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A new genus and three new species of dactylogyrids (Monogenea), gill parasites of the threadfin bass, *Pronotogrammus multifasciatus* Gill (Perciformes: Serranidae) in the Southeastern Pacific Ocean off Peru

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

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Abstract *Pronotogrammella* n. g. is erected to accommodate *Pronotogrammella boegeri* n. sp. (type-species), *Pr. scholzi* n. sp. and *Pr. multifasciatus* n. sp. (Monogenea: Dactylogyridae). The new species are gill parasites of the threadfin bass *Pronotogrammus multifasciatus* Gill (Perciformes: Serranidae), a demersal teleost collected from off the coastal zone of Puerto Pizarro, Tumbes, Peru. *Pronotogrammella* n. g. is mainly characterised by having broadly fork-shaped dorsal anchors, which have an accessory anchor sclerite articulated to the tip of the superficial roots. *Pronotogrammella* n. g. is also characterised by having: (i) a tubular tapered-shaped male copulatory organ (MCO), filamentous distally, with a clockwise coil at distal end or not, lacking accessory piece; (ii) a dorsal bar with an anteromedial delicate umbelliform membrane supported by two processes; (iii) hooks with upright blunt thumb and uniform shank; (iv) a vaginal aperture dextrolateral; (v) a subquadrangular haptor, with inconspicuous lateral flaps and lacking haptoral reservoirs; and (vi) eye-spot or chromatic granules absent. *Pronotogrammella boegeri* n. sp. is characterised by its crosier-shaped MCO having a clockwise coil at distal end and by its dorsal bar with a straight anteromedial processes. *Pronotogrammella scholzi* n. sp. is typified by possessing of a dorsal bar with the anteromedial processes like cow horns, hoof-shaped deep roots of the dorsal anchors and a broader

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shaft of the MCO. *Pronotogrammella multifasciatus* n. sp. differs from all congeners by having a tubular MCO with twisted shaft and a base with a short and broad arm and by having an almost dumbbell-shaped ventral bar.

Introduction

The Serranidae includes 540 species of marine fishes assigned to 75 accepted genera, which inhabit tropical and temperate oceans (Eschmeyer & Fong, 2019). Of them, only 28 species occur in the Pacific waters of Peru. Although many of these species are economically significant and represent important food sources, barely four species have been examined and reported as hosts for species of monogeneans in Peru, namely the damsel bass, *Hemanthias signifer* (Garman); the splittail bass, *Hemanthias peruanus* (Steindachner); the Peruvian rock seabass, *Paralabrax humeralis* (Valenciennes) and the Pacific creole-fish, *Paranthias colonus* (Valenciennes) (see Cohen et al., 2013; Luque et al., 2016; Cruces et al., 2017a, b). Five monogenean species were obtained from these hosts: *Hemitagia galapagensis* (Meserve, 1938) Sproston, 1946 (Diclidophoridae) on *P. humeralis*; *Olivacotyle hemanthiasi* Cruces, Chero, Sáez, Iannacone & Luque, 2017 (Diclidophoridae) and *Parancylodiscoides signiferi* Cruces, Chero, Sáez & Luque, 2017 (Dactylogyridae) on *H. signifer*; *Parancylodiscoides peruensis* Cruces, Chero, Sáez & Luque, 2017 (Dactylogyridae) on *H. peruanus* and *Pseudorhabdosynochus jeanloui* Knoff, Cohen, Cárdenas, Cárdenas-Callirgos & Gomes, 2015 (Diplectanidae) on *P. colonus* (see Luque et al., 2016; Cruces et al., 2017a, b).

During a study of dactylogyrids infecting serranid fish from the coastal zone of Puerto Pizarro, Tumbes, Peru, three new species of *Pronotogrammella* n. g. were encountered on the gills of the threadfin bass, *Pronotogrammus multifasciatus* Gill, a demersal teleost endemic to Eastern Pacific. Descriptions of the new species and the diagnosis of *Pronotogrammella* n. g. are presented herein.

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 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 *Pr.* and *Pa.* for the parasites (*Pronotogrammella* and *Parancylodiscoides*) and *P.* for the host (*Pronotogrammus*) are used to avoid doubt as to the genera.

For comparative purposes, the following museum specimens were studied: *Pa. peruensis* (MUSM 3480, holotype); *Pa. signiferi* (MUSM 3508, holotype); *Pa. chaetodipteri* Caballero & Bravo-Hollis, 1961 (MUSM 3247, voucher). The type-material was deposited in the Helminthological Collection of the Museum of Natural History at the San Marcos University (MUSM), Peru and in the Helminthological Collection of Institute Oswaldo Cruz (CHIOC), Brazil.

