Current state of knowledge of Cestodes from Neotropical freshwater fishes and rays

Amilcar Arandas Rego[1]

ABSTRACT: The author analyses the distribution of Cestodes in freshwater fishes and rays in Neotropic. Nearly one hundred and twenty species of cestodes from five orders and one subclasse are known in Neotropical region, especially from Brazilian rivers. Proteocephalidea is the principal Order in number of species. These are parasites of freshwater teleosts. Tetraphyllidea species are found in freshwater sting rays of family Potamotrygonidae. In these rays were also referred a species of Trypanorhyncha, *Paroncomega araya*. The Pseudophyllidea *Senga* sp. and cysticercoid larvae of the Cyclophyllidea, *Valipora campylancristrota*, were also referred in teleost, besides proteocephalids. From carps, *Cyprinus carpia*, it was found specimens of Caryophyllidea. Finally, two cestodarian species, *Nesolecithus janicki* and *Schizochoerus liguloideu*, are found in primitive osteoglossid fishes, *Arapaima gigas*, from the Amazon.

Key words: Cestoda, parasites, helminths, freshwater fishes, sting rays.

INTRODUCTION

Aproximately one hundred-twenty species of cestodes from six orders are known in Neotropical freshwater fishes (teleosts and rays). About 90% of these species are Proteocephalidae, found in teleosts. First papers describing Cestodes are due do DIESING (1850, 1855, 1856). WOODLAND (1933-1935) described the bulk

[1] *Departamento de Helmintologia, Fundação Oswaldo Cruz, Av Brasil,4365, 21045-900, Rio de Janeiro, RJ, Brasil. arego@ioc.fiocruz.br Pesquisador I-A do CNPq*

Rev. bras. Zoociências Juiz de Fora V. 6 Nº1 Jul/2004 p. 61- 79

of species of proteocephalid cestodes, from the Amazon. REGO (1981) published a first review on the cestodes of lower vertebrates of Tropical South America; however, not many species were known until that occasion.

In the last twenty years, the parasitic fauna of freshwater fishes has been scrutinized in Brazil, especially by Rego and by Rego and col. , Pavanelli and col., and recently by Chambrier and col. (see refs. *in* REGO *et al*., 1999). They described several proteocephalid species from Brazil and Paraguay. In Argentina there are the papers of PERTIERRA (1995, 2002), and PERTIERRA & VIOZZI (1999). Finally, there are very important papers of BROOKS (1978, 1995), BROOKS & THORSON (1976), BROOKS & DEARDORFF (1980), BROOKS & AMATO (1992) BROOKS & RASMUSSEN (1984), BROOKS *et al*. (1981). They described species from Colombia and Venezuela and also published interesting papers on the phylogeny of neotropical proteocephalids and the evolution of freshwater stingrays and their parasites.

The amount of cestode species already described is only a fraction of the presumible number of species in the fishe´s fauna; less than one hundred species of fishes had been examined and had their cestodes identified. It is supposed that there are nearly two thousand fish species in the Amazon, Orinoco, San Francisco, and Paraná-Paraguay systems.

The bulk of Cestode species, mostly proteocephalids, are parasites of Teleosts. Aproximately fifteen species of Tetraphyllidea and one species of Trypanorhyncha were described from freshwater stingrays (Chondrichthyes). These rays belong to the family Potamotrygonidae, with three genera endemic in South America (*Paratrygon* Duméril,1865 *Potamotrygon* Barman*, 1913 and Plesiotrygon* Rosa, Castello&Thorson, 1987). These rays are distributed in every important basin of South America.

Other Orders of Cestodes than Proteocephalidea are present in teleosts in the Neotropics, orders Trypanorhyncha, Cyclophyllidea, Pseudophyllidea and Caryophyllidea. There are also two cestodarian species, *Nesolecithus janicki* and *Schizochoerus liguloideus*, found in primitive osteoglossid fishes, *Arapaima gigas* in the Amazon.

