DOI 10.2478/s11687-012-0018-x

HELMINTHOLOGIA, 49, 2: 87 – 91, 2012

Unilatus unilatus Mizelle & Kritsky, 1967 (Monogenea, Ancyrocephalinae) in *Hypostomus* spp. (Siluriformes, Loricariidae) from the Chavantes reservoir, São Paulo State, Brazil

É. O. P. ZICA[1,3], V. D. ABDALLAH[1,4], R. K. DE AZEVEDO[1,4], A. C. WUNDERLICH[1,3], E. D. CARVALHO[2,5], R. J. SILVA[1,5]

[1]UNESP – Univ Estadual Paulista, Campus de Botucatu, Instituto de Biociências, Departamento de Parasitologia, Botucatu, São Paulo, Brazil. Distrito Rubião Júnior, s/n., Cep: 18618-970, Botucatu, SP, Brazil, E-mail: *ericazica@hotmail.com*; [2]UNESP – Univ Estadual Paulista, Campus de Botucatu, Instituto de Biociências, Departamento de Morfologia, Botucatu, São Paulo, Brazil; [3]Bolsista doutorado CNPq (Conselho Nacional de Pesquisa e Desenvolvimento Científico); [4]Bolsista pós-doutorado FAPESP (Fundação de Amparo a Pesquisa do Estado de São Paulo); [5]Pesquisador do CNPq (Conselho Nacional de Pesquisa e Desenvolvimento Científico)

Summary

In this paper, the occurrence and new morphological data of *Unilatus unilatus* Mizelle et Kritsky, 1967 from the gills of *Hypostomus strigaticeps* (Regan, 1907), *Hypostomus regani* (Ihering, 1905), and *Hypostomus iheringii* (Regan, 1908) from the Chavantes reservoir, São Paulo State, Brazil are reported. *Unilatus unilatus* from this reservoir presents differences in relation to the holotype previously described such as, eggs with no bifid or trifid filament and a rounded termination, anterior bar slightly curved with a posterior projection, and posterior bar which may present three shapes. This is the first record of *U. unilatus* in southeastern Brazil outside the Amazon River Basin, with *H. strigaticeps, H. regani* and *H. iheringii* as new hosts.

Keywords: Ancyrocephalinae; *Unilatus unilatus*; ectoparasite; Loricaridae; *Hypostomus*; Chavantes reservoir

Introduction

Unilatus unilatus Mizelle & Kritsky, 1967 was initially described in *Plecostomus* sp. (= *Hypostomus* sp.) obtained from the Steinhart Aquarium, California Academy of Sciences, San Francisco (collected in Amazon River Basin, Brazil) (Mizelle & Kritsky, 1967). Posteriorly, Mizelle *et al.* (1968) proposed a redescription for this species with more detailed drawings and Molnar *et al.* (1974) reported this species in *Hypostomus robinii* Valenciennes, 1840, Talparo River near Talparo, Trinidad and Tobago. Currently, the genus *Unilatus* includes seven species: *Unilatus anoculus* (Price, 1968) from *Plecostomus bolivianus* Pearson, 1924; *U. brevispinus* Suriano, 1985 from *Pterygoplichthys multiradiatus* (Hancock, 1828); *U. brittani* Mizelle, Kritsky et Crane, 1968 from *Hypostomus* sp. and *Plecostomus* sp.; *U. dissimilis* Suriano, 1985 from *Hemiancistris* sp.; *U. longispinus* Suriano, 1985 from *Pterygoplichthys multiradiatus*; *U. scaphirhynchae* Suriano, 1985 from *Hemiancistrus scaphirhynchae* Kner, 1854; and *U. unilatus* Mizelle et Kritsky, 1967 from *Hypostomus robinii* Valenciennes, 1840, and *Plecostomus* sp. (Type species) (Boeger & Vianna 2006).

During a parasitological survey in *H. iheringii* (Regan, 1908), *H. regani* (Ihering, 1905), and *H. strigaticeps* (Regan, 1907), specimens of *U. unilatus* were collected from the gill filaments. The shape of the anterior and posterior bars, anterior and posterior anchors, vagina, accessory piece and egg filament termination found in these fishes were slightly different in relation to the type species (Mizelle & Kritski, 1967; Mizelle *et al.*, 1968).

