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OCCURRENCE AND INTENSITY OF PARASITES IN EUROPEAN CATFISH, *Silurus glanis* L., 1758 FROM THE ANZALI WETLAND, SOUTHWEST OF THE CASPIAN SEA, IRAN

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ABSTRACT

The Anzali wetland is located in the southwest of the Caspian Sea. A total of 86 European catfish, *Silurus glanis* L., 1758, were collected between April and July 2012 in this wetland. After recording biometric characteristics, common necropsy and parasitology methods were used. In the present study, a total of 17,214 individuals of 14 parasite species were recovered from European catfish. Parasitofauna consisted of two protozoans: *Ichthyophthirius multifiliis* and *Trichodina* sp.; two nematodes: *Raphidascaris acus* and *Eustrongylides excisus* larvae; one acanthocephalan: *Acanthocephalus lucii*; three cestodes: *Silurotaenia siluri*, *Proteocephalus osculatus* and *Bothriocephalus* sp. larvae; two digenean trematodes: *Orientocreadium siluri* and *Diplostomum spathaceum*; two monogenean trematodes: *Silurodiscoides vistulensis* and *Silurodiscoides siluri*; and two crustaceans: copepodid stage of *Lernaea cyprinacea* and *Argulus foliaceus*. The occurrence of *R. acus, I. multifiliis*, *Trichodina* sp., *Silurotaenia siluri*, *A. lucii*, *A. foliaceus* in *S. glanis* has been reported for the first time in Iran.

INTRODUCTION

The Anzali wetland (37^0 25' N, 49^0 28' E), with a surface area of about 15,000 ha and 49 fish species is located in the southwest of the Caspian Sea in Guilan province, Iran. This freshwater lagoon is filled by several rivers and separated from the sea by a dune system. Based on the Ramsar convention on wetlands, the Anzali Wetland has an international importance (The Ramsar list of Wetlands of International Importance, 2013). One of the most important species in the Anzali wetland is European catfish, *Silurus glanis*, also known as wels or sheatfish. It is among the largest freshwater fish worldwide, with a maximum record of 5 m in total length and body mass of 306 kg (Alp et al., 2011) and individuals over 50 kg being regularly angled (Slavík et al., 2007). European catfish is a nocturnal predator which forages near bottom and in water column. Larvae and juveniles are benthic, feeding on a wide variety of invertebrates and fish. Adults prey on fish and other aquatic vertebrates. The type of its diet depends on the food availability and the age of European catfish. The very wide diet spectrum facilitates the transmission of the parasites of complex life cycle (Sobecka et al., 2010). Parasites of bonyfish species in the southern parts of Caspian Sea and its basin have been reported by several authors (Eslami and Kohneshahri, 1978; Sattari, 1996, 1999; Daghigh Roohi, 1997; Pazooki and Aghlmandi, 1998; Sattari et al., 2002; Daghigh Roohi and Sattari, 2004; Sattari et al., 2005; Khara et al., 2005, 2011), but there have been limited studies on European catfish parasites in the Anzali wetland (Sefidkare-Langerudi, 1965; Sattari, 1996). Sefidkare-Langeroudi (1965) reported seven parasite species from the intestine of *S. glanis* in the Anzali wetland consisting of *Proteocephalus osculatus*, *Pomphorhynchus perforator*, *Aphanurus stossichi*, *Corynosoma strumosum*, *Cucullanus sphaerocephalus*, *Anisakis* sp. larvae and *Bunocotyle cingulata*. In other studies, Sattari (1996) recovered *Eustrongylides excisus* larvae from one specimen of *S. glanis* and Jalali Jafari (1998) reported two monogenean species including *Silurodiscoides siluri* and *Silurodiscoides vistulensis* from *S. glanis.* In addition, Khara et al. (2005) re-

covered seven parasite species from *S. glanis* in the Amirkelayeh wetland (37^0 17' N, 50^0 12' E) consisting of copepodid stage of *Lernaea cyprinacea*, *Aphanurus stossichi*, *Raphidascaroides* sp., *Triaenophorus crassus, Diplostomum spathaceum, S. siluri* and *S. vistulensis.*

On the other hand, Yakhchali et al. (2012) recovered three helminth parasites in the gastrointestinal tract of *S. glanis* from the Zarrineh-rud river (36^0 49' N, 46^0 20' E) consisting of *Orientocreadium siluri*, *Crowcrocoecum skrjabini* and *Botriocephalus gowkongensis,* but there is no recently published report on the parasite communities of European catfish and epizootiological aspects of these parasites in the Anzali wetland.

