

## Study on Internal helminthes parasites in Persian sturgeon (*Acipenser persicus*) spawners in southwest coasts of the Caspian Sea (2009-2011)

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**Abstract:** This research was done on 60 *Acipenser persicus* spawners caught in the southwest coasts of the Caspian Sea (Guilan Province) from April through June 2009-2011 to identify the parasitological fauna and prevalence, intensity and dominance of these parasites. On capture biometry was performed on the spawners and all parameters were recorded. The spawners were examined for the presence of wounds and macroscopic parasites. The digestive tract, egg, liver, gall bladder of the fish were removed and transferred to the laboratory of Parasitology of the International Sturgeon Research Institute. Parasites found were removed and stored in 10% formalin solution for identification following methods used by Stoskope (1993). Standard statistical computations were carried out using SPSS and Excel. Four types of internal helminthes parasites were identified in *A.persicus* spawners caught in each year that include, *Cucullanus sphaerocephalus* Rudolphi 1809, *Skrjabinopsolus semiarmatus* Molin 1858, *Eubothrium acipenserinum* Cholodkovsky 1918 and *Leptorhynchoides plagicephalus* Westrumb 1821. It is evident from the results obtained that *Cucullanus sphaerocephalus* and *Skrjabinopsolus semiarmatus* showed the highest prevalence and highest mean infection intensity in the Persian sturgeon spawners under study. Sum of dominance of these two parasites in 2009, 2010 and 2011 was 98.5%, 97.7% and 97.16%, respectively. Statistical relationship between age of spawners with the number of parasites isolated from them was also determined.

[Soheil Bazari Moghaddam. **Study on Internal helminthes parasites in Persian sturgeon (*Acipenser persicus*) spawners in southwest coasts of the Caspian Sea (2009-2011)**. *Life Sci J* 2013;10(10s):12-16] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 3

**Keyword:** *Acipenser persicus* - Caspian Sea - helminthes parasites – spawners

### Introduction

The population of the Caspian Sea sturgeon is falling drastically during recent years and the sturgeon stocks is encountering with depletion (Pourkazemi, 2006), so the study of the harmful factors on these valuable fishes is necessary. Aquaculture of sturgeon is also increasing in the Islamic Republic of Iran and abroad, so study and identification of different pathogen factors especially parasites is essential to develop the best methods for treatment and prevention. Parasite can effect on fish health directly and indirectly in the larval as well as in the adult stage (Pazooki *et al*, 2006). Different factors have roles in the life cycle of parasite such as fish anatomical structure. The sturgeon mouth is located inferiorly hence it serves as an ability to feed on benthic organisms. Since sturgeons are known to be the intermediate hosts of more parasites in comparison with fish, which posses a different form of mouth (Choudhury and Dick, 1998). The internal parasites of sturgeons have been studied by several authors (Dogiel and Bykhovshy (1939); Schulman (1954); Mokhayer (1973); Skrjabina(1974); Raikova (1984); Rahmani (1985); Ghoroghi (1986); Pourgholam (1993); Sattari (1999); Bauer *et al*. (2002); Pazooki and Masoumian (2004); Bazari Moghaddam (2002) and Masoumzadeh (2006)). This study was conducted in the southwest coasts of the

Caspian Sea during three years (2009-2011) to collect some information about the prevalence and mean intensity of sturgeon spawners parasites and compare these results with those of previous researchers.

### Material and Methods

This survey was done on 60 *Acipenser persicus* spawners caught in the southwest coasts of the Caspian Sea (Guilan Province) from April through June 2009-2011 to identify the parasitological fauna and prevalence, intensity and dominance of these parasites. A number of 20 spawners (10 males and 10 females) were studied each year in this survey. The biometric measurements including, weight (Kg), total length (cm) and age determination were conducted on spawners and all parameters were recorded (Table 1). Age determination of the sturgeons was done by removing pectoral fin ray. A macroscopic examination of abdomen was done and then the entrails of the fish were removed. Egg samples were collected from the ovary and also samples were transferred to the laboratory of Parasitology of the International Sturgeon Research Institute. This survey was carried on egg, liver, gall bladder and digestive tract of spawners. Parasites found were removed and stored in 10% formalin solution for identification following methods used by Stoskope (1993). Cestodes, trematodes and

acanthocephalans were stained with aqueous acetocarmine and nematodes were cleared in lacto phenol. Standard statistical computations (prevalence, mean intensity, intensity range and dominance) were carried out for each parasite. The relationship between the age of spawners and number of parasites and the relation between weight of spawners and number of parasites were compared with Pearson correlation coefficient. Significant relation between parasites isolated from spawners, was determined by T-test analytical test. Standard

statistical computations were carried out using SPSS (Ver. 17) and Excel (2007).