In this paper, we provide new information on the geographical location, new hosts, and complementary morphological data on *U. unilatus* on the basis of specimens collected in *Hypostomus* spp. from the upper Paraná basin.

Materials and methods

Five specimens of *Hypostomus strigaticeps* measuring 12.94 cm (9.2 – 16.3 cm), one specimen of *H. regani* (14.7 cm), and another one of *H. iheringii* (16.2 cm) were collected with nets in October and November 2010 in the upper Paraná basin, municipality of Ipaussu, São Paulo State, Brazil. The Chavantes reservoir is located in the middle of the Paranapanema River, between the São Paulo and Paraná States (Zica *et al*., 2009).

The gills were removed from the hosts and placed in vials containing hot water (about 70 – 75 ºC). Posteriorly, they were shaken and absolute ethanol was added, and the monogeneans were collected using a stereomicroscope (Boeger & Vianna, 2006). Some specimens were stained

with Gomori's trichrome and mounted in Canada balsam for analysis of internal organs (Eiras *et al*., 2006). Other specimens were mounted in Gray and Wess' medium (Humason, 1979) to study of sclerotized structures. Measurements are given in micrometers and are presented as mean followed by range in parentheses. The illustrations of the sclerotized structures were made with the aid of a camera lucida mounted on a Leica DMLS microscope, while the photographs were made using a differential interference contrast microscope (Leica DM 5000B). Voucher host fish specimens were deposited in the fish collection of the Laboratório de Biologia e Genética de

