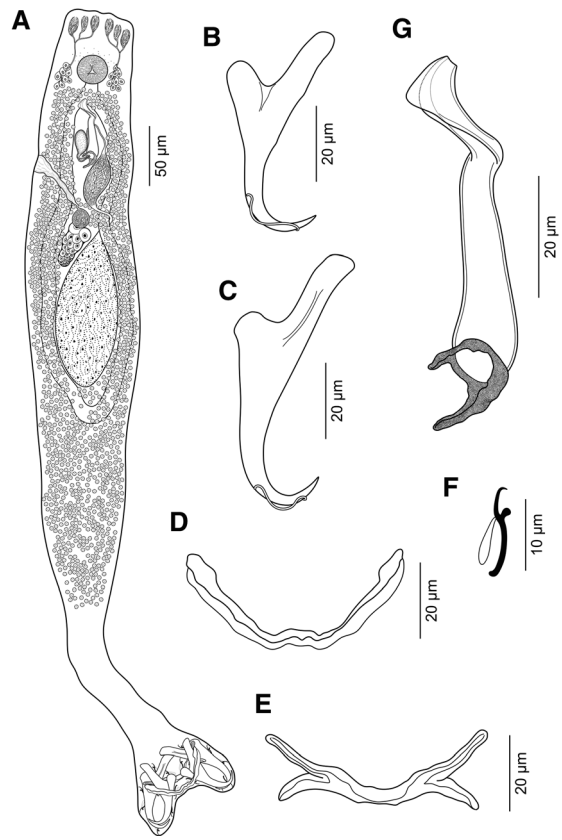


**Fig. 3** *Bicentenariella puertopizarroensis* **n. g., n. sp.** ex *Pronotogrammus multifasciatus*. A, Whole worm, ventral view; B, Ventral anchor; C, Dorsal anchor; D, Ventral bar; E, Dorsal bar; F, Hook; G, Male copulatory organ

