Infection of *Aphanius dispar* (Holly, 1929) with *Ligula intestinalis* plerocercoids in Mehran River, Hormuzgan province, south of Iran

Gholami Z. [1]; Akhlaghi M. [2]*; Esmaeili H.R. [3]

Received: January 2009 Accepted: April 2010

1- Department of Veterinary Medicine, Islamic Azad University, Babol Branch, Babol, Iran.
2- Aquatic Animal Health Unit, School of Veterinary Medicine, Shiraz University, P.O. Box: 71345-1731, Shiraz, Iran.
3- Department of Biology, College of Science, Shiraz University, P.O.Box: 71454, Shiraz, Iran.
*Corresponding author's email: akhlaghi@shirazu.ac.ir

Keywords: *Aphanius dispar*; *Ligula intestinalis*, Plerocercoid, Mehran river, Iran

Aphanius dispar (Holly, 1929) (knowm as Mahi gour-e khari, mahi dom parchami, kopurdandandar-e balehbolband) is an euryhaline tooth-carp fish which apparently prefers brackish waters of coastal areas of Iran. It is also distributed in Cyprus, Iraq, Somalia, Israel, Saudi Arabia, Syria and Djibouti (Etemadfar et al., 1983) available at: www.fishbase.org, accessed in May, 2008). *Aphanius dispar* occurs in shallow water and among vegetation over sand, rock or soft detritus bottoms (Coad, 1996) at: www.briancoad.com).

Ligula intestinalis (L., 1758) is a pseudophyllidean cestode which in its plerocercoid stage infects a range of freshwater fish species, particularly members of the cyprinidae, as its second intermediate host and it has a widespread distribution throughout the northern hemisphere (Dubinina, 1980). The plerocercoid stage is infective to a wide range of fish-eating birds, which serve as the final host. *Ligula* has been the subject of a number of studies, mainly those aimed at differences in pathogenicity and parasite-host relationships (Arme et al., 1983). The parasite-host relation parameters were studied in many fish species including *Abramis brama, Blicca bjoerkna* (Barus and Prokes, 2002), *Rutilus rutilus* (Kennedy et al., 2001) and *Tinca tinca* (Ergonul and Altindag, 2005). Jalali (1998) reported *Ligula intestinalis* infection in some native fishes of Iranian basins in the north and south of the country, from ship sturgeon of the Caspian Sea (Mousavi et al., 2000) and from river whitefishes in Aras Dam (Yousefi et al., 2005). Karemi et al. (2006) investigated the procercoid of *L. intestinali*s from copepods in Satarkhan Dam, East Azarbaijan Province, north-western Iran. In the Middle East, Rahemo and Al-Nouri (1999) evaluated the effect of *L. intestinalis* on gonad histology of *Acanthobrama marmid* in Iraq. However, no report is available on the occurrence of *L. intestinalis* from tooth-carp fish found

in southern Iran. Recently, the present authors studied the infection of *A. persicus* in Barme-e-Shoor Spring-Stream System, Maharlu Basin, Shiraz, Iran (Unpublished data). The present study was undertaken to investigate the possibility of *A. dispar* acting as an intermediate host for *Ligula intestinalis* from Mehran river (27°3′14.20″N- 54°20′40.26″ E,) in Mehran basin, near Bastak city, Hormuzgan Province, south of Iran. The water is clear and runs slowly in summer but it is floody in winter. We dissected a total of 63 *A. dispar* (Fig. 1) found in this river using dip net and preserved them in 10% formalin until examination. Total length (TL), standard length (SL) of the collected specimens, total length of parasites nearest to.05 mm using vernier caliper and weight of parasites nearest to 0.001 g (total weight, TW) were measured. The fish were dissected; the body cavity and viscera were examined to determine the presence of the parasite. Prevalence (%) was calculated according to the percent of infected fish divided by the total number of fish. Mean intensity was determined by dividing the total number of collected parasites to the number of infected fish samples, while abundance was calculated by dividing the total number of collected parasites to the total number of examined fish.

Mean length and weight of fish and parasites were compared statistically using analysis of variance in SPSS version 11.5 for windows.

In this survey, 31 males and 32 females (total and standard length ranging from 24.6-54.1 mm and 20.5-45.3 mm respectively) were collected in July 2003 of which 14 specimens (22.22 %) including 4 males and 10 females were infected. The morphology of the infected fish was normal but their abdomen appeared distended and hard. However, the plerocercoids of *L. intestinalis* coiled around the viscera and occluded the body cavity (Fig. 2). From 63 dissected fish only two fish were infected with 4 and 3 parasites respectively and the others had only one parasite. The maximum and minimum of parasite lengths were 64.2 mm and 22.7 mm respectively. Also the maximum and minimum of parasite weights were 0.3 and 0.047 g respectively (Table 1). Mean parasite length and weight were 41.48 mm and 0.19 g respectively. Althought the total length of male and female fish was not significantely different, the total length of parasites in male and female fish was significantly different ($P< 0.05$). No significant difference was observed when the weight of male and female fish and their parasites were compared. The prevalence, intensity and abundance of infection by pleurocercoid of *L. intestinalis* were 22.22%, 1.36 and 0.3 respectively.