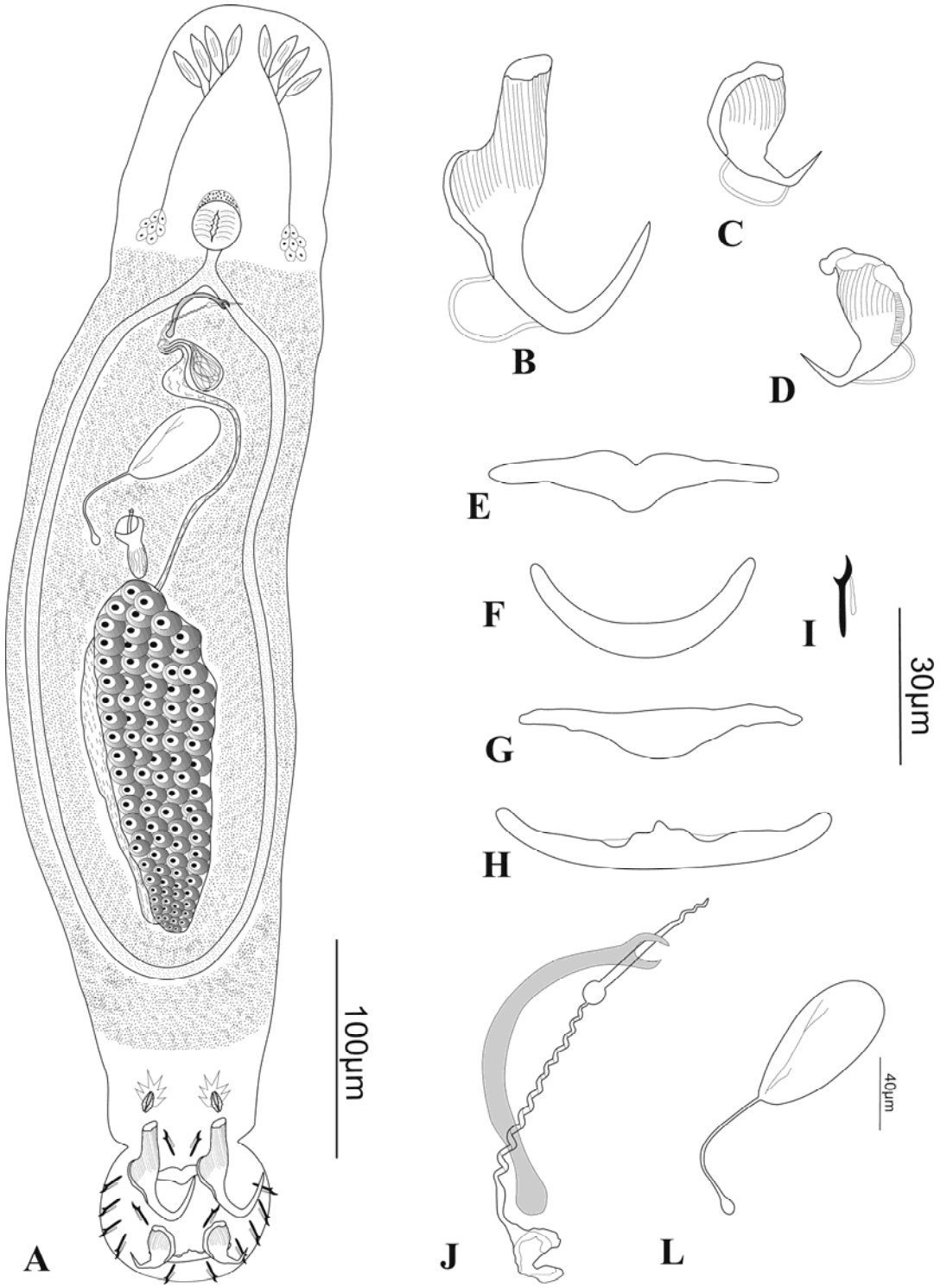

Fig. 1. *Unilatus unilatus* Mizelle & Kritsky, 1967 (A) Whole worm, ventral view. (B) Anterior anchor. (C, D) Posterior anchor. (E) Anterior bar. (F, G, H) Posterior bar. (I) Hook. (J) Male copulatory complex: MCO and accessory piece. (L) Egg. All figures are to the same scale (30µm) except figure A (100µm) and figure L (40µm).

Peixes (LBP), Universidade Estadual Paulista (UNESP), municipality of Botucatu, São Paulo State, Brazil. Voucher helminth specimens were deposited in the Helminthological Collection of the Departamento de Parasitologia of the Instituto de Biociências (CHIBB), UNESP, municipality of Botucatu, São Paulo State.

Results

Dactylogyridae Bychowski, 1933
Ancyrocephalinae Bychowski, 1937
Unilatus unilatus Mizelle & Kritsky, 1967
Hosts: *Hypostomus iheringii* (LBP 12232), *H. regani* (LBP 12233), and *H. strigaticeps* (LBP 12234) (Siluriformes, Loricariidae).
Locality: Chavantes reservoir, municipality of Ipaussu, São Paulo, Brazil (23º 07' 36"S and 49º 37' 35"W).
Site of infection: Gills
Specimens deposited: Vouchers, CHIBB 050L, 051L, 052L.
Prevalence: 100 % (5/5 in *Hypostomus strigaticeps*, 1/1 in *H. regani* and 1/1 in *H. iheringii*).
Mean intensity: 2.14 in *Hypostomus strigaticeps*, 4 in *H. regani* and 3 in *H. iheringii*.
Specimens studied: 10 in Gray and Wess' medium and 2 stained with Gomori's trichrome.

Morphological description (morphometric measurements are presented on Table 1)
Based on 12 specimens: Body fusiform, 579 (475 – 680) long; greatest width 138 (96 – 176) near mid-length (Figs. 1A; 2A). Cephalic lobes incipient or absent. Three head organs extensive; cephalic glands inconspicuous, posterolateral to pharynx. Pharynx subspherical, anterior part smaller; 23 (21 – 25) long, 20.5 (19 – 21) wide. Pair of accessory structures at junction of peduncle, ornamented and striated (Fig. 1A). Haptor subovate, 69 (59 – 75) long, 84 (71 – 93) wide. Anterior anchor superficial root elongate with slight slots; anchor 54 (50 – 55) long, base 18 (14 – 20) wide (Figs. 1B; 2B). Posterior anchor may present as one of two shapes with heavily sclerotized basal border, point bent a maximum of 90° (Fig. 1C), anchor 24 (23 – 25) long, base 15 (12 – 17) width (Figs. 1C, D). Anterior bar slightly curved with rounded ends and posterior projection, 52 (49 – 56) long (Fig. 1E). Posterior bar may present as one of three shapes: bowed (Fig. 1F); straight with rounded ends directed posteriorly and with posterior projection (Fig. 1G); or straight with rounded ends directed anteriorly, anterior projection and two slight depressions (Fig. 1H), 56 (49 – 59) long. Hook 14 (11 – 16) long, with slightly curved shaft, straight shank (Fig. 1I). Loop 0.7 shank long. Gonads ovate, ovary elongate and larger, 130 (111 – 149) long, 43 (20 – 50) wide; testis subovate 112 (90 – 121) long, 29 (15 – 41) wide. Cirrus elongate, proximal and distal parts of shaft spiraled with knob and cirral thread between, cirrus 81 (76 – 89) long. Accessory piece curved, distally bifid, 63 (59 – 68) long (Figs. 1J; 2C). Seminal vesicle elongate; prostatic reservoir saccate. Vagina ventral well sclerotized, funnel-shaped; seminal receptacle not observed. Vitelline follicles densely distributed in trunk; egg elongate-ovate with filament proximally rounded (Figs. 1L; 2D), 72 (42 – 88) long, 41 (39 – 43) wide.