**Results**

Four types of internal helminthes parasites were removed from digestive tract of *A. persicus* spawners including (*Cucullanus sphaerocephalus* Rudolphi 1809), (*Skrjabinopsolus semiarmatus* Molin 1858), (*Leptorhynchoides plagicephalus* Westrumb 1821) and (*Eubothrium acipenserinum* Cholodkovsky 1918).

**Table 1:** Mean total length (cm), Weight (Kg) and age of *A.persicus* spawners during 2009-2011

	Females (N=30)				Males (N=30)			
	2009	2010	2011	Three years	2009	2010	2011	Three years
Total length (cm)	178±10.86	180.5±11.40	172.7±6.49	177.1±9.72	160.8±8.11	158.2±6.76	162.6±2.7	160.5±6.17
Weight (Kg)	29±4.64	30.2±8.32	26.4±3.65	28.5±5.69	19.3±1.82	16.4±0.65	17.4±2.16	17.7±1.99
Age (year)	16±1.87	16.4±1.95	15.8±1.92	16.07±1.79	12.4±1.14	13.8±1.30	13±1	13.1±1.22

**Table 2:** The internal helminthes parasite in *A.persicus* spawners during 2009-2011, (N=60)

Parasite	2009 ( N=20)				2010 (N=20)				2011 ( N=20)			
	Prevalence (%)	Mean intensity ± SD	Intensity range	Dominance (%)	Prevalence (%)	Mean intensity ± SD	Intensity range	Dominance (%)	Prevalence (%)	Mean intensity ± SD	Intensity range	Dominance (%)
<i>Cucullanus sphaerocephalus</i>	100	14.5±17.91	2-62	36.25	100	23.2±18.91	2-76	56.17	100	16.4±4.09	3-35	58.16
<i>Skrjabinopsolus semiarmatus</i>	80	31.13±49.19	1-78	62.25	90	18.8±13.86	1-46	41.53	100	11±5.9	4-25	39
<i>Eubothrium acipenserinum</i>	30	1.33±0.58	1-2	1	40	1.5±0.58	1-2	1.45	20	1.5±0.71	1-2	1.07
<i>Leptorhynchoides plagicephalus</i>	10	2±ERR	2	0.5	40	1.5±0.58	1-2	1.45	30	1.67±1.1	1	1.77

**Table 3:** The internal helminthes parasite in female *A.persicus* spawners during 2009-2011, (N=30)

Parasite	2009 ( N=10)				2010 (N=10)				2011 ( N=10)			
	Prevalence (%)	Mean intensity ± SD	Intensity range	Dominance (%)	Prevalence (%)	Mean intensity ± SD	Intensity range	Dominance (%)	Prevalence (%)	Mean intensity ± SD	Intensity range	Dominance (%)
<i>Cucullanus sphaerocephalus</i>	100	21±24.62	2-62	40.22	100	30.2±40.91	2-76	63.98	100	20.2±12.87	3-35	62.74
<i>Skrjabinopsolus semiarmatus</i>	60	51.33±48.59	1-78	59	100	15.8±16.98	6-46	33.68	100	11.2±3.11	6-14	34.78
<i>Eubothrium acipenserinum</i>	20	1± ERR	1	0.39	40	1.5±0.71	1-2	1.17	40	1± ERR	1	1.24
<i>Leptorhynchoides plagicephalus</i>	20	1± ERR	1	0.39	40	1.5±0.71	1-2	1.17	20	2± ERR	2	1.24

