Pakistan Journal of Nematology (2016) 34 (2):205-212 ISSN 0255-7576 (Print)
ISSN 2313-1942 (Online)
http://dx.doi.org/10.18681/pjn.v34.i02.p205

Occurrence of some nematode parasites in the gastrointestinal tract of Ariidae (Teleostei: Siluriformes) catfish, *Arius arius* (Hamilton, 1822) from Karachi coast

A. Sattar[1, †], A. Khan[2], N. Khatoon[1]and A. Mujahid[3]

[1]*Department of Zoology, University of Karachi, Karachi-75270, Pakistan*
[2]*Crop Diseases Research Institute, Karachi University Campus, Karachi, Pakistan*
[3]*M. A. H. Qadri Biological Centre, University of Karachi, Karachi, Pakistan*

[†]Corresponding author: sattarazad82@gmail.com

Abstract

Current study was carried out in December, 2014 to investigate the occurrence of helminth parasites in catfish species belonging to family Ariidae (Blecker, 1862). Four species of catfishes namely *Arius arius* (Hamilton, 1822), *Arius caelatus* (Valenciennes, 1840), *Arius dussumieri* (Valenciennes, 1840) and *Arius sona* (Hamilton, 1822) off the Karachi coast were screened for the occurrence of helminth parasites. Fish were examined after washing contents of gastrointestinal tract and observed under light microscope with the help of regular parasitological methods. The nematode parasites namely; *Raphidascaris acus* (Bloch, 1779) larvae, *Metabronema magnum* (Taylor, 1925), *Haplonema immutatum* (Ward et Magath, 1917) and *Hedruris bryttosi* (Yamaguti, 1935) were recorded from the gut of the catfish, *Arius arius* (Hamilton, 1822). These are new host records as these parasites have not been reported from *Arius arius* species in the region, off the Karachi coast.

Key Words: Catfish, helminth parasites, occurrence, gastrointestinal tract (GIT), Karachi coast, Ariidae.

Parasites cause infections and diseases in both fresh water as well as marine water fish. These parasitic infections are becoming threat for fish health, therefore proper attention must be given to the problem in aquaculture production. Many different parasites such as monogenean, digenean, cestodes, nematodes and acanthocephalans infect fish (Khalil & Polling, 1997) and are parasitic to the host (Paperna, 1996). The normal physiology of the fish gets affected and may cause many fatal diseases (Kabata, 1985) and extraordinary changes in the host which leads to mass mortalities of fish (Al-Marjan & Abdullah, 2009). Van Dan Brock (1979) discovered that the disease conditions arise that cause nutritional devaluation of fish. Petter & Le Bel (1992) described *Cucullanus laurotravassosi* n. sp. from *Arius* spp. in Australian River.

Amin (1984) reported four male and five mostly gravid females of *Haplonema immutatum* from the intestine (one from the stomach) of three *Amia calva* from Tichigan Lake. Smith (1984) studied the larval development and morphology of *Raphidascaris acus* and considered fish as secondary intermediate host or paratenic host for *Raphidascaris* sp. (Kosinova, 1965; Supriaga & Mozgovoi, 1974). Al-Salim & Ali (2011) reported *Cucullanus armatus* Yamaguti, 1954 from the intestine of giant sea catfish *Netuma thalassina*; from North West of Arabian Gulf near Khor Al-Ummia. Akram & Khatoon (1999) considered *Dichyline* as synonym of *Cucullanus* and designed keys to three subgenera (*Pakdacnitis*, *Truttaedanilis* and *Campanarougettina*) and species in both marine and freshwater of Pakistan. Al-Zubaidy & Mhaisen (2011) studied the occurrence of some trypanorhynchid cestodes in the body cavity,

viscera and flesh of some commercial Red Sea fish, *Arius dussumieri* and *A. thalassinus* from Yemeni coastal waters. The liver diseases of yellow perch have been studied by Poole & Dick (1984) which was infected by the larvae of *Raphidascaris acus* (Bloch, 1779). Baker (1982) reported *Hedruris transvaalensis* (Habronematoidea) from Africa.

