Pakistan J. Agric. Res. Vol. 27 No.2, 2014

PREVALENCE AND MORPHOLOGY OF HELMINTH PARASITES OF FISH FROM RIVER SWAT, KHYBER PAKHTUNKHWA

Nazir Ahmad*, Sultan Ayaz*, Sumaira Shams**, Karimullah*** and Riaz Ahmad****

ABSTRACT:- A study of the Helminth parasites of fish of River Swat was conducted from September, 2012 to August, 2013. A total of 250 fish belonging to five genera and six species were examined. The parasites collected were *Diplozoon khyberensis*, *Bathybothrium rectangulum*, *Bothriocephalus, Nippotaenia, Cucullanidae, Proteocephalus, Rhabdochona charsaddiensis*, *Rhabdochona schizothoracis* and *Neoechynorhynchus devdevi.* They were identified by morphological characteristics through microscopic techniques. Overall prevalence of the fish parasites was 58% (145/250). Among these *Schizothorax plageostomus* fish 93.04% (107/115), *Schizothorax labiatus* 61.11% (33/54), *Salmo trutta fario* 17.85% (05/28), *Gara gotyla* 0% (0/09), Rita rita 0% (0/25) and *Oncorhynchus mykiss* were 0% (0/19). The intensity of the parasite varied from 1% to 9.2%. Among them high intensity was noted in *Rhabdochona schizothoracis* (9.2%) and *Schizothorax labiatus*.

Key Words: Fish Parasite; Intensity; Prevalence; Microscopy; Pakistan.

INTRODUCTION

Fish all over the world suffer from varieties of parasitic diseases that cause mortality in fish either directly or indirectly (Lerssutthichawal, 1999). Especially the Helminth parasites of fish which live in the alimentary canal damage the lining wall of host and some other organs such as liver and bile duct. The parasitic activities cause injuries to their tissues which then become infected by the secondary activity of microorganisms (Khanum et al., 2008). Besides mortality in fish, some Helminth parasites are also transmitted to humans through fish. Wisniewski (1958) stated that characters of the water body in which the fish live affects the parasitic fauna and also help in determination of parasitic community. According to Bykovskaya et al. (1964), the fresh water fish contain about 1211 species of different parasites belonging to 5 phyla and 11 different classes of invertebrates.

Helminth parasites belong to Trematodes, Cestodes, Acanthocephalans and Nematodes. Most of them complete their life cycle through intermediate host, majorly the piscivorous birds (Schmidt, 1990). According to Ahmed (1994), the intensity of the parasitic activity increases when an intermediate host is involved in their life cycle. This is the reason why Helminth parasites cause grea-

* *Department of Zoology, Kohat University of Science and Technology, Kohat, Khyber Pakhtunkhwa, Pakistan.*
** *Department of Zoology, Abdul Wali Khan University, Mardan, Pakistan.*
*** *Department of Zoology, University of Hazara, Mansehra, Pakistan.*
**** *Government Degree College, Kabal, Swat, Pakistan.*
Corresponding author: nazir@jc.edu.pk

ter damage to the fish. These parasites either cause diseases in fish directly or make them susceptible to other disease. Both the cases result in the fish loss (Onyedineke et al., 2010).

The present research work was designed to determine the Helminth parasites fauna of fish species in River Swat and their status in parasite communities (prevalence, mean intensity, abundance and dominance) and to educate the local community on parasitic fish diseases and their consequences.

MATERIALS AND METHOD

Field Study

Fish were randomly collected from different areas of River Swat, Khyber Pakhtunkhwa with gill nets and cast nets. Some fish were taken from the local market of the surrounding area of River Swat such as Behrain, Madyan, Fateh Pur, Khwaza Khela, Fizagat, Kanju, Gogdara, Barikot and Chakdara.

Fish Preservation

Before being transported to the laboratory, the fish samples were kept in plastic coolers containing ice blocks. During handling the fish and collecting the parasites, surgical gloves were put on hands as precautionary measures. A separate plastic cooler was used for collecting each sample of fish so that the parasites of different samples may not inter mix with each other and it may help in further data specification.