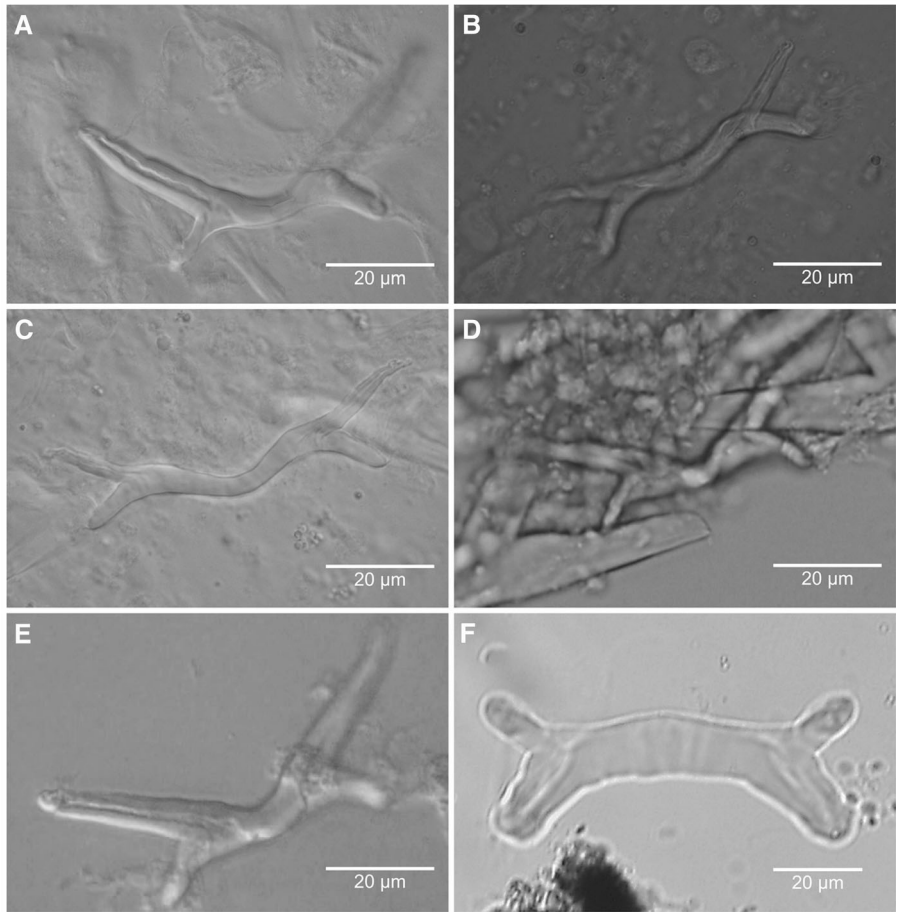


**Fig. 4** Compound micrographs of the dorsal bar of A, *Bicentenariella claudiae* **n. g., n. sp.**; B, *Bicentenariella sinuosa* **n. g., n. sp.**; C, *Bicentenariella puertopizarroensis* **n. g., n. sp.**; D, *Bicentenariella peruensis* (Cruces, Chero, Sáez & Luque, 2017) **n. comb.** (MUSM 3487, paratype); E, *Bicentenariella signiferi* (Cruces, Chero, Sáez & Luque, 2017) **n. comb.** (MUSM 3536, paratype); F, *Parancylodiscoides chaetodipteri* Caballero & Bravo-Hollis, 1961 (MUSM 3247, voucher).

subtrapezoidal, differentiated from body proper, 66–75 (69; n = 7) long; 85–92 (89; n = 5) wide. Anchors with fine conspicuous alae, slightly dissimilar in shape (Fig. 3B, C); ventral anchor 51–54 (52; n = 6) long, base 15–18 (16; n = 7) wide, with well-developed elongate superficial root, rounded deep root, slightly curved shaft and short curved point; dorsal anchor 57–63 (60; n = 8) long, base 17–19 (18; n = 5) wide, with well-developed elongate superficial root, inconspicuous deep root, slightly curved shaft and short curved point. Ventral bar 78–81 (80; n = 8) long, narrow, W-shaped, inconspicuous medial projections, slightly expanded lateral ends (Fig. 3D). Dorsal bar 51–58 (54; n = 5) long, developed and narrow anterior arms, posterior arms robust (Fig. 3E, Fig. 4C). Fourteen similar hooks, 12–13 (13; n = 8) long, each with depressed obtuse thumb, uniform shank and delicate point (Fig. 3F); filamentous hook (FH) loop about shank length. MCO 69–75 (72; n = 8) long, a sclerotized tube with twisted distal end; base of MCO widely expanded having bifurcated flap directed posteriorly; delicate membrane placed at distal end of MCO (Fig. 3G). Testis large, intercaecal, ovate, not lobulated, 118–124 (121; n = 6) long, 46–52 (48; n = 6) wide; vas deferens dilating to form big fusiform seminal vesicle slightly in left side of trunk, lateral to MCO; one almost pyriform prostatic reservoir, dextrolateral to MCO. Ovary 37–39 (38; n = 4) long, 18–25 (23; n = 4) wide; pyriform; oviduct, oötype and uterus not observed. Vaginal aperture dextrolateral at level of seminal vesicle; vaginal vestibule elongate, not sclerotised, lying obliquely on right side of body

anterior to ovary; vaginal duct running posteriorly to join small subspherical seminal receptacle; seminal receptacle overlapping the anterior end of ovary. Vitelline follicles throughout trunk, absent in regions of reproductive organs. Eggs not observed.

Remarks

*Bicentenariella puertopizarroensis* **n. sp.** is easily differentiated from all congeners by possessing a tubular-shaped MCO with twisted distal end and a base widely expanded having a bifurcated flap. In addition, *B. puertopizarroensis* **n. sp.** differs by having a W-shaped ventral bar, a delicate membrane associated with the distal end of the MCO, and anchors slightly dissimilar.

***Bicentenariella peruensis*** (Cruces, Chero, Sáez & Luque, 2017) **n. comb.**

Syn *Parancylodiscoides peruensis* Cruces, Chero, Sáez & Luque, 2017
(Fig. 4D)
*Type-host*: *Hemanthias peruanus* (Steindachner) (Perciformes: Serranidae), splittail bass.
*Type-locality*: Puerto Pizarro (3°29'S, 80°24'W), Tumbes, Peru, South America.
*Site in host*: Gill filaments.
*Specimens studied*: Holotype (MUSM 3480); 27 paratypes (MUSM 3481–3507).