Table 1. Comparative measurements of *Unilatus unilatus* Mizelle & Kritsky, 1967 from *Hypostomus* spp., for specimens collected in this study and published data
(measurements in micrometers; mean followed by range in parentheses; -, indicates no measurement available)

Measurements	Mizelle & Kritsky (1967) (n = 14)	Present study (n = 12)
Body length	666	579
	(630 – 774)	(475 – 680)
Body width	131 (121 – 145)	138 (96 – 176)
Pharynx length	-	23 (21 – 25)
Pharynx width	27 (24 – 28)	20.5 (19 – 21)
Haptor length	87 (78 – 90)	69 (59 – 75)
Haptor width	86 (78 – 90)	84 (71 – 93)
Anterior anchor length	34 (32 – 37)	54 (50 – 55)
Anterior anchor base width	19 (18 – 20)	18 (14 – 20)
Posterior anchor length	20 (19 – 22)	24 (23 – 25)
Posterior anchor base width	18 (17 – 19)	15 (12 – 17)
Anterior bar length	27 (25 – 28)	52 (49 – 56)
Posterior bar length	41 (38 – 44)	56 (49 – 59)
Hook length	12 (11 – 13)	14 (11 – 16)
Ovary length	-	130 (111 – 149)
Ovary width	-	43 (20 – 50)
Testes length	-	112 (90 – 121)
Testes width	-	29 (15 – 41)
Cirrus length	59 (56 – 61)	81 (76 – 89)
Acessory piece length	43 (38 – 48)	63 (59 – 68)
Egg length	-	72 (42 – 88)
Egg width	-	41 (39 – 43)

Discussion

Our results showed new host and new geographical location for *U. unilatus* and also that the specimens found in *Hypostomus* spp. from the upper Paraná basin are slightly different in comparison with the specimens collected in the Amazon River basin by Mizelle and Kritsky (1967), and Mizelle *et al.* (1968). Mizelle and Kritsky (1967) reported in *U. unilatus* an accessory piece bifid which is straight and proximally bowed as a hook, whereas in our specimens the accessory piece is well bowed and proximally rounded. Mizelle and Kritsky (1967) also described the egg with a single bifid or trifid filament and bowed anterior and posterior bars; however, in our specimens, the egg does not have a bifid or trifid filament, the termination is rounded, the anterior bar is slightly curved with a posterior