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

***Pronotogrammella* n. g.**

Diagnosis

Body fusiform, consisting of cephalic region, trunk, peduncle and haptor. Tegument thin, surface smooth. One terminal and 2 bilateral cephalic lobes; 3 pairs of bilateral head organs. Cephalic glands unicellular, anterior and posterolateral to pharynx. Eye-spots absent; chromatic granules absent. Mouth subterminal, midventral; pharynx muscular, glandular; oesophagus short, intestinal caeca 2, confluent posterior to gonads, lacking diverticula. Common genital pore midventral, near level of intestinal bifurcation. Gonads intercaecal. Testis lobed, dorsal to ovary; vas deferens looping left intestinal caeca; seminal vesicle a dilation of vas deferens, thick-walled; prostatic reservoir single, thin-walled. Male copulatory organ (MCO) tubular tapered-shaped, filamentous distally, with a clockwise coil at distal end or not. Accessory piece absent. Ovary dextral to anterior portion of testis. Vaginal aperture dextrolateral; vagina unsclerotised, emptying to seminal receptacle. Vitelline follicles dense, coextensive with intestinal caeca. Haptor subquadrangular, with inconspicuous lateral flaps, lacking haptoral reservoirs, armed with 2 pairs of anchor-bar complexes and 7 pairs of hooks with ancyrocephaline distribution *sensu* Mizelle (1936). Anchors dissimilar; ventral anchor with well-developed superficial root and short deep root; dorsal anchor broadly fork-shaped, having accessory anchor sclerite articulated to tip of superficial root. Ventral bar bowed; dorsal bar with anteromedial delicate umbelliform membrane supported by two processes. Hooks with undilated shanks and upright blunt thumb. Parasites of gills of serranid fishes.

Type-species: *Pronotogrammella boegeri* n. sp.

Other species: *Pronotogrammella scholzi* n. sp.; *Pronotogrammella multifasciatus* n. sp.

ZooBank registration: The Life Science Identifier (LSID) for *Pronotogrammella* n. g. is urn:lsid:zoobank.org:act:D850440C-A510-4C9B-9FF5-A83E4163432F.

Etymology: The generic name refers to the genus of the fish host (*Pronotogrammus*). The genus is appended to the diminutive *-ella* and should be treated as feminine.

Remarks

Pronotogrammella n. g. can be readily distinguished from all other marine dactylogyrid genera by the possession of modified dorsal anchors, which are broadly fork-shaped, having an accessory anchor sclerite articulated to tip of the superficial root. In addition, *Pronotogrammella* n. g. is also characterised by having: (i) a tubular tapered-shaped MCO, filamentous distally, with a clockwise coil at distal end or not, lacking accessory piece; (ii) a dorsal bar with an anteromedial delicate umbelliform membrane supported by two processes; (iii) hooks with upright blunt thumb and uniform shank; (iv) a dextrolateral vaginal aperture; (v) a subquadrangular haptor, with inconspicuous lateral flaps and lacking haptoral reservoirs; and (vi) eye-spot or chromatic granules absent. *Pronotogrammella* n. g. most closely resembles *Parancylodiscoides* Caballero y Caballero & Bravo Hollis, 1961, which includes species that infect ephippids and serranids (Kritsky, 2012; Kritsky & Bakenhaster, 2016; Cruces et al., 2017a). Species of both genera have a copulatory complex without accessory piece, dissimilar dorsal and ventral bars, simple ventral bar, two intestinal caeca lacking diverticula and united posteriorly to the gonads, and an ovary dextral to the testis. However, and in addition to the aforementioned distinguishing features, *Pronotogrammella* n. g. is easily differentiated from *Parancylodiscoides* by having: (i) dissimilar anchors (rather than similar as in *Parancylodiscoides* spp.); (ii) a dorsal bar without bifurcated ends (bifurcated in *Parancylodiscoides* spp.); (iii) hooks with upright blunt thumb (depressed blunt thumb in *Parancylodiscoides* spp.); and (iv) a haptor with inconspicuous lateral flaps (well-developed in *Parancylodiscoides* spp.).

***Pronotogrammella boegeri* 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 4430); 10 paratypes (MUSM 431a-j); 5 paratypes (CHIOC 39218a-e).

Site in host: Gill filaments.

ZooBank registration: The Life Science Identifier (LSID) for *Pronotogrammella boegeri* n. sp. is

urn:lsid:zoobank.org:act:4B22B429-B8F5-4778-AA18-206D3D37BF18.
Etymology: This species is named in honor of Dr Walter A. Boeger (Federal University of Paraná, Brazil) in recognition to his valuable contribution to the knowledge of the Neotropical dactylogyrids.