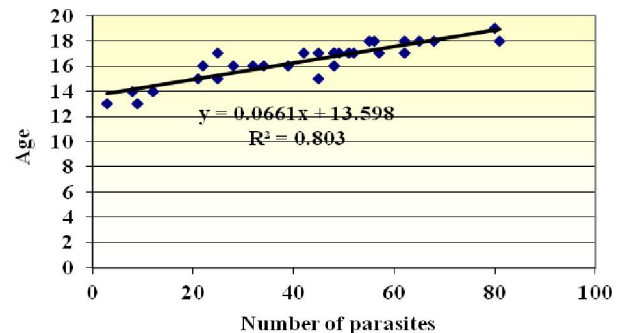
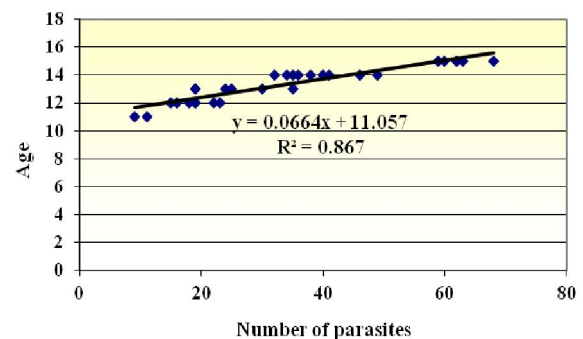
**Table 4:** The internal helminthes parasite in male *A.persicus* spawners during 2009-2011, (N=30)

Parasite	2009 (N=10)				2010 (N=10)				2011 (N=10)			
	Prevalence (%)	Mean intensity $\pm$ SD	Intensity range	Dominance (%)	Prevalence (%)	Mean intensity $\pm$ SD	Intensity range	Dominance (%)	Prevalence (%)	Mean intensity $\pm$ SD	Intensity range	Dominance (%)
<i>Cucullanus sphaerocephalus</i>	100	8 $\pm$ 3.16	3-11	28.57	100	16.2 $\pm$ 11.26	7-29	45.57	100	12.6 $\pm$ 5.22	8-21	51.07
<i>Skrjabinopsolus semiarmatus</i>	100	19 $\pm$ 12.92	6-34	67.86	80	22.5 $\pm$ 9.75	11-32	50.45	100	10.8 $\pm$ 8.35	4-25	44.62
<i>Eubothrium acipenserinum</i>	20	2 $\pm$ ERR	2	1.43	40	1.5 $\pm$ 0.71	1-2	1.99	20	3 $\pm$ ERR	3	2.98
<i>Leptorhynchoides plagicephalus</i>	40	1.5 $\pm$ 0.71	1-2	2.14	40	1.5 $\pm$ 0.71	1-2	1.99	20	1 $\pm$ ERR	1	1.33

It is evident from the results obtained that *Cucullanus sphaerocephalus* and *Skrjabinopsolus semiarmatus* showed the highest dominance among all samples. Sum of dominance of these two parasites in 2009, 2010 and 2011 was 98.5%, 97.7% and 97.16%, respectively (Table 2). Four types of parasites were identified in females that include *Cucullanus sphaerocephalus*, *Skrjabinopsolus semiarmatus*, *Leptorhynchoides plagicephalus* and *Eubothrium acipenserinum*. *Cucullanus sphaerocephalus* and *Skrjabinopsolus semiarmatus* showed the highest dominance between all female samples. Sum of dominance of these two parasites in 2009, 2010 and 2011 was 99.22%, 97.66% and 97.52%, respectively (Table 3). Also, *Cucullanus sphaerocephalus*, *Skrjabinopsolus semiarmatus*, *Leptorhynchoides plagicephalus* and *Eubothrium acipenserinum* were identified in males like females (Table 4). Two types of internal parasite including *Cucullanus sphaerocephalus* and *Skrjabinopsolus semiarmatus* showed the highest dominance between all male samples. Sum of dominance of these two parasites in 2009, 2010 and 2011 was 96.43%, 96.02% and 95.69%, respectively (Table 4).

The effect of age of *A.persicus* spawners and its' relation with number of parasites was studied in this survey (Figures 1 and 2).

Results of Pearson correlation coefficient test showed that there is a direct and positive correlation between age and number of parasites in *A.persicus* females ( $R^2= 0.803$  and  $P< 0.01$ ). So increase in age of spawners directly increased the number of parasites.

**Fig. 1:** Correlation between age and number of parasites in *A.persicus* females**Fig. 2:** Correlation between age and number of parasites in *A.persicus* males

Results of Pearson correlation coefficient test revealed that there is a direct and positive correlation between age and number of parasites in *A.persicus* males ( $R^2= 0.867$  and  $P<0.01$ ). So increase in age of spawners directly increased the number of parasites.

Results of Pearson correlation coefficient test was used to find the relationship between the weight of *A. persicus* females and number of parasites ( $R^2 = 0.782$  and  $P < 0.01$ ). Also, There is no correlation between weight and number of parasites in males ( $P > 0.01$ ). Significant differences ( $P > 0.05$ ) were not determined in number of parasites between two sexes (T-test).