Seventeen different species of *Hedruris* were found in amphibians, reptiles and fish all over the world by Skrjabin & Sobolev (1963). Tripathi (1957) described *Neocalceostoma elongatum* from the gills of *Arius arius* and *Osteogeneosus militaris* in India while Kritsky *et al*., (1978) re-described *Neocalceostoma elongatum* Tripathi (1957) from the gills of *Arius serratus* (Day), Ariidae, from the Karachi Coast, Pakistan. Moravec *et al*., (1999) described *Gorgorhynchus medius* (Linton, 1908) from catfish of the genus *Arius* from the Gulf of Mexico.

Ward & Magath (1917) established *Haplonema* for *immutatum*, a new species of nematode which they described from the bowfin (*Amiacalva* Linn.) from Northern U.S.A. These genera are composed of species parasitic in the alimentary tract of freshwater fish of Europe, Asia, and North America (Arthur & Margolis, 1975).

The genus *Hedruris* may occur in fish and frogs (Baker, 1986) and contains 24 different species found throughout the world among frogs, salamanders, freshwater turtles, lizards, and both freshwater and marine water fish (Baker, 1982) while according to Bursey & Goldberg (2000, 2007) there were 22 documented nominal species of *Hedruris* distributed worldwide and found in the digestive gut of their hosts (Luque *et al*., 2010). Moravec & Justine (2007) redescribed *Metabronema magnum* (Taylor, 1925) from specimens collected from the swim bladder of the fish (golden trevally) *Gnathanodon speciosus* (Forsskål) off New Caledonia, South Pacific.

The parasites are normally found in the visceral mass and the body cavity of catfish and damage the gastrointestinal tract of its hosts. Fish parasites are becoming a serious fiscal and health issue (Imam & Dewu, 2010). Thus there is a need to study fish parasites leading to their control. Therefore the present study was undertaken to identify species diversity of gastrointestinal tract helminths of catfish and to evaluate their prevalence in the region off the Karachi Coast.

Materials and Method

During December, 2014 a total of 18 infected fish were obtained from local fish market of Korangi, Karachi-Pakistan and brought to the laboratory of Zoology Department, University of Karachi, Karachi, for detailed study. The fish were examined, identified and measured. Each fish was dissected carefully by a cut made on the ventral side from the anal opening to the lower jaw, in order to expose the body cavity and alimentary tract, two more lateral cuts were made. Parasites were recovered from the alimentary canals of the fish after cutting it into smaller pieces.

Each part of gastrointestinal tract (GIT) was then transferred into a Petri dish having normal saline. The intestine and parts of GIT were dissected in search of helminth parasites. Upon dissection of the GIT the worms were observed. They were cautiously removed by forceps and placed into the Petri dishes having normal saline. 70% ethanol was used for fixation of the parasites and then stored in different sample bottles until studied; later on nematodes were stained for morphological studies, parasites were then cleared in glycerine, examined under light microscope and identified up to species level using identification key of Yamaguti (1959).

The parasites were examined under microscope (Nikon Optiphot, Japan 211316) using different magnifications. The photomicrographs were taken

in the Laboratory of Parasitology, Department of Zoology, University of Karachi, Karachi, Pakistan by digital camera (Fine pix S6000 fd). All the measurements are given in millimeters.

Results

The present study is the first host record of these parasites from *Arius* species of this region. Eighteen Ariidae fish were dissected and a total of four nematodes were recovered from *Arius arius* (Hamilton, 1822). These parasites belonged to four different genera viz., *Raphidascaris acus* (Bloch, 1779) larvae, *Metabronema magnum* (Taylor, 1925), *Haplonema immutatum* (Ward et Magath, 1917) and *Hedruris bryttosi* (Yamaguti, 1935). All the four parasites recovered were males. No trematode, cestode or acanthocephalans were recovered.

Raphidascaris acus (Bloch, 1779), larvae (Fig. 1: A-C)

Description: Nematode larvae pale in colour, cuticle with transverse striation. Body 3.92 and width 0.186 mm. Oesophagus cylindrical, muscular, 0.51 long. Broader posteriorly than anteriorly, posterior appendix 0.504 mm long. Nerve ring encircling oesophagus, excretory pore situated shortly below nerve ring. Tail conical in both sexes, slightly curved ventrally in male, 0.729 long. Spicules long and subequal.

Haplonema immutatum (Ward et Magath, 1917) (Fig. 2: A-C)

Description: Male 13.15 mm long, maximum width slightly posterior to oesophageal-intestinal junction 0.205 mm, width at mid body 0.214 mm, at anus 0.87 mm. Cuticle striated, maximum distance between striations 0.016 mm at mid body. Anterior end flexed dorsally, head with four sub median single papillae and two lateral amphids. Lips absent, mouth opening directly into oesophagus. Oesophagus muscular, divided at level of nerve ring into two sections, the posterior wider than anterior. Tail attenuated without caudal alae, two pairs of pre-anal and three pairs of post-anal papillae. Spicules equal.

