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INTENSITY OF NEMATODE (*RAPHIDASCARIS ACUS* BLOCH, 1779) IN DIFFERENT MONTHS FROM JANUARY, 2013 TO DECEMBER, 2014 IN CATFISH (*ARIUS ARIUS* HAMILTON, 1822) OF KARACHI COAST, PAKISTAN

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ABSTRACT

The marine catfish (*Arius arius*) is widely consumed in many Asian countries because of their good nutrient values and meat. Helminth infection constitutes significant economic loss in fish industry. The aim of this study was to determine seasonal intensity of nematode (*Raphidascaris acus* Bloch, 1779) in different months from January, 2013 to December, 2014 in catfish (*Arius arius* Hamilton, 1822). During the study period a total of 560 catfish were examined. Amongst them 420 fish were infected with *Raphidascaris acus.* The location of the parasite was intestine. The data was analysed using one way analysis of variance (ANOVA). The follow up ANOVA included Duncan's multiple range test. The month wise percentage of infection was significant ($p < 0.001$), while during 2013 the highest number of nematodes recorded were in the month of October followed by April. Whereas during 2014 the highest rate of infection was recorded during April. The high prevalence of nematode *R. acus* in October, 2013 and April, 2014 could be due to physical conditions such as water temperature, besides age of the fish may plays an important role in occurrence of helminth infection.

Keywords: Seasonal variation, nematode (*Raphidascaris acus* Bloch, 1799), catfish, Karachi coast, Pakistan.

INTRODUCTION

The marine fish are known to be infected with helminths including nematodes, cestodes, acanthocephalan and trematodes. Fish being of zoonotic importance as a number of disease are transmitted to human by fish parasites (Bilqees *et al.*, 2003). While *Arius arius* (Hamilton, 1822) also known as threadfin catfish are migratory in nature and are found in tropical brackish and marine waters of a number of countries including, Bangladesh, Malaysia, India, Pakistan, Thailand, China, Myanmar, Singapore and Philippine. The diet of threadfin catfish are prawns, crabs and molluscs besides other invertebrates (Hamilton, 1822). Ascaridoid nematodes are dependent upon aquatic hosts in order to complete their life cycle which generally involves different invertebrates and crayfish as intermediate hosts and birds which consume fish, reptiles, marine mammals and fish as definitive hosts (Koinaria *et al.*, 2013).

Iglesias *et al.* (2002) suggested that Raphidascarididae are mostly not zoonotic except in sporadic cases. Yagi *et al.* (1996) had reported a female worm of *Hysterothylacium aduncum* (Rudolphi, 1802) (Nematoda: Anisakidae) excreted from human in Japan.

Raphidascaris acus (Bloch, 1779) is widely spread in the digestive tract of marine fish which are predatory in nature. Definitive hosts are commonly Pike, brown trout and occasionally other fish species. *R. acus* develops to the second stage in the egg, which are then infective to both fish and invertebrates (Smith, 2011). Supriaga and Mozgovoi (1974) reasoned fish as secondary intermediate or paratenic host of *Raphidascaris* sp.

Smith (1986) had studied in freshwater fish the transmission of *R. acus* in two lakes on Manitoulin Island, Ontario. Several fish including cyprinids and percids were intermediate host with second, third and fourth stage larvae in the liver. Yellow Perch being the most important. He observed intensities up to 928 and increased with age and length to 100%. The population of *R. acus* was greater in large fish but was not related to sex or condition of the fish. In the present study month wise infection with *R. acus* Bloch, 1779 in catfish (*Arius arius* Hamilton, 1822) was studied from January 2013 to December 2014.

MATERIALS AND METHODS

The study was carried out for 2 years from January 2013 to December 2014. During the study 560 catfish (*Arius arius*) had been brought to the Parasitology Laboratory from different fish market including Water pump, Moosa Colony and West Wharf fish market. The whole viscera of fish was examined by naked eye for the presence of nematodes. Collected worms were properly washed in isotonic saline solution for almost eight times to remove the

mucous attached. Later the specimens were preserved in 5% glycerin and 70% ethanol in order to straighten up the body of the worm during fixation process and for preventing the dryness of the collected worms kept in small glass vials with labels carrying information details. Later, the nematodes based on the morphological characters were identified. Among 560 fish, 420 fish were infected with nematode (*Raphidascaris acus*). The data were statistically analysed using one way analysis of variance (ANOVA). The follow up of ANOVA included Duncan's multiple range test (Zar, 1999).

