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Helminths collected from some freshwater fishes and amphibians in Ecuador and Venezuela

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Abstract: The present paper comprises a systematic survey of helminths (trematodes, an acanthocephalan and nematodes) found in nine species of freshwater fishes in Ecuador collected in March 1999 and those (a trematode and acanthocephalans) collected from an amphibian and two species of freshwater fishes in Venezuela in 1992, 1996 and 2001. The following 17 helminth species were recorded: Trematoda: *Prosthenhystera ornamentosa* sp. n., *P. obesa* (Diesing, 1850), *Crassicutis intermedius* (Szidat, 1954), *C. cichlasomae* Manter, 1936 and *Glypthelmins eleutherodactyli* sp. n. Acanthocephala: *Quadrigyrus torquatus* Van Cleave, 1920, *Gracilisentis variabilis* (Diesing, 1851) and *Neoechinorhynchus* (*Neoechinorhynchus*) *ecuadoris* sp. n. Nematoda: *Cosmoxynema vianai* Travassos, 1949, *Travnema travnema* Pereira, 1938, *Touzeta ecuadoris* Petter, 1987, *Sprentascaris hypostomi* Petter et Cassone, 1984, *Sprentascaris* sp., *Contracaecum* sp. Type 1 larvae, *Contracaecum* sp. Type 2 larvae, *Procamallanus* (*Procamallanus*) *peraccuratus* Pinto, Noronha et Rolas, 1976 and *Procamallanus* (*Spirocamallanus*) sp. juv. Nearly all of these parasites are reported from Ecuador or Venezuela for the first time and many of these findings represent new host records. The new species *P. ornamentosa* sp. n. was collected from the gall-bladder of an unidentified anostomid (Anostomidae, Characiformes) in Ecuador, *G. eleutherodactyli* sp. n. from the digestive tract of the frog *Eleutherodactylus* sp. (Eleutherodactylidae, Anura) in Venezuela and *N.* (*N.*) *ecuadoris* sp. n. from the intestine of *Lebiasina* sp. (Lebiasinidae, Characiformes) in Ecuador. Most parasites are briefly described and illustrated and problems concerning their morphology, taxonomy, hosts and geographical distribution are discussed.

Keywords: helminth parasites, Trematoda, Acanthocephala, Nematoda, taxonomy, Pisces, Anura, Neotropical Region

Helminth parasites of freshwater fishes in South America are still little known, the main source of information being the Paraná and La Plata River basins in Brazil and Argentina, respectively (Choudhury et al. 2016). On the contrary, there are only few data on these parasites from other regions, mostly based on occasional findings. This is a case of Venezuela, where previously a few papers dealing with freshwater fish helminths were published (see Moravec and Prouza 2024), and Ecuador from where, as far as we know, only several nematode species were reported in freshwater fishes of Province Napo (Amazon River basin) by Petter (1987).

During zoological expeditions of the Moravian Land Museum (Brno, Czech Republic) to Ecuador in 1999 and to Venezuela in 1992, 1994, 1996 and 2001, the junior author of this paper (A. Prouza) examined a number of fish and other aquatic vertebrates for the presence of helminth parasites. The results of the systematic evaluation of nematodes and cestodes parasitising freshwater fishes and those from *Caiman crocodilus* (Linnaeus) collected in Venezuela in 1992 and 1994 were already published (Moravec et al. 1996, 1997, Scholz et al. 1996, Moravec and Prouza 2003), but other helminths, mainly trematodes and acanthocephalans, remained unexamined.

Nevertheless, all available trematodes and acanthocephalans were soon after their collection stained and mounted as permanent slides in the Institute of Parasitology, Biology Centre, CAS, in České Budějovice. Unfortunately, A. Prouza passed away in December 2022 and his dissecting protocols from expeditions to South America, although incomplete, remained with the first author of this paper (FM). This enabled, after years, to examine and evaluate the material of fish trematodes collected in Venezuela in 1992, 1996 and 2001 and the results obtained were recently published (Moravec and Prouza 2024).

The rest of Prouza's helminth materials, represented by stained specimens mounted as permanent slides, included fish trematodes and acanthocephalans collected in Ecuador in March 1999 and amphibian trematodes and fish acanthocephalans collected in Venezuela in February 1992, April 1996 and April 2001. All these specimens were recently examined, whereas the fish nematodes collected in Ecuador in March 1999 were studied soon after their collection (see Materials and methods). In our opinion, even though

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in many cases the hosts of helminths were not identified to species, the present material is interesting enough, contributes to the knowledge of these parasites in insufficiently explored areas of South America and is worth publishing. Consequently, the purpose of this paper is to put the results obtained on record.

MATERIALS AND METHODS

The helminths were collected from the following ten Ecuadorian freshwater fish species, and from two freshwater fish species and one amphibian species in Venezuela:

Ecuador (fishes)

Characiformes: Anostomidae – an unidentified anostomid (designated as "Leporinid" in the dissecting protocol); Characidae – *Astyanax* sp. and "Tetra"; Curimatidae – "Silver-coloured curimatid"; Erythrinidae – Erythrinidae gen. sp.; Lebiasinidae – *Lebiasina* sp.

Siluriformes: Loricariidae – *Ancistrus* sp.

Cichliformes: Cichlidae – "*Cichlasoma*" sp., Cichlidae gen. sp. and *Crenicichla* sp.

Venezuela (fishes and amphibian)

Characiformes: Erythrinidae – *Hoplias malabaricus* (Bloch)

Siluriformes: Loricariidae – *Pterygoplichthys multiradiatus* (Hancock)

Anura: Eleutherodactylidae – *Eleutherodactylus* sp.

The trematodes and acanthocephalans were fixed (mostly slightly compressed under a coverslip) and preserved in 4% formalin. Later they were stained in carmine, dehydrated through an ethanol series and mounted in Canada balsam as permanent slides. The nematodes were fixed and preserved in 4% formalin and cleared with glycerine as temporal slides for light microscopy (LM) examination; these were examined by LM soon after their collection and subsequently they were kept in vials filled with 4% formalin (unfortunately, the vials dried up after many years and, consequently, the nematodes could not be deposited). Drawings were made with the aid of a Zeiss drawing attachment. All measurements in species descriptions are in micrometres unless otherwise indicated. The trematode and acanthocephalan specimens were deposited in the Helminthological Collection of the Institute of Parasitology, Biology Centre of the Czech Academy of Sciences, České Budějovice, Czech Republic (IPCAS). Fish nomenclature follows FishBase (Froese and Pauly 2024).

RESULTS

TREMATODA

Family Callodistomidae Odhner, 1910

***Prosthenhystera ornamentosa* sp. n.** Fig. 1A,B

ZooBank number for species:
urn:lsid:zoobank.org:act:2D8F31F1-1D6B-46E5-B35B-44087BB4C4CB

Description (1 specimen, holotype): Body flattened, widely oval, 2.73 mm long, maximum width 241 mm; body width/length ratio 1 : 1.14. Tegument of entire body including surface of suckers densely covered with fine, elevated transverse cordons appearing on body sides as numerous tegumental spines 3–6 high. Oral sucker terminal, rounded, size 435 × 625; ventral sucker transverse oval, smaller than oral sucker, 449 × 612, located in anterior half of body; size ratio of suckers 1 : 1.14. Prepharynx indistinct. Pharynx muscular, 163 long and 150 wide. Oesophagus short, 95 long. Intestinal bifurcation approximately at 1/4 of body length; caeca narrow, long, not extending to body end. Testes small, spherical, parallel, situated at level just posterior to posterior margin of ventral sucker; left testis 150 × 150, partly overlapping caecum; right testis slightly smaller, 122 × 122, near inner side of right caecum. Genital pore median, just anterior to intestinal bifurcation. Cirrus sac 313 long and 122 wide, oriented to left, containing distinct oval seminal vesicle, pars prostatica and ejaculatory duct. Ovary irregularly oval, 245 × 299, at level of testes, submedian, intertesticular, located near right testis. Small round seminal receptacle somethat posterior to ovary. Vitelline follicles in two symmetrical lateral fields between testes and intestinal bifurcation. Uterus fills most of hindbody and middle and lateral forebody up to level of cirrus sac. Eggs oval, 63–75 long and 45–51 wide. Excretory vesicle not observed.

Type host: An unidentified anostomid (designated as "Leporinid" in the dissecting protocol) (Anostomidae, Characiformes); body length 18 cm.

Site of infection: Gall-bladder.

Type locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 14 March 1999).

Number of specimens collected: 1 in 1 fish.

Deposition of holotype: IPCAS D-882.

Etymology: The specific name *ornamentosa* (= ornamental) is a Latin adjective, which relates to the main characteristic feature of this species, i.e., the presence of remarkable tegumental ornamentations.

Comments: The diagnosis of the Callodistomidae, where *Prosthenhystera* Travassos, 1922 and a few other genera belong, shows that its representatives are characterised by a smooth, unarmed tegument (Skryabin 1959, Gibson et al. 2002). This also concerns the genus *Prosthenhystera* that currently includes the following four species: *P. obesa* (type species) reported from many species of characiform and siluriform fishes (occasionally those of other fish orders) in South America and Mexico (e.g., Diesing 1850, Travassos et al. 1928, Caballero and Jiménez Guzmán 1969, Kohn et al. 1997, Martins et al. 2012, Tkach and Curran 2015); *P. caballeroi* Jiménez Guzmán, 1973 from *Astyanax mexicanus* (De Filippi) and *A. aeneus* (Günther) (Characidae) in Mexico, Nicaragua and Costa Rica (Jiménez Guzmán 1973, Tkach and Curran 2015); *P. oonastica* Tkach et Curran, 2015 from the ictalurid catfishes (Ictaluridae, Siluriformes) in the southern United States (Tkach and Curran 2015); and *P. gatti* from *Bryconamericus ikaa* Casciotta, Almirón et Azpelicueta (Characidae) in Argentina (Montes et al. 2020).