Description (Fig. 1A–H)

[Based on 6 specimens mounted in Gray and Wess medium and 10 stained with Gomori's trichrome.] Body elongate (Fig. 1A), 428–585 (490; n = 14) long; greatest width 117–138 (130; n = 14) usually at level of testis. Cephalic region broad; cephalic lobes poorly developed. Pharynx spherical, greatest width 28–34 (31; n = 11). Peduncle broad, short. Haptor differentiated from body proper, 42–71 (56; n = 12) long, 54–68 (61; n = 12) wide; group of well-developed secretory gland-cells lying on peduncle. Anchors with fine conspicuous alae (Fig. 1B, C). Ventral anchor 43–45 (44; n = 6) long, with well-elongated superficial root, short deep root, slightly arced shaft and recurved point (Fig. 1B); base 8–11 (10; n = 6) wide. Dorsal anchor 32–35 (34; n = 6) long, with arced and well-elongated superficial root, subrectangular deep root, arced shaft and recurved point (Fig. 1C); base 5–7 (6; n = 6) wide; accessory anchor sclerite delicate, U-shaped (Fig. 1D). Ventral bar 30–32 (31; n = 6) long, with two short anteromedial knobs, expanded and rounded lateral ends posteriorly directed (Fig. 1E). Dorsal bar 26–29 (27; n = 6) long, straight, rod-shaped, with an anteromedial delicate umbelliform membrane supported by 2 straight processes (Fig. 1F). Hooks 14–15 (14; n = 7) long, similar in shape and size, each with slender shank, slightly curved proximally, rounded thumb, curved shaft and short and curved point (Fig. 1G); filamentous hook (FH) loop about shank length. MCO 139–147 (142; n = 10) long, crosier-shaped, with a clockwise coil at distal end; base with a well-elongated, basal, stick-shaped arm directed posteriorly (Fig. 1H). Testis ovate, post-equatorial, 99–116 (108; n = 12) long, 58–78 (65; n = 12) wide; vas deferens dilating to form large fusiform seminal vesicle; seminal vesicle lying slightly in left side of trunk, posterolateral to MCO; prostatic reservoir elongate, dorsal to MCO. Ovary 42–53 (48; n = 10) long, 15–23 (19; n = 10) wide, elongate, narrow, almost pyriform. Vaginal aperture unsclerotised; vaginal vestibule elongates, muscular, narrow, lying obliquely to midline; vaginal duct short, narrow, running posteriorly to join subspherical seminal receptacle. Oviduct, oötype and uterus not observed. Vitelline follicles dense throughout trunk, lateral fields of follicles confluent anterior to MCO and seminal receptacle and posterior to gonads. Eggs not observed.

Remarks

Pronotogrammella boegeri n. sp. is the type-species of the newly erected genus. The new species is characterised by its MCO, which is crosier-shaped with a clockwise coil at distal end. In addition, *Pr. boegeri* n. sp. is characterised by its dorsal bar, which has straight anteromedial processes.

***Pronotogrammella scholzi* 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 4432); 6 paratypes (MUSM 4433a-f); 5 paratypes (CHIOC 39220a-e).
Site in host: Gill filaments.
ZooBank registration: The Life Science Identifier (LSID) for *Pronotogrammella scholzi* n. sp. is urn:lsid:zoobank.org:act:257FD3B0-5011-41FD-9818-DBA77A6A2387.
Etymology: This species is named in honor of Dr Tomáš Scholz (Institute of Parasitology Biology Centre, ASCR, Helminthology, Czech Republic) in recognition of his significant contributions to fish parasitology.

Description (Fig. 2A–H)

[Based on 4 specimens mounted in Gray and Wess medium and 8 stained with Gomori's trichrome.] Body elongate (Fig. 2A), 530–711 (604; n = 8) long; greatest width 121–166 (146; n = 8) usually at level of testis. Cephalic region broad; cephalic lobes moderately developed. Pharynx spherical, greatest width 25–44 (35; n = 8). Peduncle broad, elongate. Haptor differentiated from body proper, 44–69 (59; n = 8) long; 49–72 (62; n = 8) wide; group of poorly developed secretory gland-cells lying on peduncle. Anchors with fine conspicuous alae (Fig. 2B, C).

