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RESEARCH ARTICLE

SUSCEPTIBILITY OF *LABEO ROHITA* AND *TOR PUTITORA* TO A CRUSTACEAN PARASITE *ARGULUS FOLIACEOUS*

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ABSTRACT

The present investigation has been conducted in the river Tawi of Jammu region, a major tributary of river Chenab from April 2015- December 2015 with an aim to work out the crustacean parasitic diversity of the water body. Two species viz. *Labeo rohita* and *Tor putitora* were selected to investigate their susceptibility to parasitic infections. A total of 42 Branchiuran parasites belonging to the genus *Argulus* could be retracted from the skin and gills of fish *Labeo rohita.* During the study period, a total of 140 fish specimens were collected, their number being 80 and 60 for *Labeo rohita* and *Tor putitora* respectively. Of the two, *Tor* sp. appears to be quite resistant to *Argulus* invasion since not a single specimen was found to be parasitized. The high prevalence of *Argulus* infection in *Labeo* suggests its low resistance to the parasitic infection. The prevalence of infection was calculated to be 66.67%. This is the first report of crustacean parasite *Argulus* from river Tawi of Jammu & Kashmir.

INTRODUCTION

Infectious diseases are broadly classified as parasitic, bacterial, viral or fungal (Duijn 1973). Like other animals, fish are susceptible to wide range of health problems. However, the overwhelming majority of common health problems involve external parasites, fungus, viral and bacterial infections (Notash, 2012). Majority of the disease causing pathogens are protozoans, digenetic trematodes and parasitic crustaceans most of which have a direct life cycle (Al-Rasheid *et al*., 2000). Like other animals, fish are susceptible to a number of diseases; however majority of them are caused due to external parasites, fungus, viral and bacterial infections. Keeping in view the severity of the losses due to the parasites in fisheries sector, different researchers across the world have conducted studies for the assessment of parasitic population by applying various epidemiological techniques. (Wilson 1926, Jain 1957, Wilmer 1967,Ahmad 1976,Singhal *et al* 1986,Oldwage and Van 1988).

There is a plethora of published material relating to fish parasites (e.g. Kabata, 1985; Barber *et al*., 2000; Nolan *et al*., 2000; Benz *et al*., 2001, Piasecki *et al* 2004).

Species of genus *Argulus* (Crustacea) are common parasites of freshwater fish (Bykhovskaya *et al* 1964, Soulsby 1982).They are macroscopic parasites belonging to family *Argulidae*. They are commonly known as fish lice and belong to Branchiuran group of parasites. About 100 species of *Argulus* are distributed worldwide both in fresh and marine fishes. The three most studied species are *A.japonicus, A.foliaceous and A.coregoni* (Adnan- Al – Darwesh *et al* 2014).

The present study was conducted to make a survey for the various crustacean parasitic infections including their identification, their prevalent frequencies and host specificity in the river Tawi of Jammu region. Jammu and Kashmir, the crown of India, lies in the north western side of India, located between 32º15// to 37º05// North latitude and 73º26// and 80º30// East longitude. Jammu city is drained by River Tawi which is also considered sacred and holy and is also locally known as "Surya-Putri". Tawi river is a major source of drinking water for the old city. Untreated sewage in Jammu pollutes Tawi river as it passes through the city. The catchment area of the river up to Indian border (Jammu) is 2168 km² and falls in the districts of Jammu, Udhampur and a small part of Doda. After transversing Jammu city, the river crosses into Pakistan's Punjab and joins Chenab River. Tawi is a major left bank tributary of river Chenab.

Fishes are a resource of great nutritional value. Apart from predation, pollution and overfishing, the main threat to fish in their natural environment is parasitism. (De Kinkelin *et al*.,

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1985) is parasitism. In pisciculture, as we have already stated, parasitism is the predominant threat and therefore, it necessitates the need to carry a thorough study of the taxonomy and biology of parasites and/or potential pathogens of hosts in their natural environment, before any attempt at their breeding is made.

MATERIAL AND METHODS

Samplings

The present study was conducted in River Tawi, Jammu from April 2015-December 2015.The sampling was done using the cast nets of one inch mesh size and the fishes were brought live to the Fisheries Lab. at P.G. Deptt. Of Zoology, University of Jammu. The total length, standard length and the weights were recorded.