Hedruris bryttosi (Yamaguti, 1935) (Fig. 3: A-C)

Description: Male body length 9.4 by 0.25 mm. Head 0.13 wide. Nerve ring 0.24 mm from anterior end. The oesophagus 0.9 long and slender. Excretory pore 0.35 from the anterior end. Tail 0.4 long, pointed. One adanal and nine postanal papillae. Spicules equal and 0.16 long.

Metabronema magnum (Taylor, 1925) (Fig. 4: A-C)

Description: Male body length 17.50 mm; maximum width 467 mm. Height of pseudolabia 25 mm. Length of entire vestibule including prostom 269 mm; prostom 44 mm long, 103 mm wide in lateral view; thickness of wall 12 mm. Muscular oesophagus 989 mm long and 71 mm wide, glandular oesophagus 3.62 mm long, maximum width 151. Preanal papillae four pairs, post anal papillae five pairs. Phasmids very small in size, situated posterior to last pair of sub ventral papillae. Spicules unequal, right spicules slender, 1.55 long, proximal end of spicule somewhat broader, distal end sharply pointed, left spicule short, boat-shaped and 0.44 long. Tail long with round tip.

Discussions

Fish helminth parasites are found in all the fish and their prevalence and intensity depend on various factors. The infection rates vary from locality to locality. These four nematodes have not been reported earlier from *Arius* species of this region. The high prevalence observed in *Arius arius* may be due to some factors such as pollutants, physio-chemical properties of water, availability of suitable host for parasites or parasitic load could be attributed to random selection of the specimen from study area and age of the host.

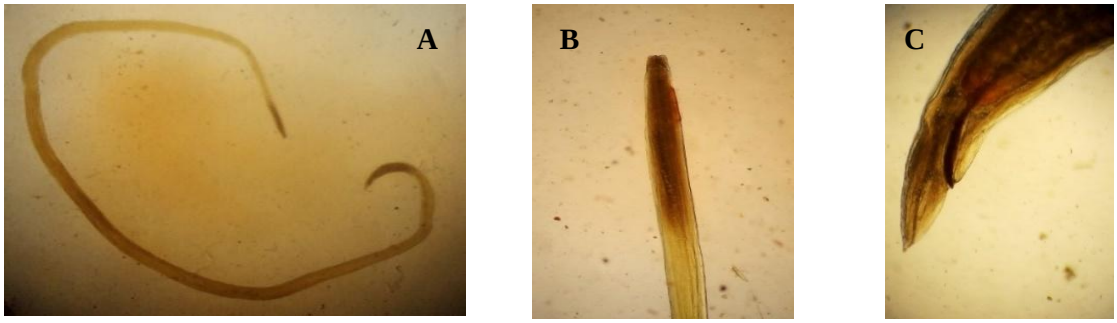

Fig. 1 (A-C). Photomicrographs of *Raphidascaris acus* (Bloch, 1779). Male: A. Entire body (x 0.66); B. Anterior end (x4); C. Posterior end (x10).

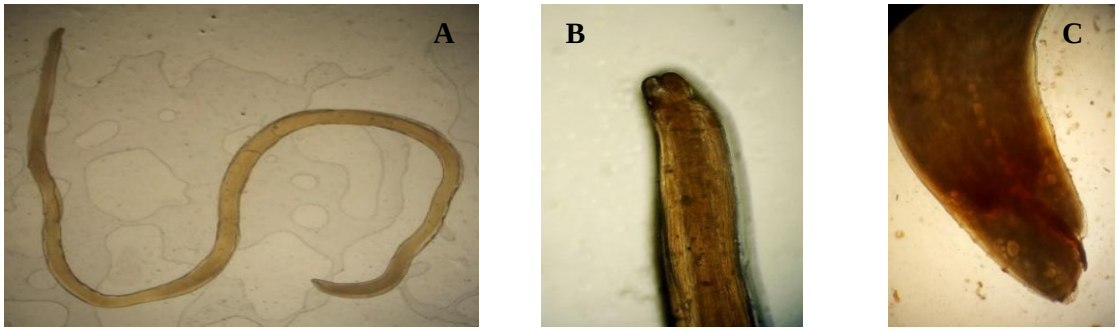

Fig. 2 (A-C). *Metabronema magnum* (Taylor, 1925). Male: A. Entire body (x 0.66); B. Anterior end (x10); C. Posterior end (x10).