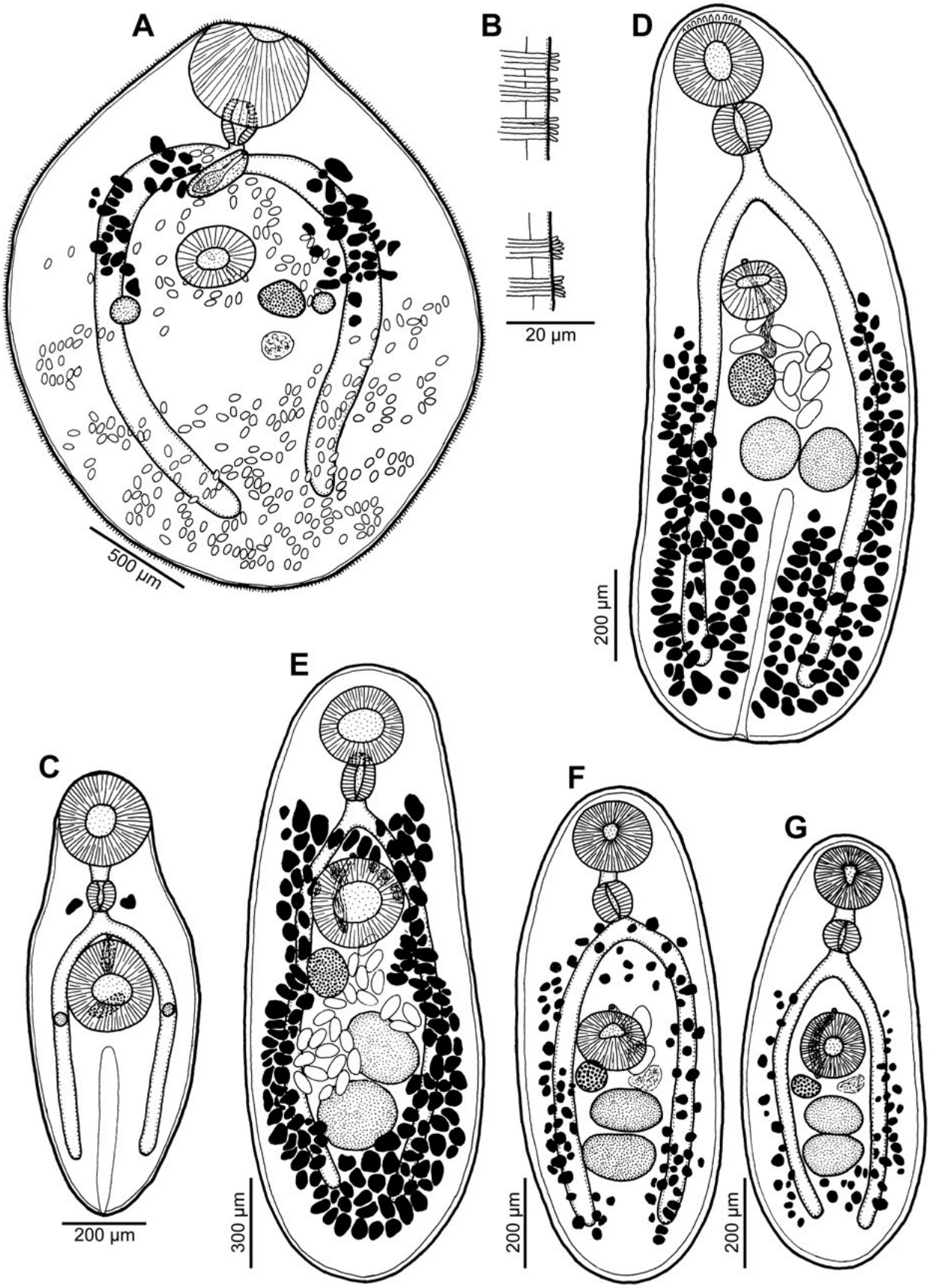

Fig. 1. A, **B** – *Prosthenhystera ornamentosa* sp. n. (holotype) from unidentified anostomid fish, Ecuador (A – total view, B – tegumental ornamentations); **C** – *Prosthenhystera obesa* (Diesing, 1850) from unidentified characid fish ("Tetra"), Ecuador; **D** – *Crassicutis intermedius* (Szidat, 1954) from *Ancistrus* sp., Ecuador; **E**–**G** – *Crassicutis cichlasomae* Manter, 1936 from "*Cichlasoma*" sp., Ecuador (E, F – gravid specimens, G – nongravid specimen).

In having conspicuous, very distinct tegumental ornamentations, *P. ornamentosa* sp. n. can be easily distinguished from all its congeners, in which the tegument was reported as smooth or spineless. Only Caballero and Jiménez Guzmán (1969) mention that the tegument of the only available specimen identified as *P. obesa* from an unusual host *Centropomus undecimalis* (Bloch) (Centropomidae, Carangaria/misc) in Mexico (Veracruz) was provided with minute papillae. Minute tegumental papillae were also observed by SEM in a round-shaped specimen of *P. obesa* from *Salminus brasiliensis* (Cuvier) in Brazil by Kohn et al. (1997). The latter authors also mention the presence of long and slender structures resembling spines on the body surface of *P. obesa* that are visible only at higher SEM magnification, but not using LM or by SEM in low magnification. On the contrary, the tegumental ornamentations of the new species are conspicuous, well visible by LM on the body surface of the stained and mounted specimen.

For comparison, we examined a stained and mounted gravid specimen of *P. obesa* deposited in the Helminthological Collection of the Institute of Parasitology, BC CAS (IPCAS D-383/1), collected from the gall-bladder of *Psaliodon fasciatus* (Cuvier) (reported as *Astyanax fasciatus*) (Characidae) in the River Hondo, southern Mexico in January 1995 (see Scholz and Vargas-Vázquez 1998). The tegument of this specimen examined by LM proved to be thick and smooth, without any visible superficial ornamentations.

Besides the presence of tegumental ornamentations, the new trematode species differs from *P. caballeroi* and *P. gatti* by the mutual position of testes (parallel *vs* distinctly oblique) and by the shape of the body (round-shaped *vs* elongate-oval; width/length ratio 1 : 1.14 *vs* 1 : 2.2–2.8 and 1 : 3.36–5, respectively); from *P. caballeroi* also by the extent of vitelline follicles (from the intestinal bifurcation to testes *vs* only in the region of the ventral sucker, by far not reaching the bifurcation anteriorly) and the length of the oesophagus (very short *vs* long); from *P. gatti* also by the location of the genital pore (just anterior to the intestinal bifurcation *vs* distinctly posterior to the bifurcation), the length of the oesophagus (very short *vs* long) and the anterior extent of uterine coils (up to the intestinal bifurcation *vs* to the genital pore, by far not reaching the bifurcation).

The general morphology of *P. obesa* and *P. oonastica* is much the same and, as stated by Tkach and Curran (2015), there are no significant morphological features enabling discrimination between these two species. Consequently, the validity of the latter species can be questioned, because a certain genetic difference found by Tkach and Curran (2015) is not supported by clear-cut morphological differences. Nevertheless, the authors separated these two species based on the non-overlapping host taxa and different geographical ranges, in addition to some genetic divergence. In contrast to the new species (*P. ornamentosa* sp. n.), the tegument of both *P. obesa* and *P. oonastica* is without distinct superficial ornamentations and these species have a long oesophagus (*vs* oesophagus very short); also the shape of body of the *P. obesa* and *P. oonastica* is usually elongate-oval (*vs* round-shaped), even though Kohn et al. (1997) recorded a round-shaped specimen of *P. obesa* from *Salminus brasiliensis* (Cuvier) (syn. *S. maxillosus* Valenciennes) (Bryconidae) of the Paraná River, Brazil.

The authors are aware of the fact that *P. ornamentosa* sp. n. is being described from a single specimen, a procedure that cannot be generally recommended; however, in this case, the new species appears to be well established and, therefore, they consider it more reasonable and much useful to give it a specific name rather than to report it as *Prosthenhystera* sp. and to wait years until more specimens are available.

***Prosthenhystera obesa* (Diesing, 1850) Travassos, 1922**

Fig. 1C

Syn.: *Distomum obesum* Diesing, 1850;

***Pseudoprosthenhystera microtesticulata* Kloss, 1966.**

Description (2 immature specimens): Body elongate-oval, 639–694 long, maximum width 272–286; body width/length ratio 1 : 2.23–2.55. Tegument smooth. Two distinct pigment eye-spots present at level of pharynx. Oral sucker subterminal, size 108–153 × 141–150; ventral sucker circular to oval, 120 × 120–126, located at mid-body; size ratio of suckers 1 : 1.01–1.26. Short prepharynx present. Pharynx muscular, 27–36 long and 27 wide. Oesophagus short, 69–75 long. Intestinal bifurcation approximately at 1/3 of body length; caeca narrow, long, not extending to body end. Testes very small, spherical, parallel, situated at level of posterior part of ventral sucker, overlapping caeca; left testis 21–24 × 18, right testis 18 × 18. Genital pore median, just posterior to intestinal bifurcation. Cirrus sac 96 long and 33 wide. Ovary transversely oval, 30–74 × 18–60, median, at level of testes. Uterus empty, indistinct. Vitelline follicles not yet developed. Excretory vesicle I-shaped, reaching anteriorly almost to posterior margin of ventral sucker.