Parasitological examination and isolation of pathogens

In the whole fish survey, the body surfaces and gills were checked with naked eyes followed by thorough scanning under 10x lens of the dissecting microscope. Scraped mucous from the body surface of the fish were also examined for parasites (under the pectoral fin is a good place to look). Mucous from the margin of lesion if any were also taken and scanned through 10X, 40X and 100X. Operculum was removed with scissors carefully and gills were studied for attatched parasites. Moreover, small filaments from outer gill arch were also taken out and placed in several drops of water and observed under microscope for attatched parasites. Further investigation of mouth for visible parasites was done by scrapping the roof of mouth for a smear. Collected parasites were preserved in 70% alcohol for later studies.

Statistical analysis

Prevalence, mean intensity and abundance concepts as suggested by Margolis *et al* (1982) were used in the present study.

$$\text{Prevalence (\%)} = \frac{\text{No. of infected fish}}{\text{Total no. of fish examined}} \times 100$$

$$\text{Mean intensity (Unit)} = \frac{\text{No. of collected parasites per specimen}}{\text{No. of infected fish}}$$

$$\text{Abundance (Unit)} = \frac{\text{No. of parasites per specimen}}{\text{Total No. of fish examined}}$$

RESULTS AND DISCUSSION

A total of 140 specimens were collected by regular and random field surveys from a mixed species fishing site at river Tawi. During this sampling, various fish samples were collected which belonged to two main species *Labeo rohita* and *Tor putitora.* The details regarding the catch of the two species are given in the table 1.

Out of the 80 specimens of *L.rohita,* 11 specimens were found to be infected by ecto as well as endoparasites. Intestines were found to be the most infected organ and nematodes were the most prevalent helminth parasites in *L.rohita* and *Tor putitora* in Tawi river. Not a single specimen of *Argulus* was evident in *Tor putitora* thereby revealing its resistance to the parasitic invasion for *Argulus.*

In the present study, we have focussed on the crustacean parasite *Argulus*. A total of 42 specimens of *Argulus foliaceous* were recovered from 11 specimens of *Labeo rohita.* Many argulids were assembled in several regions of the fish especially in the lateral area of the trunk and the dorsal area of the head where the epidermis disappeared and the dermal tissues were exposed externally.

The attatchment sites also showed the signs of ulceration. The argulids measured 4.07mm with a carapace length of 2.45mm. Acute hemorrhagic skin wounds, spill of scales, an increased production of mucosal material and corrosion of fins were observed in the infested fishes. The skin of *Argulus* infected fishes became abnormally pigmented.

The visual observations showed that parasites are found attached to the skin with head and operculum being the favourite sites of attachment. The affected fishes were mucous studded, mostly pale in colour but sometimes abnormally pigmented. The fins showed the corroded fin filaments which might prove a hinderance in fish movement (Fig 1 and 2). Clinical signs and behaviors observed in infected fish were in accordance with the cases reported by Toksen(2006), Yildiz and Kumantas(2002) and Noaman *et al* (2010).

Under the light microscope these parasites were identified as *Argulus foliaceous* characterized by the rounded lobes of abdomen not reaching the midline, the posterior lobes of cephalothoracic carapace not extending beyond the beginning of abdomen (Fig 3). The microscopical photographs were snapped by Olympus O/C 91525.

As is evident from Table 2 and Fig 4, the prevalence of parasites is a temperature dependent parameter as the number of parasites recovered marked an increasing trend as the temperature progressed from 24 º C (April) to June 37 º C (June). Even in the following months i.e in July and August when temperature is in the range of 30º- 32º C, intensity of parasites is significantly high (40 -50%).

Further during September and onwards, though a good number of fishes appeared in the catch, they were exclusively free of any parasitic load. Our observations are in line with those reported by Gun Kovskii and Khudolei (1989) who have also reported a direct correlation between temperature and parasitic infection. Also a thorough study of the life cycle of *Argulus* sps reveals that egg hatching takes lesser days in hotter months than the winter season. Juvenile males and females appeared in the first half of June; their number showed a gradual decrease towards the end of September which almost became nil in November. This is also supported by the findings of Pasternak *et al* 2000. Our results, however, stand in strong contradiction with those made by Tak *et al* (2014) who have reported highest *Argulus* prevalence (54%) during winter months (December – February). Many more workers too, have come up with the

similar observations viz. Bower-Shore, 1940; Kimura, 1970; Shafir and Van As, 1986, Ahmed *et al* 1991, Bhuiyan *et al* 2007, Rahman *et al* 2007, Farhaduzzaman *et al* 2010, Mofasshalin *et al* 2012. The probable reasons for this variation could be:

- Recording of adult Argulids by these workers.
- Sampling been made from culture ponds (Tak *et al.* 2014).