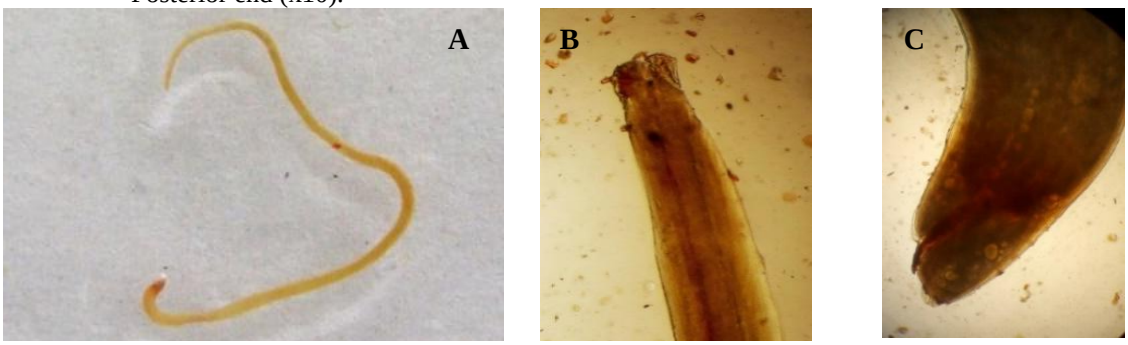

Fig. 3 (A-C). *Haplonema immutatum* (Ward et Magath, 1917). Male: A. Entire body (x 0.66); B. Anterior end (x10); C. Posterior end (x10).

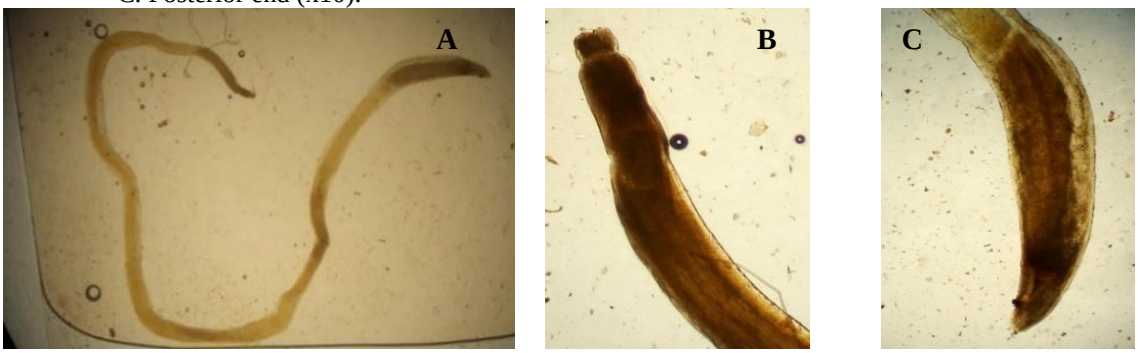

Fig. 4 (A-C). *Hedruris bryttosi* (Yamaguti, 1935). Male: A. Entire body (x 0.66); B. Anterior end (x10). C. Posterior end (x10).

Water conditions (Rohde *et al*., 1995), geomorphology (Palm, 1999; Hayward, 1997) as well as season are contributing factors. Sosanya (2002) reported positive correlation between pollution and physico chemical properties and prevalence of parasites. Lile (1998) concluded that the higher prevalence rate is due to availability of suitable host for parasites. The availability and abundance of the definitive host and the intermediate hosts could be a factor responsible for the variations in the levels of infections in the host (Okaka, 2005).

Also the parasitic load may be attributed to the feeding habit of host fish (Willoughby, 1974; Bruton, 1979). Lagler *et al*., (1979) suggested that the age factor is most important for prevalence of parasites because increasing age increases resistance and infections may be less. Akinsanya *et al*., (2007) attributed the load of parasites to the random selection and the low level of immunity in the smaller sized fish. Onwuliri & Magbemena (1987) observed that distribution of helminth parasites depend on their nutritional and respiratory requirements. According to Dogiel *et al*., (1958) and Emere (2000) the foodstuff is most likely responsible for the burden of parasite species in host fish.