RESULTS

The nematode (*R. acus*) was recorded from the intestine of catfish (*Arius arius*). During January 2013 to December 2013 the month wise percentage of infection with nematode *Raphidascaris acus* Bloch, 1779 in the marine fish *Arius arius* Hamilton, 1822 was found to be significant ($p < 0.001$) (Table 1). Similarly during January 2014 to December 2014 the month wise percentage of infection with the nematode *Raphidascaris acus* (Bloch, 1779) was significant ($p < 0.001$) (Table 3).

During 2013 the highest number of nematodes were recovered in the month of October followed by April while the lowest were recovered in the month of December (Table 2). Whereas during 2014 the highest number of nematodes recovered during April and least in the month December (Table 4).

Table 1. ANOVA for rate for infection percentage by *R. acus* Bloch, 1779 nematode in Catfish in different months during 2013.

Source	**ss**	**df**	**MS**	**F**
Months	2035.96	11	185.08	46.96***
Error	94.58	24	24.31	
Total	2130.55	35		
*** = $p < 0.001$				
LSD 0.05 = 3.34				

Table 2. Mean value of percentage infection with nematode *R. acus* Bloch, 1779 in catfish (*Arius arius* Hamilton, 1822) alongwith the significant ranges at $p = 0.05$ during 2013.

Month	**Mean value of percentage of infection**	**Non-significant ranges***
January	52.4	G
February	57.0	Ef
March	61.1	Cd
April	69.1	A
May	56.5	Ef
June	59.5	De
July	68.1	A
August	66.4	Ab
September	64	Bc
October	216.7	H
November	55.7	Fg
December	45	H

*Mean followed by having a common letter are not significantly different.

Table 3. ANOVA table for infection % by nematode (*R. acus* Bloch, 1779) in different months during 2014.

Source	**Ss**	**Df**	**MS**	**F**	**F**
Months	2053.68	11	106.69	22.06	***
Error	203.08	24	8.46	–	–
Total	2256.76	35			
*** = $p < 0.001$					
L.S.D 0.05 = 4.90					

Table 4. Mean values of percentage of infection with nematode (*R. acus* Bloch, 1779) in catfish *Arius arius* Hamilton, 1822 alongwith the significant ranges at p = 0.05 during 2014.

Months	**Mean value % infection**	**Non-significant ranges***
January	52.7	G
February	57	Ef
March	61.1	Cd
April	69.1	A
May	56.5	Ef
June	59.5	De
July	68.1	A
August	66.4	Ab
September	64	Bc
October	46.7	H
November	55.7	Fg
December	45	H

*Mean values are Percentage infection with nematodes.

DISCUSSION

Intestine was the most infected site of marine fish *Arius arius* infected with *Raphidascaris acus.* The high prevalence of nematode *R. acus* in the month October 2013 and in the month of April 2014 which could be explained by physical condition especially temperature as well the age of the fish host, because as the fish grow older the food consumption is increased (Fernández *et al.,* 2005; Cruz *et al.,* 2007; Cruz *et al.,* 2009; Khalil, 1969).

Anisakids are typically found in meso or benthopelagic fish species which occur in deep sea water and are predators in character. They are more likely to be transmitted naturally when they find their characteristic nutrients (Kalay *et al.,* 2009). Abollo *et al.* (2001) had reported that in the case of anisakid parasites which are natural part of tropical network of marine ecosystems. Many parasitic helminth species possess complex life cycles including trophic transmission from one host to the other host by consuming infected intermediate hosts. The high intensity of infection in October 2013 and April 2014 can be compared with earlier study of high prevalence of anisakis reported by Santos *et al.* (2009). If *R. acus* infects a fish which is already infected by a parasite the harm can be to a dangerous level as reported earlier by Al-Jahdali and Hassanine (2010). Iwanowicz (2011) and Kotob *et al.* (2017) suggested that co-infections are very common amongst fish, when host is infected by two or more different pathogens. These infection has different severity of fish disease. The parasites harm may be mechanical as proliferation and fusion of gill lamellae and tissue replacement by the parasite, besides cell proliferation change in behavior, immunomodulation along with affecting reproductive capacity of fish. Genc *et al.* (2005) suggested that there was positive relationship of prevalence of *Phillometra lateolabracis* and water temperature. During both 2013 and 2014 least number of nematodes were recovered in December.

It would be advisable in future to compare size of fish with intensity of nematodes in different months.

REFERENCES

Abollo, E., C. Gestal and S. Pascual (2001). Anisakis infestation in marine fish and cephalopods from Galician waters: an updated perspective. *Parasitol. Res.,* 87: 492-499.

Al-Jahdali, M.O. and R.M.E.S. Hassanine (2010). Ovarian abnormality in pathological case caused by *Myxidium* sp. (Myxozoa, Myxosporea) in onespot snapper fish *Lutjanus monostigma* (Teleostei, Lutjanidae) from the Red sea. *Acta Parasitol.,* 55: 1-7.