Figure 1: Photographs of male (with two dark caudal fin bars) and female *Aphanius dispar* in Mehran River, Hormuzgan province, south of Iran

From 63 dissected fish only two fish were infected with 4 and 3 parasites respectively and the others had only one parasite. The maximum and minimum of parasite lengths were 64.2 mm and 22.7 mm respectively. Also the maximum and minimum of parasite weights were 0.3 and 0.047 g respectively (Table 1). Mean parasite length and weight were 41.48 mm and 0.19 g respectively. Althought the total length of male and female fish was not significantely different, the total length of parasites in male and female fish was significantly different ($P< 0.05$). No significant difference was observed when the weight of male and female fish and their parasites were compared. The prevalence, intensity and abundance of infection by pleurocercoid of *L. intestinalis* were 22.22%, 1.36 and 0.3 respectively. This is the first report of *Aphanius dispar* infection with *L. intestinalis* pleurocercoid. *Ligula* is thought to be the most important tapeworm of cyprinids and can be a major threat to natural and farmed fish populations. The ecological situation in which *Ligula* infection in fish are found are so variable that the frequency distribution must be regarded as a random one (Aydogdu and Ozturk, 2003). In most cases, the prevalence varies from year to year and no statistically significant seasonal patterns can be recorded (Smyth, 1994). In this study *Ligula intestinalis* infection increased with increasing fish size probably due to a consequence of increased consumption of infected copepods in larger fish.

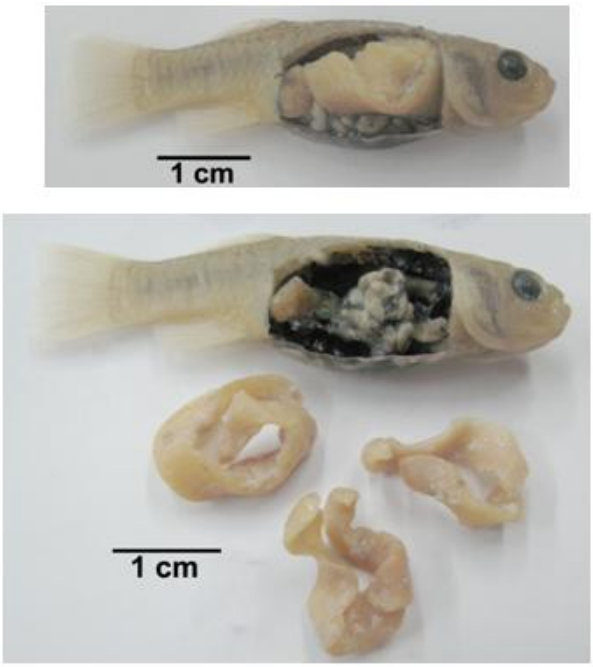

Figure 2: Photographs of female with three parasites coiled around the viscera and occluded the body cavity *in Aphanius dispar* in Mehran River, Hormuzgan province, south of Iran

The parasitic infection was higher in females than males suggesting the affinity of *L. intestinalis* procercoids invading females of *A. dispa*r. Kalantan et al. (1987) reported higher infestation of females of *A. dispar* with the metacercaria of *Clinostomum complanatum* than males. The present authors have also observed higher infection of females of *A. persicus* with *L. intestinalis* plerocercoids. More research is required to elucidate the affinity of these parasites to females. The total length of parasites in male fish was significantly higher than that of females ($P< 0.05$) (Table 1). This could be explained as males are less infected with *L. intestinalis* and usually one parasite exists, so the length grows larger. The highest number of plerocercoid counted in *A. dispar* in this study was 4 parasites while the present authors found at 18 *L. intestinalis* plerocercoids with small sizes in *A. persicus*. Jalali (1998) reported the highest counted ligula plerocercoids in the studied fish as 13. Our data showed that by increasing the number of parasites in fish, the size of parasites decrease. This could be due to the lower space in the body cavity for the growth of the parasites. The plerocercoids of *L. intestinalis* may normally be expected to have a negative impact on *A.dispar* population and the prevalence of infection may increase. It has been proved that *L. intestinalis* plerocercoid can damage somatic and gonadal growth (Arme et al., 1983). Thus, an epidemiological survey in the region for screening the intensity of infection in other

fish species is very important for a successful infection control strategy.