Host: "Tetra" (Characidae, Characiformes); body length 3.5 cm.

Site of infection: Gall-bladder.

Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 14 March 1999).

Number of specimens collected: 2 in 2 fish; intensity of infection 1 trematode.

Deposition of voucher specimen: IPCAS D-383.

Comments: At present, three species of *Prosthenhystera* are known as gall-bladder parasites of fishes in South America: *P. gattii*, *P. obesa* and *P. ornamentosa* sp. n.; the fourth congeneric species *P. oonastica*, reported from ictalurid catfishes in the USA, is morphologically indistinguishable from *P. obesa* and its validity can be questioned (see above). Even though vitelline follicles are not yet developed in the two present young specimens at disposal, their tegument without superficial ornamentations and a parallel location of small testes makes it possible to identify them as *P. obesa*. This trematode is reported from many species of characiform and siluriform fishes (occassionally also those of other fish orders) in South America and Mexico (see above). Nevertheless, further molecular and life cycle studies may show that *P. obesa* represents in fact a species complex.

Family Apocreadiidae Skryabin, 1942

***Crassicutis intermedius* (Szidat, 1954) Bray, de Chambrier et Vaucher, 1996** Fig. 1D

Syn.: *Eocreadium intermedium* Szidat, 1954.

Description (1 specimen): Body oval, with thick, smooth tegument; numerous small sclerotised granullae present just anterior to anterior margin of oral sucker. Body length 1.88 mm, maximum width 694. Oral sucker subterminal, measuring 218 × 231; ventral sucker 177 × 190, situated in middle third of body; size ratio of both suckers 1 : 1.22. Prepharynx absent. Pharynx muscular, size 150 × 150. Oesophagus 82 long. Caeca slender, ending short distance from posterior extremity. Testes spherical or almost spherical, entire, parallel; size of left testis 177 × 190, of right testis 177 × 177. Cirrus sac absent. Seminal vesicle just anterior to ovary. Genital pore median, immediately anterior to ventral sucker. Ovary spherical, smaller than testes, size 136 × 136, in space between testes and ventral sucker. Vitelline follicles extending mainly laterally and dorsally from caeca and connecting in space behind testes; anteriorly they reach to level of posterior margin of ventral sucker and posteriorly almost to body end. Uterus contains ten eggs. Eggs oval, 99–105 long and 54–60 wide. Excretory vesicle I-shaped, reaching just posteriorly to testes.

Host: *Ancistrus* sp. (Loricariidae, Siluriformes); body length 10 cm.

Site of infection: Intestine.

Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 16 March 1999).

Prevalence and intensity: 9% (1 fish infected/11 fish examined); 1 trematode.

Deposition of voucher specimen: IPCAS D-881.

Comments: The morphology and measurements of the only available specimen agree, more or less, with the descriptions of *C. intermedius* (Szidat, 1954), as provided by Szidat (1954) and Bray et al. (1996). It only differs in the anterior extent of vitelline follicles (reaching only to the level of the posterior margin of the ventral sucker *vs* usually to the anterior margin of the ventral sucker or more anteriorly) and in the presence of numerous distinct sclerotised granullae just anterior to the anterior margin of the oral sucker, not reported by previous authors. Since these differences may be considered to be within intraspecific variability (extent of vitelline follicles) or may be due to inaccurate observations (presence of granullae at the anterior body end), we identify this trematode specimen as *C. intermedius*.

Crassicutis intermedius is known as a parasite of the digestive tract of siluriforms (mainly loricariids *Hypostomus* spp.) and a characiform of the Paraná River basin in Argentina, Brazil and Paraguay (Szidat 1954, Fortes et al. 1985, Kohn and Fróes 1986, Bray et al. 1996, Ostrowski de Núñez et al. 2017). The present finding of this trematode from *Ancistrus* sp. of the Amazon River basin in Ecuador represents new host and geographical records.

***Crassicutis cichlasomae* Manter, 1936** Fig. 1E–G

Syn.: *Crassicutis opisthoseminis* Bravo-Hollis et Arroyo, 1962.

Description (7 specimens): Body oval, with very thick, smooth tegument; body length 1.10–2.38 mm, maximum width 476–938. Subterminal oral sucker measuring 177–299 × 177–340; ventral sucker 163–299 × 163–354, situated in middle third of body; size ratio of both suckers 1 : 0.98–1.21. Short prepharynx present. Pharynx muscular, size 95–150 × 109–136. Oesophagus absent or very short, 27 long. Caeca slender, ending short distance from posterior extremity. Testes oval to almost spherical, entire, those in large specimens diagonal, in small specimens tandem; size of anterior testis 109–258 × 163–313, of posterior testis 109–272 × 177–280. Seminal vesicle elongate, reaching posteriorly to level of posterior margin of ventral sucker in small specimens. Genital pore median, immediately anterior to ventral sucker. Ovary spherical to oval, small (82–204 × 82–177), in space between anterior testis and ventral sucker. Seminal receptacle present near ovary. Uterus upward. Eggs present in larger specimens; size of eggs 99–111 × 60–69. Vitelline follicles extending mainly laterally and dorsally from caeca and connecting in space behind testes and anteriorly anterior to ventral sucker, reaching anteriorly almost to pharynx; vitelline follicles not connecting anteriorly to ventral sucker in smallest, nongravid specimen. Excretory vesicle not observed.

Host: "*Cichlasoma*" sp. (Cichlidae, Cichliformes).

Site of infection: Intestine.

Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 17 March 1999).

Number of specimens collected: 7 in 2 fish; intensity of infection 3 and 4 trematodes.

Deposition of voucher specimens: IPCAS D-15.

Comments: This trematode species seems to be a frequent intestinal parasite of cichlid fishes (Cichlidae) in the Neotropical Region, being reported from southern Mexico, Nicaragua, Costa Rica, Venezuela and Brazil (Moravec and Prouza 2024). However, according to Pantoja et al. (2021), recent molecular studies idicate that *Crassicutis cichlasomae* may represent a species complex in Middle American cichlids, whereas the validity of findings of this species in South America should be confirmed by subsequent studies.

Recently, Moravec and Prouza (2024) reported *C. cichlasomae* from cichlids of the Orinoco River basin in Venezuela, differentiating it on the basis of its morphology from other congeneric species. As compared with the Venezuelan specimens, the present trematodes from Ecuador have somewhat smaller eggs (99–111 × 60–69 µm *vs* 132–144 × 96–108 µm) and testes in small specimens are tandem (Fig. 1) instead of being diagonal. These differences are probably within the intraspecific variability of this species. It is also interesting that, in the smallest, nongravid specimen of the present material, the lateral fields of vitelline follicles are not interconnected in the region anterior to the ventral sucker (Fig. 1G).

This is the first record of *C. cichlasomae* is fishes in Ecuador and in the Amazon River basin.

Family Plagiorchiidae Lühe, 1901

***Glypthelmins eleutherodactyli* sp. n.** Fig. 2

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Description (10 specimens; measurements of holotype in parentheses): Body elongate-oval, 4.08–7.09 (7.09) mm long, maximum width 1.40–1.71 (1.54) mm; width/length ratio of body 1 : 2.78–4.61 (1 : 4.61). Tegument of almost entire body armed with minute spines. Oral sucker subterminal, larger than ventral sucker, size 408–490 × 455–571 (490 × 571). Ventral sucker small, less muscular than oral sucker, located approximately between first and second thirds of body, measuring 163–286 × 163–286 (286 × 286). Size ratio of both suckers 1 : 1.63–2.59 (1 : 1.85). Prepharynx very short, at most 68 (68) long, or indistinct. Pharynx large, 286–326 × 340–442 (326 × 422), somewhat smaller than oral sucker; ratio of widths of pharynx and oral sucker 1 : 1.19–1.40 (1 : 1.35). Pharyngeal glands absent. Oesophagus short, 41–109 (109) long. Caeca extend to near posterior end of body. Testes spherical to oval, entire, diagonal, intercaecal, near middle of body; size of anterior testis 272–394 × 354–517 (394 × 435), of posterior testis 313–503 × 354–476 (503 × 354). Cirrus sac curved, 326–517 (517) long and 231–286 (286) wide, containing coiled seminal vesicle, prostatic part and cirrus; genital pore median, just anterior to ventral sucker. Ovary submedian, spherical to oval, entire, somewhat smaller than testes, size 313–340 × 272–367 (340 × 340), situated anterior to testes. Vitelline follicles form lateral, extracaecal fields extending from about level of cirrus sac posteriorly to approximately mid-length between posterior testis and body end. Uterus extends to posterior end of body; transverse uterine loops intercaecal; anteriorly uterine loops occupy pretesticular region. Eggs operculate, 27–30 (27–30) long, 12–15 (12–15) wide. Excretory vesicle indistinct.

Type host: *Eleutherodactylus* sp. (Eleutherodactylidae, Anura).

Site of infection: Not known (probably digestive tract).

Type locality: Campo Alegre near Valencia, Venezuela (collected 14 April 1996).

Number of specimens collected: 10 in 3 frogs.

Deposition of type specimens: IPCAS D-879.

Etymology: The term *eleutherodactyli* is the genitive form of the generic name of the type host.

Comments: As pointed out by Razo-Mendivil and Pérez-Ponce de León (2008), "the taxonomic history of the genus *Glypthelmins* Stafford, 1905 shows that the classification of this group is complex, remains controversial and is unsettled". According to these authors, this situation is due to the lack of adequate generic diagnoses and robust phylogenetic hypotheses within the plagiorchiid trematodes. They mention that at least 36 species were considered to belong to *Glypthelmins* until 2006. As indicated by Razo-Mendivil and León-Règagnon (2001), the confusion in the species composition of *Glypthelmins* was caused by investigators creating some non-monophyletic artificialy groups, so that some species that should be included in *Glypthelmins* were assigned to other genera.