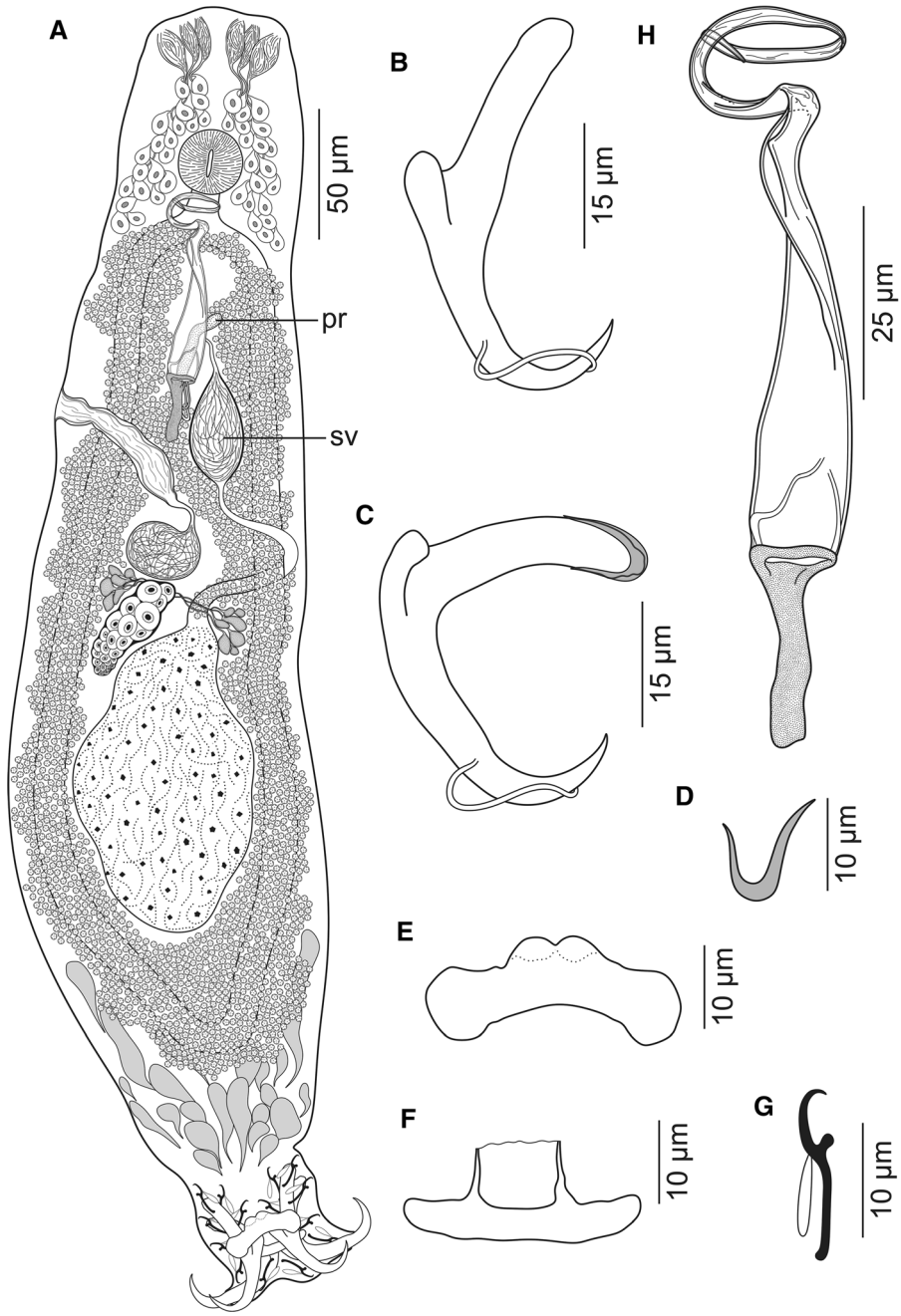

Fig. 1 *Pronotogrammella boegeri* n. g., n. sp. ex *Pronotogrammus multifasciatus*. A, Whole worm, ventral view; B, Ventral anchor; C, Dorsal anchor; D, Accessory anchor sclerite; E, Ventral bar; F, Dorsal bar; G, Hook; H, Male copulatory organ. *Abbreviations*: pr, prostatic reservoir; sv, seminal vesicle

Ventral anchor 41–48 (45; n = 11) long, with well-elongated and rounded superficial root, short and rounded deep root, arced shaft and recurved point (Fig. 2B); base 8–11 (9; n = 11) wide. Dorsal anchor 34–40 (38; n = 11) long, with arced and well-elongated superficial root, hoof-shaped deep root, arced shaft and recurved point (Fig. 2C); base 7–8 (7; n = 11) wide; accessory anchor sclerite delicate, U-shaped (Fig. 2D). Ventral bar 21–33 (28; n = 10) long, posteriorly curved, with 2 poorly developed