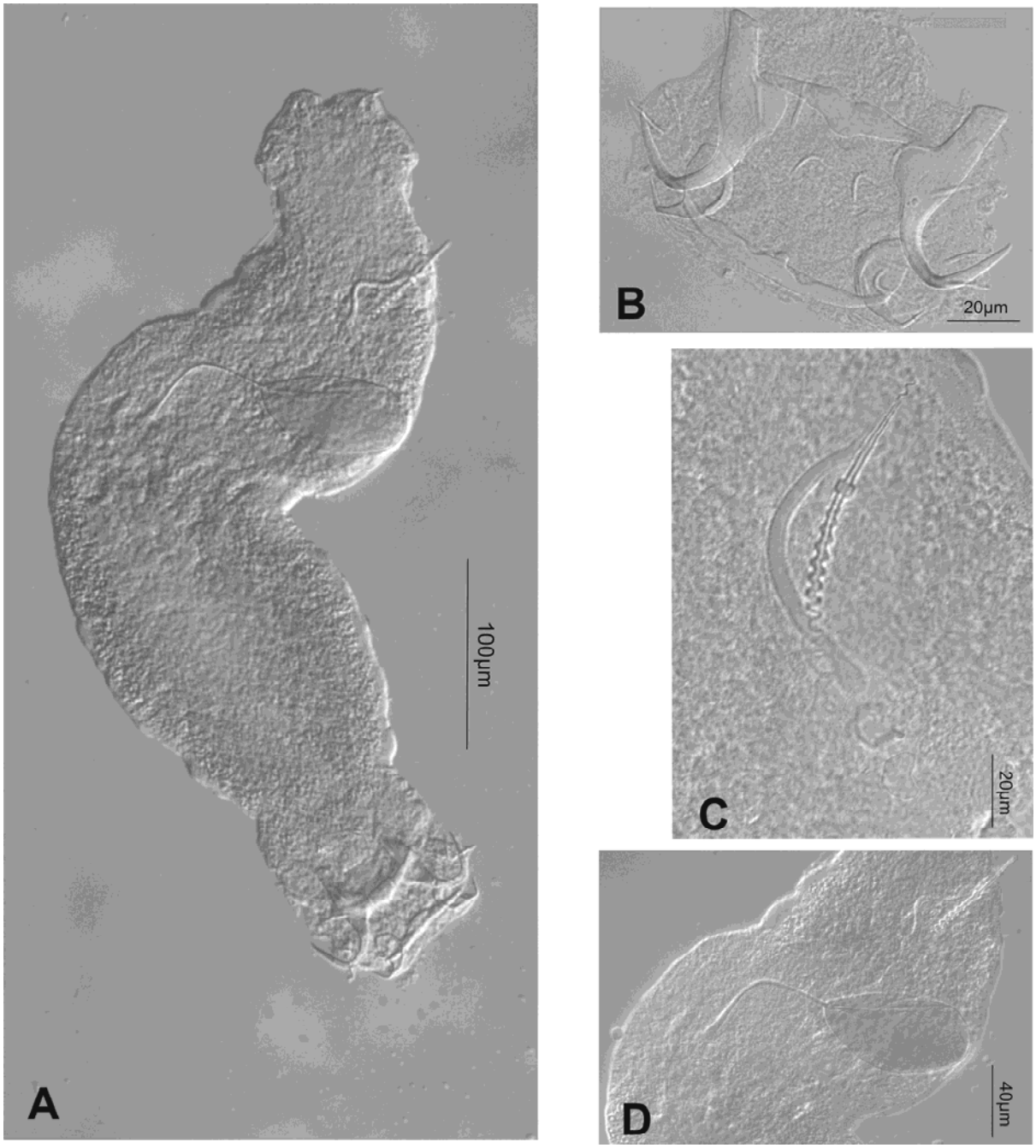

Fig. 2. *Unilatus unilatus* Mizelle & Kritsky, 1967 (A) Whole worm, ventral view. (B) Anterior and posterior anchor; anterior and posterior bar (C) Copulatory complex. (D) Egg

projection, and the posterior bar may present in one of three shapes. Our specimens show an anterior anchor with slight slots and without a dual wing, while that Mizelle and Kritsky (1967) observed the anterior anchor with a dual wing, posterior proximally single and otherwise dual. These differences also may be due to orientation of bars between our specimens and of the original description. Moreover, the vagina described by Mizelle and Kritsky (1967) was associated with an expanded tube, but in specimens collected in the present study the vagina is funnel-shaped (see Fig 1A). Furthermore, the whole body in ventral view is lacking in illustrations of Mizelle and Kritsky (1967) but is clearly presented in our study.

