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Prevalence and intensity of metazoan parasites of Mesopotamian spiny eel, *Mastacembelus mastacembelus* (Banks & Solander 1794) according to some parameters of the host, inhabiting in Euphrates-Tigris Basin

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Abstract. This study was conducted to determine seasonal infections of the metazoan parasite fauna of Mesopotamian spiny eel (*Mastacembelus mastacembelus*) inhabiting in Euphrates and Tigris Basin, Eastern Anatolia, Turkey. A total of 122 fish were caught between November 2016 and August 2017 and 4932 parasites were recorded. One species of protozoan parasite (*Ichthyophthirius multifiliis*), two species of Monogenea (*Mastacembelocleidus heteranchorus* and *Diplozoon* sp.), one species of Digenea (*Diplostomum spathaceum*), one species of Cestoda (*Polyonchobothrium magnum*), two species of Nematoda (*Procamallanus viviparous* and *Rhabdochona denudata*), two species of Copepoda (*Eergasilus sieboldi* and *Argulus foliaceus*), one species of Hridunea (*Piscicola geometra*) and one species of Unionidae (*Unio pictorum*) observed respectively. According to their prevalence, *I. multifiliis* (10.66%), *M. heteranchorus* (58.19%), *Diplozoon* sp. (0.1%), *D. spathaceum* (63.93%), *P. magnum* (24.59%), *P. viviparous,* (0.41%), *R. denudata* (9.01%), *E. sieboldi* (14.75%), *A. foliaceus* (3.27%), *P. geometra* (3.3%) and *U. pictorum* (58.19%) were found. All parasite species except *A. foliaceus* in this study are new records. From these parasites, *Diplozoon* sp. and *P. geometra* are the first records for the Mesopotamian spiny eel parasite fauna worldwide.
(mandatory for all types of papers, full-length papers, short notes, correspondence type papers)

Key words: *Mastacembelus mastacembelus,* metazoan parasites, Euphrates, Tigris, Eastern Anatolia.

Introduction

The spiny eels (family Mastacembelidae) include five genera and 74 species known from North Africa, Korea, Malaysia, Iran, Iraq, and Turkey (Moyle and Cech 2004). Mesopotamian spiny eel (*M. mastacembelus*) distributes Tigris and Euphrates rivers basin and known from Turkey (Froese & Pauly 2007, Geldiay & Balık 2009). The species is economically and traditionally important because it is preferred by the people of the region, as food and used for traditional treatment for broken bones (Kaçara et al. 2018).

There are some related researches on the fish at different locations in Turkey, these studies are more relevant to morphology, growth, and ecological aspects of Mesopotamian spiny eel. (Karadede et al. 1997, Kılıç 2002, Şahinöz et al. 2006a, Şahinöz et al. 2006b, Oymak et al. 2009, Gümüş et al. 2010, Pala et al. 2010, Kara et al. 2014). But there was no known previous report about the parasitic fauna of this host fish species except a note in the Atatürk Dam Lake (Öktener & Alaş 2009).

However, there are some studies abroad about genus *Mastacembelus*, they are; spermatological characters of bothriocephalidean cestod Senga found in *Mastacembelus armatus* (Šípková et al. 2011), the revision paper about *Senga rostellarae* sp. nov. and *S. chandrashekhari* sp. nov. in *M. armatus* (Dhole et al. 2011). And the others *Circumoncobothrium template* n. sp. recorded in *M. armatus* (Reddy et al. 2011, Sonune & Kasar 2012). There are some studies of Mastacembelus in neighboring countries such as Iran and Iraq (Kritsky et al. 2004, Jalali et al. 2008, Bashĕ & Abdullah 2010, Pazooki & Masoumian 2012, Jouladeh-Roudbar et al. 2015). There are some data algorithms were published about ectoparasites of Mesopotamian spiny eels (Koyun & Çelik 2020), and the complementary work, aims to describe the helminth parasite fauna of Mesopotamian spiny eels. Accordingly, the purpose of this study is to identify the helminth parasites of *M. mastacembelus* as well as determining its ectoparasite prevalence according to season, fish length, and gender.