After collection, fish were injected with 5% formalin through mouth, anus and body wall. Preservation for a longer period was carried out in 5% formalin. Trout fish were collected from the Madyan Fish Hatchery. The fish were collected for the investigation of the helminthes (Table 1).

Table 1. Fish examined for the Helminth parasites

Fish (No.)	Length (cm)	Weight (g)
Schizothorax plageostomus (150)	18-24	60-120
Schizothorax labiatus (50)	13-24	50- 90
Gara gotyla (10)	09-11	38- 45
Rita rita (10)	40-60	18- 23
Salmo trutta fario (20)	20-30	60-140
Oncorhynchus mykiss (10)	10-30	80-160

Identification of Fish

In the laboratory, fish were identified according to the methods described by Jayaram (1999), Talwar and Jayaram (1991), Mirza and Sandho (2007). Weight, length and sex of each fish were noted. Fish standard length (from snout to the base of the caudal peduncle) was determined by using china tape and steel scale. Body weight (BW) was noted with the help of an electric balance. Sex of the fish was also noted. Fish were brought to the laboratory alive in a small container and each species was maintained in glass aquaria separately.

Parasitic Investigation

After morphometric measurement, each fish was washed with distilled water and studied under binocular for further investigation. Examination for external parasites (eyes, mouth, nostril and fins) was made using binocular or magnifier. The mucus was also examined under the microscope. The gills of the fish were removed carefully with the help of scissor and taken out with the help

of forceps and placed in a petri dish in tap water. They were scraped and shaken by brush in a dish and examined under binocular. Parasites if present were collected in a separate dish.

Fish Dissection for Parasites Collection

The fish were later dissected. An incision was made along the mid-ventral line using the surgical dissecting box. The alimentary canal was taken out of the body and was placed in a separate dish. The surfaces of the visceral organs and body cavities and serous membranes were examined for encysted larvae and parasites by using hand lens.

Nematodes were preserved in 50:50 parts alcohol (70%) pure glycerine. The containers were kept open for 3-5 days till the complete evaporation of alcohol and only parasites and glycerine remained. Parasites recovered from each site were properly washed in fresh saline solution, fixed in alcohol-formol-acetic acid according to protocol of Olurin and Somorin (2006) and site of infection was noted. All the measurements were taken with calibrated compound microscope and were expressed in millimeters.

Parasites Identification

The parasites were also processed (Eiras et al., 2000; Martins et al., 2007) and counted (Tavares-Dias et al., 2001). Parasite identification was done according to Yamaguti (1958; 1959; 1961 and 1963).

Prevalence Rate of Parasite

The prevalence rate was determined by the following formula as described by Ayaz et al. (2011).

Prevalence rate = number of fish infected with parasite x 100 / total No. of fish examined.

Statistics

The data was statistically analyzed by using Korean Statistic 9 software.

RESULTS AND DISCUSSION

Two hundred and fifty fish belonging to six genera collected from various localities of River Swat were examined for the parasites. A total prevalence of the fish parasites 58% (145/250) was determined. Out 115 fish of *Schizothorax plag-eostomus*, 107 were found infected. Major parasites collected from it were *Diplozoon khyberensis, Bathybo-thrium rectangulum, Bothriocephalus* sp., two species of the genus *Rhab-dochona* and *Neoechynorhynchus devdevi*. Out of 54 *S. labiatus*, 33 were found infected with *Diplozoon khyberensis*, *Rhabdochona charsaddiensis, R. schizothoracis* and *N. devdevi*.

A statistically significant difference ($P<0.05$) was noted during the data analysis.

