Study on the parasites of *Pseudorhombus elevatus*, *Psettodes erumei* and *Brachirus orientalis* from the Persian Gulf, Iran

Hosseini S.H.[1]*; Alinezhad S.[2]; Mobedi I.[3]; Halajian A[4].; Karimi E.[1]; Ahoo M.B.,[1] Yasemi M.[5]

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Abstract

The Persian Gulf is of great economical, environmental and political importance, and includes around 205 species of fishes that only some of them have been studied parasitologically. From the order Pleuronectiformes (ray-finned fishes), *Psettodes erumei* (Psettodidae), *Pseudorhombus elevatus* (Bothidae) and *Brachirus orientalis* (Soleidae) were selected for the survey. One hundred and forty eight fishes including 97 *P. erumei*, 43 *P. elevatus* and 8 *B. orientalis* were provided from two different regions of Iranian waters of the Persian Gulf and Oman Sea. From *P. erumei,* 4 species of nematodes, one cestode and one acanthocephal species are reported including: *Philometra* sp., *Contracaecum* sp., *Pseudoterranova* sp., *Raphidascaris* sp., *Dasyrhynchus* sp. (Trypanorhyncha) larvae and *Serrasentis sagittifer*. This is the first report of *S. sagittifer* in *P. erumei* from the Persian Gulf. *P. elevatus* had fewer species of parasites including one nematode, *Contracaecum*, one copepod, *Heterochondria pillai* and one digenea metacercaria *Stephanostomum* sp. *Brachirus orientalis* harbored one copepod and two digenea species, *Allocreadium* sp. and *Lepocreadioides zebrini*. Our research provides evidences that Indian spiny turbots have larger diversity of parasites than the deep flounders.

Keywords: Pleuronectiformes, Fish, Parasites, Persian Gulf

1-Department of Parasitology Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

2-Department of Veterinary Medicine, Higher Education Institute of Applied Science and Technology of Jihad Agriculture, Tehran, Iran

3-Department of Parasitology, School of Public Health, Tehran University of Medical Science, Tehran, Iran

4-Department of Biodiversity, University of Limpopo, Turfloop Campus, Private Bag X1106, Sovenga, 0727 Polokwane, South Africa

5- Department of Fishery, Higher Education Institute of Applied Science & Technology of Jihad Agriculture.

*Corresponding author email: hhoseini@ut.ac.ir

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Introduction

Persian Gulf is one of the most economically and politically important seas in the world with an approximate area of 226,000 km^2. It includes more than 600 fish species that is the main source of marine food for the countries around it (Assadi and Dehghani, 1997; Valinassab, 2013).

Flatfishes (Order: Pleuronectiformes) include several families with numerous species, existing in the Persian Gulf (Valinassab, 2013). Indian spiny turbot (*Psettodes erumei*) belongs to the family Psettodidae that in fishing seasons can be found in the fish markets of neighboring provinces of the Persian Gulf and Oman Sea , south of Iran. This fish is easily identifiable based on having a thicker body than most other flatfishes, large mouth with strong teeth and a brown-grey body color (Assadi and Dehghani, 1997).

Deep flounder (*Pseudorhombus elevatus*), family Bothidae, is usually available in fish markets of south of Iran, especially Chabahar, in the fishing seasons. The most peculiar feature of this fish is the left position of the eyes, an oval and flat body, and is a smaller size than *P. erumei* (Assadi and Dehghani, 1997).

Soles belong to the family Soleidae that includes 3 species in the Persian Gulf, but we could only find samples of *Brachirus orientalis* (Oriental sole).

Little is known about parasites fauna of above-mentioned fishes and besides a few reports of individual parasites in other species of Pleuronectiformes in other countries around Persian Gulf (Hassan et al., 2002; Nahhas and Sey, 2002), and only one report of parasites of *B. orientalis* in Iran (Bagherpour et al., 2011), the rest have not been checked for parasites in Iran before this study.

So in regard to clarify and improve our current knowledge about parasites of these fishes, we designed this study.

.Materials and methods

Indian spiny turbots (n=97) were bought from the fish market of Chabahar, southeast of Iran and Deep flounders (n=43) and Oriental soles (n=8) were bought from Bushehr fish market.
The fishes were placed in bags with ice and transported to the laboratory of Parasitology Museum, Veterinary Faculty of Tehran University.