Material and Methods

The Tigris–Euphrates River system is a large river system in Western Asia that discharges into the Persian Gulf. The sampling area in this study were located from Tigris River Bismil (37°50′02.94′′N,40°41′52.10′′E) and Lice (38°22′5052′′N,40°41′02.56′′E) Diyarbakır, from Euphrates River Keban Dam (38°51′ 35.57′′ N,38° 56′01.87′′E) Elazığ, from Murat River Genç (38°44′30.81′′N,40°31′06.62′′E) Bingöl cities.

One hundred and twenty-two specimens of *M. mastacembelus* (200-650 mm long) were collected from The Euphrates, Tigris, and Murat Rivers from November 2016 to August 2017. The fish specimens were collected by gill and dip nets and were transported to the laboratory in river water alive. In the laboratory, the fish were measured and examined externally and internally for metazoan parasites. Water quality parameters were recorded on a seasonal basis from November 2016 to August 2017 in the Euphrates and Tigris Basin. These parameters included temperature, dissolved oxygen (DO) and pH. Water temperature and DO were measured using a HANNA HI-9142 oxygen meter, while pH and conductivity were measured using a CRISON PH25 pH meter (Table 5).

The total lengths (mm), weight (g) and sex (after dissection) of the fish were recorded. Parasites were collected from the fins, skin, gills, body cavity, intestines and eyes. For each parasite specimen a complete examination was done. From collected parasites that for Digenea, Cestoda and Crustacea in 4% formaldehyde, for Monogenea, ammonium picrate-glycerin, and for Nematodes, glycerin - alcohol solutions were used for preserving. And recorded parasites were identified using standard identification keys and pictorial guides (Gussev 1985, Fernando et al. 1972, Bychovskaya-Pavlovskaya 1962, Bauer 1985, Pugachev et al. 2009).

Results

A total of 122 (67 females and 55 males) host specimens were collected during the four sampling seasons; spring (n=51), summer (n=45); autumn (n=24) and winter (n=2). Standard lengths of the Mesopotamian spiny eel ranged from 200 to 650 mm total length and all fish specimens were infected (100%) with at least one parasite taxon (Table 2). The main intensity was lower in the spring, autumn than in the summer, respectively. In the winter season, since the fish sampling is very low, a similar density could not be interpreted for mentioned this parasite.

Eleven parasite species were recorded and identified during the present study. The distribution of these parasites and their host location are given in Table 1, whereas Table 4 shows the distribution of parasites in the host fish on a monthly basis. In Table 2 fish length parasite relationship and in Table 3 seasonal parasite distributions of *M. mastacembelus* according to sex and age are given.

One species of protozoan parasite (31 *I. multifiliis*), two species of Monogenea (1432 *M. heteranchorus*, 1 *Diplozoon* sp.), one species of Digenea (538 *D. spathaceum*), one species of Cestoda (85 *P. magnum*), two species of Nematoda (26 *P. viviparous* and 46 *R. denudata*), two species of Copepoda (139 *E. sieboldi* and 18 *A. foliaceus*), one species of Hridunea (20 *P. geometra*) and one species of Unionidae (2596 *U. pictorum*) were found on the gills, lenses of the eye, and in the intestinal tract of *M. mastacembelus* with their infection levels listed in Table 4. The most prevalent and abundant parasite species were the *D. spathaceum* (63.93%) followed by *M. heteranchorus* and the Unionidian *U. pictorum*, (58.19%). The cestode *P. magnum* in 24.59%, *E. sieboldi* in 14.75%, *P. viviparous* 4.09%, *R. denudata* in 9.01%, *P. geometra* in 3.3% and. *A. foliaceus* 3.27% of studied fish were recorded. Among these parasites, *Diplozoon* sp., and *P. geometra* are the first record on Spiny eel (*M. mastacembelus*) and in freshwater fish parasite fauna of the world.