Total prevalence of the fish parasites was 58% (145/250). Among these *Schizothorax plageostomus* fish was 93.04% (107/115), *S. labiatus* 61.11% (33/54), *Salmo trutta fario* 17.85% (05/28), *Gara gotyla* 0% (0/09), *Rita rita* 0% (0/25) and *Oncorhynchus mykiss* were 0% (0/19) (Table 2). High prevalence of parasites was recorded in December (86.67% (13/15), followed by January/ February 81.25% (13/16), September 62.06% (18/29), November 60% (30/50) and the lowest was recorded in October 37.5% (15/40). The difference of prevalence was observed

due to seasonal variations and environmental conditions of River Swat.

A similar study was conducted about the prevalence of parasitic infection by Mithal (1981), Muzzal (1984), Khan and Bilqees (1990) and Khan (1991) and they found high prevalence rate. In their study they determined that the low infection rate in *Channa puctatus* is due to its feeding habit as it does not ingest infected food. Some Cestodes show low prevalence rate because of their habitats. When the ponds, where their hosts live, get dry, their life cycle is disturbed or blocked. Therefore the parasites show low prevalence rate and low intensity as the further transmission of the parasite is stopped.

Helminth parasites are common among fresh water fish. Many factors influence the prevalence and intensity of these parasites such as their life cycle, feeding habits of the parasites and their host and the physical characteristics of the water in which the fish live. The presence of intermediate host e.g. fish eating birds is also responsible for spreading the parasitic infection (Zaidi and Khan, 1976).

In the current study, high prevalence of the parasite *Rhabdochona schizothoracis* (22.8%, 57/250) was recorded followed by *Diplozoon khyberensis* (14.4%, 36/250), *Rhabdochona charsaddiensis* (10.8%, 27/250), Cucullanidae (2.4%, 06/250) and the lowest was recorded in *Bathybothrium rectangulum, Bothriocephalus* sp. and *Proteocephalus* sp. (1.2%, 03/250) (Table 3). Similar work was carried out by Rogelio et al. (2008) and in

Table 2. Overall prevalence of Helminth parasites in the host (fresh water fish) from River Swat, Khyber Pakhtunkhwa

Host	Examined (No.)	Infected (No.)	Prevalence (%)	Parasites
Schizothorax plageostomus	115	107	93.04	*Diplozoon khyberensis* *Bathybothrium rectangulum* *Bothriocephalus* sp. *Nippotaenia* sp. *Proteocephalus* sp. *Rhabdochona charsaddiensis* *Rhabdochona schizothoracis* *Cucullanidae* *Neoechynorhynchus devdevi*
Schizothorax labiatus	54	33	61.11	*Diplozoon khyberensis* *Rhabdochona charsaddiensis* *Rhabdochona schizothoracis* *Neoechynorhynchus devdevi*
Gara gotyla	09	Nil	Nil	Nil
Rita rita	25	Nil	Nil	Nil
Salmo trutta fario	28	05	17.85	*Neoechynorhynchus devdevi*
Oncorhynchus mykiss	19	Nil	Nil	Nil

South-eastern Mexico (Crisp et al., 2001) which reflected the high prevalence of fish parasites. They studied the prevalence rate of different Helminth parasites from the Papaloapa river basin to the Yucatan Penninsula. They found that prevalence rate of some parasites was very high in some areas and low at others. Four parasites viz., *Crepidostomum cornutum, Rhab-dochona cascadilla, Neocucullanus neocucullanus* and *Rhabdochona acuminate* showed high prevalence rate in North and South America in a single host, but in Mexico, it was collected only from a single site (Valles and Ruiz, 1997; Caspeta et al., 2005).

Difference in prevalence of parasites in fish may be due to many factors. According to Polyanski (1961), the parasitic fauna of fish, its intensity and prevalence in the aquatic habitats is affected by the feeding habits of the host, its life span, change in the environmental conditions or moving through various habitats, its size of the body and population density. It is observed that intensity of the parasites in fish is not affected by the change in sex of the fish, but is more affected by change in habitat. In the present study the parasites were processed (Eiras et al., 2000; Martins et al., 2007) and counted (Tavares et al., 2001). Identification of parasites was carried out according to Yamaguti (1958; 1959; 1961; 1963).