In the laboratory, all fishes were dissected. Internal organs were removed, abdominal cavity was checked, stomach and intestines were cut and placed in separate plates and the contents were checked carefully under stereomicroscope. Gills were dissected and checked individually in plates under stereomicroscope.

Parasites were removed, counted and kept in water during the necropsy procedure. After finishing the necropsy on each fish, the parasites were fixed and preserved in ethanol 70% for further studies.

Cestodes were stained with acetocarmine, dehydrated and mounted in Canada balsam and nematodes were cleared with lactophenol and then temporary mounted. The morphological characteristics were checked using a calibrated light microscope with ocular micrometer and drawings were made with a camera lucida.

Eventually specimens were identified using the key identification books (Yamaguti, 1961;

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Moravec, 1994; Palm, 2004) and were deposited in the National Parasitology Museum, Veterinary Faculty, University of Tehran.

Results

Six parasite species were found in *P. erumei*, four nematode, one cestode and one acanthocephalan species. *Philometra* sp. (Fig. 1) was found with the intensity of 1-5 parasites per fish in the intestines of 31% of the studied fishes. As all the worms were female, identification to species level was not possible.

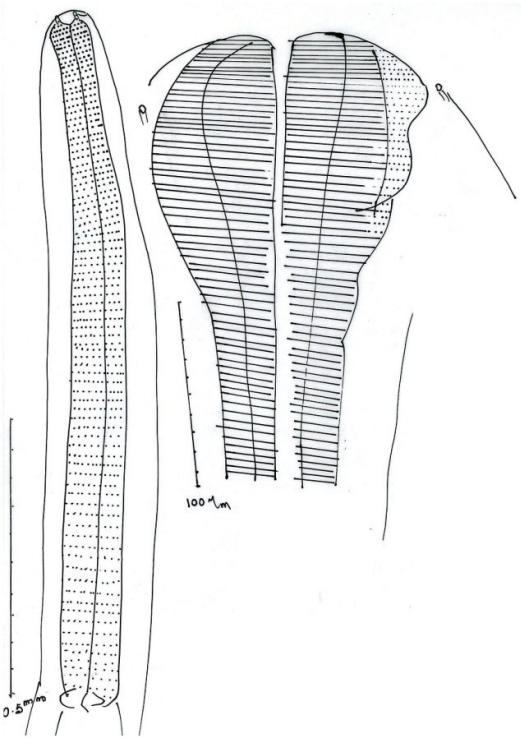


Figure 1: *Philometra* sp. from the abdominal cavity of *P. erumei*

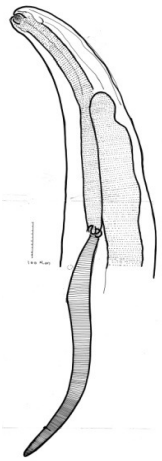


Figure 2: *Contracaecum* sp. from the abdominal cavity of *P. erumei*

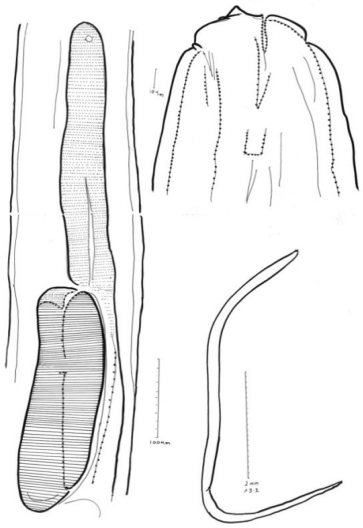


Figure 3: *Pseudoterranova* sp. from the abdominal cavity of *P. erumei*

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From the anisakidae family of nematodes, three genera including *Contracaecum*, *Pseudoterranova* and *Raphidascaris* larvae were found mostly on the serosal surface of stomach and on the muscles. *Contracaecum* sp (Fig.2) was found in 9.2% with intensity of 1-8 parasites per fish, *Pseudoterranova* sp (Fig.3) was found in 4.1% with the intensity of 1-3 parasites per fish and *Raphidascaris* sp.(Fig.4) was found in 15.6% with the intensity of 1-12 parasites per fish. Trypanorhynch cestode larvae were found in the abdominal cavity of 7.2% of the fishes, that were identified as *Dasyrhynchus* sp. (Fig. 5) based on the morphological characteristics (Palm, 2004).