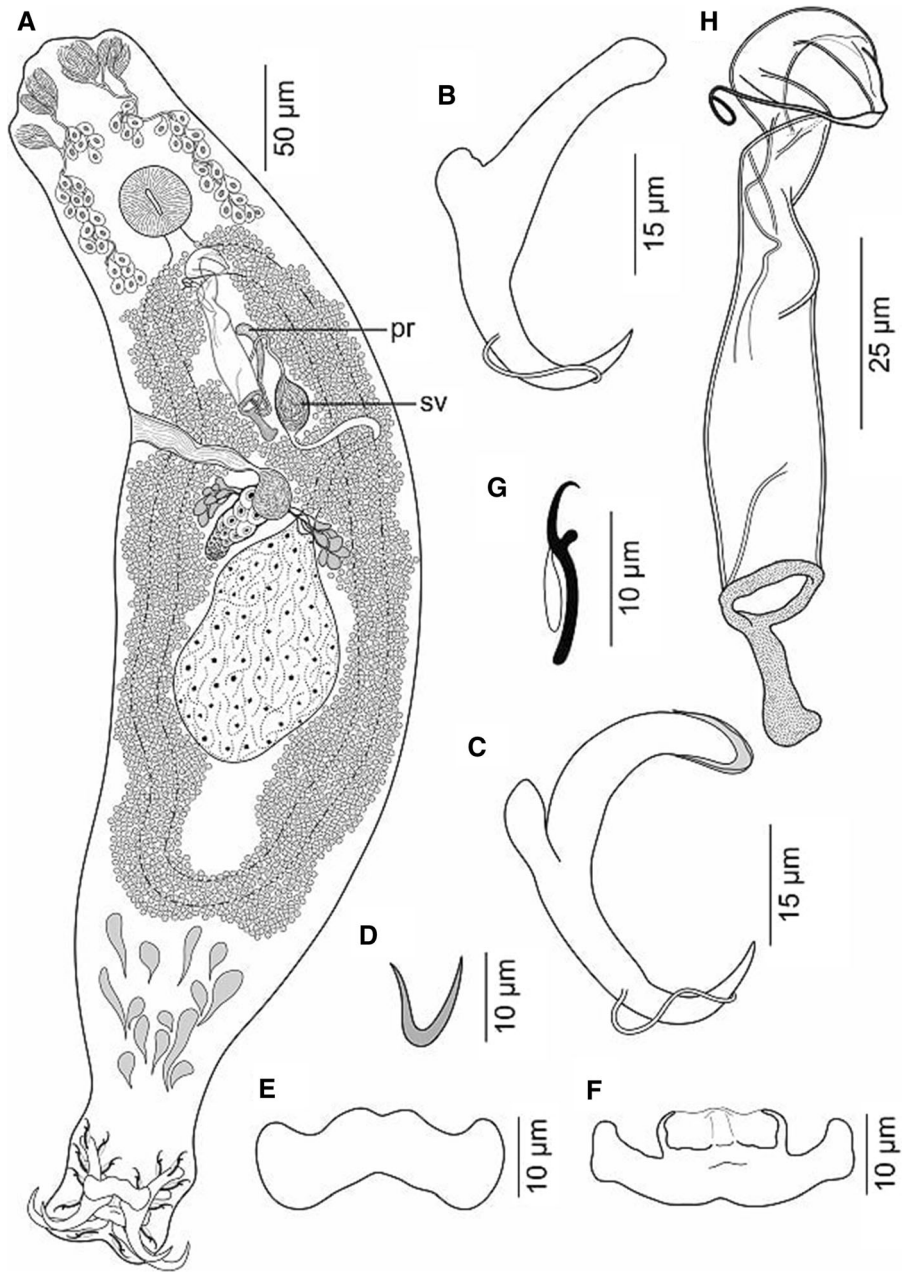

Fig. 2 *Pronotogrammella scholzi* n. sp. ex *Pronotogrammus multifasciatus*. A, Whole worm, ventral view; B, Ventral anchor; C, Dorsal anchor; D, Accessory anchor sclerite; E, Ventral bar; F, Dorsal bar; G, Hook; H, Male copulatory organ. *Abbreviations*: pr, prostatic reservoir; sv, seminal vesicle

anteromedial knobs, short and rounded lateral ends anteriorly directed (Fig. 2E). Dorsal bar 26–33 (30; n = 7) long, rod-shaped, anteriorly curved, with an anteromedial delicate umbelliform membrane supported by 2 processes like cow horns (Fig. 2F). Hooks, 14–15 (14; n = 10) long, similar in shape and size, each with slender shank, slightly curved proximally, rounded thumb, curved shaft and short, curved point (Fig. 2G); filamentous hook (FH) loop about shank length. MCO 136–145 (141; n = 6) long, tapered-shaped, with broad shaft; base with an elongate and rod-shaped arm directed posteriorly; arm expanded

distally (Fig. 2H). Testis ovate, post-equatorial, 111–116 (114; n = 7) long, 67–79 (73; n = 7) wide; vas deferens dilating to form small fusiform seminal vesicle; seminal vesicle slightly in left side of trunk, posterolateral to MCO; prostatic reservoir elongate, dorsolateral to MCO. Ovary 39–51 (44; n = 6) long, 18–26 (22; n = 6) wide; narrow, almost pyriform. Vaginal aperture unsclerotised; vaginal vestibule elongates, muscular, lying obliquely to midline; vaginal duct short and narrow, running posteriorly to join subspherical seminal receptacle. Oviduct, oötype and uterus not observed. Vitelline follicles dense throughout trunk, lateral fields of follicles confluent anterior to MCO and seminal receptacle and posterior to gonads. Eggs not observed.

Remarks

Pronotogrammella scholzi n. sp. differs from *Pr. boegeri* n. sp. mainly by having a dorsal bar with the anteromedial processes like cow horns (*vs* straight anteromedial processes in *Pr. boegeri* n. sp.) and a ventral bar with anteriorly directed lateral ends (*vs* posteriorly directed in *Pr. boegeri* n. sp.) The new species also differs from *Pr. boegeri* n. sp. by having hoof-shaped deep roots of the dorsal anchors (see Figs. 1C, 2C) and a broader shaft of the MCO (see Figs. 1H, 2H).