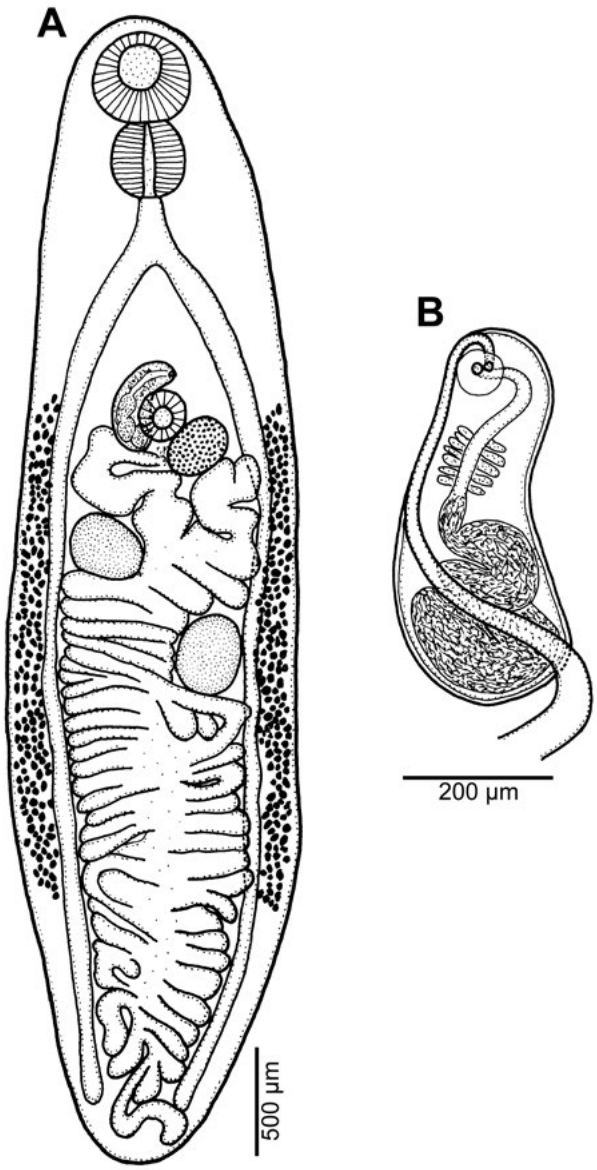

Fig. 2. *Glypthelmins eleutherodactyli* sp. n. (holotype) from the digestive tract of the frog *Eleutherodactylus* sp. in Venezuela.

In having the extracaecal distribution of vitelline follides, together with the presence of a coiled seminal vesicle (except for *G. proximus* Freitas, 1941), the traits considered to be synapomorphic for *Rauschiella* clade (Razo-Mendivil and León-Règagnon 2001), *G. eleutherodactili* sp. n. can be assigned to the group of Neotropical species of *Glypthelmins* that were reported by some authors mostly as representatives of the controversial genus *Rauschiella* Babero, 1951 considered by others as a synonym of *Glypthelmins*: *G. palmipedis* (Lutz, 1928) Travassos, 1930, *G. poncedeleoni* Razo-Mendivil et León-Règagnon, 2001, *G. proximus*, *G. repandum* (Rudolphi, 1819) Travassos, 1924, *G. robustus* Brooks, 1976, *G. sera* Cordero, 1944 and *G. tineri* (Babero, 1951) Brooks, 1977 (see Razo-Mendivil and León-Règagnon 2001). Extracaecally distributed vitellarium differentiate these species

from all other members of the genus (Razo-Mendivil and León-Règagnon 2001).

In contrast to the new species, *G. palmipedis* possesses a pharynx that is distinctly smaller than the oral sucker (width ratio of the pharynx and oral sucker 1 : 1.50–2.00 *vs* 1.19–1.40), its vitelline follicles are arranged in clusters (*vs* continuous without clusters) and extending anteriorly to the level of the caecal bifurcation (*vs* to the level of the cirrus sac) and posteriorly sometimes up to caecal ends (*vs* approximately to the mid-length between the posterior testis and the body end; see Sullivan 1977).

Glypthelmins poncedeleoni differs in having the ovary distinctly larger than testes (*vs* ovary smaller than testes), the pharynx markedly smaller than the oral sucker (width ratio 1 : 2.00 *vs* 1 : 1.19–1.40) and vitelline follicles arranged in clusters; *G. proximus* in having a bipartite seminal vesicle (*vs* seminal vesicle coiled) and lateral fields of vitelline follicles ending at a short distance posterior to testes; *G. repandum* is characterised by lateral fields of vitelline follicles extending anteriorly only to the level of the ovary, not reaching the region of the ventral sucker (*vs* reaching the level of the cirrus sac).

Glypthelmins robustus differs from the new species in having the uterine loops not exceeding the intestinal caeca posteriorly (*vs* postcaecal uterine loops present), follicular vitelline follicles extending from the level of the intestinal bifurcation to near caecal tips, distinctly larger eggs (55–67 × 35–38 µm *vs* 27–30 × 12–15 µm) and the tegument spinose anteriorly to the level of the pharynx (*vs* spinose almost throughout the body) (see Brooks 1976). Caeca of *G. sera* do not reach the posterior end of the body (*vs* caeca extend posteriorly near to the body end), whereas the uterine loops of *G. tineri* (see Babero 1951) do not reach caecal ends posteriorly (*vs* postcaecal uterine loops present). *Glypthelmins eleutherodactyli* sp. n. and the above-mentioned congeners also differ in the amphibian host family (Eleutherodactylidae *vs* Bufonidae, Hylidae, Leptodactylidae, Ranidae and Typhlonectidae).

The new species of *Glypthelmins* (*G. eleutherodactyli* sp. n.) is so far the only known representative of this genus parasitising an eleutherodactylid frog. According to Schlüter and Rödder (2007), at least 44 species of *Eleutherodactylus* Duméril et Bibron are known to occur in Venezuela.

In their Checklist of helminth parasites of amphibians from South America, Campião et al. (2014) reported a total of 12 species of *Glypthelmins*, of which only one (*G. palmipedis*) also from Venezuela. However, in addition to *G. palmipedis* recorded in Venezuela from *Lithobates palmipes* (Spix) (Ranidae), *Leptodactylus bolivianus* Boulenger (Leptodactylidae) and *Rhinella marina* (Linnaeus) (Bufonidae) (see Lutz 1928, Caballero et al. 1953, 1956, Sullivan 1977, Cañizales 2020), also four other species were reported from Venezuela: *G. incurvatum* Nasir, 1966 and *G. ramitesticularis* Nasir, 1966 both from *Pseudis paradoxa* (Linnaeus) (Hylidae); *G. linguatula* (Rudolphi, 1819) Travassos, 1924 from *Rhinella granulosa* (Spix) (Bufonidae); and *G. vesicalis* (Ruiz et Leão, 1942) Yamaguti, 1958 from *R. marina* (see Nasir 1966, Nasir and Diaz 1970, Cañizales 2020).

The four last-mentioned species mainly differ from *G. eutherodactyli* sp. n. as follows: *G. incurvatum* – caecal tips far from the body end; vitelline follicles extend anteriorly to the level of the intestinal bifurcation and posteriorly to the caecal ends; *G. linguatula* and *G. vesicalis* – vitelline follicles extend from the level of the intestinal bifurcation to the posterior margin of the posterior testis; *G. ramitesticularis* – testes deeply branched; vitelline follicles extend anteriorly to the level of the pharynx.

Accordingly, *G. eleutherodactyli* sp. n. is the fifth known species of *Glypthelmins* parasitising amphibians in Venezuela.

ACANTHOCEPHALA

Family Quadrigyridae Van Cleave, 1920

***Quadrigyrus torquatus* Van Cleave, 1920** Fig. 3

Description: Body elongate, maximum width near its anterior end. Proboscis elongate, armed with 5 spiral rows of 4 gradually diminishing in size hooks provided with distinct roots. Body wall thick, provided with 2 large hypodermal nuclei, 1 dorsal and 1 ventral, at anterior region of trunk (at level of proboscis receptacle and lemnisci). Anterior end of trunk bearing 4 transverse rows of very small tegumental spines, each spine with large flat root of rather complicated structure. Lemnisci short, slightly exceeding proboscis receptacle, each with 1 giant nucleus in middle. Nerve ganglion at base of proboscis receptacle.

Male (1 complete specimen and 1 body fragment): Body 6.54 mm long, maximum width 830. Proboscis including short neck 381 long and 190 wide. Length of hooks in first anterior row 78–90, in second row 66–78, in third row 39–45, in fourth row 30–39. Trunk spines 9–12 long. Proboscis receptacle 490 long, 177 wide. Lemnisci equal, 544 long. Testes oval, tandem, located in anterior half of body; size of anterior testis 435–517 × 231–299, of posterior testis 435–490 × 245–258. Cement glands syncitial, 1.97–2.45 mm long. Caudal end with inverted short genital bursa.

Female (5 nongravid specimens): Body 7.75 mm long, maximum width 843–1,333. Proboscis including short neck 313–544 long and 204–231 wide. Length of hooks in first anterior row 105, in second row 78, in third row 45, in fourth row 33–39. Trunk spines 9–12 long. Proboscis receptacle 544–571 long, 177–218 wide. Lemnisci equal or subequal, 422–571 long. Eggs not yet present. Numerous ovarian balls present in anterior region of body. Posterior end of body rounded, with terminal genital pore.