Bilqees, F.M., N. Khatoon and R. Hadi (2003). A new species of the genus *Stromaturus* from a fish *Otopithus argenteus* of Karachi coast. *India J. Exp. Zool.,* 8: 435-439.

Cruz, C., A. Saraiva, M.J. Santos, J.C. Eiras, C. Ventura, J.P. Soares and M. Hermida (2009). Parasitic infection levels by *Anisakis* spp. larvae (Nematoda: Anisakidae) in the black scabbardfish *Aphanopus carbo* (Osteichthyes: Trichiuridae) from Portuguese waters. *Sci. Mar.,* 73S2: 115-120.

Cruz, C., C. Barbosa and A. Saraiva (2007). Distribution of larval anisakids in blue whiting off Portuguese fish market. *Helminthologia,* 44(1): 21-24.

Fernández, M., F.J. Aznar, F.E. Montero and J.A. Raga (2005). Endoparasites of the blue whiting, *Micromesistius poutassou* from morth-west Spain. *J. Helminthol.,* 79(1): 15-21.

Genc, E., M.A. Genc, E. Genc, I. Cengizler and M.F. Can (2005). Seasonal variation and Pathology associated with Helminths infecting two Serranids (Teleostei) of Iskenderun Bay (Northeast Mediterranean Sea), Turkey. *Turkish J. Fisheries and Aquatic Science,* 5: 29-33.

Hamilton, F. (1822). An account of fishes found in the river ganges and its branches. Edinburgh 2 London i-vii + 1-405, pls. 1-39.

Iglesias, L., A. Valevo, L. Galvez, R. Benitez and F.J. Adroher (2002). Invitro cultivation of *Hysterothylacium aduncum* (Nematoda: Anisakidae) from 3rd stage larvae to egg laying adults. *Parasitology,* 125: 467-475.

Iwanowicz, D.D. (2011). Overview on the effects of parasites on fish health. Proceedings of third bilateral conference between Russia and United States, 12-20 July, 2009, held in Shepherdstown West Virginia. pp. 176-184.

Kalay, M., A.E. Dönmez, C.E. Koyuncu, E. Genc and G. Sahin (2009). Seasonal variation of *Hysterothylacium aduncum* (Nematoda: Raphidascarididae) infestation in sparid fishes in the Northeast Mediterranean Sea. *Turk. J. Vet. Anim. Sci.,* 33(6): 517-523.

Khalil, L.F. (1969). Larvae (Nematoda) in herring (*Clupe pallasi*) of the British coastal waters and adjacent territories. *J. Mar. Biol. Assoc.,* U.K. 49: 641-649.

Koinaria, M., S. Karlb, A. Elliot, U. Ryana and A.J. Lymberye (2013). Identification of *Anisakis* species (Nematoda: Anisakidae) in marine fish hosts from Papua in New Guinea. *Vet. Parasitol.,* 193: 126-133.

Kotob, M.H., S. Menanteau-Ledouble, G. Kumar, M. Abdelzaher and M. El-Matbouli (2017). The impact of co-infections on fish: a review. *Vet. Res.,* 47: http://doi.org/10.1186/s13567-016-0383-4.

Santos, M.J., A. Saraiva, C. Cruz, J.C. Eiras, M. Hermida, C. Ventura and J.P. Soares (2009). Use of parasites as biological tags in stock identification of black scabbardfish *Aphanopus carbo* Lowe, 1839 (Osteichthyes: Trichiuridae) from Portuguese waters. *Sci. Mar.,* 73S2: 55-62.

Smith, J.D. (1986). Seasonal transmission of *Raphidascaris acus* (Nematoda), a parasite of freshwater fishes in definitive and intermediate hosts. *Environmental Biology of fishes,* 16:295-308.

Smith, J.D. (2011). Development of *Raphidascaris acus* (Nematoda, Anisakidae) in paratenic, intermediate, and definitive hosts. *Can. J. Zool.,* 62: 1378-1386.

Supriaga, V.G. and A.A. Mozgovoi (1974). Biological characteristics of *Raphidascaris acus* (Anisakidae: Ascardata) a fish parasite of freshwater fish. *Parazitologiia,* 8:494-503.

Yagi, K., K. Nagasawa, H. Ishikura A. Wakagawa and W. Sato (1996). Female worm *Hysterothylacium aduncum* excreted from human. A case report. *Jap. J. Parasitol.,* 45:12-13.

Zar, J. H. (1999). *Biostatistical Analysis.* 4th ed. Prentice – Hall, Englewood Cliffs, N.J.

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