***Pronotogrammella multifasciatus* 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 4434); 2 paratypes (MUSM 4435a-b); 1 paratype (CHIOC 39219).
Site in host: Gill filaments.
ZooBank registration: The Life Science Identifier (LSID) for *Pronotogrammella multifasciatus* n. sp. is urn:lsid:zoobank.org:act:FC05E63A-D80D-40AC-95D3-1C53DB425EF6.
Etymology: The specific name refers to the specific name of the type-host.

Description (Fig. 3A–H)

[Based on 2 specimens mounted in Gray and Wess medium and 2 stained with Gomori's trichrome.] Body elongate (Fig. 3A), 361–513 (437; n = 2) long; greatest width 113–128 (120; n = 2) usually at level of testis. Cephalic region broad; cephalic lobes poorly developed. Pharynx spherical, greatest width 30–31 (30; n = 2). Peduncle broad, short. Haptor differentiated from body proper, 45–69 (57; n = 2) long; 60–66 (63; n = 2) wide; group of poorly developed secretory gland-cells lying on peduncle. Anchors with fine conspicuous alae (Fig. 3B, C). Ventral anchor 44–46 (45; n = 2) long, with well-elongated superficial root, short and rounded deep root, slightly arced shaft and recurved point (Fig. 3B); base 7–8 (8; n = 2) wide. Dorsal anchor 38–40 (39; n = 2) long, with arced and well-elongated superficial root, elongate deep root, arced shaft and recurved point (Fig. 3C); base 7–8 (7; n = 2) wide; accessory anchor sclerite delicate, U-shaped (Fig. 3D). Ventral bar 27–31 (29; n = 2) long, almost dumbbell-shaped, posteriorly curved, with 2 inconspicuous anteromedial knobs, expanded and slightly bilobed lateral ends (Fig. 3E). Dorsal bar 33–35 (34; n = 2) long, rod-shaped, anteriorly curved, asymmetric, with a well-developed anteromedial delicate umbelliform membrane supported by 2 short and straight processes (Fig. 3F). Hooks, 13–14 (14; n = 2) long, similar in shape and size, each with slender shank, slightly curved proximally, rounded thumb, slightly curved shaft and short and curved point (Fig. 3G); filamentous hook (FH) loop about shank length. MCO 133–138 (136; n = 2) long, tubular, with twisted shaft; base with a short arm directed posteriorly (Fig. 3H). Testis ovate, post-equatorial, 77–99 (88; n = 2) long, 59–65 (62; n = 2) wide; vas deferens dilating to form inconspicuous fusiform seminal vesicle; seminal vesicle slightly in left side of trunk, posterolateral to MCO; prostatic reservoir not observed. Ovary 39–40 (40; n = 2) long, 13–14 (14; n = 2) wide; elongate, narrow, almost pyriform. Vaginal aperture unsclerotised; vaginal vestibule elongate, narrow, muscular, lying obliquely to midline; vaginal duct short and narrow, running posteriorly to join subspherical seminal receptacle. Oviduct, oötype and uterus not observed. Vitelline follicles dense throughout trunk, lateral fields of follicles confluent anterior to seminal vesicle and seminal receptacle and posterior to gonads. Eggs not observed.