Tak *et al* (2014) have collected *Labeo* sps from culture ponds and have attributed the high prevalence of *Argulus* to the crowded conditions. Presently however, the collection of specimens have been made from river Tawi, a fast flowing tributary of river Chenab where there is no chance of overcrowding. Second important point worth mentioning here is that the opcit workers have recorded the presence of Adult *Argulus* whereas the present authors, in addition to the adults, have recorded the juvenile lice, that too in a higher number as compared to the adult lice. Presence of Juvenile lice itself authenticates the fact that the summer season is quite favourable for the *Argulus foliaceous* to flourish.

High prevalence of *Argulus* in summer months bear a clear correlation with the life cycle of the species as it is witnessed by the presence of Juvenile lice in the peak summer months, i.e June to August (Table 2). *Argulus* infection is at its peak during summer months also got strengthened by the observations made by several other workers (Anjum 1986, Yildiz and Kumantas 2002, Khan *et al* 2003, Toksen 2006, Walker 2008,Noga 2010; Notash 2012; Abd el-mohsen 2013, Adnan-Al- Darwesh 2014). *Argulus* has also been reported from Gold fish (*Carassius auratus)* by many workers (Adnan-Al-Darwesh *et al* 2014, Saha and Bandyopadhyay 2015) whose results are also in agreement with the one recorded by the present authors. In India, *Argulus* has been reported from Goldfish (Chanda *et al* 2011, Ali- Adnan Al Darwesh *et al* 2014 and Saha and Bandyopadhyay 2015) and Koi fish (Kaur *et al* 2014) but reporting of *Argulus foliaceous* from natural waters of Jammu and that too, during summer season is the very first report.

Fig1 Showing the infected mucous studded fish

Fig: 2 showing corrosion of fins

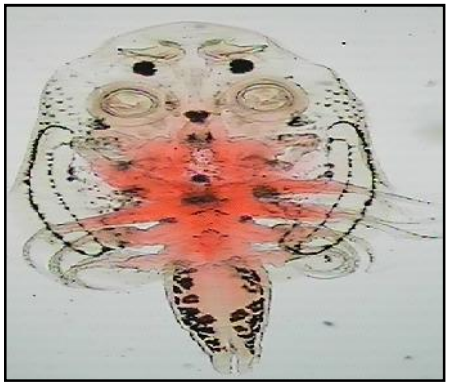

Fig: 3 showing the adult Argulid

Table 1 showing the number of each species collected along with their parasitic burden

S.No	Fish species	No. of specimens	Parasitic burden
1.	*Labeo rohita*	80	*Argulus*, Helminth parasites
2.	*Tor putitora*	60	Helminth parasites

Table 2 showing the species wise monthly catch along with parasitic stage (Adult/ Juvenile) and prevalence (L:*Labeo rohita* and T:*Tor putitora*)

Sampling month	Temperature (° C)	No. of fishes		No. of Infectedfishes		Juvenile lice	Adult lice	Prevalence (%)
		(L)	(T)	(L)	(T)			
April	24	8	5	0	0	0	0	0
May	28	6	4	1	0	0	5	16.67
June	37	6	4	4	0	11	7	66.67
July	30	8	5	4	0	7	4	50
August	32	5	8	2	0	6	2	40
September	28	7	4	0	0	0	0	0
October	20	8	7	0	0	0	0	0
November	14	13	4	0	0	0	0	0
December	11	7	9	0	0	0	0	0

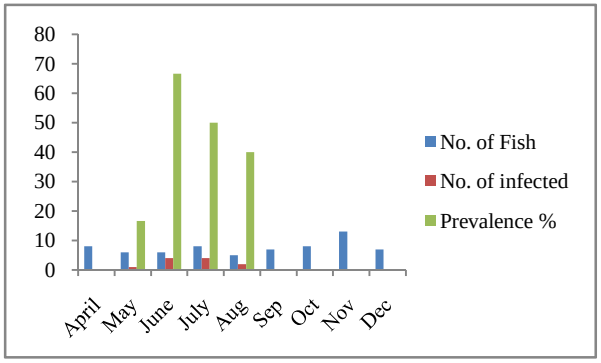

Fig4 shows the Graphical representation of month wise prevalence of *Argulus* in *Labeo rohita* in Tawi

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References

Abd- el-Mohsen, Mohamed, H., and Amany, M. 2013. Studies on argulosis in some freshwater ornamental fishes with special reference to treatment trials. *New York Science Journal*. 6(10):37-41.