Host: *Hoplias malabaricus* (Erythrinidae, Characiformes), body length 9–11 cm.

Site of infection: Intestine and pyloric caeca.

Locality: Hato Corralito, south from El Baulu, Venezuela (collected 4 April 2001).

Number of specimens collected: 9 in 2 fish; intensity 1 and 8 acanthocephalans.

Deposition of voucher specimens: IPCAS A-141.

Comments: At present, four nominal species of *Quadrigyrus* Van Cleave, 1929 have been reported from fresh-

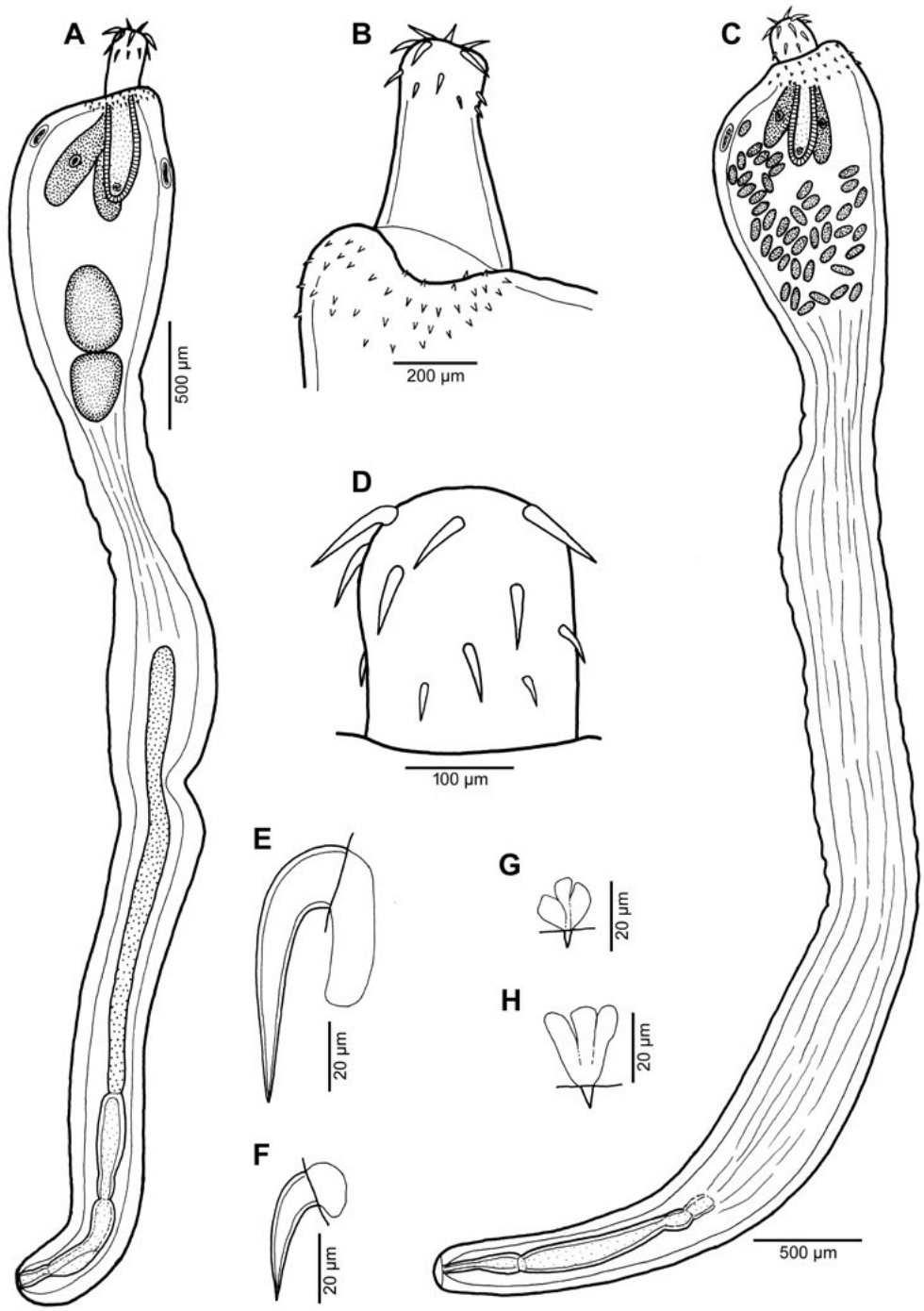

Fig. 3. *Quadrigyrus torquatus* Van Cleave, 1920 from *Hoplias malabaricus* (Bloch), Venezuela. **A** – male, general view; **B** – proboscis with anterior end of female; **C** – nongravid female, general view; **D** – proboscis of female; **E** – hook of most anterior row; **F** – hook of most posterior row; **G**, **H** – two different tegumental hooks.

water fishes in South America: *Q. brasiliensis* Machado Filho, 1941 from Brazil, *Q. machadoi* Fabio, 1983 from Brazil and Argentina, *Q. nickoli* Schmidt et Hugghins, 1973 from Colombia and *Q. torquatus* Van Cleave, 1920 from Brazil, Colombia, Surinam and Venezuela (Van Cleave 1920, Machado Filho 1941, Petrochenko 1956, Schmidt and Hugghins 1973, Fabio 1983, Thatcher 2006, Santos et al. 2008, Chemes and Brusa 2013, Hernández-Orts et al. 2019). It is interesting that the erythrinid *H. malabaricus* is among the main hosts of three of the above-mentioned species (*Q. brasiliensis*, *Q. machadoi* and *Q. torquatus*).

In having the proboscis armed with hooks arranged in five oblique rows of four each and by other morpphological and biometrical features, the present specimens belong to *Q. torquatus*. Chemes and Brusa (2013) distinguish *Q. torquatus* from *Q. machadoi* by the separated testes (*vs* testes juxtaposed), but it is only mentioned in the original description of the former species that the testes may be (i.e., not necessarily) separated; both species also differ in the size of proboscis hooks.

Quadrigyrus torquatus, the type species of the genus, was originally described from *H. malabaricus* and four

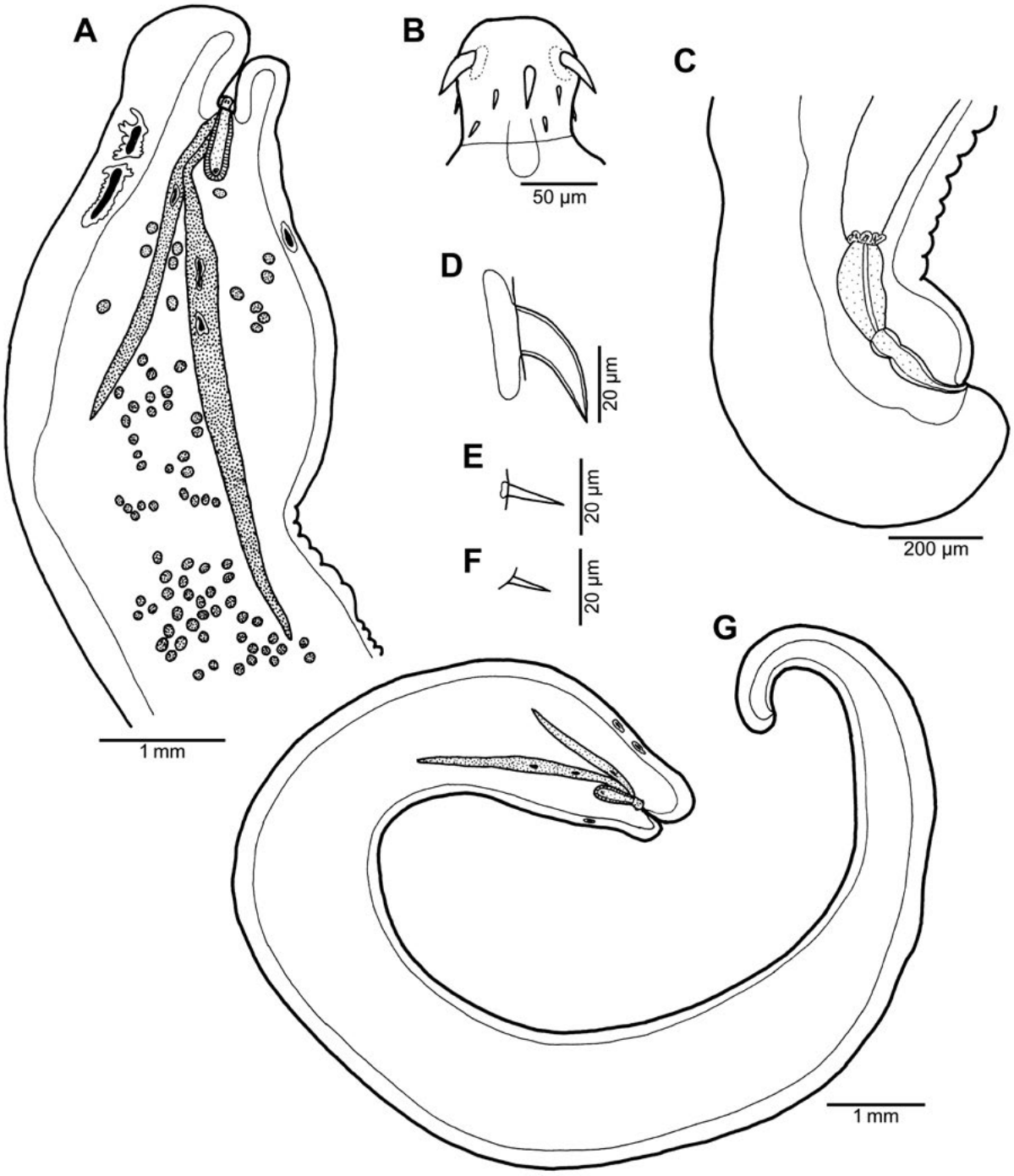

Fig. 4. *Gracilisentis variabilis* (Diesing, 1851) from *Pterygoplichthys multiradiatus* (Hancock), Venezuela, gravid female (holotype). **A** – anterior part of body; **B** – proboscis; **C** – posterior end of body, lateral view; **D**–**F** – hooks of anterior, middle and posterior rows, respectively; **G** – general view.

other species of freshwater fishes in Venezuela (Van Cleave 1920; see also Díaz-Ungría and Rodrigo 1957).