Remarks

This species was originally described as P. *peruensis* by Cruces, Chero, Sáez & Luque (2017a) from the gills of *H. peruanus* collected from Puerto Pizarro, Tumbes, Peru. *Parancylodiscoides peruensis* is now transferred to *Bicentenariella* **n. g.** as *B. peruensis* (Cruces, Chero, Sáez & Luque, 2017) **n. comb.** based on the broadly X-shaped dorsal bar with the anterior arms longer than posterior arms, the ventral bar with two medial projections, haptor lacking haptoral reservoirs: tubular tapered-shaped MCO, lacking accessory piece and vaginal aperture dextrolateral. *Bicentenariella peruensis* differs from all of congeners by its tapered-shaped MCO having curved distal tip and a bell-shaped base.

***Bicentenariella signiferi*** ( Cruces, Chero, Sáez & Luque, 2017) **n. comb**.

Syn *Parancylodiscoides signiferi* Cruces, Chero, Sáez & Luque, 2017
(Fig. 4E)
*Type-host*: *Hemanthias signifer* (Garman) (Perciformes: Serranidae), damsel bass.
*Type-locality*: Puerto Pizarro (3°29'S, 80°24'W), Tumbes, Peru, South America.
*Site in host*: Gill filaments.
*Specimens studied*: Holotype (MUSM 3508); 31 paratypes (MUSM 3509–3539).

Remarks

This species was described as *P. signiferi* by Cruces et al. (2017a) from the gills of *H. signifer* collected from Puerto Pizarro, Tumbes, Peru. *Parancylodiscoides signiferi* was herein transferred to *Bicentenariella* **n. g.** based on it having a broadly X-shaped dorsal bar with the anterior arms longer than posterior arms, a ventral bar with two medial projections, an haptor lacking haptoral reservoirs; a tubular tapered-shaped MCO, lacking accessory piece and a vaginal aperture dextrolateral. *Bicentenariella signiferi* (Cruces, Chero, Sáez & Luque, 2017) **n. comb.** differs from all its congeners by the morphology of its MCO, which is tubular with a loop at distal end. In addition, *B. signiferi* is typified by having anchor points with furrow on external surface.

## Discussion

Although barely three species of serranid hosts have previously been examined for monogenean parasites in Peru (Cruces et al., 2020), the diversity appears higher, with species apparently exhibiting high host specificity (oioxenous). From the five valid species of dactylogyrid monogeneans reported from serranids from Peru, three species seem to be restricted infecting *P. multifasciatus*: *Pronotogrammella boegeri* Cruces, Chero, Sáez & Luque, 2020, *Pr. multifasciatus* Cruces, Chero, Sáez & Luque, 2020, and *Pr. scholzi* Cruces, Chero, Sáez & Luque, 2020 (Cruces et al., 2020).

The other two dactylogyrid monogeneans infecting serranid hosts in Peru are P. *peruensis* and P. *signiferi*

infecting the gills of *H. peruanus* and *H. signifer*, respectively. Cruces et al. (2017a) assigned these two specimens to genus *Parancylodiscoides* based, among other features, by having a dorsal bar with bifurcated ends. However, a detailed analysis of the type specimens of P. *peruensis* (MUSM 3480, holotype; MUSM 3481–3507, paratypes) and P. *signiferi* (MUSM 3508, holotype; MUSM 3509–3539, paratypes) indicated that their dorsal bars have broadly X-shaped (see Fig. 4D-E) and not rood-shaped with bifurcate ends as in *Parancylodiscoides* species (See Fig. 4F). Based on this and other features P. *peruensis* and P. *signiferi* are now transferred to *Bicentenariella* **n. g.** as *B. peruensis* and *B. signiferi*. With our updated parasitological data, the dactylogyrid fauna of serranid fishes from Peru, which are relatively poorly studied hosts, is now composed of eight species: five species of *Bicentenariella* **n. g.** and three species of *Pronotogrammella*.