Moravec (1970) concluded that fish acts as an intermediate host for second stage larvae of *Raphidascaris acus*. Many fish species have been experimentally infected by larvated eggs (Engashev, 1965; Moravec, 1970; Supriaga & Mozgovoi, 1974). Sometimes the second stage larvae enter the liver of fish through invertebrate hosts and infect the fish (Engashev, 1965; Supriaga & Mozgovoi, 1974). The specificity in the nematode parasites of *Arius* spp., is much broader in their intermediary hosts than in their definitive hosts (Moravec, 1994; Moravec *et al*., 1995; Moravec & Vargas-Vazquez, 1996).

The nematodes infection reflects that the piscivorous birds (Intermediate host) after ingesting the infected fish remain hovering on the water body and while flying add their feces with nematode larvae in the water that then is ingested by crustaceans and small fish which become food for large fish. The absence of other helminth besides nematodes may be due to the absence of certain intermediate hosts for parasites. In Ascaridoidea, little data is available concerning the pathogenicity of *Raphidascaris acus*. Similarly few reports are available on anisakis larvae (Cisse & Belgyti, 2005).

Thus the present investigation was undertaken to know the nematodes present in gastrointestinal tract of Ariidae catfish from Karachi coast, Sindh, Pakistan.

References

Akinsanya, B., Hassan, A. A. & Otubanjo, O. A. (2007). A comparative study of the parasitic helminth fauna of *Gymnarchus niloticus* (Gymnarchidae) and *Heterotis niloticus* (Osteoglossidae) from Lekki Lagoon Lagos, Nigeria. *Pakistan Journal of Biological Sciences*, 10, 427-432.

Akram, M. & Khatoon, N. (1999). A preliminary report on diversity of *Cucullanus* species in marine and freshwater fishes of Pakistan. *Pakistan Journal of Marine Biology* (*Mar. Res.*), 5, 123-132.

Al-Marjan, K. S. N. & Abdullah, S. M. A. (2009). Some ectoparasites of the common carp (*Cyprinus carpio*) in Ainkawa fish Hatchery, Erbil Province, Kurdistan Region, Iran. *Journal of Duhok University*, (Special issue), 14, 102-107.

Al-Salim, N. K. & Ali, A. H. (2011). First record of three nematode species parasitizing some marine fishes in Iraq. *Journal of Basrah Researches* (Sciences). 37, 17-26.

Al-Zubaidy, A. B. & Mhaisen, F. T. (2011). Larval tapeworms (Cestoda: Trypanorhyncha) from some Red Sea fishes, Yemen. Mesopot. *Journal of Marine Sciences*, 26, 1-14.

Amin, O. M. (1984). Camallanid and other nematode parasites of lake fishes in Southeastern Wisconsin. *Proceedings of the*

Helminthological Society of Washington, 51, 78-84.

Arthur, J. R. & Margolis, L. (1975). Revision of the genus *Haplonema* Ward and Magath, 1917 (Nematoda: Seuratoidea). *Canadian Journal of Zoology*, 53, 736-747. Doi: 10.1139/z75-088

Baker, M. R. (1982). Systematics and zoogeography of three new nematode parasites of the frog *Breviceps sylvestris sylvestris* Fitz Simons from South Africa. *Canadian Journal of Zoology*, 60, 3134-3142. Doi: 10.1139/z82-398

Baker, M. R. (1986). Revision of *Hedruris* Nitzsch (Nematoda: Habronematoidea) from aquatic vertebrates of North America. *Canadian Journal of Zoology*, 64, 1567-1572. Doi: 10.1139/z86-234.

Bruton, M. N. (1979) .The food and feeding behaviour of *Clarias gariepinus* (Pisces: Claridae) in Lake Sibaya, South Africa, with emphasis on its role as predator of cochlids. *Transactions of the Zoological Society of London*, 35, 47-114.Doi: 10.1111/j.1096-3642.1979.tb00057.x

Bursey, C. R. & Goldberg, S. R. (2000). *Hedruris hanleyae* n. sp. (Nematoda: Hedruridae) from *Hemidactylus garnotii* (Sauria: Gekko-nidae) from the Cook Islands, Oceania. *The Journal of Parasitology*, 86, 556-559. Doi: 10.1645/0022-3395 (2000) 086 [0556:HHNSNH] 2.0.CO;2