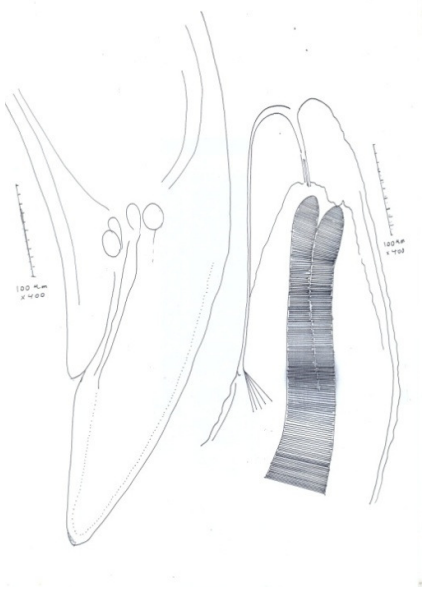


Figure 4: *Raphidascaris* sp. from the abdominal cavity of *P. erumei*

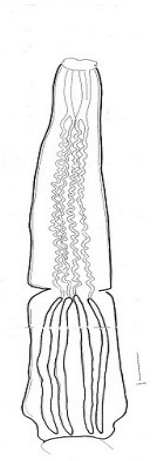


Figure 5. *Dasyrhynchus* sp. from the abdominal cavity of *P. erumei*

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The only acanthocephalan, *Serrasentis sagittifer* (Fig.6), was found with the intensity of 1-3 parasites per fish in 2.3% of the fishes. These parasites were found in the intestinal lumen of infected fishes.



Figure 6: *Serrasentis sagittifer* from the intestine of *P. erumei*

In *P. elevatus*, one nematode species, *Contracaecum,* was found in the abdominal cavity of 16.2%, one copepod species, *Heterochondria pillai*, attached to the gills of 4.6% of fishes (Fig. 7) and two digene metacercariae cysts in two of the fishes (Fig. 8).



Figure 7: *Heterochondria pillai* from the gills of *P.elevauts*

These cysts were first classified based on the spines located on the oral sucker which is a characteristic of the metacercaria of either a cryptogonimid or an acanthocolpid digene, both having eye-spot pigment. Based on the morphological studies, it is most likely the metacercaria of *Stephanostomum* (Fig. 8), that for complete identification to species level requires to cut the cysts to bring out the larvae for counting and measuring the spines which eventually requires more specimens.



Figure 8: *Stephanostomum* sp. ×40 metacercaria in a cyst from *P. elevatus*

B. orientalis harbored one copepod species attached to gills that didn't have intact appendages necessary for identification and two digenea species in the intestines, including *Allocreadium* sp. in 6 fishes with the intensity

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of 1-3 and *Lepocreadioides zebrini* in only one fish with the intensity of 4 parasites per fish.

Table 1 summarised the parasites fauna of 3 species of flatfishes from the Persian Gulf.

Table 1. Parasites fauna of 3 species of flatfishes from the Persian Gulf

Species of parasite	Species of fish			Location in the host	No infected	Intensity range
	P. erumei No: 97	*P. elevatus* No: 43	*B. orientalis* No: 8			
Philometra sp.	+	-	-	Abdominal cavity	31	3
Contracaecum sp.	+	+	-	Surface of	9/7/5	1-8
Pseudoterranova sp.	+	-	-	stomach and	4	1-3
Raphidascaris sp.	+	-	-	abdominal cavity	15	1-12
Dasyrhynchus sp. (Trypanorhyncha)	+	-	-	Abdominal cavity	7	1-3
Stephanostomum sp.	-	+	-	Intestine	2	1-3
Allocreadium sp.	-	-	+	Intestine	6	1-3
Lepocreadioides zebrini	-	-	+	Intestine	1	4
Serrasentis sagittifer	+	-	-	Intestine	3	1-3
Heterochondria pillai	-	+	-	Gill	2	1-2