The occurrence of species of *Bicentenariella* **n. g.** on different host species of the same family (*B. claudiae*, *B. sinuosa* and *B. puertopizarroensis* on *P. multifasciatus*; *B. peruensis* on *H. peruanus*; and *B. signiferi* on *H. signifer*) may appear unexpected, but it has been shown that these three serranid fish species are phylogenetically closely related based on analyses of 12S and 16S ribosomal mtDNA sequences (Craig and Hastings, 2007). The hosts Po. *multifasciatus*, *H. peruanus* and *H. signifer* are members of the subfamily Anthiinae, a group apparently monophyletic and phylogenetically related to Serraninae (Craig and Hastings, 2007). Thus, species of *Bicentenariella* **n. g** are confirmed as natural gill parasites of serranid fishes assigned to the Anthiinae and apparently restricted to the Eastern Pacific.

Presence of a broadly X-shaped dorsal bar with the anterior arms longer than the posterior arms is the main taxonomic feature of *Bicentenariella* **n. g.** This character also apparently occurs in some dactylogyrid species infecting serranid fishes, i.e. *Haliotrema cromileptis* Young, 1968 from *Cromileptes altivelis* (Valenciennes) in Autralia; *H. epinepheli* Young, 1968 from *Epinephelus fasciatus* (Forsskål) and *E. merra* Bloch in Autralia and *Variola albimarginata* Baissac in China; *Haliotrema* sp. of Justine (2007a) from *E. maculatus* (Bloch) in New Caledonia; and *Pa. macrobaculum* (Zhukov, 1983) Kritsky & Bakenhaster, 2016 from *E. morio* (Valenciennes), *Mycteroperca interstitialis* (Poey), *M. microlepis* (Goode & Bean) *M. phenax* Jordan & Swain, and *M. venenosa* (Linnaeus) in the Gulf of Mexico (Young, 1968; Justine 2007a; Dang et al., 2010; Kritsky & Bakenhaster, 2016; Nitta & Nagasawa, 2018). However, all four species are parasites of the gills of serranid fishes belonging to the subfamily Epinephelinae, and they differ from species of *Bicentenariella* **n. g.** by possessing a dorsal bar with the anterior arms of similar size as the posterior arms (dorsal bar with the anterior arms longer than the posterior arms in the new genus).

*Parancylodiscoides macrobaculum* is the only species of the genus described from serranid fishes (Kritsky & Bakenhaster 2016). The other species of *Parancylodiscoides* (including the type species) have been described from ephippid fishes off Pacific and Atlantic Oceans (Kritsky 2012). Based on that *P. macrobaculum* have some morphological differences with *Parancylodiscoides* spp. from ephippid, i. e., a dorsal bar not bifurcated but rather with X-shaped (a dorsal bar with bifurcated ends in *Parancylodiscoides* spp.), a dextrolateral vaginal aperture (a dextroventral vaginal pore in *Parancylodiscoides* spp.), a base of the MCO with a flap directed posteriorly (bifurcated or not flap directed anteriorly in *Parancylodiscoides* spp.); and a non-lobulated testis (testis lobulated in *Parancylodiscoides* spp.), this species could eventually be removed from *Parancylodiscoides* and a new genus could be proposed to assign *P. macrobaculum*. Also, the hosts of *P. macrobaculum* (Order Perciformes) and the hosts of the species of *Parancylodiscoides* that infect ephippid fishes (Order Ephippiformes) are phylogenetically distantly (Betancur et al. 2017), which could support this hypothesis. However, a detailed studied based on the examination of the type- and new specimens of *P. macrobaculum* is required to confirm its taxonomic status.

Currently, studies on monogenean parasite fauna from marine fishes in Peru have progressively increased in the last five years (Cruces et al., 2020). As a result, seventeen new monogenean species were described and four new genera were proposed, i. e. *Olivacotyle* Cruces, Chero, Sáez, Iannacone & Luque, 2017; *Hypanocotyle* Chero, Cruces, Sáez, Camargo, Santos & Luque, 2018; *Peruanocotyle* Chero, Cruces, Sáez & Luque, 2018 and *Pronotogrammella* (Chero et al. 2016; 2017a, b; 2018a, b; 2020; Cruces et al. 2017a, b; 2018; 2020). Thus, the present work along

with other work previously performed suggest that the marine fishes host from Peru harbor an exceptionally species diversity of monogeneans still unexplored.

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**Data availability** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Compliance with ethical standards**

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** All applicable institutional, national and international guidelines for the care and use of animals were followed.

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