Family Neoechinorhynchidae Van Cleave, 1919

***Gracilisentis variabilis* (Diesing, 1851) Petrochenko, 1956**
Fig. 4

Syn.: *Echinorhynchus variabilis* Diesing, 1851.

Description of female (1 gravid specimen, holotype): Body elongate, 29 mm long, maximum width 2.37 mm at its anterior portion; posterior half of body much narrower. Body wall thick, provided with 3 giant hypodermal nuclei at anterior part of body. Proboscis short, 105 long and 108 wide, armed with hooks arranged in 3 circular rows of six each; anterior hooks conspicuously larger than those of following circles; anterior hooks 39–45 long, length of middle hooks 24, of posterior hooks 15. Each anterior hook provided with large root, roots of middle and posterior hooks indistinct. Proboscis receptacle 517 long and 177 wide, with nerve ganglion at posterior end. Lemnisci narrow, very unequal in lengh and width, 3.71 mm and 4.46 mm long; longer lemniscus approximately twice as wide

as lemniscus. Shorter lemniscus with 1 large cell nucleus, longer lemniscus with 2 large nuclei. Uterine bell 245 from posterior end of body. Eggs numerous, elongate-oval, size 27–33 × 9–12.

Host: *Pterygoplichthys multiradiatus* (Loricariidae, Siluriformes).

Site of infection: Body cavity (probably escaped from the intestine).

Locality: Small lake near the ranch Hato Las Mercedes, near Boca de Anaro on the Suripá River, State of Barinas, Venezuela (collected 16 February 1992).

Number of specimens collected: 1 in 1 fish.

Deposition of voucher specimen: IPCAS A-140.

Comments: The body size and morphology of the only available female specimen shows that it belongs to *G. variabilis*, as redescribed by Hamann (1982), only the sizes of proboscis hooks and eggs are somewhat smaller. This parasite has been reported from four species of loricariid catfishes (*Glyptoperichthys lituratus* [Kner], *Hypostomus auroguttatus* Kner, *H. nematopterus* Isbrücker et Nijssen and *H. plecostomus* [Linnaeus]) and some other characiform and pleuronectiform fishes in Brazil (e.g., Travassos et al. 1928, Santos et al. 2008). It was also reported from the characiform fish *Prochilodus lineatus* (Valenciennes) in Argentina (Hamann 1982, Hernández-Orts et al. 2019). The present finding of this species from *P. multiradiatus* in Venezuela represents new host and geographical records for *G. variabilis*.

Schmidt and Hugghins (1973) reported another neoechinorhynchid species, *Gorytocephalus plecostomorum* Nickol et Thatcher, 1971 from *P. multiradiatus* in Peru (see also Tantaleán et al. 2005), previouisly described from *H. plecostomus* in Panama (Nickol and Thatcher 1971). However, this species differs considerably from *G. variabilis* by a much smaller size of the body not exceeding 12 mm and by the presence of a muscular sling surrounding the proboscis receptacle.

***Neoechinorhynchus* (*Neoechinorhynchus*) *ecuadoris* sp. n.**
Fig. 5

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Description of male (1 specimen, holotype): Body spindle-shaped, somewhat narrower at posterior half; body length 5.93 mm long, maximum width at level of anterior testis 1.54 mm. Body wall thick, with 3 large but not well visible hypodermal nuclei, 2 dorsal and 1 ventral, at anterior region of trunk. Proboscis spherical, 136 long and 150 wide, armed with 6 spiral rows of 3 hooks each; anterior and middle hooks much larger (length 51–57) than posterior hooks (length 18–21); anterior and middle hooks provided with large roots, posterior hooks with small roots. Proboscis receptacle 449 long, 326 wide, with nerve ganglion at its base. Lemnisci subequal, 680 and 789 long, without giant nuclei, somewhat exceeding proboscis receptacle. Testes irregularly spherical, tandem, located in anterior half of body; size of anterior testis 707 × 231–952, of posterior testis 707 × 245–952. Cement glands syncitial. Caudal end with inverted short genital bursa.

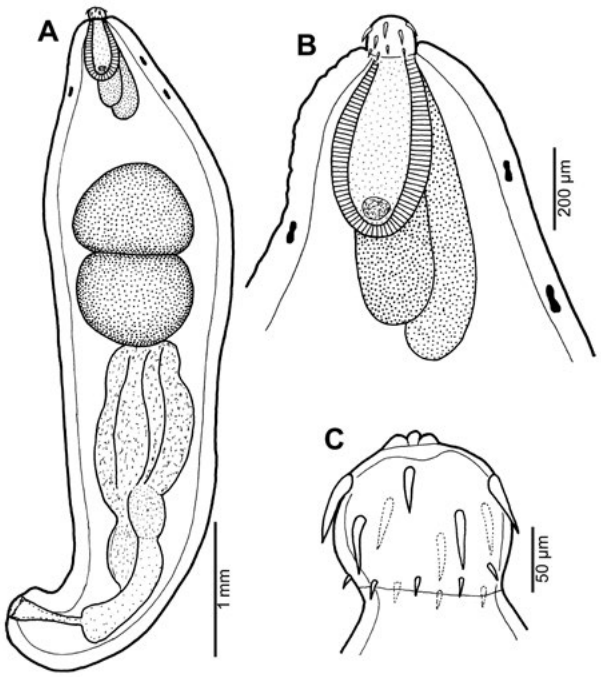

Fig. 5. *Neoechinorhynchus* (*N.*) *equadoris* sp. n., male holotype, from *Lebiasina* sp., Ecuador. **A** – general view; **B** – anterior end of body; **C** – proboscis.

Type host: *Lebiasina* sp. (Lebiasinidae, Characiformes), body length 9–11 cm.

Site of infection: Intestine.

Type locality: Milagro, western part of the Andes Mountains, Ecuador (collected 30 March 1999).

Number of specimens collected: 4 in 2 fish; intensity 1 and 3 acanthocephalans.

Deposition of type specimens: IPCAS A-139.

Etymology: The species name *ecuadoris* (the genitive form of Ecuador) relates to the country from where this parasite is recorded.

Comments: Totally one complete male (holotype) and body fragments of an another three male specimens (paratypes) were available.

At present, there are nine nominal species of *Neoechinorhynchus* (*Neoechinorhynchus*) Hamann, 1892 reported as parasites of freshwater fishes in South America (Schmidt and Hugghins 1973, Thatcher 2006, Santos et al. 2008, Hernández-Orts et al. 2019).

The present specimens from *Lebiasina* sp. differ distinctly from all of them in having the anterior and middle proboscis hooks much longer than the posterior hooks. Moreover, the anterior hooks of *N. buttnerae* Golvan, 1956, *N. paraguayensis* Machado-Filho, 1959, *N. pimelodi* Brasil-Sato et Pavanelli, 1998 and *N. pterodoridis* Thatcher, 1981 are much longer than those in the new species (100 µm *vs* 51–57 µm), the middle and posterior hooks of *N. curemai* Noronha, 1973 and *N. inermis* Brito-Porto, Silva-de Souza et de Oliveira-Malta, 2017 are

similar in size and much smaller than anterior hooks, the anterior hooks of males of *N. villoldoi* Vizcaíno, 1992 are much shorter than those in the new species (25–29 µm *vs* 51–57 µm) and *N. villoldoi* also differs in the shape of body (elongate *vs* spinder-shaped) and the location of testes (in the middle of the body *vs* in the anterior half of the body), whereas *N. macronucleatus* Machado Filho, 1954 can be distinguished by elongated (*vs* spherical) testes. From individual species *N. ecuadoris* sp. n. also differs by some other morphological and biometrical features (e.g., Machado Filho 1959, Schmidt and Hugghins 1973, Nickol and Padilha 1979, Thatcher 1981, Vizcaíno 1992, Brasil-Sato and Pavanelli 1998, Brito-Porto et al. 2017, Virgilio et al. 2021).

Besides morphological and biometrical features distinguishing *N.* (*N.*) *ecuadoris* sp. n. from other congeneric species parasitising freshwater fishes in South America, it is also necessary to take into account the fact that this species is the first neoechinorhynchid reported from a fish beloning to the family Lebiasinidae and from the western part of the Andes Mountains in Equador, not belonging to the Amazon River drainage system.

The use of molecular data for the taxonomy of *Neoechinorhynchus* spp. during the last decade indicates a high genetic diversity of this parasite group, at least in some geographical regions. For example, in addition to nine nominal species of *Neoechinorhynchus* parasitising freshwater fishes in Middle America, ten independent genetic lineages representing a possible group of cryptic species were recorded (Pinacho-Pinacho et al. 2015, 2018).