MATERIALS AND METHODS

A total of 86 European catfish, *S. glanis,* were collected from the Anzali international wetland (37^0 25' N, 49^0 28' E) in the southwest of the Caspian Sea (Guilan province, Iran) on 12 separate occasions between April and July 2012. Fish were trapped with fyke net and transported to the Parasitology laboratory of National Inland water Aquaculture Research Institute in Anzali city alive in water obtained from the collection site. A dissolved oxygen saturation of approximately 85-90% was maintained during transport. Water temperature was determined at the collection site. Dissolved oxygen was measured using a dissolved oxygen meter (Oxi-323 B/SET). Upon arrival, fish were weighed and measured and then examined externally for gross signs of parasitism. If no gross signs were observed, skin biopsies were prepared from the entire length of the lateral body wall. European catfish averaged 924.13 g (± 566.77 g, range = 186 - 3815 g) in weight, and averaged 52.80 cm (± 9.29 cm, range = 33.20 - 85.50 cm) in total length. A gill biopsy was collected from the second arch. A fin biopsy was collected from the caudal fin. Wet mounts of all biopsied tissues were prepared for further analysis.

After recording biometric characteristics, common necropsy and parasitological methods according to Stoskopf (1993) were used. All organs of the fish were examined, except blood. Live trematodes and acanthocephalans were relaxed in distilled water at 4^{0}C for 1 h and fixed in 10% hot buffered formalin. Live nematodes were fixed in hot 70% ethanol and cleared in hot lactophenol. All specimens fixed in 10% formalin were stained with aqueous acetocarmine, dehydrated and mounted in Permount. The worms were identified using parasite identification keys (Yamaguti, 1961; Bykhovskaya-Pavlovskaya et al., 1962; Moravec, 1994) and then were deposited at the Laboratory of Fish Diseases, Faculty of Natural Resources, University of Guilan, Iran.

Classical epidemiological variables (prevalence, intensity and abundance) were calculated according to Bush et al. (1997). The dominance of a parasite species was calculated as N/N sum (where N = abundance of a parasite species and N sum = sum of the abundance of all parasite species found) and expressed as a percentage. The dominance values were used for classification of parasites as: eudominant (>10%), dominant (5.1% - 10%), subdominant (2.1% - 5%), recedent (1.1% - 2%) and subrecedent (<1.0%) of given species (Niedbala and Kasparzak, 1993). Mean intensity of infection and abundances of parasite species (with prevalences >10%) among seasons, age groups and sexes were tested by the Kruskal-Wallis test (KW, multiple comparisons) and Mann-Whitney U test (MW, pairwise comparisons). Results were considered significant at the 95% level ($p<0.05$). Computations were performed using the SPSS programme at the University of Guilan Computer Services.

RESULTS

In the present study, a total of 17,214 individuals of two protozoan and 12 metazoan parasites, including members of the parasite taxa: Nematoda, Cestoda, Digenea, Monogenea, Copepoda and Brachiura were determined (Table 1). The occurrence of *R. acus, I. multifiliis*, *Trichodina* sp., *Silurotaenia siluri*, *A. lucii*, *A. foliaceus* in *S. glanis* has been reported for the first time in Iran.

In the present study, none of the fish were devoid of parasite; two fish (2.33%) were infected with two parasite species; eight fish (9.30%) with three species; 10 fish (11.63%) with four species; 23 fish (26.74%) with five species; 23 fish (26.74%) with six species; 17 fish (19.77%) with seven species and three fish (3.49%) with eight species. Only two fish were infected with less than 20 parasites (2.33%); 22 fish (25.58%) had 20 - 50 parasites; 10 fish (11.63%) had 50 - 100 parasites; 24 fish (27.91%) had 100 - 200 parasites; 15 fish (17.44%) had 200 - 300 parasites and 13 fish (15.12%) had more than 300 parasites.