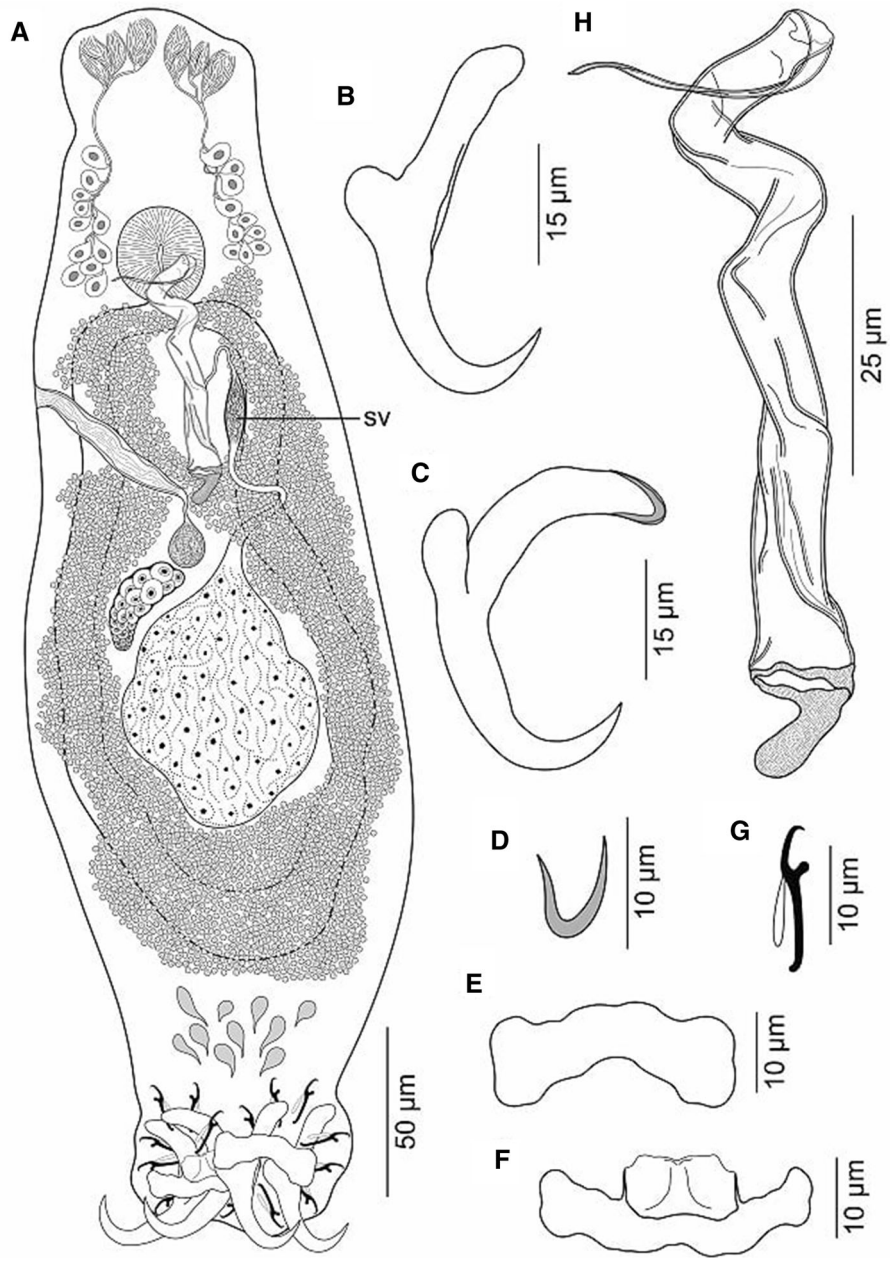

Fig. 3 *Pronotogrammella multifasciatus* n. sp. ex *Pronotogrammus multifasciatus*. A, Whole worm, ventral view; B, Ventral anchor; C, Dorsal anchor; D, Accessory anchor sclerite; E, Ventral bar; F, Dorsal bar; G, Hook; H, Male copulatory organ. *Abbreviations*: pr, prostatic reservoir; sv, seminal vesicle

Remarks

Pronotogrammella multifasciatus n. sp. differs from all congeners mainly by having a tubular MCO with a twisted shaft and a base with a short and broad arm and by having an almost dumbbell-shaped ventral bar.

Discussion

In the present study, *Pronotogrammella* n. g. is proposed to accommodate *Pr. boegeri* n. sp. (type-species), *Pr. scholzi* n. sp. and *Pr. multifasciatus* n. sp. from the gill filaments of *P. multifasciatus* (type-host)

from Peru. The new dactylogyrid genus is mainly characterised by the peculiar morphology of the dorsal anchor, which is broadly fork-shaped having an accessory anchor sclerite articulated to tip of the superficial root.

Species of *Pronotogrammella* n. g. share morphological characteristics with those of species of *Haliotrema* (*sensu lato*) reported on serranids, namely *H. cromileptis* Young, 1968 from the humpback grouper *Cromileptes altivelis* (Valenciennes) and *H. epinepheli* Young, 1968 from the blacktip grouper *Epinephelus fasciatus* (Forsskål) (see Young, 1968; Dang et al., 2010). Species of the new genus slightly resemble these species by possessing a copulatory complex without accessory piece, a dextrolateral and dorsal vaginal aperture and dissimilar ventral bars. However, species of *Pronotogrammella* n. g. could be easily distinguished from *H. cromileptis* and *H. epinepheli* by having fork-shaped dorsal anchors with an accessory anchor sclerite articulated to the tip of the superficial root, a dorsal bar with an anteromedial delicate umbelliform membrane supported by two processes, hooks with upright blunt thumb, and a haptor with inconspicuous lateral flaps. Based on the presence of a dorsal bar with bifurcated ends, hooks with depressed thumb, a dextrolateral vaginal aperture and a copulatory complex without accessory piece, *H. epinepheli* closely resembles species of *Parancylodiscoides*, suggesting that this species might eventually be part of *Parancylodiscoides*. However, a detailed examination of the type- or new specimens of *H. epinepheli* is required to confirm its taxonomic status. Two undescribed species of *Haliotrema* (*sensu lato*) were also reported from serranids, *Haliotrema* sp. of Justine (2007a) from the highfin grouper *E. maculatus* (Bloch) and *Haliotrema* sp. of Justine (2007b) from the tomato hind *Cephalopholis sonnerati* (Valenciennes). Species of the new genus slightly resemble these species by having a copulatory complex without accessory piece but differ by the morphology of the anchors and bars.