NEMATODA

Family Pharyngodonidae Travassos, 1919

Cosmoxynema vianai Travassos, 1949

Description of female (2 gravid specimens): Small nematodes with slightly transversely striated cuticle. Body length 3.89–5.79 mm, maximum width 367–435. Narrow lateral alae present, 18 wide, anteriorly iniciating at 68 from anterior extremity. Anterior end of body rounded, oral aperture simple, surrounded by 4 small cephalic papillae. Buccal capsule 9–15 long, 15 wide. Oesophagus divided into short pharynx, long anterior portion with posterior half conspicuously expanded and posterior bulboid portion opening into intestine through small valve. Entire oesophagus 530–585 long; pharynx 18–21 long; anterior portion of oesophagus including pharynx 394–462 long, maximum width of its anterior and posterior halves 54–69 and 87–123, respectively; bulb 123–135 long and 132–153 wide. Nerve ring 174–213 from anterior extremity. Excretory pore and vulva of larger specimen 1.48 and 1.96 mm, respectively, from anterior body end. Size of eggs 195–219 × 33–36, diameter of their opercula 30–33; opercula visible only in more developed eggs. Tail of larger specimen 340 long.

Host: "Silver-coloured curimatid" (Curimatidae, Characiformes), body length 7.5 cm (host specimen deposited in the Moravian Land Museum, Brno: ECU 99 R-2).

Site of infection: Intestine.

Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 17 March 1999).

Number of specimens collected: 2 in 1 fish.

Deposition of voucher specimens: Not deposited.

Comments: The morphology of the present specimen is in accordance with the descriptions of *Cosmoxynema vianai* (see Travassos 1949, Moravec et al. 1992); the male of this species is not known.

Cosmoxynema vianai is known as a parasite of curimatid fishes in Brazil, reported mainly from the Paraná River basin (Moravec 1998, Luque et al. 2011). Its present finding in Ecuador represents a new geographical record and the first record in the Amazon River drainage system.

Travnema travnema Pereira, 1938 Fig. 6A–C

Description (1 male): Body elongate, 966 long, maximum width 60, with rounded anterior end and ventrally curved caudal end. Buccal capsule voluminous, 9 long, 15 wide. Entire oesophagus 144 long; its pharyngeal part 66 long and 24 wide; isthmus 48 long, 15 wide; bulb 33 × 33. Nerve ring and excretory pore 90 and 312, respectively, from anterior extremity. Spicule one, well sclerotised, 51 long and 6 wide. Cloacal opening located on genital conus 15 high and 12 wide. Genital aperture surounded by 2 pairs of minute circumcloacal preanal and postanal papillae. One pair of submedian caudal papillae present just posterior to genital cone and 1 median ventral papilla situated at 69 posterior to cloaca. Tail conical with sharply pointed tip, 96 long.

Host: *Astyanax* sp. (Characidae, Characiformes).

Site of infection: Intestine.

Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 16 March 1999).

Number of specimens collected: 2 in 1 fish.

Deposition of voucher specimen: Not deposited.

Comments: To date, two species of *Travnema* Pereira, 1938, *T. travnema* Pereira, 1938 and *T. araujoi* Fernandes, Campos et Artigas, 1983, are known as intestinal parasites of fishes belonging to the families Characidae and Curimatidae (both Characiformes) in Brazil (Moravec 1998, Luque et al. 2011). Mainly based on the body size, almost equally long pharyngeal and posterior portions of the oesophagus, the length of spicule and the presence of a distinct genital cone, the only available male specimen is considered to belong to *T. travnema*; this is supported by the fact that *T. travnema* is known to occur in the congeneric host *Astyanax bimaculatus* (Linnaeus) in Brazil (Luque et al. 2011).

The male of *T. travnema* is known only from the inadequate original description provided by Pereira (1938), who reported the presence of one median papilla located immediately posterior to cloacal opening. Apparently he overlooked some of the caudal papillae reported in our paper; however, it is necessary to remark that it is very difficult to observe caudal papillae in such small nematodes by LM. Female

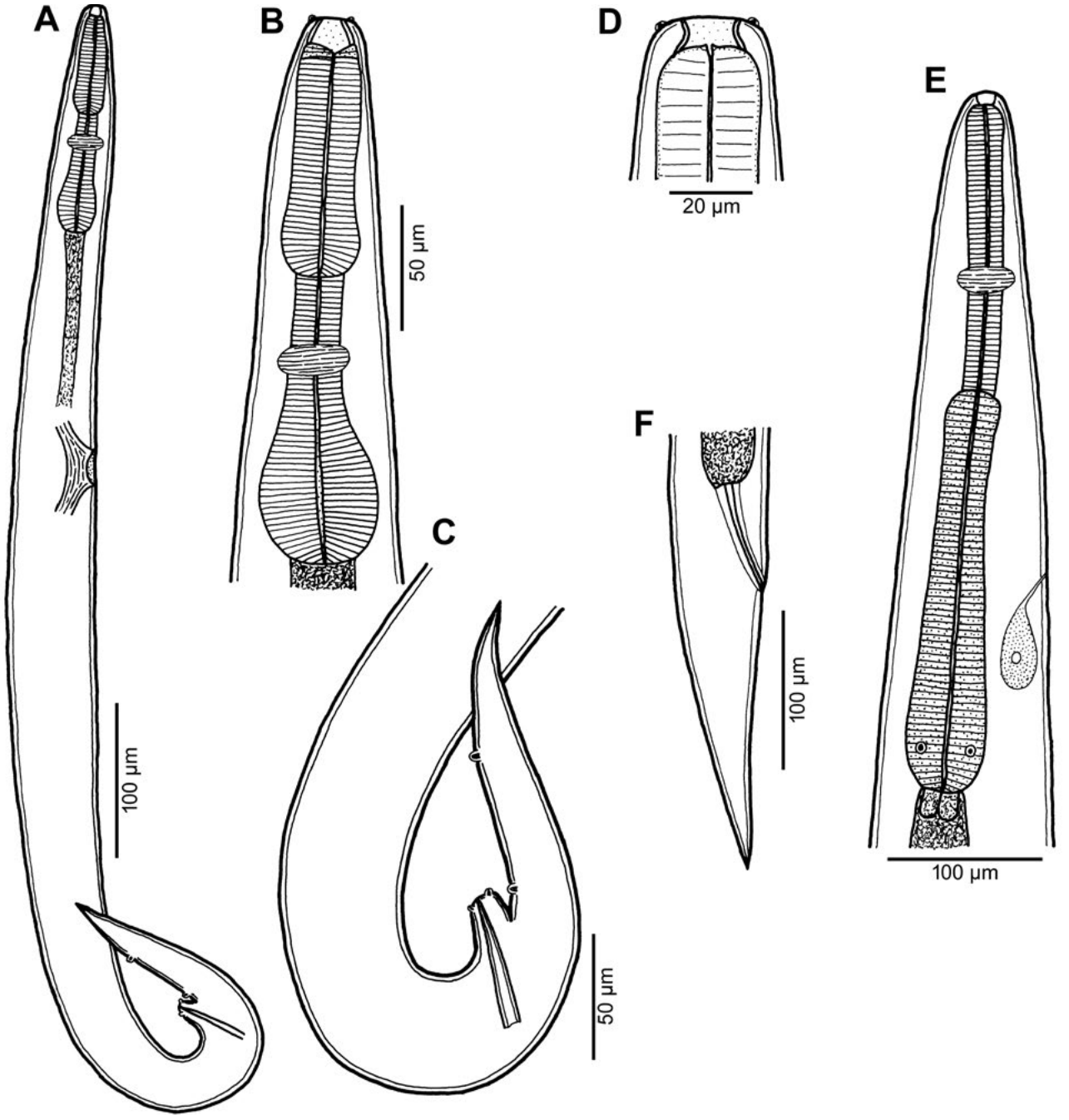

Fig. 6. A–**C** – *Travnema travnema* Pereira, 1938 from Astyanax sp., Ecuador, male (A – general view, B – anterior end, C – posterior end of body); **D**–**F** – *Touzeta equadoris* Petter, 1987 juv. from Cichlidae gen. sp., Ecuador (D – cephalic end, E – anterior end of body, F – tail).

morphology of *T. travnema* was studied in detail by LM and cephalic structures by SEM by Moravec et al. (1992, 1994).

Travnema travnema has so far been reported only from Brazil, mainly from the Paraná River basin (Luque et al. 2011). The present finding of *T. travnema* in Equador represets a new geographical record and the first record of this parasite in the Amazon River drainage system.

Family Quimperiidae Gendre, 1928

***Touzeta ecuadoris* Petter, 1987 juv.** Fig. 6D–F

Description (2 immature females): Body whitish, slender, 2.69–3.44 mm long and 122–150 wide. Cuticle thin and smooth. Cephalic end rounded, without lips. Oral aperture large, surrounded by distinct cephalic papillae. Buccal cavity large, 4–6 long, 12–15 wide. Oesophagus divided into 2 parts of different diameters; anterior part almost cylindrical, 198–216 long and 30–33 wide; posterior part distended towards posterior end, 270–273 long, maximum width 54–69; overal length of oesophagus 471–486. Nerve ring situated somewhat anterior to junction of both parts of oesophagus, excretory pore near mid-length of posterior end of oesophagus; nerve ring and excretory pore 138–144

and 324–390, respectively, from anterior extremity. Vulva in larger specimen 1.51 mm from anterior end. Tail slender, conical with sharply pointed tip, 177–180 long.

Host: Cichlidae gen. sp. (Cichliformes), body length 14 cm.
Site of infection: Intestine.
Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 16 March 1999).
Number of specimens collected: 2 in 1 fish.
Deposition of voucher specimens: Not deposited.

Comments: The monotypic genus *Touzeta* Petter, 1987 is only represented by one species, *T. ecuadoris* Petter, 1987, described from an unidentified cichlid fish in the Amazon River basin of Ecuador (Petter 1987). Since the present specimens are morphologically and biometrically similar to *T. ecuadoris* (except for the more anterior location of the excretory pore), they are considered to belong to this species.