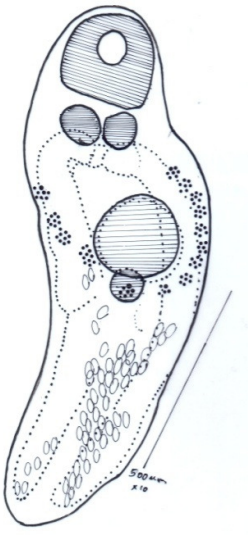


Figure 9: *Allocreadium* sp. from intestine of *B. orientalis*

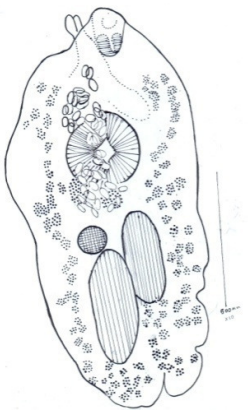


Figure 10: *Lepocreadioides zebrini* from intestine of *B. orientalis*

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Discussion

Based on obtained results it is obvious that *Psettodes erumei* has a more diverse fauna of parasites with more intensity than *Pseudorhombus elevatus* that this can be attributed to the host body conditions and to the different life patterns.

Genus *Philometra* has a large number of species, usually occurring in the abdominal cavity or inside the internal organs of freshwater, brackish water and marine fishes. Recently several new species of this genus have been reported in the fishes of Persian Gulf in the coasts of Iraq (Moravec et al., 2005). As the males are small and identification of the species only based on the females isn't conclusive, we could only identify our specimens up to genus.

Trypanorhynch cestodes are cestodes characterised by having a scolex with four eversible tentacles armed with hooks2 or 4 bothridia, and sometime ciliated pits and prebulbular organs.

Adult forms of these cestodes exist in the digestive tract of definitive hosts (Elasmobranches: Sharks and Rays) and larvae are found in the first invertebrate intermediate hosts and second intermediate hosts or paratenic hosts that are usually teleost fishes and some invertebrates.

Different species of Trypanorhynch cestodes have been reported in the Persian Gulf and Oman Sea, including different species from sharks (Alinezhad and Hosseini, 1998; Haseli et al., 2010), some of the economically important commercial fish species (Hassan et al., 2002; Peyghan et al., 2004) and even there are some cases of trypanorhynch larvae in shrimps (*Penaeus semisulcatus*) (Malollahi et al., 2003).

Hassan et al. (2002) studied 867 fishes from 42 species of fishes from Qatef, Eastern province of Saudi Arabia. They reported *Dasyrhynchus thomasi* from *P. erumei*. This cestode was found in several parts of the fish including trunk region, between vertebral spines and also tail region.This is the first report of trypanorhynch cestodes in one species of Persian Gulf fishes.

Stephanostomum is a very usual digenetic trematode in the Persian Gulf and has been reported in the fishes of different families like Chirocentridae, Lethrinidae, Lutjanidae, Mullidae, Psettodidae, Serranidae, and Triacanthidae families. Although in most of the cases, species have not been mentioned (Al Kawari et al., 1996). In This study, because of the few number of samples, species of this digene was not identified.

Although *Serrasentis* species have been reported from several different fish species of Persian Gulf (Peyghan et al., 2004; Tavakol et al., 2007), *Serrasentis sagittifer* has been reported only in a few fish species (Amin et al., 1984; Kardousha, 2005; Ghaem Maghami et al., 2008).

The only report of this acanthocephalan in a fish close to our examined fishes, is a report in *Bothus* sp. (Bothidae) (Amin et al., 1984), that is from the same family with *P. elevatus*, however our study is the first report of this acanthocephalan in *P. erumei* in the Persian Gulf.

Number of Oriental Soles checked in this study (n=8) was not significant enough to discuss the parasites found or compare the results with previous reports, but in the only previous study on this flatfish in Iran (n=108,

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obtained from Abadan port), they also reported *Allocreadium* sp. and *Lepocreadioides zebrini* like our study, but they also found *Hysterothylacium* and *Proteocephalus* (prevalence of 23 and 16% , respectively) that we didn't find in our fishes, and seems they didn't check the fishes for copepods (Bagherpour et al., 2011).

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