The eudominant parasites of European catfish (Table 1) were monogeneans and *Trichodina* sp. (D = 66.10% and 14.53%, respectively). The dominant parasite was *I. multifiliis* (D = 7.22%). The subdominant parasites were copepodid stages of *L. cyprinacea* and *R. acus* (D = 3.78% and 3.01%, respectively). The recedent parasites were *E. excisus*, *O. siluri* and *D. spathaceum* (D = 1.87%, 1.23% and 1.22%, respectively) and subrecedent parasites were cestodes (*S. siluri*, *Bothriocephalus* sp. and *P. osculatus*), *A. lucii* and *A. foliaceus* (D = 0.69%, 0.01% and 0.01%, respectively).

The prevalence (P), mean intensity of infection (MI), range and mean abundance (MA) of the parasites are presented in Table 1. As shown in Table 1, monogeneans, *S. vistulensis* and *S. siluri,* had the highest prevalence values (98.84%) in *S. glanis*. The mean intensity of infection and abundance of these parasites (134.42 and 134.42, respectively) were also higher than the others. Prevalence, mean intensity of infection and abundance of *R. acus* (86.05%, 7.00, 6.02, respectively) and *E. excisus* larvae (69.77%, 5.37, 3.74, respectively) were also high. *A. lucii* and *A. foliaceus* had the lowest values of prevalence, mean intensity and abundance in comparison to all parasites (1.16%, 2.00, 0.02 and 1.16%, 1.00, 0.01, respectively).

Table 1. The prevalence, mean intensity, range, abundance and dominance of parasites in *S. glanis*

Parasite	Prevalence (%)	Mean ± SD	Range	Abundance±SD	Dominance (%)
Diplostomum spathaceum N=209	37.21	6.53±11.39	1-59	2.43 ± 7.58	1.22
Trichodina sp. N=2500	16.28	178.57±210.96	50-500	29.07±105.85	14.53
Ichthyophthirius multifiliis N=1241	54.65	26.40±34.08	1-130	14.43±28.35	7.22
*Lernaea cyprinacea** N=651	59.30	12.76±19.42	1-93	7.57±16.17	3.78
Monogeneans** N=11426	98.84	134.42±212.79	4-1756	134.42±212.82	66.10
Raphidascaris acus N=518	86.05	7.00±6.99	1-42	6.02±6.92	3.01
Orientocreadium siluri N=211	60.47	4.06±2.95	1-14	2.45±3.03	1.23
Cestodes*** N=133	37.21	3.72±5.01	1-28	1.38±3.53	0.69
Eusrongylides exisus (larvae) N=322	69.77	5.37±4.65	1-21	3.74±4.60	1.87
Acanthocephalus lucii N=2	1.16	2.00 ± -	2	0.023±0.22	0.01
Argulus foliaceus N=1	1.16	1.00 ± -	1	0.01±0.10	0.01

* Copepodid stage

** Consisting of *Silurodiscoides siluri* and *S. vistulensis*

*** Consisting of *Proteocephalus osculatus*, *Bothriocephalus* sp.and *Silurotaenia siluri*

According to Table 2, the prevalence of parasites in females and males had varying values, but the differences between them were not significant (Z test, $p>0.05$). It was also true for the mean intensity of infection and abundance of these parasites (Mann-Whitney U test, $p>0.05$).

As shown in Table 3, the prevalence of parasites in different localities had varying values, but the differences between them were not significant (Z test, $p>0.05$). It was also true for the mean intensity of infection and abundance of these parasites (Mann-Whitney U test, $p>0.05$).

According to Table 4, the mean intensity and abundance of R. acus in spring was significantly higher than in summer (Mann-Whitney U test, $X^2 = 7.451$, df = 1, $p<0.05$; $X^2 = 6.644$, df = 1, $p<0.05$, respectively). Conversely, the abundance of cestodes (S. siluri, Bothriocephalus sp. and P. osculatus) in summer was significantly higher than in spring (Mann-Whitney U test, $X^2 = 9.586$, df = 1, $p<0.05$).

The prevalence of parasites in different weight groups had varying values, but the differences between them were not significant (Z test, $p>0.05$). It was also true for mean intensity and abundance values (Kruskal-Wallis test, $X^2 = 69.42$, df = 69, $p>0.05$ and $X^2 = 76.26$, df = 79, $p>0.05$ for R. acus; $X^2 = 322.00$, df = 32, $p>0.05$ and $X^2 = 80.55$, df = 79, $p>0.05$ for the cestodes, respectively).