Discussion

This study is the first report on the parasite fauna of the Spiny eel from the Euphrates-Tigris River in relation to the season and host fish characteristics. Mesopotamian spiny eel is an endemic fish that belongs to the Tigris-Euphrates water system, and according to the literature research, no parasitic studies have been found on this host fish in the Euphrates-Tigris River region in Turkey. For this reason, this study was conducted from March 2016 to December 2017 and helminth parasites of the host fish were tried to be detected. During the study 122 spiny eel were examined, endo and ectoparasites were found in 100% of them in different taxa. Among these parasites, *M. heteranchorus*, *U. pictorum*, *E. siaboldi* and *D. spathaceum* were found to be more common than other taxa detected, and the rest of recorded parasites were found to have lower rates of infection and intensity. Except for *A. foliaceus* all recorded parasite species are new records for *M. mastacembelus* in Turkey. From these recorded parasites, *U. pictorum* and *M. heteranchorus* 58.19%, *I. multifiliis* 10.66%, *E. siaboldi* 14.75% in gill lamellas, *D. spathaceum* 63.93% in the lenses, *P. magnum* 24.59%, *R. denudata* 9.01%, *P. magnum* 24.59% and *P. viviparous* 4.09%, were found in the intestines (Table 1).

In this study, recorded *M. heteranchorus*, and *P. viviparous* species are characteristics for *Mastacembelus* genera, so has not found any record of other freshwater fish in Turkey. However, recorded some parasite species in this study (*Diplozoon* sp., *D. spathaceum, P. magnum P. geometra, R. denudata*, *E. siaboldi, A. foliaceus, I. multifiliis, and U. pictorum*) are given in freshwater fish in Turkey (Soylu & Emre 2005, Öztürk 2011).

Mastacembelocleidus heteranchorus (Kulkarni, 1969)

M. heteranchorus, a monogeneous parasite was first identified on *Mastacembelus armatus,* in India (Kritsky et al. (2004) but later it was also found in *M. mastacembelus* in Iraq. The aforementioned parasite was recorded in this study in 71 (58.19%) of 122 fish in different seasons during the study period. 479 individuals' parasites were found in 20 fish in spring, 362 individuals in 26 fish in summer, 578 individuals in 24 fish in autumn, and 13 parasites in only one fish in winter. As can be understood from these data, this parasite was detected in the fish samples caught in all seasons depending on the effects of seasonal conditions (Table 5). According to the distribution of *M. heteranchorus* depending on the length of the fish, the highest parasite number was observed in the hosts of 401-500 mm length, while this parasite was least observed in fish of 200-300 and >601 mm length. According to this data, it can be said that parasite is more common in host fish between 300-600 mm (Table 2). When occurrences of *M. heteranchorus* analyzed by sex, it was recorded in 46.48% of females and 53.52% of male hosts in 33 out of 71 hosts throughout the year. With the study of the parasites in *M. mastacembelus* at the Euphrates and Tigris rivers within the borders of Iraq (Bashě & Abdullah 2010) our study partially overlaps with the finding of *M. heteranchorus.*

Piscicola geometra (Linnaeus, 1761)

P. geometra, a Hrudian parasite, shows a cosmopolitan distribution in freshwater fish and it is a new record for *M. mastacembelus*. It is reported that they adhere to many water creatures in order to be fed in the environment they live in (Koyun et al. 2015a). During this study, this parasite species was recorded only in four fish caught from the Tigris River in the spring. *P. geometra* was reported from ten freshwater fish species in Turkey but has not previously been reported from this host fish (*M. mastacembelus*) (Karatoy & Soylu 2006, Öktener et al. 2007, Akbeniz & Soylu 2008, Aslan & Emiroğlu 2011).