Ahmad, ATA., 1976. Trichodiniasis of Goldfish and other carps. Bangladesh J. Zool. 4:12-20.

Adnan- Al- Darwesh, A., Maytham, A., Alwan Al – Shabbani., and Bushra Hamza Faris. 2014. Diagnostic and pathological study of *Argulus japonicas* in Goldfish *Carassius auratus* G.J.B.B. 3(4): 384-387.

Al-Rasheid, KAS., Ali, MA., Sakran, T., Abdel Baki, A.A., and Abdel Ghaffar, FA. 2000. Trichodinid ectoparasites (Ciliophora:Peritrichida) of some river Nile fish, Egypt. Parasitol.Int. 49:131-137.

Anjum, R., 1986. Carp diseases and their control. Progressive farming.Pakistan. 6: 48-56.

Ahmed, A., Ali, SMK., and Samad, A. 1991. Probable cause of fish ulcer in Bangladesh. Nutr. News. 14(1):3.

Barber, I., Hoare D., and Krause, J. 2000. Effects of parasites on fish behaviour: a review and evolutionary perspective. Reviews in Fish Biology and Fisheries. 10:131-165.

Benz, GW., Bullard, SA., and Dove, AD. 2001. Metazoan parasites of fishes: synoptic information and portal to the literature for aquarists. pp 1–15.

Bhuiyan, AS., Akther, S., and Musa, GM. 2007. Occurance of parasites in *Labeo rohita* (Hamilton) from Rajshahi. Univ. J.Zool.26;31-34.

Bower-Shore, C., 1940. An investigation of the common Fish Louse, *Argulus foliaceus* Bulletin of the Freshwater Fisheries Research Laboratory Tokyo. 20:109–126.

Bykhovskaya- Pavlovskaya, IE., Gusev, AV., Dubinina, MN., Izyumova, NA., Smirnova, TS., Sokolovskaya, IL., Shtein, GA., Shulman, SS., and Epstein, VM. 1964. Key to parasites of Freshwater fish of the U.S.S.R.Leningrad.

Chanda, M., Paul, M., Maity, J., Dash, G., Sen, S.,Bidhan, G., and Patra, C. 2011.Ornamental fish goldfish, *Carassius auratus* and related parasites in three districts of West Bengal, India. Chron Young Sci . 2(1):51-54.

De Kinkelin, P., Michel, C., and Ghlttlno, P. 1985. Specific pathology Fish. I.N.R.A. Paris (Éd.), pp: 339.

Duijn, Van Jnr. C., 1973. Diseases of Fish. Lliffe Books, London, 3rd ed. 372 pp.

Farhaduzzaman, AM., Alam, MM., Hussain, MA., and Rahman, MH. 2010 Prevalence of parasites in Indian major carp *Labeo rohita* (Hamilton) in Rajshahi, Bangladesh. Univ.J.Zool..Rajshahi Univ. 28,65-68.

Gun Kovskii, SA., and Khudolei, GA. 1989. Lernaeosis in Farmed Salmonids.Vestnik-Zoologii.1:65-67.

Jain, SL., 1957. Monogenea of Indian fresh water fishes VI. Three new trematodes belonging to the genus *Neodactylogyrus* price,1938 from some fresh water fishes of Lucknow.India. Proc. Natl.Acad.Sci.Sec. 1:53-63

Kabata, Z., 1985. Parasites and Diseases of Fish Cultured in the Tropics. Taylor and Francis, London. 318pp.

Kaur, P. and Pandey, S. 2014. Effect on marketability of ornamental fishes due to parasitic infection. Biolife.2(4):1094-1099

Khan, MN., Aziz, F., Afzal, M., Rab, A., Sahar, L., Ali, R., and Mehdi Naqvi, S.M.H. 2003. Parasitic infestation in Different fresh water fishes of Mini Dams of Patohar Region, Pakistan. Pakistan Journal of Biological sciences. 6(13) :1092-1095

Kimura, S., 1970. Notes on the reproduction of water lice (*Argulus japonicus* Thiele). Bulletin of the Freshwater Fisheries Research Laboratory Tokyo. 20: 109–126.