MATERIAL AND METHODS

The Cestodes examined belong to the Collection of Oswaldo Cruz Institute, and much of the data were obtained from published papers of the author (REGO, REGO & col., loc. cit.). In order to study the cestodes, fishes must be examined immediatly post-mortem. Cestodes are fixed "in situ" in the intestine, on using 100ºC 4% formaldeyde solution. In the Laboratory the fixed intestine is examined and the worms collected and transferred to ethanol for storage. To study the scolex it is better to use a scaning electron microscope which provides optimum resolution details. For the study of the proglottids, complete strobila or peces of strobila, that include mature and gravid proglottids are stained with Delafield haematoxylin or Langeron alcoholic carmine, dehidrated and mounted in slides with Canada balsam.

RESULTS AND DISCUSSION

HOSTS

I. TELEOST FISHES

The rivers of South America are inhabited by more than 2.000 species of Ostariophysan fishes. These teleosts are the dominant group of fishes in freshwater in South America. They are represented by several families, most of them belong to Siluriforms (catfishes) and Characiforms. There are 13 families of catfishes endemic to South America. One of them, the Pimelodidae, hosts the majority of cestodes parasites already referred. Note that several species of Pimelodidae are of commercial importance, however, some species of non siluriform fishes were described as host of cestodes proteocephalids (REGO & PAVANELLI, 1990).

The primitive Osteoglossidae are present in South America. One of these species, the "pirarucu", *Arapaima gigas*, hosts two species of Cestodaria.

No more than 70 teleost species altogether were mentioned as host of cestodes in Neotropic.

II. ELASMOBRANCHS

The rivers of South America are inhabited by several species of Potamotrygonid rays. The only elasmobranch clearly adapted to life in freshwater. Marine elasmobranch capable of ascending rivers are not considered here as their normal habitat is the sea.

The Potamotrygonidae, family of Suborder Myliobatoidea is the only family of rays that inhabits South American and Central American rivers. These rays exhibit low tolerance to salt water and therefore are restricted to freshwater systems They belong to three genera endemics in Neotropical region, *Paratrygon*, *Plesiotrygon*, and *Potamotrygon*, distributed in the bazins of Amazon, Magdalena, Orinoco, Essequibo and Paraguay. These rays are phylogenetically important because of their phyletic proximity with to their marine relatives and the close affinities to the parasites of both, marine and freshwater rays.

BROOKS (1995) suggested that Potamotrygonidae have phylogenetic affinities with Dasyatidae. He especulate that ancestral of Potamotrygonidae penetrated the Amazon when this river communicate with Pacific Ocean. Orogenic events that resulted in the Andes could have isolated the rays, and subsequently occurred a diversification of the group after the desalinization of the habitat and the appearing of adaptations to the new environment.

The potamotrygonid rays have a distinct cestode fauna composed by species from the orders Tetraphyllidea Carus, 1863 and Trypanorhyncha Diesing, 1863.

CESTODE GROUPS

I. PROTEOCEPHALIDEA (Figs. 1 - 2)

Figura 1. *Monticellia belavistensis*, scolex.

Figura 2. *Nomimoscolex admonticellia*, scolex.

REGO *et al*. (1999) referred eigthy species of proteocephalid cestodes from freshwater fishes in South America, most of them are found in Siluriform fishes. Proteocephalid cestodes constitute the most numerous and important helminths

of freshwater fishes. The Amazon river system is the biggest and richest drainage in South America, and has the greatest representation of fish species in South America. Several other systems are connected with the Amazon: the Magdalena-Orinoco, San Francisco and Paraguay-Paraná systems.

It is interesting that the large concentration of proteocephalid genera occurs in South America, but the greatest concentration of species, specially of the primitive genus *Proteocephalus* Weiwlawdi *1858* occurs in Eurasia and North America. *Proteocephalus* species also occurs in Neotropical region, however, the species of *Proteocephalus* from South America differ in several characteristics from *Proteocephalus* from Palearctic. Probably the genus *Proteocephalus* could be splited into two or three genera.