Family Raphidascarididae Hartwich, 1954

Sprentascaris hypostomi Petter et Cassone, 1984

Host: *Ancistrus* sp. (Loricariidae, Siluriformes), body length 9–11 cm.
Site of infection: Intestine.
Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 14 March 1999).
Number of specimens collected: 122 in 11 fish; intensity 1–46 (mean 11) per fish.
Deposition of voucher specimens: Not deposited.

Comments: Species of *Sprentascaris* Petter et Cassone, 1984 are known only as parasites of freshwater fishes in South America. For a long time, *Sprentascaris* was considered to be a subgenus of *Raphidascaris* Railliet et Henry, 1915 (see, e.g., Moravec et al. 1990, Moravec 1998, Carvalho de Melo et al. 2011, Luque et al. 2011, Ailán-Choke et al. 2017, Pereira and Luque 2017). However, molecular studies of Malta et al. (2018, 2019) revealed a monophyly of *Sprentascaris*, subsequently also confirmed by Ramallo et al. (2022). Consequently, *Sprentascaris* is the valid genus, as it was originally established by Petter and Cassone (1984).

In Ecuador, numerous specimens (males, females and juveniles) of *S. hypostomi* were collected from *Ancistrus* sp. The morphology of the available specimens was identical with the descriptions of this species provided by Petter and Cassone (1984) and Moravec et al. (1990).

Sprentascaris hypostomi is an intestinal parasite reported from armoured catfishes (Loricariidae), including species of *Ancistrus*, in Paraguay and southern Brazil (Petter and Cassone 1984, Moravec et al. 1990, Petter 1995, Thatcher 2006, Luque et al. 2011). The present finding of this species from the Amazon River basin in Ecuador represents a new geographical record.

Sprentascaris sp.

Host: *Crenicichla* sp. (Cichlidae, Cichliformes), body length 17 cm.
Site of infection: Intestine.
Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 16 March 1999).
Number of specimens collected: 4 in 1 fish.
Deposition of voucher specimens: Not deposited.

Comments: Only four female specimens were collected from *Crenicichla* sp., and, therefore, their species identification is impossible. Of the eight South American species of *Sprentascaris*, only two morphologically very similar species, *S. lanfrediae* Carvalho de Melo, Nascimento dos Santos, Guerreiro Giese, Nunes dos Santos et Portes Santos, 2011 and *S. andersoni* Malta, Paiva, Elisei, Tavares et Pereira, 2018, are parasites of cichlids (Cichlidae, Cichliformes), whereas all other six congeneric species are parasitic in armoured and pimelodid catfishes (Loricariidae and Pimelodidae, Siluriformes) exceptionally reported from a characiform fish; both *S. lanfrediae* and *S. andersoni* were described from the Amazon River basin in Brazil from *Geophagus* spp. and *Gymnogeophagus balzanii* (Perugia), respectively (Carvalho de Melo et al. 2011, Malta et al. 2018).

Judging from the host type (*Crenicichla* sp.) and the locality belonging to the Amazon River basin, the present specimens from Ecuador most probably belong either to *S. lanfrediae* or *S. andersoni*. In contrast to the previous species *S. hypostomi* and those of *S. marano* Ramallo, 2009, *S. pampaensis* Ramallo, Chemes, Amavet et Rossi, 2022 and *S. saltaensis* Ailán-Choke, Ramallo et Davies, 2017, the oesophagus of the present specimens is not conspicuously inflated (see Ramallo 2009, Ailán-Choke et al. 2017, Ramallo et al. 2022).

The present finding represents new host and geographical records for *Sprentascaris*.

Family Anisakidae Railliet et Henry, 1912

Contracaecum sp. Type 1 larvae of Moravec et al. (1993)

Host: *Lebiasina* sp. (Lebiasinidae, Characiformes), body length 7 cm (host specimen deposited in the Moravian Museum, Brno: ECU 99-R2).
Site of infection: Abdominal cavity (?).
Locality: Milagro, western part of the Andes Mountains, Ecuador (collected 30 March 1999).
Number of specimens collected: 1 in 1 fish.
Deposition of voucher specimens: Not deposited.

Comments: This larva is characterised by the presence of a very long ventricular appendix the length of which exceeds that of the intestinal caecum. Adults are probably parasitising fish-eating birds.

Contracaecum sp. Type 2 larvae of Moravec et al. (1993)

Hosts: *Crenicichla* sp. (Cichlidae, Cichliformes), body length 17 cm; and Erythrinidae gen. sp. (Characiformes) (host specimen deposited in the Moravian Museum Brno: ECU 99-R2).
Sites of infection: Liver and surface of intestine.
Localities: *Crenicichla* sp.: Tarapoa, Sucumbíos Province

(eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 16 March 1999). Erythrinidae gen. sp.: Milagro, western part of the Andes Mountains, Ecuador (collected 30 March 1999).

Numbers of specimens collected: *Crenicichla* sp.: 1 in 1 fish. Erythrinidae gen. sp.: 2 in 1 fish.

Deposition of voucher specimens: Not deposited.

Comments: A characteristic feature of these larvae is the length of the intestinal caecum reaching just posterior to the nerve ring and the relatively short ventricular appendix. Adults are parasites of fish-eating birds.

Family Camallanidae Railliet et Henry, 1915

Procamallanus (*Procamallanus*) *peraccuratus* Pinto, Fábio, Noronha et Rolas, 1976

Host: *Crenicichla* sp. (Cichlidae, Cichliformes), body length 17 cm.

Site of infection: Intestine.

Locality: Tarapoa, Sucumbíos Province (eastern part of the Andes Mountains, Amazon River basin), Ecuador (collected 16 March 1999).

Number of specimens collected: 10 in 1 fish.

Deposition of voucher specimens: Not deposited.

Comments: The present material included several males, females and juvenile specimens. *Procamallanus* (*P.*) *peraccuratus* is mainly a parasite of cichlid fishes, less often of some other fishes, in Brazil, being reported largely from the Paraná River basin (Moravec 1998, Luque et al. 2011). The finding of this species in Equador represents a new geographical record and its first record in the Amazon River drainage system.

Procamallanus (*Spirocamallanus*) sp. juv.

Host: *Lebiasina* sp. (Lebiasinidae, Characiformes), body length 7 cm (host specimen deposited in the Moravian Museum, Brno: ECU 99-R2).

Site of infection: Digestive tract.

Locality: Milagro, western part of the Andes Mountains, Ecuador (collected 30 March 1999).

Number of specimens collected: 1 in 1 fish.

Deposition of voucher specimen: Not deposited.

Comments: There are many species of this subgenus parasitising as adults freshwater and marine fishes in South America. At present it is impossible to identify their juveniles to species based on their morphology.

DISCUSSION

Despite the fact that Ecuador is one of the smallest and most populated countries in South America, its territory is very interesting from the zoogeographical point of view, because the Andes separate mainland Ecuador in two major hydrographic regions: the western (Coastal) and the eastern (Amazonian) watersheds (Celi and Villamarín 2020). Whereas the eastern part of the country belongs to the Amazonian basin, the largest and most diverse freshwater basin in the world, where almost 75% of Ecuadorian freshwater fishes occur, freshwater fish diversity in the Ecuadorian western basin complex is relatively species-poor but with a very high degree of endemism (Celi and Villamarín 2020).

To date, there are almost no data on the helminth parasites of freshwater fishes in Ecuador (see Luque et al. 2016), probably the only paper being that of Petter (1987) reporting five species of nematodes from these hosts in Napo Province (the Amazon River basin). In addition to the previously known species *Paraseuratum albidum* Kloss, 1966 and *Rhabdochona acuminata* (Molin, 1860), she described a new genus and species *Touzeta ecuadoris* Petter, 1987 (Quimperiidae) from an unidentified cichlid, *Spinitectus multipapillatus* Petter, 1987 (Cystidicolidae) from pimelodid catfishes *Pimelodella* sp. and *P.* cf *hasemani* Eigenmann, and *Guyanema ancistri* Petter, 1987 (Guyanemidae) from the armoured catfish *Ancistrus* sp.

Therefore, except for *T. ecuadoris*, all helminth species (trematodes and nematodes) reported in the present paper from the Amazon River basin in Ecuador represent the first records from this country. Of the helminth species found in the eastern (Amazonian) region of Ecuador, three trematode species (*Prosthenhystera obesa*, *Crassicutis intermedius* and *C. cichlasomae*) and seven species of nematodes (*Cosmoxynema vianai*, *Travnema travnema*, *Sprentascaris hypostomi*, *Sprentascaris* sp., *Contracaecum* sp. Types 1 and 2 larvae and *Procamallanus* (*P.*) *peraccuratus*) were previously reported from Brazil, Argentina, Venezuela and Paraguay, mainly from the Amazon, Paraná and Orinoco River drainage systems (see above).

The acanthocephalan *N.* (*N.*) *ecuadoris* sp. n. from the characiform fish *Lebiasina* sp. is so far the only known helminth parasite recorded from freshwater fishes in the Ecuadorian western basin complex. It may well be that this species is endemic in this region.

Of the two species of acanthocephalans (*Quadrigyrus torquatus* and *Gracilisentis variabilis*) reported here from freshwater fishes in Venezuela, the finding of *G. variabilis* represents the first record of this parasite in this country as well as from the Orinoco River basin. This again shows that there are many helminth parasites of freshwater fishes co-occurring in the Orinoco River basin and in the Amazon/Paraná River basins (Moravec et al. 1997, Moravec and Prouza 2024).

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