Bursey, C. R. & Goldberg, S. R. (2007). New species of *Hedruris* (Nematoda: Hedruridae), *Anuracanthorhynchus lutzi* (Hamann, 1891) n. comb. and other helminths in *Lithobates warszewitschii* (Anura: Ranidae) from Costa Rica. *Caribbean Journal of Science*, 43, 1-10. Doi: 10.18475/cjos.v43i1.a2

Cisse, M. & Belgyti, D. (2005). Helminth parasites of club mackerel, *Scomber japonicas* (Honttuyn, 1782) from the harbor Mehdia-kenitra (Atlantic Coast of Morocco). *Journal of Aquatic Sciences*, 20, 63-67. Doi: 10.4314/jas.v20i1.20041.

Dogiel, V. A., Petrsheuski, G. K. & Polyanski, Y. V. I. (1958). *Parasitology of fishes*. Lenningrad University Press (translated from Kabata, 1961) Edinburgh and London, Oliver and Boyd.

Emere, M. C. (2000). Parasitic infection of the Nile prech (*Latesniloticus*) in River Kaduna. *Journal of Aquatic Science*, 31, 34-45. Doi: 10.4314/jas.v15i1.19988.

Engashev, V. G. (1965). Study of the life cycle of *Raphidascaris acus* (Bloch, 1779) (in Russian). *Materiali Nauchnoi Konferentsii Vsesoyuznogo Obshchestva Gel'mintologii*, 2, 89-94.

Hayward, C. J. (1997). Distribution of external parasites indicates boundaries to dispersal of sillaginid fishes in the Indo-West Pacific. *Marine and Freshwater Research*, 48, 391-400. Doi: 10.1071/MF96125

Imam, T. S. & Dewu, R. A. (2010). Survey of Piscine ecto and intestinal parasites of *Clarias* species sold at Galadima Road fish Market, Kano Metropolis, Nigeria. *Bioscience Research Communication*, 22, 209-214.

Kabata, Z. (1985). *Parasites and diseases of fish cultured in the tropics*. London: Taylor & Francis, 318 pp. Doi: 10.1017/S0266467400000171.

Khalil, L. F. & Polling, L. (1997). *Check list of the helminth parasites of African freshwater fishes*. University of the North Republic of South Africa, 161 pp.

Kosinova, V. G. (1965). Life cycle of the nematode *Raphidascaris acus* (Bloch, 1779) Railliet et Henry, 1915- a parasite of fish (in Russian). *Materiali Nauchnoi Konferentsii Vsesoyuznogo Obshchestva Gel'mintologii*, 2, 128-131.

Kritsky, D. C., Mizelle, J. D. & Bilqees, F. M. (1978). Studies on Monogenea of Pakistan III. Status of the Calceostomatidae (Parona and Perugia, 1890) with a redescription of *Neocalceostoma elongatum* Tripathi, 1957 and the proposal of *Neocalceostomoides* gen. n. *Proceedings of the Helminthological Society of Washington*, 45, 149-154.

Lagler, K. F., Bardach, J. E. & Miller, R. R. (1979). *Ichthyology*. John Wiley, New York.

Lile, N. K. (1998). Alimentary tract helminth of four pleuronectid flatfish in relation to host

phylogeny and ecology. *Journal of Fish Biology*, 53, 945-953. Doi: 10.1111/j.1095-8649.1998.tb00455.x

Luque, J. L., Vieira, F. M., Herrmann, K., King, T. M., Poulin, R. & Lagrue, C. (2010). New evidence on a cold case: trophic transmission, distribution and host-specificity in *Hedruris spinigera* (Nematoda: Hedruridae). *Folia Parasitologica*, 57, 223-231. Doi: 10.14411/fp.2010.029.

Moravec, F. (1970). Studies on the development of *Raphidascaris acus* (Bloch, 1779) (Nematoda: Heterocheilidae). *Vestnik Ceskoslovenske Spolecnosti Zoologicke*, 34, 33-49.

Moravec, F. (1994). *Parasitic nematodes of freshwater fishes of Europe.* Academia Praha 473 pp.