Procamallanus viviparous Ali, 1956

This parasite was recorded from the intestine of 26 specimens of this host, with prevalence of infection 4.09% and the mean intensity was 1.08. The first report of *P. viviparous* was from Iraq in some freshwater fishes including *M. mastacembelus* but there are no records from Turkey freshwater fishes. (Bashě & Abdullah 2010, Shwani & Abdullah 2010). Hence *M. mastacembelus* on this study is considered as a new host record for this parasite in Turkey. *P. viviparous* was only recorded in the intestine of *M. mastacembelus* from Tigris River at Lice –Diyarbakır vicinity in autumn.

Table 1. The distribution of the parasites recorded in different organs of *M. mastacembelus*. EFN: Examined fish number, IFN: Infected fish number, Prev. (%): Prevalence, MI: Mean intensity, M-M P N: Number of minimum-maximum parasites, SI: Site of infection, NTP: Total number of parasites.

Recorded Parasites	EFN/IFN	Prev (%)	MI	M-M P N	SI	NTP
M. heteranchorus	122/71	58.19	11.74	1-329	Gills	1432
P. geometra	122/4	3.30	0.16	1-15	Skin	20
Diplozoon sp.	122/1	0.10	0.0	1	Gills	1
P. viviparous	122/5	4.09	0.21	5-11	Intestine	26
R. denudata	122/8	9.01	0.38	2-4	Intestine	46
P. magnum	122/30	24.59	0.70	1-10	Intestine	85
U. pictorum	122/71	58.19	21.28	1-189	Gills	2596
D. spathaceum	122/78	63.93	4.41	1-42	Eye lens	538
E. siaboldi	122/18	14.75	1.14	3-16	Gills	139
A. foliaceus	122/4	3.27	0.15	1-15	Gills, opercula and skin	18
I. multifiliis	122/13	10.66	0.25	1-8	Gills	31
Totally	-	-	40.42	-	-	4932

Table 2. Fish length parasite relationship of *M. mastacembelus*. FLG: Fish length groups EFN: Examined fish number, IFN: Infected fish number, (1) *M. heteranchorus,* (2) *P. geometra,* (3) *Diplozoon* sp., (4) *P. viviparous,* (5) *R. Denudate,* (6) *P. magnum,* (7) *U. pictorum*, (8) *D. spathaceum,* (9) *E. siaboldi,* (10) *A. foliaceus*, (11) *I. multifiliis,* (12) Total parasite.

FLG (mm)	EFN	IFN	1	2	3	4	5	6	7	8	9	10	11	12	M: Male, F: Female
200-300	14	14	(3)27	(3) 8	0	0	(5)33	(1)1	(9)75	(9)75	0	0	(3)6	16	M:3, F:11
301-400	24	24	(19) 152	0	0	0	(2)9	(6)7	(18)623	(20)78	(2)17	(1)15	(4)6	912	M: 15, F: 19
401-500	43	43	(27) 701	(1) 2	(1)1	(3)17	(1)4	(10)18	(29)1246	(28)155	(3)17	(2)2	(3)15	2178	M: 17, F:26
501-600	22	22	(16) 527	0	0	4	0	(8)33	(13)479	(19)169	(7)63	0	(1)1	1276	M: 11, F:11
>601	9	9	(6) 25	0	0	0	0	(5)26	(2)173	(7)131	(6)42	(1)1	(2)3	401	M: 9, F: 0
Overall	122	122	(71) 1432	(4) 20	(1)1	(5) 26	(8)46	(30)85	(71)2596	(78)538	(18)139	(4)18	(13)31	4932	M: 55, F:67

Table 3. Seasonal parasite distributions of *M. mastacembelus* according to sex and age. (1) *M. heteranchorus,* (2) *P. geometra,* (3) *Diplozoon* sp., (4) *P. viviparous,* (5) *R. Denudate,* (6) *P. magnum,* (7) *Unio pictorum*, (8) *D. spathaceum,* (9) *E. siaboldi,* (10) *A. foliaceus*, (11) *I. Multifiliis,* (12) Total parasite.