Most of the South American proteocephalid genera are monotypic. Some species of Pimelodid fish exhibit an amazing quatity of proteocephalid species and genera. For instance, *Paulicea luetkeni*, a well studied South American fish which is parasitized by seven different proteocephalid species from seven genera.

II. TRYPANORHYNCHA (Figs 3 - 4)

Figura 3. *Pterobothrium crassicole*, scolex. Tentacles retracted.

Figura 4. *Pterobothrium crassicole*, scolex, tentacles everted.

Trypanorhyncha are common parasites in marine elasmobranches (sharps and rays). The rivers of South America are inhabited by a few species of rays of Potamotrygonidae family. Curiously, only one specie of Trypanorhyncha, *Paroncomegas araya* (Woodland, 1934) (=*Eutetrarhynchus araya* (Woodland, 1934), was described from these rays (CAMPBELL, *et al*., 1999). Therefore *P. araya* seems common in rays. However, no larvae (blastocysts) was found in teleosts from the same environment. REGO (1982) described plerocercus of *Eutetrarhynchus araya* (Woodland, 19234) collected from *Dilocarcinus pagei* (Crustacea) in Mato Grosso State, Brazil. Crustacea could be the second intermediate hosts of Trypanorhyncha. It is known that crabs constitute an habitual food to the freshwater stingrays.

Plerocercoid larvae of trypanorhynchs are rarely found. However, blastocysts identified as *Pterobothrium crassicole* Diesing, 1850 were found in freshwater teleosts, *Brachyplatystoma flavicans*, *B. vaillanti* and *Bagrus marinus* from the estuary of Amazon, Brazil (REGO, 1987a). The adults occurs in marine elasmobranches. It is know that sharks can enter rivers,

consequently these teleost hosts from freshwater can not be considered suitable intermediate hosts for *P. crassicole*.

III. PSEUDOPHYLLIDEA (Figs 5 -6)

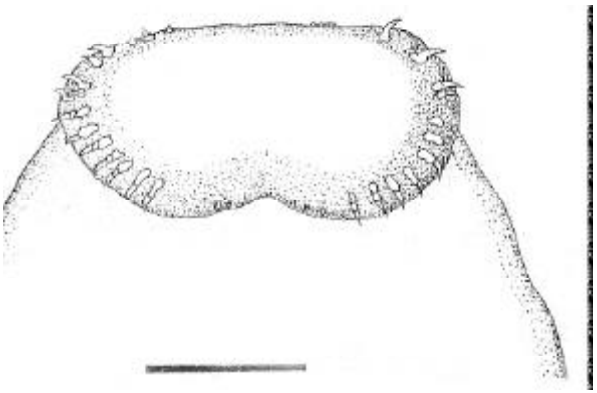

Figura 5. *Senga* sp. Apical disc with hooks. Scale bar 0,1 mm.

Figura 6. *Bothriocephalus acheilognathi*, scolex, note the two bothria.

Pseudophyllidea adults were collected from the intestine of the freshwater teleost *Astyanax scabripinnis* from S. Paulo, Brazil. They were placed in the genus *Senga* (REGO, 1997), but no identified at level of species. This is the first reference in South America. Species of *Senga* are common in Indian freshwater fishes, but rare in South America.

Pseudophyllids identified as *Bothriocephalus acheilognathi* were found in *Cyprinus carpio* imported from Europe (REGO *et al*., 1999). Naturally there are translocated species, both host and parasite. Apart from *Senga*, no other case of Pseudophyllidea was cited from native fauna of fishes in South American. Notwithstanding, WOODLAND (1935c) referred a non-identified ptychobothriid from *Plagioscion squamosissima*, a fish from the Amazon.