The present work also confirms the already described patterns of taxonomical structure of Helminth fauna of freshwater fish of Mexico, as early described by Salgado-Maldonado et al. (2011). In their study of the Helminth parasites, Trematodes and nematodes were abundantly observed in the host fish of various families. In their study however, Cestodes and acanthocephalan were not richly found. Their study determines that in the Mexican freshwater fish, some families and genera of Helminth parasites show great diversity (Salgado-Maldonado et al., 2011).

LITERATURE CITED

Ahmed, M.S. 1994. Trypanosomiasis

Table 3. Total prevalence of Helminth parasites in the fish of River Swat

Parasite	Examined (No.)	Infected (No.)	Prevalence (%)
Diplozoon khyberensis	250	36	14.4
Bathybothrium rectangulum	250	03	1.2
Bothriocephalus sp.	250	03	1.2
Nippotaenia sp.	250	07	2.8
Proteocephalus sp.	250	03	1.2
Rhabdochona schizothoracis	250	57	22.8
Rhabdochona charsaddiensis	250	27	10.8
Cucullanidae sp.	250	06	2.4
Neoechynorhynchus devdevi	250	13	5.2

in common carp, *Cyprinus carpio* L. Ph.D. thesis, Zoological Institute, Catholic University Leuven, Belgium. p. 12.

Ayaz, S., K. Sanaullah, N.K. Shahid, B. Farzana, S. Sumaira, and Masood, A. 2011. Prevalence of zoonotic parasites in drinking water of three districts of Khyber Pakhtunkhwa Province, Pakistan. Pakistan J. Life Soc. Sci. 9(1): 67-69.

Bykovskaya, I.E., A.V. Pavlovskaya, M .N. Gusev, N.A. Dubinina, T.S. Izyumova, I.L. Smirnova, G.A. Sokolov-Skaya, S.S. Shtein, and V.M. Shul'man. 1964. Key to parasites of freshwater fish of the U.S.S.R. Israel Program for Scientific Translations, Jerusalem. 9(2): 37-40.

Caspeta-Mandujano, J.M. 2005. Nematode parasites of freshwater fishes in Mexico: Key to species, descriptions and distribution. Cuernavaca: Universidad Autónomadel Estado de Morelos. Comp. Parasitol. 71(1): 67-72.

Crisp, M.D., S. Laffan, H.P. Linder, and A. Monro. 2001. Endemism in the Australian fiora. J. Biogeography, 28: 183-198.

Eiras, J.C., R.M. Takemoto, and G.C. Pavanelli. 2000. Métodos de estudo e técnicas. laboratoriais em parasitologia de peixes. Maringá: Eduem. 171 p.

Jayaram, K. C. 1999. The freshwater fish of the Indian region. Narendra Publishing House: New Delhi. 174 p.

Khan, A. 1991. Studies on some helminth parasites of freshwater fish of Sind. Ph.D. thesis, Department of Zoology, University of Karachi. 376 p.

Khan, A. and P. M. Bilqees. 1990. *Allocreadium kalriai*, New species (Trematoda: Allocreadiidae) from the fish *Chana striatus* (BL) of Kalri Lake, Sind. Pakistan, J. Zool. 22: 345-351.

Khanum, H., J. Ferdows, and R. Farhana. 2008. Community of Helminth Parasites in *Rita rita* (Hamilton Buchanun). J. Biosci. 16: 133-135.

Lerssutthichawal, T. 1999. Monogeneans of the freshwater siluriform fish of Thailand. Dissertation submitted to the Institute of Post Graduate Studies and Research, Univ. of Malaya, Kuala Lumpur. 465 p.

Martins, M.L., L. Ghiraldelli, F. Garcia, E.M. Onaka, and R.Y. Fujimoto. 2007. Experimental infection in *Notodiaptomus* sp. (Crustacea: Calanoida) with larvae of *Camallanus* sp. (Nematoda: Camallanidae). Arq. Brasil. Med. Vet. Zootec. 59(2): 382-386.