Season-♀/♂	Recorded parasites																						
	1		2		3.		4		5		6		7		8		9		10		11		12
	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	
Spring-32/19	(8)118	(12)361	(4)20	0	0	(1)1	0	0	0	0	(1)1	(3)12	(32)1154	(17)685	(21)88	(15)69	0	(1)2	0	0	0	0	2511
Summer-23/22	(14)258	(12)104	0	0	0	0	0	0	(7)42	0	(7)22	(13)40	(11)134	(8)527	(19)118	(19)249	(6)53	(11)84	(2)16	(2)2	(7)11	(5)17	1677
Autumn-11/13	(11)293	(13)285	0	0	0	0	(2)15	(3)11	(1)4	0	(2)4	(3)5	(1)40	(1)35	(1)5	(2)8	0	0	0	0	(1)3	0	708
Winter-1/1	0	(1)13	0	0	0	0	0	0	0	0	0	(1)1	(1)21	0	(1)1	0	0	0	0	0	0	0	36
Totally	(33)669	(38)763	(4)20	0	0	(1)1	(2)15	(3)11	(8)46	0	(10)27	(20)58	(45)1349	(26)1247	(42)212	(36)326	(6)53	(2)86	(2)16	(2)2	(8)14	(5)17	4932
Rate of %	46.48	53.52	-	-	-	-	42.30	57.70	-	-	31.76	68.24	51.96	48.04	39.41	60.59	38.13	61.87	88.89	11.11	45.16	54.84	

Table 4. Prevalence and mean intensity of infestation with metazoan parasites of Spiny eel from different seasons. I F N.: Infected fish number, Prev. (%): Prevalence M N P : Mean number of parasites, MI: Mean intensity, M-M P N: Number of minimum-maximum parasites, N T P: Total number of parasites.

Recorded Parasites		I F N	Prev. (%)	M N P	M I	M -M P N	N T P
Spring (n:51/50)	*M. heteranchorus*	20	40	23.95	9.39	1-329	479
	P. geometra	4	8	5	0.39	1-15	20
	Diplozoon sp.	1	2	1	1	1	1
	P. viviparous	0	0	0	0	0	0
	R. denudata	0	0	0	0	0	0
	P. magnum	4	8	3.25	0.25	1-10	13
	U. pictorum	49	98	37.53	36.02	5-189	1839
	D. spathaceum	36	72	4.36	3.08	1-6	157
	E. siaboldi	1	2	2	3	3	2
	A. foliaceus	0	0	0	0	0	0
	I. multifiliis	0	0	0	0	0	0
Summer (n:45/45)	*M. heteranchorus*	26	57.7	13.92	8.04	1-146	362
	P. geometra	0	0	0	0	0	0
	Diplozoon sp.	0	0	0	0	0	0
	P. viviparous	0	0	0	0	0	0
	R. denudata	7	15.55	6	0.93	3-11	42
	P. magnum	20	44.44	3.1	1.38	1-10	62
	U. pictorum	19	42.22	34.78	14.69	1-163	661
	D. spathaceum	38	84.44	9.66	8.16	1-42	367
	E. siaboldi	17	37.77	8.06	3.04	3-16	137
	A. foliaceus	4	8.88	4.5	0.4	1-15	18
	I. multifiliis	12	26.66	2.33	0.62	1-8	28
Autumn (n:24/24)	*M. heteranchorus*	24	100	24.08	24.08	2-100	578
	P. geometra	0	0	0	0	0	0
	Diplozoon sp.	0	0	0	0	0	0
	P. viviparous	5	20.83	5.2	1.08	5-11	26
	R. denudata	1	4.16	4	0.16	2-4	4
	P. magnum	5	20.83	1.8	0.38	1-3	9
	U. pictorum	2	8.33	37.5	3.13	35-40	75
	D. spathaceum	3	12.5	4.33	0.54	3-6	13
	E. siaboldi	0	0	0	0	0	0
	A. foliaceus	0	0	0	0	0	0
	I. multifiliis	1	4.16	3	0.13	3	3
Winter (n:2/2)	*M. heteranchorus*	1	50	13	6.5	13	13
	P. geometra	0	0	0	0	0	0
	Diplozoon sp.	0	0	0	0	0	0
	P. viviparous	0	0	0	0	0	0
	R. denudata	0	0	0	0	0	0
	P. magnum	1	50	1	0.5	1	1
	U. pictorum	1	50	21	10.5	21	21
	D. spathaceum	1	50	1	0,5	1	1
	E. siaboldi	0	0	0	0	0	0
	A. foliaceus	0	0	0	0	0	0
	I. multifiliis	0	0	0	0	0	0
							4932