## Discussion

According to the results of studies in the last decades, the diversity of parasites in sturgeons has decreased (Sattari, 1999). Mokhayer (1973) identified 8 species of internal helminthes parasites in sturgeon (*A. persicus* and *A. stellatus*) and Sattari (1999) found 6 species of internal helminthes parasites in *A. persicus*. Four types of internal parasites were removed from *A. persicus* in this study. Decrease in diversity of parasites in sturgeons may be related to unfavorable conditions of rivers ecosystems, making it impossible for the sturgeons to ascend the rivers for spawning, thus decreasing the incidence of freshwater parasites in these fish (Sattari, 1999). It was also found that the diversity of internal helminth parasites in *A. persicus* spawners was less than that in *A. stellatus* spawners. This is because *A. persicus* has selective feeding habits while *A. stellatus* shows diversity in feeding (Holcik, 1989). Sattari (1999) also revealed that the diversity of parasites in *A. persicus* was less than other sturgeons. According to the results in tables 1 and 2, there is a direct and positive correlation between increase in age and the number of parasites in *A. persicus* spawners. Investigations by Jalali Jafari (1998) revealed that with increase in age, a wide variety of food items was consumed by fish due to the higher demands for feeding in these fish. Because of the high rate of intermediate hosts, fish are more affected by parasite. Austen *et al* (1994) confirmed the relation between number of helminthes and age of host fish. Skrjabina (1974) has pointed out the relation between mean intensity and diversity in sturgeons with increase in age. In this study *Cucullanus sphaerocephalus* and *Skrjabinopsolus semiarmatus* were the most prevalent parasites of *A. persicus* spawners and sum of dominance of these two parasites in 2009, 2010 and 2011 was 98.5%, 97.7% and 97.16%, respectively. Although, there is no exact data on diversity of intermediate hosts and life cycle of *Cucullanus sphaerocephalus* and *Skrjabinopsolus semiarmatus* (Bauer, 2002). The increase in these two parasite communities may be related to the occurrence of Nereids (polychaeta), the intermediate host for *Cucullanus sphaerocephalus* (Moravec, 1994) and Oligochaeta, the intermediate host for *Skrjabinopsolus semiarmatus* (Choudhury and Dick,

1998). According to the results shown in tables 2, 3 and 4, the sum of dominance of these two parasites during 2009-2011 has decreased. It is probably due to decrease in the biomass of intermediate hosts of these two parasites in water reservoirs as a result of pollution. Regarding that the most distribution of *Acipenser persicus* observed in middle and southern parts of Caspian Sea and due to enriched food diversity and existence of intermediate hosts, more helminthes found in fishes of this area than other parts of Caspian Sea (Rajabpour *et al*, 2008). There are a few reports about the life cycles of *Cucullanus sphaerocephalus*, *Leptorhynchoides plagicephalus*, *Skrjabinopsolus semiarmatus* and *Eubothrium acipenserinum* and their pathological effects on their hosts (Bauer, 2002). The presence of some sturgeon parasites like *Leptorhynchoides plagicephalus* can be the cause of intestinal inflammation in these fish (Ivanov and Golovin, 1966). Also, Bauer *et al* (2002) observed *Gammarus pulex* as the intermediate host of *L. plagicephalus* parasite. According to the results of study on internal parasites in *A. persicus* during 2001-2003, there is no relation between weight of female spawners and number of parasites (Masoumzadeh, 2006). The results of present study showed that there is a direct and positive correlation between weight and number of parasites in *A. persicus* females ( $P < 0.01$ ) but also there is no relation between weight and number of parasites in *A. persicus* males in both studies ( $P > 0.01$ ). Bauer (2002) declared that intensity of some parasites changes during different seasons of year, so as intensity of *S. semiarmatus* is more in spring and winter than summer and autumn. Regarding that this study conducted only on spring spawners of west of west southern part of Caspian Sea, so we cannot determine the changes in intensity and prevalence of parasites in other seasons of the year and need to investigate on parasites during different seasons of the year.

## Acknowledgements

I am grateful to Dr. Mahmoud Bahmani, Director of the International Sturgeon Research Institute and my colleagues in Institute, Alireza Shenavar Masouleh (Ph.D), Jalil Jalil pour (MSc.), Mehdi Masoumzadeh (DVM) and Mehdi Alizadeh (MSc.) for supporting during this study.

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