Mirza, M.R., and A.A. Sandhu. 2007. Fish of the Punjab Pakistan. Polymer publications: Lahore. 71 p.

Mithal, R.P. 1981. Two new Acanthocephalan worms *Palli-sentis croftonin* sp. and *P. indican* sp. from fresh water fish of genus *Ophiocephalus*. Indian J. Zool. 17: 165-175.

Muzzall, P.M. 1984. Observation of *Acanthocephalan* species infecting the central mud minnow *Umbra limi*, in a Michigan River. Proc. Helminthol. Soc. Wash. 51(1): 92-97.

Olurin, K.B., and C. A. Somorin. 2006. Intestinal helminths of the fish of Owa stream, south-west Nigeria. Res. J. Fisheries and Hydrobiol. 1: 6-9.

Onyedineke, N.E., U. Obi, P.U.

Ofoegbu, and I. Ukogo. 2010. Helminth parasites of some freshwater fish from River Niger at Illushi, Edo State, Nigeria. J. Am. Sci. 6(3): 16-21.

Polyanski, Y.I. 1961. Zoogeography of parasites of the USSR marine fish. In: Dogiel, V.A. G.K. Petrushevskii, and V.I. Polyanski, (eds). Parasitology of Fish. Oliver and Boyd: Edinburgh. 384 p.

Rogelio, A., G. Salgado-Maldonado, R. Contreras-Medina, and A. Martínez-Aquino. 2008. Richness and endemism of helminth parasites of freshwater fishes in Mexico. Biological J. Linnean Society, 94: 435-444.

Salgado-Maldonado, G., J.M. Caspeta-Mandujano, F. Moravec, E.S. Galera, R. Rodiles-Hernández, G. Cabañas-Carranza, and J. Montoya-Mendoza. 2011. Helminth parasites of freshwater fish in Chiapas, Mexico. Parasitol. Res. 108(1): 31-59.

Schmidt, G.D. 1990. Essentials of Parasitology (4th edn.), W.M.C. Brown Publishers.

Talwar, P. K., and A.G. Jhingra. 1991. Inland fish of India and adjacent countries. Oxford & IBH publishing Co. Pvt. Ltd., New Delhi. 322 p.

Tavares-Dias, M., M.L. Martins, and F.R. Moraes. 2001. Fauna parasitária de peixes oriundos de "pesque-pague" do município de Franca, São Paulo, Brasil. I. Protozoários. Revta Brasil. Zool. 18(1): 67-79.

Valles-Ríos, M.E., and G. Ruiz-Campos. 1997. Prevalencia e intensidad de helmintos parasitos del tracto digestivo de la trucha arcoiris *Oncorhynchus mykiss nelsoni* (Pisces: Salmonidae). de Baja California, México. Revista de Biología Tropical, 44/45: 579-584.

Wisniewski, W.L. 1958. Characterization of parasite fauna of an eutrophic lake. Acto. Parasitol. Poland, 6: 1-64.

Yamaguti, S. 1958. The Digenetic Trematodes of Vertebrates. Systema Helminthum Vol. 1. Int. Sci Pub. New York. 1575 p.

Yamaguti, S. 1959. The Cestodes of Vertebrates. Systema Helminthum Vol. 3. Int. Sci Pub. New York. 160 p.

Yamaguti, S. 1961. The Nematodes of Vertebrates. Part I & II. Systema Helminthum Vol. 3. Int. Sci Pub. New York. 1261 p.

Yamaguti, S. 1963. Monogenea and Aspidocotylea. Systema Helminthum. Int. Sci. Pub. New York & London. 699 p.

Zaidi, D.A., and D. Khan. 1976. Cestodes of fish from Pakistan. Dept. Zool. Univ. of Punjab. Lahore, Pakistan, Biologia, 22: 157-179.