Table 5. Some water parameters measured during the seasonal period at the workstations.

	Tigris River/Diyarbakır			Keban Dam/Elazığ			Murat River/Bingöl		
Seasons	pH	^{0}C	DO	pH	^{0}C	DO	pH	^{0}C	DO
Spring	7.79	17.5	7.12	8.30	13.00	8.36	8.40	13.60	9.40
Summer	7.95	25.5	6.63	8.60	22.70	7.83	8.60	22.00	8.20
Autumn	7.68	18.8	7.75	8.40	15.30	8.26	8.25	12.10	8.60
Winter	8.25	5.93	8.94	8.20	6.33	9.00	8.20	5.30	8.90

Rhabdochona denudata (Dujardin, 1845) Railliet, 1916
Rhabdochona genus has 54 species, mostly found in Percidae, Salmonidae, Siluridae, and Gobitidae family fishes. In same study *R. denudata* was reported a variety of freshwater fishes in Czechoslovakia (Moravec 1989). Also, this parasite given from some freshwater fish at different locations in Turkey (Aydogdu et al. 2001, Karatoy & Soylu 2006; Koyun et al. 2005b). This study is the first record for *R. denudata* in *M. mastacembelus* and 46 individuals of *R. denudata* has recorded during summer and autumn in this host. With our findings, Aydoğdu et al. (2001) study coincides largely with the findings of *L. cephalus* in spring and autumn.

Polyonchobothrium magnum (Zméev, 1936)
P. magnum was reported from the intestine and was counted in minimum one and maximum ten specimens per fish with the infection prevalence of 24.59 %. Some of recoded specimens were in juvenile stage and some of them adult stages. The genital structure of proglottis was seen clearly in adult. Identification of species was based on the characteristic shape and dimensions of the scolex. There were 54 hooks on the scolex of *P. magnum* caught from Tigris River fishes, and 62 hooks from Euphrates River (Figs 1-2). In the study of Soylu and Emre (2005) *P. magnum* is the first records from *Clarias lazera* for Turkey but after that there wasn't any data until this study. So, this study is the first record from *M. mastecembellus*.

Unio pictorum (Linnaeus, 1758)
U. pictorum was reported as a glochidia larvae from the gills of numerous fish species from the Euphrates River in Iraq, one of the mentioned fishes *M. mastacembelus* (Mhaisen et al. 2015, Ali et al. 1987). There are numerous studies relating to *U. pictorum* recoded from the Euphrates but there is no recorded study of inland water fish of Turkey. So, the present study represents new host records for *U. pictorum* on *M. mastacembelus* in Turkey. According to the distribution of *U. pictorum* depending on the seasons were recorded in this study in 71 (58.19%) of 122 fish in different seasons during the study period. 1839 individuals' parasites were found in 49 fish in spring, 661 individuals in 19 fish in summer, 75 individuals in 2 fish in autumn, and 21 parasites in only one fish in winter. As can be understood from these data, this parasite was detected in the fish samples caught in all seasons depending on the effects of seasonal conditions (Table 5).