Table 2. The prevalence, mean intensity and range of parasites of *S. glanis* in males and females

Parasite sex	*Diplostomum* Prevalence (%) Mean±SD Range	*Trichodina* Prevalence (%) Mean±SD Range	*Ichthyophthirius* Prevalence (%) Mean±SD Range	*Lernaea** Prevalence (%) Mean±SD Range	Monogeneans** Prevalence (%) Mean±SD Range	*Raphidascaris* Prevalence (%) Mean±SD Range	*Orientocreadium* Prevalence (%) Mean±SD Range	Cestodes*** Prevalence (%) Mean±SD Range	*Eustrongylides* Prevalence (%) Mean±SD Range
Female (N=46)	41.30 8.47±14.40 1-59	15.22 178.60±219.60 50-500	60.87 23.89±35.76 1-130	63.04 8.38±12.64 1-43	100.00 146.24±265.87 6-1756	86.96 7.20±6.04 1-31	58.70 4.37±3.42 1-14	36.95 3.58±2.52 1-9	71.74 5.33±4.69 1-20
Male (N=34)	35.29 3.75±3.19 1-12	17.65 125.00±183.71 50-500	50.00 31.71±33.20 2-100	61.76 19.19±25.39 1-93	97.06 131.88±130.13 4-487	82.35 7.21±8.58 1-42	64.71 3.77±2.43 1-8	52.94 4.19 ±6.72 1-28	76.47 5.46±4.78 1-21

*Copepodid stage

**Consisting of *Silurodiscoides siluri* and *S. vistulensis*

***Consisting of *Proteocephalus osculatus*, *Bothriocephalus* sp. and *Silurotaenia siluri*

The prevalence of parasites in different length groups had varying values, but the differences between them were not significant (Z test, $p>0.05$). It was also true for mean intensity and abundance (Kruskal-Wallis test, $X^2 = 36.55$, $df = 32$, $p>0.05$ and $X^2 = 42.44$, $df = 33$, $p>0.05$ for R. acus; $X^2 = 21.77$, $df = 19$, $p>0.05$ and $X^2 = 34.15$, $df = 33$, $p>0.05$ for the cestodes, respectively).

DISCUSSION

Seven parasite species of European catfish in the Anzali wetland previously reported by Sefidkare-Langeroudi (1965) were not found during the present study. However, 14 other parasite species were found, and six of them (*R. acus, I. multifiliis, Trichodina* sp., *S. siluri, A. lucii* and *A. foliaceus*) were reported for the first time from S. glanis in Iran. Now the list of European catfish parasites in Iran exceeds to 23 species.

Parasites of *S. glanis* have been reported by several authors. Sobecka et al. (2010) reported 18 parasite species from Lake Dabie in Poland, eight species including *D. spathaceum, Trichodina* sp., *S. vistulensis, R. acus, O. siluri, P. osculates, A. lucii, A. foliaceus* were similar to those of the present study. There are also other studies concerning reports of some parasitic infection such as *Pomphorhynchus laevis* and *Sphaerospora siluri* in European catfish from other parts of the world (Ejsymont, 1970; Dezfuli, 1992; Molnar, 1993; Euzet and Pariselle, 1996; Galli et al., 2003) which have never been found in *S. glanis* in natural water bodies of Iran.

Comparing the results of the present study with those of Sefidkare-Langeroudi (1965) showed that the composition of parasite species has been changed over time, while the prevalence, intensity and abundance of parasites have been increased. It may be due to changing environmental conditions such as increasing discharge of effluent, eutrophication and increasing salinity of the wetland because of the upraising of sea water into the wetland. It is also true for the comparison between the Anzali and Amirkelayeh wetland (Khara et al., 2005). The latter water resource receives less quantity of effluent.

In the present study, found in all four of the tissues examined, monogeneans were responsible for the highest prevalence recorded in this study, 98.83% in the gills and on the skin of the sampled fish (Table 1). Intestine necropsies yielded the greatest diversity of parasites with seven taxa represented in this organ.