Plerocercoid larvae designed collectively as *Scolex pleuronectis* Muller, 1788 were collected from the teleost *Brachyplatystoma* sp. From the estuary of Amazon, Belém, Brazil, and could not be identified further (Rego, unpublished data). The adults are parasites of marine elasmobranchs.

IV. TETRAPHYLLIDEA (Figs 7 - 8)

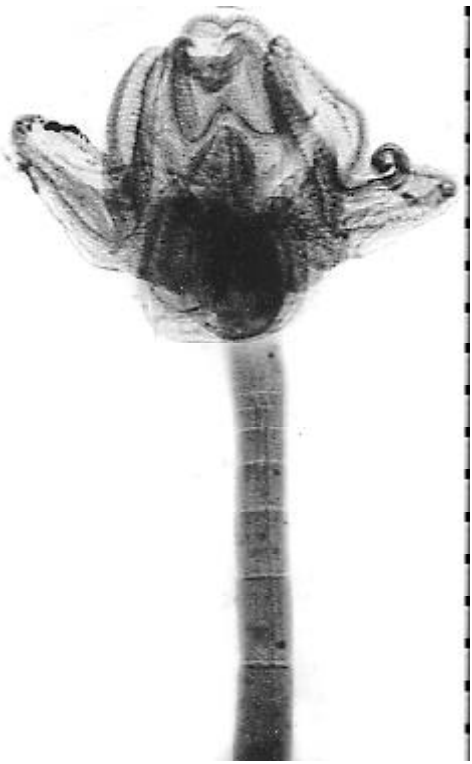

Figura 7. *Rhinebothrium scorzai*, scolex. Note the foliate bothridia.

Figura 8. *R. scorzai*, mature proglottid.

Stingrays of the family Potamotrygonidae host a rich helminth fauna of tetraphyllids.

REGO & DIAS (1976) described or redescribed three Tetraphyllids species collected from *Paratrygon* from Mato Grosso State, *Rhinebothrium paratrygoni*, *Rhinebothrium scorzai* and *Acanthobothrium terezae*. Later, REGO (1979) added two new tetraphyllidean species, *Rhinebothrium freitasi* and *Potamotrygonocestus travassosi* from *Paratrygon hystrix* from Amazon, Brazil.

In recent year, s these studies have had great developement. BROOKS & AMATO (1992) referred thirteen species of tetraphyllideans from several genera of Potamotrygonidae from Mato Grosso and Amazon, Brazil, Orinoco (Venezuela), Magdalena (Colombia) and Santa Fé(Argentina). Subsequently, BROOKS (1995), BROOKS & THORSON (1976), BROOKS *et al*., (1981) and MARQUES (2000) added new tetraphyllid species to the genera *Potamotrygonocestus*, *Acanthobothrium*, *Anidobothrium*, *Rhinebothrioides* and *Rhinebothrium*. According to Brooks, these genera/species reflects their Pacific marine ancestry.

No tetraphyllids larvae were found until the present time in freshwater teleosts of Neotropics, therefore we have no data of the life-cycle of these parasites.

V. CYCLOPHYLLIDEA (Fig. 9)

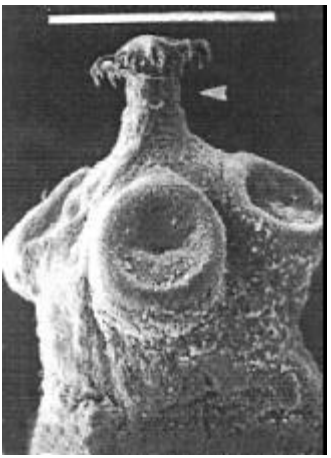

Figura 9. *Valipora campylancristrota*, scolex of larva, note the rostellum with hooks (arrow). Scale bar 0,1 mm.