When the distribution of *U. pictorum* parasite according to the length of these host fish studied; the highest number of *U. pictorum* was observed in the hosts of 401-500 mm length (1246 specimens), while this parasite was least observed in fish of 200-300 mm length. According to this data, it can be said that parasite is more common in host fish between 301 to >600 mm (Table 2). And the occurrences of *U. pictorum* analyzed by sex, it was recorded in 63.38% 45out of 71 hosts of female and 36.62% of the male host in 26 out of 71 hosts throughout the year.

Diplostomum spathaceum (Rudolphi, 1819) Olsson, 1876
This metacercariae was founded from the eye lens with a prevalence of 63.98% and mean intensity 4.41 (Table 1). The first record of *D. spathaceum* in Turkey was done by Soylu (1990) from the eye lens of *R. rutilus, Scardinius erythrophthalmus, Blicca bjoerkna, Esox lucius, Silurus glanis, Tinca tinca*. After that, it was recorded in several fish host species excluding *M. mastacembelus*. In this study *D. spathaceum* was observed in all seasons of the year in the examined in 78 of the 122 examined host fish. During the summer in 38 of the 45 fish examined, the highest density was recorded in the summer season with a prevalence of 84.44% and the main intensity of 8.16%. The main intensity was lower in the spring, autumn than in the summer, respectively. In the winter season, since the fish sampling is very low, a similar density could not be interpreted for mentioned this parasite.

According to the distribution of *D. spathaceum* depending on the length of the fish, the highest parasite number was observed in the hosts of 501-600 mm length, while this parasite was least observed in fish of 200-300 mm and 301-400

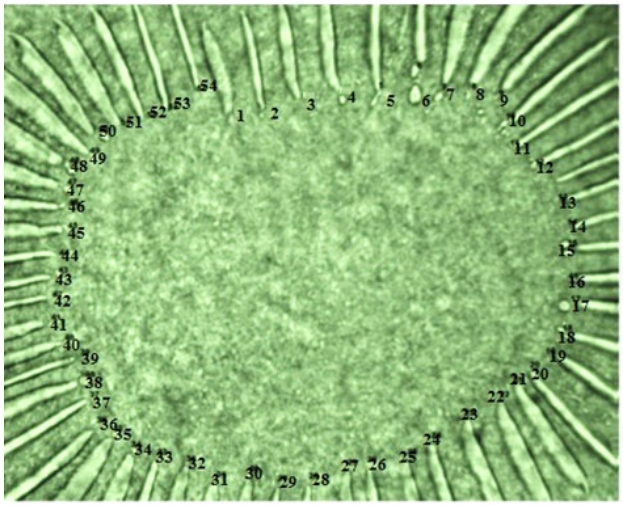

Figure 1. The scolex of *P. magnum* has 54 hooks caught from Tigris River fishes.

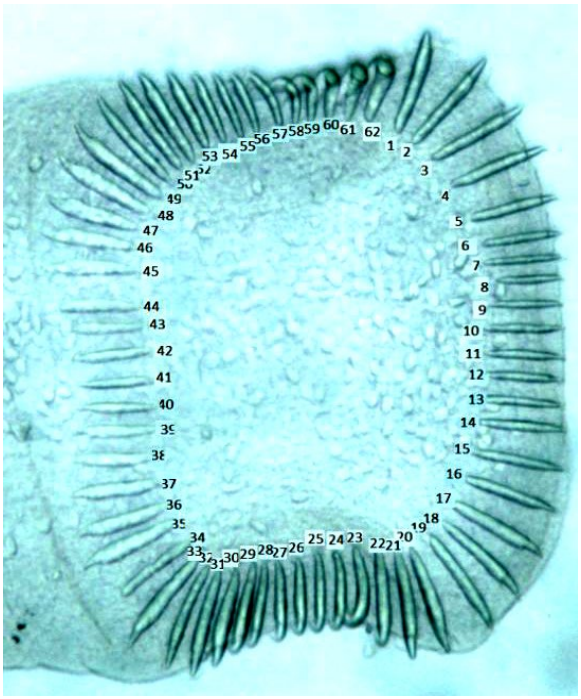

Figure 2. The scolex of *P. magnum* has 62 hooks caught from Euphrates River fishes.