Margolis, L., Esch, G.W., Holmes, J.C., Kuris, A.M.and Schad, G.A. 1982. The use of Ecological Terms in Parasitology (Report on an ad-hoc Committee of the American Society of Parasitologists), Journal of Parasitology, 68:131-133.

Mofasshalin, MS., Bashar, MA., Alam, MM., Alam, GM., Moumita, D., Mazian, AG., and Simon, KD. 2012. Parasites of three Indian major carps of Rajshahi, Bangladesh. Asian J. Anim. Vet. Adv. 7(7): 613-620.

Noaman, V., Chelongar, Y., and Shahmoradi, AH. 2010.The First Record of *Argulus foliaceus* (Crustacea: Branchiura) Infestation on Lionhead Goldfish(*Carassius auratus*) in Iran. Iranian J Parasitol. 5(2):71-76.

Noga, EJ., 2010. Fish disease diagnosis and treatment. 2nd ed. Mosby-yearbook, Inc. watsworth publishing Co.,USA. pp.366.

Nolan, DT., Van der Salm, AL., and Wendalaar Bonga, SE. 2000. The host–parasite relationship between the rainbow trout (*Oncorhynchus mykiss*) and the ectoparasite *Argulus foliaceus*(Crustacea: Branchiura): epithelial mucous cell response, cortisol and factors which may influence parasite establishment. Contributions to Zoology. 69:57–63.

Notash, S., 2012 Study on prevalence of *Argulus* in Goldfishes (*Carassius auratus*) of east Azerbaijan province of Iran. Ann Biol Res. 3(7): 3444-3447.

Oldwage, W.H., and A.S.J.G.Van 1988. A key for the identification of African Piscine Parasitic ergasilids

(Copepoda:Poecilostomatoida) S.Afr.Tydskr.Dierk. 23: 42-436.

Pasternak, AF., Mikhheev,VN., and Valtonen, ET. 2000. Life history characteristics of *Argulus foliaceous* L.(Crustacea:Branchiura) populations in Central Finland. Ann. Zool.Fennici. 37:25-35.

Piasecki, W., Goodwin, AE., Eiras, JC., and Nowak, BF. 2004. Importance of copepoda in freshwater aquaculture. Zoological Studies. 43(2): 193-205.

Rahman, MR., Akter, MA. and Hossain, MD. 2007. Parasitic diseases of exotic carp in Bangladesh. J. Agric. Rural. Dev. 5(1 & 2):127-134.

Saha, M., and Bandyopadhyay, PK. 2015. First report of three species of *Argulus* (Crustacea: Branchiura) infesting on red can Oranda gold fish (*Carassius auratus auratus*) in India. *Biolife Journal* .3(4):813-819.

Shafir, A., and Van As, JE. 1986 The opportunistic nature of *Argulus japonicus* in Spring, MD, pp 1-15

Singhal , RN., Jeet, S., and Davies, RW. 1986. Chemotherapy of six ectoparasitic diseases of cultured fish. Aquaculture. 54, 165-171.

Soulsby, EJL., 1982. Helminths,Arthropods and Protozoa of Domesticated Animals.7th ed. Bailliere Tindall, London, UK.Spring, MD, pp 1-15.

Toksen, E., 2006. *Argulus foliaceus* (Crustacea:Branchiura) infestation on Oscar, *Astronotus ocellatus*(Cuvier, 1829) and Its Treatment. A case study. *Journal of Fish. Aquat. Sci*. 23:177 179.No. 2, pp 71-76.

Tak, IR., Dar, SA., Chishti, MZ., Kaur, H., and Dar GH. 2014. Parasites of some fishes (*Labeo rohita* and *Schizothorax niger*) of Jammu and Kashmir in India. *International Journal of Fisheries and Aquaculture*.6 (9): 104-107.

Walker, PD., 2008. *Argulus* the Ecology of a fish Pest, Ph.D thesis.Nijmegen; Radboud University. Watsworth publishing Co. USA. pp.366.

Wilmer, AR., 1967. ew genera and species of Ancyrocephalinae (Trematoda :Monogenea) from centrachid fishes of the south eastern , U.S. The Journal Parasitol. 53, 15-20.

Wilson, CB. 1926. New parasitic copepod from siam. J.SIAM. Sco.NAT.SUPPL., 6:361-364.

Yildiz, K., and Kumantas, A. 2002. *Argulus foliaceus* infection in a goldfish *(Carassius auratus).* Isr. Journal Vet Med. 57(3):118-120.

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