The only Cyclophyllidea found in teleost are larvae cysticercoid of the Dilepididae *Valipora campylancristrota* found in the lumen of gall blader of the teleost *Prochilodus scrofa*, from Paraná river, Brazil (TAKEMOTO *et al*., 1994). The adults are parasites of aquatic birds. However, these findings are very rare in Brazil.

VI. CESTODARIA (Fig. 9)

Figura 10. *Nesolecithus janicki*, entire worm. Scale bar 10 mm.

An interesting occurrence is the presence of Cestodaria (a subclass of unsegmented cestodes) in the Osteoglossid fish *Arapaima gigas*, the " pirarucu", the species *Schizochoerus liguloideus* (Diesing, 1850) and *Nesolecithus janicki* Poche, 1922. They were described from this fish from the Amazon river (REGO *et al*. 1974)

VII.CARYOPHYLLIDEA (Fig. 11)

Figura 11. Cestodaria not identified. Entire worm.

Caryophyllids are monozoic worms without internal ox external proglottidization and with a single set of reproductive organs. They superficially resemble cestodarians, but they have a 6-hooked onchosphere, characteristic of the Eucestoda. They are found in siluriform and cypriniform freshwater fishes in Australia, Asia, Europa, Noth America, Africa. There are no references of caryophyllids in South America, except a finding of some specimens collected from *Cyprinus carpia* from Paraná State, Brazil (data not published).

LIFE-CYCLES (Figs. 12 - 15)

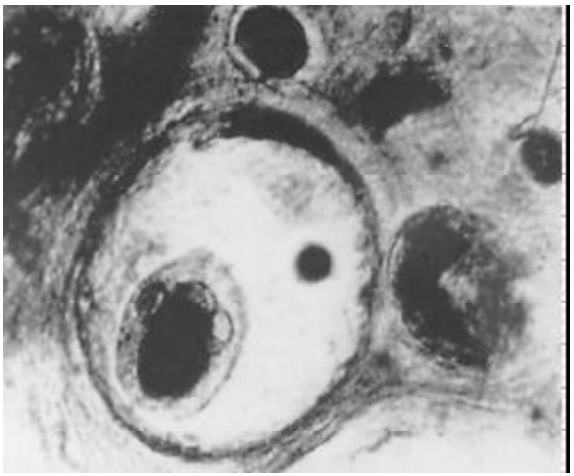

Figura 12. Proteocephalidea. Encapsulated larva from peritoneum of *Loricarithriix platymetopon*.

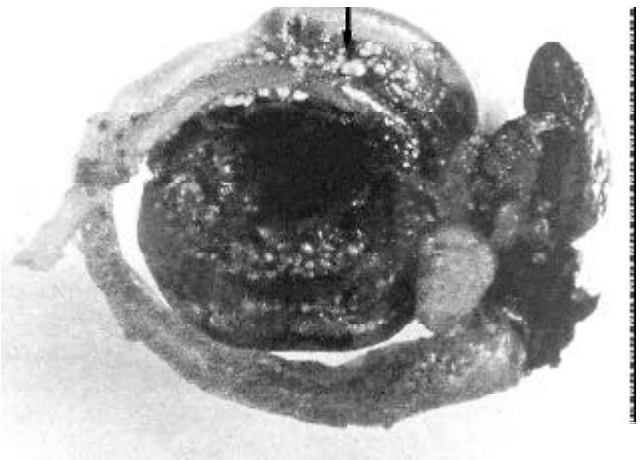

Figura 13. Liver and peritoneum of fish with numerous nodules of proteocephalid larva (arrow).