mm length. According to this data, it can be said that this parasite species is more common in host fish between 400-600 mm (Table 2). When the occurrences of *D. spathaceum* analyzed by sex, it was recorded in 53.84% of female in 42 and 46.16% of male host in 36 out of 78 hosts throughout the year. With the study of the parasites in *D. spathaceum* at the Euphrates and Tigris rivers within the borders of Iraq (Bashě & Abdullah 2010), our study partially overlaps with work done about the finding of *D. spathaceum* in Iraq.

Eergasilus siaboldi Nordmann, 1832 and *Argulus foliaceus* L., 1758

E. sieboldi can be seen distributed on a wide range of freshwater fishes but sometimes this copepodit shows cosmopolitan distribution as a free form. We encountered, copepodit parasites *E. siaboldi* and *Argulus foliaceus*, in this study. *E. sieboldi* was first described by Nordmann in 1832 infecting various freshwater fish in Europe and is the type species of the genus *Ergasilus.* In fish, injury, weakening of the gills primarily causes the entry of other disease agents from the injured gills. It causes necrosis of epithelial lesions by attaching to the gills with its hooks.

Another copepodit parasite *A. foliaceus*, is known as a cosmopolitan parasite (Poly 2008, Møller 2009). This parasite has generally been seen in freshwater fish and sometimes on amphibians (Kennedy, 1974; Fryer, 1982). *A. foliaceus* related to the presence of freshwater fish, there are many records in Turkey (Sarieyyüpoglu & Saglam 1991, Tokşen 2006). One of these studies is reported from the *M. mastacembelus* at Atatürk Dam Lake (Öktener & Alaş 2009). This parasite is mostly seen in stagnant waters such as lakes and dams. In our study, the presence of fish caught only from the Keban dam also supports this situation. In our study, it was both local and rare only recorded information was given.

Ichthyophthirius multifiliis

I. multifiliis a protozoan parasitic ciliate is seen on freshwater fish gills and skin causes white spot disease (Davis et al. 2002, Clark et al. 1995). This disease is effective in fisheries environments and aquarium fish on the gills and skin and causes economic losses (He et al. 1997, Piazza et al. 2006). *I. multifiliis* is seen intensively in the summer months when the temperature increases, but its effect decreases as the temperature decreases (Davis et al. 2002). It is a compulsory parasite to complete their life cycle (Dickerson 1985, Ewing & Kocan 1992).

On some freshwater fishes such as *Alburnus caeruleus, Alburnus orontis, Alburnus sellal, Barbus grypus, Carasobarbus luteus, Chondrostoma regium, Coptodon zilli, Cyprinion kais, Cyprinion macrostomum, Garra rufa, Glyptothorax steindachneri, Leucis vorax, Liza abu* and *Mystus pelusius*, while the presence of *I. multifiliis* has been reported but from *M. mastacembelus* no record was found in Turkey. Given in some study about *I. multifiliis* in *Oncorhynchus mykiss* from a fisheries environment in the Eastern Black Sea (Ogut et al. 2005).

In this study, the prevalence and quantitative of metazoan parasites changes in eleven endo and ectoparasites of Mesopotamian spiny eel *(M. mastacembelus*) from the Tigris-Euphrates water system have been described. Among the recorded parasites in this study except for A. foliaceus are new records for Mesopotamian spiny eel and in freshwater fish parasite fauna of Turkey.

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