For the majority of internal parasites, European catfish is the definitive host (digeneans, acanthocephalan and cestodes). *E. excisus* ends its life cycle in water birds and according to Karmanova (1968), *S. glanis* is its paratenic host. *E. excisus* larvae have been reported from all sturgeon species including *Acipenser persicus, A. stellatus, A. nudiventris, A. gueldenstaedtii* and *Huso huso*, some bonyfish species of the Caspian Sea including *Esox lucius*, *Barbus capito, Aspius aspius*, *Neogobius fluviatilis*, *N. melanostomus*, *N. kessleri*, *N. bathybius* and *N. caspius* (Sattari, 1996, 1999; Sattari et al., 2002; Daghigh Roohi and Sattari, 2004). In the present study, *S. glanis* was found to be infected with *E. excisus* larvae. The prevalence (69.77%), mean intensity of infection (MI ± SD = 5.37 ± 4.65) and mean abundance (MA ± SD = 3.74 ± 4.60) of these larvae in *S. glanis* were higher than in the other fish species previously reported.

R. acus was found in European catfish in the larval stage. Numerous species of piscivorous fishes from different families are reported as the hosts of adult *R. acus* (Moravec, 1994), but the principal definitive host of *R. acus* is pike (*E. lucius*), and frequently also brown trout (*Salmo trutta*) (Moravec, 1970). *R. acus* has been previously reported from *E. lucius* in the Anzali wetland (Sattari, 1996). The occurrence of its larvae has also been reported from *Tinca tinca*, *Carassius gibelio* and *Abramis brama orientalis* (Sattari, 1996). The

Table 3. The prevalence, mean intensity and range of parasites of *S. glanis* in different localities

Parasite Locality	*Diplostomum* Prevalence (%) Mean±SD Range	*Trichodina* Prevalence (%) Mean±SD Range	*Ichthyophthirius* Prevalence (%) Mean±SD Range	*Lernaea* * Prevalence (%) Mean±SD Range	Monogeneans* * Prevalence (%) Mean±SD Range	*Raphidascaris* Prevalence (%) Mean±SD Range	*Orientocreadium* Prevalence (%) Mean±SD Range	Cestode* * * Prevalence (%) Mean±SD Range	*Eustrongylides* Prevalence (%) Mean±SD Range
Central Part (N=43)	39.53 5.06±7.64 1-34	18.60 162.50±208.30 50-500	48.84 24.86±27.17 1-100	58.14 10.40±17.68 1-84	97.67 103.90±116.25 4-487	81.40 6.60±4.89 1-19	53.49 3.43±2.37 1-8	34.88 4.73± 6.82 1-28	72.09 6.06± 5.86 1-21
East Part (N=9)	44.44 2.75±2.36 1-6	-	77.78 18.71±23.75 4-69	77.87 3.86±2.73 1-9	100 118.33±106.38 6-331	88.89 8.38±4.10 2-14	66.67 6.00±4.90 2-14	33.33 1.33± 0.58 1	100.00 4.33± 2.83 1-10
West Part (N=30)	36.67 10.18±16.83 1-59	20.00 200.00±232.40 50-500	60.00 32.56±44.40 1-130	63.33 19.16±23.36 1-93	100 193.90±318.51 7-1756	90 7.74±9.81 1-42	73.33 4.32±2.73 1-11	56.67 3.35±2.50 1-9	66.67 4.75±2.83 1-10

* Copepodid stage

* *Consisting of *Silurodiscoides siluri* and *S. vistulensis*

* * *Consisting of *Proteocephalus osculatus*, *Bothriocephalus* sp. and *Silurotaenia siluri*

prevalence of *R. acus* in *E. lucius* was high (84.00%), while its larvae had low prevalence (2.40%) in *C. gibelio* (Sattari, 1996). Moravec (1994) stated that the occurrence of *R. acus* in silurids is rare, but in the present study, the nematode was found in *S. glanis* with higher prevalence (86.05%) and also higher abundance (6.02) and mean intensity (7.00) than in *E. lucius,* which may be due to its predatory behaviour and consuming different fish species serving as intermediate host for *R. acus.*

The occurrence of *D. spathaceum* metacercariae, a digenean trematode, has been reported from several fish species in the southern part of the Caspian Sea: *T. tinca, C. gibelio, Cyprinus carpio*, *A. brama orientalis, E. lucius, Perca fluviatilis* , *Hypophthalmichthys molitrix*, *Vimba vimba persa, Chalcalburnus chalcoides* from the Anzali wetland and *Rutilus rutilus caspius, A. bjoerkna, Scardinius erythrophthalmus* from the Boojagh wetland and *S. glanis* from the Amirkelayeh wetland (Sattari, 1996; Daghigh Roohi, 1997; Sattari et al., 2005; Khara et al., 2005; Khara et al., 2011). In the present study, this parasite was found in the eyes of *S. glanis*, but its prevalence in the Anzali wetland (P = 37.21%, MI ± SD = 6.53 ± 11.39, MA ± SD = 2.43 ± 7.58) was higher than in those of the Amirkelayeh wetland (P = 3.10%, MI ± SD = 4.00 ± 2.80, MA ± SD = 0.10 ± 0.70).