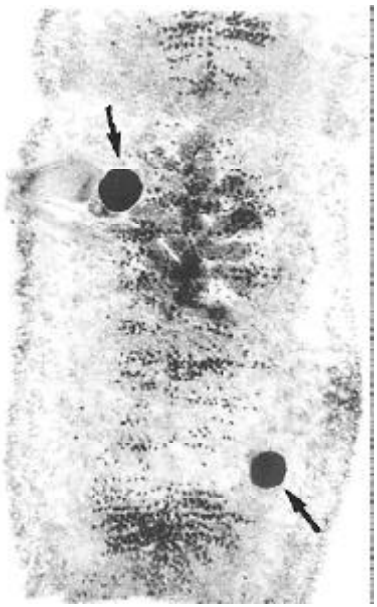

Figura14. Two cysts with cysticercoid larva in a proglottid of unidentified proteocephalid from *Pseudoplatystoma fasciatus*.

Figura 15. Cysticercoid–like larvae encysted in an unidentified proteocephalid cestode from *Pseudoplatystoma fasciatus*.

No complete life-cycle of a South American fish cestode has been experimentally demonstrated. The presence in proteocephalids of great variety of eggs including many with filaments or polar knobs, may be indirect evidence that there is not such a uniformity in the spectrum of intermediate host as in the Holoarctic. Virtually, nothing is known about an intermediate host, apart from BEKÉSI *et al*. (1992).However, some observations give us some informations on the biology of proteocephalids. Many fish species have encapsulated larvae on the intestine wall and in the mesentery. Full-grown larvae removed from the host response capsule have proteocephalid scoleces (fig. 12). Their origin could be atributed to plerocercoid invasion of the intestine wall of a fish intermmediate host, leading to encapsulation. SCHAEFFER *et al*. (1992) noted a large number of encysted larvae in liver and peritoneum of *Loricariichthys platymetopon* (fig.13*)*. These larvae are definitely cysticercoid-like. BEKESI *et al.* (1992) found plerocercoids in *Astronotus ocellatus*, *Cichla ocellaris* and other fish species. Various stages of plerocercoids were found making their way through the intestine wall to capsules on visceral serosa or pyloric caeca. He found adult proteocephalid tapeworms in the intestine of larvae-infected *C. ocellaris*, but were unable to identify species of adult. Procercoides were found in the haemocoel of a copepod *Diaptomus* sp. in samples of plankton.

REGO & GIBSON (1989) found hyperparasitism of adult proteocephalid species by larval proteocephlids cysticercoid-like (fig. 14-15) and less frequentlty by nematode larvae.

Paratenic hosts, represented by teleosts, seems very common in the transmission of proteocephalids in freshwater

There are no data about the life-cycles of Trypanorhyncha and Tetraphyllidea in freshwater sting rays.

REFERENCES

BEKESI, L.; V.A. FEITOSA & F.A.B. CABRAL. 1992. Metacestodosis caused by plerocercoids of Proteocephalidea (Cestoda) in fish fry cultured in large scale in the Brazilian Northeast. **Parasitol. Hung., 25**: 9-13

BROOKS, D.R. 1978. Evolutionary history of the cestode order Proteocephalidea. **Syst. Zool., 27**: 312-323.

BROOKS, R. 1995. Neotropical freshwater stingrays and their parasites: a tale of an ocean and a river long ago. **J. of Aquaculture and Aquatic Science, 7** : 52-61.

BROOKS, D. R. & J. F. R. AMATO. 1992. Cestodes parasites in *Potamotrygon motoro* (Chondrichthyes: Potamotrtgonidae) from Southwestern Brazil, including *Rhinebothrioides mclennanae* sp.n (Tetraphyllidea: Phyllobothriidae), and a revised host-parasite checklist for helminths inhabiting neotropical freshwater stingrays. **J. Parasitol**., **78** (3): 393-398.

BROOKS, D.R. & T.L. DEARDORFF. 1980. Three proteocephalid cestodes from Columbian siluriform fishes, including *Nomimoscolex alovarius* sp.n. (Monticellidae: Zygobothriinae). **Proc. Helminthol. Soc. Washington., 47**: 15-21.

BROOKS, D. R.; M. A. MAYES & T.B. THORSON. 1981. Systematic review of cestodes infecting freshwater stingrays (Chondrichthys: Potamotrygonidae) including four new species from Venezuela. **Proc. Helminth. Soc. Washington, 48**: 43-64.