Moravec, F. & Justine, J. L. (2007). Redescription of *Metabronema magnum* (Nematoda: Cystidicolidae), a swim bladder parasite of the carangid fish *Gnathanodon speciosus* off New Caledonia. *Folia Parasitologica*, 54, 293-300. Doi: 10.14411/fp.2007.038

Moravec, F. & Vargas-Vázquez, J. (1996). The development of *Procamallanus* (*Spirocamallanus*) *neocaballeroi* (Nematoda: Camallanidae), a parasite of *Astyanax fasciatus* (Pisces) in Mexico. *Folia Parasitologica*, 43, 61-70.

Moravec, F., Mendoza-Franco, E., Vargas-Vázquez, J. & Vivas-Rodríguez, C. (1995). Studies on the development of *Procamallanus* (*Spirocamallanus*) *rebecae* (Nematoda: Camallanidae), a parasite of cichlid fishes in Mexico. *Folia Parasitologica*, 42, 281-292.

Moravec, F., Wolter, J. & Körting, W. (1999). Some nematodes and acanthocephalans from exotic ornamental freshwater fishes imported into Germany. *Folia Parasitologica*, 46, 296-310.

Okaka, C. E. (2005). A survey into the helminth parasites of fishes of Asa River and the impoundment at Asa dam, Ilorin, Nigeria. *Rivista di Parasitologia*, 22, 207-214.

Onwuliri, C. O. E. & Magbemena, M. O. (1987). The parasitic fauna of fresh water fishes from Jos Plateau, Nigeria. *Nigerian Journal of Applied Fishes and Hydrobiology*, 2, 33-37.

Palm, H. W. (1999). Ecology of *Pseudoterranova decipiens* (Krabbe, 1878) (Nematoda: Anisakidae) from Antarctic waters. *Parasitology Research*, 85, 638–646.

Paperna, I. (1996). *Parasite, Infections and Disease of Fishes in Africa- An update*. CIFA Technical paper, 31, 1-220 pp.

Petter, A. J. & Le Bel, J. (1992).Two new species in the genus *Cucullanus* (Nematoda: Cucullanidae) from the Australian Region. *Memorias do Instituto Oswaldo Cruz, Reo de Janeiro*, 87, 201-206.

Poole, B. C. & Dick, T. A. (1984). Liver pathology of yellow perch, *Perca flavescens* (Mitchill), infected with larvae of the nematode *Raphidascaris acus* (Bloch, 1779). *Journal of Wildlife Diseases*, 20, 303-307. Wildlife Disease Association, 1984. Doi: 10.7589/0090-3558-20.4.303

Rohde, K., Hayward, C. & Heap, M. (1995). Aspects of the ecology of metazoan ectoparasites of marine fishes. *International Journal for Parasitology*, 25, 945-970. Doi: 10.1016/0020-7519(95)00015-T

Skrjabin, K. I. & Sobolev, A. A. (1963). Spirurids of animals and man and diseases caused by them (in Russian.) *Osnovy Nematodolgii* Vol. 11. Akademiya Nauk, SSSR, Moscow.

Smith, J. D. (1984). Development of *Raphidascaris acus* (Nematoda; Anisakidae) in paratenic, intermediate, and definitive hosts. *Canadian Journal of Zoology*, 62, 1378-1386. Doi: 10.1139/z84-198

Sosanya, M. O. (2002). *Fish parasite as indicators of Environmental quality.* M. Sc. Thesis, University of Ibadan, 142 p.

Supriaga, V. G. & Mozgovoi, A. A. (1974). Biological peculiarities of *Raphidascaris acus* (Anisakidae: Ascaridata), a parasite of freshwater fish (in Russian). *Parazitologiya*, 8, 494-503.

Tripathi, Y. R. (1957). Monogenetic trematodes from fishes of India. *Indian Journal of Helminthology*, 9, 1-149.

Van Dan Brock, W. L. F. (1979). Copepod ectoparasites of *Mertanginus malangus* and *Platichy flescic*. *Journal of Fish Biology*, 14, 1-6.

Ward, H. B. & Magath, T. B. (1917). Notes on some nematodes from fresh-water fishes. *Journal of Parasitology*, 3, 57-64.

Willoughby, N. G. (1974). *The Ecology of Synodontis* (*Pisces: Siluroides*) *in Lake Kainji, Niger, Nigeria*. Ph. D. thesis, University of Southampton. 288p.

Yamaguti, S. (1959). *Systema Helminthum. V III, Part I. The nematodes of vertebrates.* Interscience Publishers Inc. New York. 680pp.

(Accepted: April 15, 2016)