Table 4. The prevalence, mean intensity and range of parasites of *S. glanis* in different seasons

Parasite season	*Diplostomum* Prevalence (%) Mean±SD Range	*Trichodina* Prevalence (%) Mean±SD Range	*Ichthyophthirius* Prevalence (%) Mean±SD Range	*Lernaea* * Prevalence (%) Mean±SD Range	Monogeneans* * Prevalence (%) Mean±SD Range	*Raphidascaris* Prevalence (%) Mean±SD Range	*Orientocreadium* Prevalence (%) Mean±SD Range	Cestodes* * * Prevalence (%) Mean±SD Range	*Eustrongylides* Prevalence (%) Mean±SD Range
spring (N=71)	38.03 7.30±12.27 1-59	19.72 178.6±210.96 50-500	54.93 27.49±34.60 1-130	50.70 10.47±16.66 1-84	98.59 138.80±226.76 6-1756	87.32 7.60±7.18 1-42	60.56 4.12±3.12 1-14	32.39 4.21±6.10 1-28	67.61 4.71±4.06 1-21
summer (N=15)	33.33 2.40±1.34 1-4	-	53.33 21.13±33.10 1-100	100 18.27±24.63 1-93	100 114.00±123.17 6-334	80 3.92±5.09 1-17	60 3.78±2.05 1-7	73.33 2.91±2.30 1-9	80 8.00±6.02 1-18

* Copepodid stage

* * Consisting of *Silurodiscoides siluri* and *S. vistulensis*

* * * Consisting of *Proteocephalus osculatus*, *Bothriocephalus* sp. and *Silurotaenia siluri*

The other digenean trematode, *O. siluri* was also recovered from *S. glanis* with high prevalence (60.47%), mean intensity of infection (MI ± SD = 4.06 ± 2.95) and mean abundance (MA ± SD = 2.45 ± 3.03) which is reported for the first time from fishes of Iran. It was also true for cestodes, *S. siluri*, *Bothriocephalus* sp. and *P. osculatus*. For the former cestode this is also the first report in the fishes of Iran.

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Sažetak

POJAVA I INTENZITET PARAZITA KOD EUROPSKOG SOMA, *Silurus glanis* L., 1758 IZ MOČVARE ANZALI U JUGOZAPADNOM DIJELU KASPIJSKOG JEZERA U IRANU

Močvara Anzali nalazi se u jugozapadnom dijelu Kaspijskog jezera. U razdoblju od travnja do srpnja 2012. godine u tom je području sakupljeno ukupno 86 europskih somova *Silurus glanis* L., 1758. Nakon snimanja biometrijskih karakteristika, korištene su uobičajene metode nekropsije i parazitologije. Kod europskog soma ukupno je otkriveno 17 214 jedinki iz 14 vrsta parazita. Parazitofauna se sastojala od dvije protozoe: *Ichthyophthirius multifiliis* i *Trichodina* sp.; dvije nematode: *Raphidascaris acus* i ličinke *Eustrongylides excisus*; jednog akantocefala: *Acanthocephalus lucii*; tri cestode: *Silurotaenia siluri*, *Proteocephalus osculatus* i ličinke *Bothriocephalus* sp.; dva dvorodna metilja (trematoda): *Orientocreadium siluri* i *Diplostomum spathaceum*; dva jednorodna metilja (trematoda): *Silurodiscoides vistulensis* i *Silurodiscoides siluri*; i dva račića: kopepodni račić *Lernaea cyprinacea* i *Argulus foliaceus*. Pojava *R. acus*, *I. multifiliis*, *Trichodina* sp., *Silurotaenia siluri*, *A. lucii*, *A. foliaceus* u *S. Glanis* prvi je put zabilježena u Iranu.

Ključne riječi: riba, parazit, *Silurus glanis*, Kaspijsko jezero, Anzali, močvarno područje

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