BROOKS, D.R. & G. RASMUSSEN. 1984. Proteocephalidean cestodes from Venezuelan siluriform fishes with a revised classification of the Monticellidae. **Proc. Biol. Soc. Wash., 97**: 748-760.

BROOKS, D. R & T.B. THORSON,1976. Two tetraphyllydean cestodes from the freshwater stingray *Potamotrygon magdalenae* Duméril, 1852 (Chondrichthyes : Potamotrygonidae) from Colombia. **J. Parasitol; 62** : 943-947.

CAMPBELLI, R. A; F. MARQUES & V. A. IVANOV. 1999. *Paroncomegas araya* (Woodland, 1934) n.gen. et comb (Cestoda: Trypanorhyncha: Eutetrarhynchidae) from the freshwater stingray *Potamotrygon motoro* in South America. **J. Parasitol., 85** (2): 313-320.

DIESING, C.M. 1850. **Systema Helminthum**. **Vol. I** Vindobonae, Wilhelmum Braumüller, 679 p.

DIESING, K.M. 1855. Sechzehn Gattungen von Binnewürmern und ihre Arten. **Denkschr. der Kaiserlichen Akad. der Wissenschaften. Mathematisch-Naturwiss. Classe Wien., 9**: 171-185.

DIESING, K.M. 1856. Zwanzig arten von Cephalocotyleen. **Denkschr. der Kaiserlichen Akad. der Wissenschaften. Mathematisch-Naturwiss. Classe Wien., 12**: 23-38.

MARQUES, F. P. L. 2000. **Evolution of Neotropical freshwater stingrays and their parasites taking ito account space in time**. Dissertation. University of Toronto, Canada. 325 p.

PERTIERRA, A.A.G. de. 1995. *Nomimoscolex microacetabula* sp. n. y *N. pimelodi* sp.n. (Cestoda: Proteocephalidea), parásitos de Siluriformes del Río de La Plata. **Neotrópica, 41**: 19-25.

PERTIERRA, A A G. 2002. Redescription of *Proteocephalus bagri* and *P. rhamdiae* (Cestoda: Proteocephalidae), parasites of *Rhamdia quelen* (Siluriformes: Pimelodidae) from South America, with comments on morphological variation. **Folia Parasitologica, 49** : 55-60.

PERTIERRA, A A G. & G.VIOZZI. 1999. Redescription of *Cangatiella macdonaghi* (Szidat & Nani, 1951) comb.nov. (Cestoda: Proteocephalidae) a parasitic of the Atheriniform fish *Odontesthes hatcheri* (Eigenmann, 1909) from the Patagonian region of Argentina. **Neotropica 45**: (113-114) : 13-20.

REGO, A.A; 1979. Contribuição ao conhecimento dos helmintos de raias fluviais Paratrygonidae. **Rev. Brasil. Biol., 39** (4) : 879-890.

REGO, A A . 1981. **Cestoda**. In: **Aquatic Biota of Tropical Souht América.** Part 2: **Anarthopoda**. (Hulbert, S.H.G. Rodriguez and N. D. Santos, eds) San Diego State University. Sand Diego, California. Xi + 298 p.

REGO, A .A . 1982. Identificação de Temnocephalida (Turbellaria) e de plerocercos de Trypanorhyncha (Cestoda) encontrados em caranguejos de água doce. **Rev. Brasil. Biol., 42** (2) : 275-278.

REGO, A.A. 1987a. Redescrição de *Pterobothrium crassicolle* Diesing, 1850 (Cestoda : Trypanorhyncha) e revalidação da espécie. **Mem. Inst. Oswaldo Cruz, 82:** 51-53.

REGO, A.A. 1987b. Cestóides proteocefalídeos do Brasil. ReorganizaçÃo taxonômica. **Rev. Brasil. Biol., 47**: 203-212.