Finally, the measurements of the specimens collected in hosts from the Chavantes reservoir present large differences in relation to the specimens described by Mizelle and Kritsky (1967) (Table I). This may be related to intra-species variations that are common in Monogenea or to an adaptive process (Kritsky *et al.*, 1995). These same authors studied the morphometric variability of specimens of

Scleroductus reported from the external surface of four Siluriformes from the Guandu river and questioned whether the observed variations in morphology and size are of specific value or result from influences of host and/or environmental factors. Justine and Grugeaud (2010) found that the sclerotized structures varied linearly with the size and age in a monocotylid. The haptor of an immature specimen provides valid characters for the description of a species. Moreover, temperature can affect the development and growth of certain species of capsalid monogeneans, especially regarding the lengths of the hamulus (Lackenby *et al.,* 2007). Thus, the difference found between specimens of *U. unilatus* from Amazon river and upper Parana river may be explained by geographic distribution, environmental condition differences and also because our specimens were collected in another *Hypostomus* species. This is the first record of *U. unilatus* in southeastern Brazil, outside the Amazon River Basin, with *H. strigaticeps, H. regani,* and *H. iheringii* as new hosts, and also with presentation of complementary data to the morphology of this monogenoid species.

Acknowledgments

The authors would like to thank Dr. Claudio Henrique Zawadzki from the Departamento de Biologia, Centro de Ciências Biológicas, Universidade Estadual de Maringá, Paraná State, Brazil, who identified the host species in this study. We are also grateful to Kristin Nicole Taylor, from Weill Cornell Medical College, New York, USA, for the English review of the manuscript.

References

BOEGER, W. A. VIANNA. R. T. (2006): Monogenoidea. In: THATCHER, V. E. (Eds) *Amazon Fish Parasites*. Sofia, Moscow: Pensoft Publishers, pp. 42 – 116

EIRAS, J. C., TAKEMOTO, R. M., PAVANELLI, G. C. (2006): *Métodos de estudo e técnicas laboratoriais em parasitologia de peixes*, Eduem, Maringá, 199 pp.

HUMASON, G. L. (1979): *Animal Tissue Techniques*. 4th Edition, San Francisco, USA, W.H. Freeman Company, 661 pp.

JUSTINE, J. L., GRUGEAUD, A. (2010): Does the number of sclerotised structures used for the systematics of monogeneans change with age? A study of the monocotylid *Dendromonocotyle pipinna*. *Parasitol. Res.*, 107(6): 1509 – 1514. DOI: 10.1007/s00436-010-2019-3

KRITSKY, D. C., BOEGER, W. A., POPAZOGLO, F. (1995): Neotropical Monogenoidea. 22. Variation in *Scleroductus* species (Gyrodactylidae) from Siluriform fishes of Southeastern Brazil. *J. Helminthol. Soc. Washington,* 62: 53 – 56

LACKENBY, J. A, CHAMBERS, C. B, ERNST, I., WHITTINGTON, I. D. (2007): Effect of water temperature on reproductive development of *Benedenia seriolae* (Monogenea: Capsalidae) from *Seriola lalandi* in Australia. *Dis. Aquat. Organ.*, 74: 235 – 242. DOI: 10.3354/dao074235

MIZELLE, J. D., KRITSKY, D. C. (1967): *Unilatus* gen. n. a unique neotropical Genus of Monogenea. *J. Parasitol.*, 53(5): 1113 – 1114

MIZELLE, J. D., KRITSKY, D. C., CRANE, J. W. (1968): Studies on Monogenetic Trematodes. XXXVIII. Ancyrocephalinae from South America with the proposal of *Jainus* gen. n. *Am. Midl. Nat.*, 80(1): 186 – 198

MOLNAR, K., HANEK, G., FERNANDO, C. H. (1974): Ancyrocephalids (Monogenea) from freshwater fishes of Trinidad. *J. Parasitol.*, 60(6): 914 – 920.

ZICA, E. O. P., SANTOS, K. R., RAMOS, I. P., ZANATTA, A. S., CARVALHO, E. D., SILVA, R.J. (2009): First case of an infection of the metacercariae of *Austrodiplostomum compactum* (Lutz, 1928) (Digenea, Diplostomidae) in *Hypostomus regani* (Ihering, 1905) (Siluriformes: Loricariidae). *Pan-Am. J. Aquat. Sci.*, 4: 35 – 38

RECEIVED JANUARY 19, 2012

ACCEPTED FEBRUARY 28, 2012