Based on the presence of hooks with blunt thumbs and a dextrolateral vaginal aperture, the new species resemble *H. cirrhitusi* Mendoza-Franco & Violante-Gonzalez, 2011 and *H. pollexinus* Mendoza-Franco & Violante-Gonzalez, 2011 from the giant hawkfish, *Cirrhitus rivulatus* (Cirrhitidae) (see Mendoza-Franco & Violante-González, 2011). However, and in addition to the aforementioned distinguishing features, species of *Pronotogrammella* n. g. differ from *H. cirrhitusi* and *H. pollexinus* by having hooks with upright thumbs (*vs* depressed thumbs in *H. cirrhitusi* and *H. pollexinus*), a copulatory complex without an accessory piece (*vs* membranous accessory piece in *H. cirrhitusi* and *H. pollexinus*) and by the lack of eyespots (present in *H. cirrhitusi* and *H. pollexinus*).

An accessory anchor sclerite associated with the ventral or dorsal anchors is not very common among marine dactylogyrids, but it is present in species of the genus *Metahaliotrema* Yamaguti, 1953, *Protogyrodactylus* Johnston & Tiegs, 1922, *Neohaliotrema* Yamaguti, 1965, *Pseudodactylogyroides* Ogawa, 1986, *Triacanthinella* Bychowsky & Nagibina, 1968 and some species of *Haliotrematoides* (see Galli & Kritsky, 2008; Mendoza-Franco et al., 2009; Lim & Gibson, 2008, 2010; Kritsky et al., 2016). Furthermore, other species still allocated in *Haliotrema* (*sensu lato*), i.e. *H. longiangusticirrus* Zhukov, 1981 from the tomtate grunt *Haemulon aurolineatum* Cuvier (syn. *Bathystoma aurolineatum*) (Haemulidae) in the Gulf of Mexico has an accessory anchor sclerite articulated to tip of the superficial root (see Zhukov, 1981), a similar trait found in the new species herein described, although the shape is different (see Zhukov, 1981). In addition, *H. longiangusticirrus* resemble the species of the new genus by having a copulatory complex without accessory piece and hooks with upright thumbs. However, species of *Pronotogrammella* n. g. differ from *H. longiangusticirrus* by the morphology of the MCO, anchors and bars. The presence of an accessory anchor sclerite thus seems to be a result of convergent evolution in the abovementioned taxa and species of *Pronotogrammella* n. g.

Prior to this study, ten species of dactylogyrids have been described or recorded from eight marine fishes in Peru: *Haliotrema diplotaenia* Cruces, Chero & Luque, 2018 and *H. saezae* Cruces, Chero & Luque, 2018 from the Mexican hogfish *Bodianus diplotaenia* (Gill) (Labridae); *H. sanchezae* Cruces, Chero, Sáez & Luque, 2017 from the bumphead parrotfish *Scarus perrico* Jordan & Gilbert (Scaridae); *Euryhaliotrema luisae* Cruces, Chero & Luque, 2018 and *E. magnopharyngis* Cruces, Chero & Luque, 2018 from the Pacific porgy *Calamus brachysomus* (Lockington) (Sparidae); *E. paralonchuri* (Luque & Iannocone, 1989) Kritsky & Boeger, 2002 from the Peruvian banded croaker *Paralonchurus peruanus* (Steindachner) (Sciaenidae); *Mexicana iannaconi*

Chero, Cruces, Sáez & Alvariño, 2014 from the cherechere grunt *Haemulon steindachneri* (Jordan & Gilbert); *Parancylodiscoides chaetodipteri* Caballero & Bravo-Hollis, 1961 from the Panama spadefish *Parapsettus panamensis* (Steindachner) (Ephippidae); *Pa. peruensis* from *H. peruanus* (Serranidae); and *Pa. signiferi* from *H. signifer* (Serranidae) (see Luque et al., 2016; Cruces et al., 2018). The three new species described here raise this number of species to 13 and the number of dactylogyrid species from serranids to 5, which are relatively poorly studied fish hosts. Despite the high diversity of marine fishes in Peru (more than 700 species) (Froese & Pauly, 2019), only about 6% of the species have been examined for monogeneans (Luque et al., 2016). Thus, the current knowledge of the diversity of these fish parasites is still underestimated and many new taxa of monogeneans, especially on poorly studied fish hosts, could be discovered (Chero et al., 2018a, b; Cruces et al., 2018).

The co-occurrence of three species of *Pronotogrammella* n. g. in *P. multifasciatus* is not uncommon. The presence of multiples species of a monogenean genus infecting a single teleost species has been previously reported in other genera of marine dactylogyrids, i.e. *inter alia*, *Euryhaliotrema* Kritsky & Boeger, 2002; *Haliotrema* Johnston & Tiegs, 1922; *Hemirhamphiculus* Bychowsky & Nagibina, 1969; *Neohaliotrema*; *Protogyrodactylus* (see Galli & Kritsky, 2008; Lim & Gibson, 2010; Kritsky & Bakenhaster, 2011; Cruces et al., 2018; Kritsky, 2018a, b). Then, the present work along with other previous reports suggest that the marine fishes host an exceptionally diverse suite of dactylogyrid species.

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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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