REGO, A. A. 1997. *Senga* sp., Occurrence of a pseudophyllid cestode in a Brazilian freshwater fish. **Mem. Inst. Oswaldo Cruz, 92**: 607.

REGO, A. A.; J. C. CHUBB & G. C. PAVANELLI. 1999. Cestodes in South American freshwater teleost fishes: keys to genera and brief description of species. **Rev. Brasil. Zool., 16**: 299-367.

REGO, A. A. & A.P.L DIAS. 1979. Estudos de cestóides de peixes do Brasil.3ª.nota: Cestóides de raias fluviais Paratrygonidae. **Rev. Brasil. Biol., 36** (4): 941-956.

REGO, A. A. & D.I. GIBSON. 1989. Hyperparasitism by helminths: new records of cestodes and nematodes in proteocephalid cestodes from South American siluriform fishes. **Mem. Inst. Oswaldo Cruz, 84**: 371-376.

REGO, A.A. & G.C. PAVANELLI. 1990. Novas espécies de cestóides proteocefalídeos parasitas de peixes não siluriformes. **Rev. Brasil. Biol., 50**: 91-101

REGO, A.A.; J.C. SANTOS & P.P. SILVA. 1974. Estudo de cestóides de peixes do Brazil. **Mem. Inst. Oswaldo Cruz, 72**: 187-204.

SCHAEFFER, G. V.; A A REGO & G. C. PAVANELLI. 1992. Peritoneal and visceral cestode larvae in Brazilian freshwater fishes. **Mem. Inst. Oswaldo Cruz, 87 suppl I**: 257-258.

TAKEMOTO, R.M.; G.C. PAVANELLI & F. BONA. 1994. Ocorrência de larvas de *Valipora* sp. (Cestoda: Cyclophyllidea) em *Prochilodus scrofa*, "curimba", peixe de escama do rio Paraná, região de Porto Rico, PR, Brasil, p. 170. *In*: **VIII Simpósio Brasileiro de Aqüicultura.** Piracicaba, SP.

WOODLAND, W.N.F. 1933a. On the anatomy of some fish cestodes described by Diesing from the Amazon. **Q. J. Microsc. Sci., 76**: 175-208.

WOODLAND, W.N.F. 1933b. On two new cestodes from the Amazon siluroid fish *Brachyplatystoma vaillanti* Cuv. and Val. **Parasitology, 25**: 485-490.

WOODLAND, W.N.F. 1933c. On a new subfamily of proteocephalid cestodes - the Othinoscolecinae - from the Amazon siluroid fish *Platystomatichthys sturio* (Kner). **Parasitology, 25**: 491-500.

WOODLAND, W.N.F. 1934a. On the Amphilaphorchidinae, a new subfamily of proteocephalid cestodes, and *Myzophorus admonticellia*, gen. et sp.n., parasitic in *Pirinampus* spp. from the Amazon. **Parasitology, 26**: 141-149.

WOODLAND, W.N.F. 1934b. On some remarkable new cestodes from the Amazon siluroid fish, *Brachyplatystoma filamentosum* (Lichtenstein). **Parasitology, 26**: 268-277.

WOODLAND, W.N.F. 1934c. On six new cestodes from Amazon fishes. **Proc. Zool. Soc. Lond., 104**: 33-44.

WOODLAND, W.N.F. 1935a. Additional cestodes from the Amazon siluroids pirarará, dorad and sudobím. **Proc. Zool. Soc. Lond., 104**: 851-862.

WOODLAND, W.N.F. 1935b. Some more remarkable cestodes from Amazon siluroid fish. **Parasitology, 27**: 207-225.

WOODLAND, W.N.F. 1935c. Some new proteocephalids and a ptychobothriid (Cestoda) from the Amazon. **Proc. Zool. Soc. Lond., 105**: 619-623.

Recebido: 09/06/03
Aceito: 05/02/04