Table 1: Details of infected *A. dispar* with *L. intestinalis* plerocercoids in Mehran river, Hormuzgan province, south of Iran. (T.L= total length; S.L= standard length; W- weight)

Fish Lab. No.	Fish (sex)	Fish T.L (mm)	Fish S.L (mm)	Fish W. (g)	Parasite T.L (mm)	Parasite W. (g)	Total Parasites
8365	F	54.1	45.3	3.203	51.4	0.289	1
8366	M	53.8	43.1	2.675	51.1	0.246	1
8367	F	53.4	43.4	2.925	37.1	0.171	3
					48.2	0.26	
					44.8	0.153	
8368	M	39	31.6	0.878	43.6	0.134	1
8369	F	53.2	44.4	2.789	45	0.3	1
8372	M	45.6	37.2	1.79	64.2	0.149	1
8373	F	52.6	43.4	2.515	46.4	0.14	4
					35.1	0.175	
					22.7	0.076	
					23.5	0.115	
8375	F	48.6	41	2.054	48	0.149	1
9842	F	46.2	39.3	1.797	35.5	0.223	1
9844	F	49.4	41.5	2.073	46.8	0.299	1
9846	F	48.1	40	2.164	37.8	0.206	1
9850	F	44.7	36.4	1.567	37.6	0.228	1
9868	F	45.3	36.6	0.567	44.8	0.258	1
c216	F	31.3	26	0.549	24.5	0.047	1
							19

Acknowledgements

We would like to thank H. Dehdar and E. Divjam for helping in the fish collection, the office of vice chancellor for research and Shiraz University for financial support.

References

Arme, C., Bridges, J. F. and Hoole, D., 1983. Pathology of cestode infections in the vertebrate host. In: Biology of the Eucestoda. Edited by C. Arme C. and P.W. Pappas. London: Academic Press. Pp, 499–538.

Aydogdu, A. and Ozturk, M. O., 2003. Occurrence of *Ligula intestinalis* and *Cucullanellus minutus* in flounder, *Platichthys flesus* L., In Dalyan Lagoon, (Karacabey, Bursa, Turkey) from September 1997 to June 1998. *Bulletin of the European Association of Fish Pathologists***,** 23, 287-290.

Barus, V. and Prokes, M., 2002. Length and weight of *Ligula intestinalis* plerocercoids (Cestoda) parasitizing

adult cyprinid fishes (Cyprinidae): a comparative analysis. *Helminthologia*, 39, 29-34.

Coad, B.W., 1996. Systematics of the tooth-carp genus *Aphanius* Nardo, 1827 (Actinopterygii: Cyprinodontidae) in Fars Province, southern Iran. *Biologia, Bratislava*, 51,163-172.

Dubinina, M. N., 1980. Tapeworms (Cestoda, Ligulidae) of the Fauna of the U.S.S.R. New Delhi: Amerind Publishing Co.

Ergonul, M.B. and Altindag, A., 2005. The occurrence and dynamics of *Ligula intestinalis* in its cyprinid fish host, tench, *Tinca tinca*, in Mogan Lake (Ankara, Turkey). *Veterinary Medicine- Czech* 50:537-542.

Etemadfar, A. R., Motabar, M. and Wossughi, Gh., 1983. A biological and ecological survey on the geographical distribution of *Aphanius dispar* as larvivorous fish ar (*sic*) the southern parts of Iran. *Journal of the Faculty of Veterinary Medicine*, 38, 1-12. (In Persian)

Jalali, B., 1998. Parasites and parasitic diseases of freshwater fishes of Iran. Iranian Fisheries Organization Publishing Co. Tehran. 564p (In Persian).

Kalantan, A. M. N., Arfin, M. and Nizami, W. A., 1987. Seasonal incidence and pathogenicity of the metacercariae of *Clinostomum complanatum* in *Aphanius dispar*. Japan. *Journal of Parasitology*, 36, 17-23.

Karemi, S., Massoud, M. R., Mehdizadeh Fanid, L. and Hajirostamlo, M., 2006. Plerocercoid of *Ligula intestinalis* from copepods in Satarkhan Dam, East Azerbaijan Province, north-west Iran. *Iranian Scientific Fisheries Journal*, 5, 51-154.

Kennedy, C.R., Shears, P.C. and Shears, J.A., 2001. Long-term dynamics of *Ligula intestinalis* and *Rutilus rutilus*: a study of three epizootic cycles over 31 years. *Parasitology*, 123, 257–269.

Mosavi, HA., Vajhi, AR., Hosseini, SH., Masoudifard, M. and Moghim, M., 2000. Report of the first *Ligula intestinalis* from ship sturgeon *Acipenser nudiventris*. *Pajoohesh & Sazandegi*, **45,**140-145. (In Persian)

Rahemo, Z. I. F. and Al-Nouri, A. A., 1999. Effect of *Ligula intestinalis* on gonad histology of *Acanthobrama marmid* Heckel, 1843. *Rivista di Parassitologia*, **16,**237-241.

Smyth J.D., 1994. Introduction to animal parasitology. Third edition. Cambridge University Press. Cambridge. 549p.

Yousefi, MR., Sefidgar, AA., Maliji, Gh., Mousavi, J. and Asna-ashari, MY., 2005. Infection of river whitefishes by *Ligula intestinalis* parasite in Aras dam. *Journal of Babol University of Medical Sciences*, **7,** 80-83.