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Crustacean Parasites of Fresh and Brackish (Caspian Sea) Water Fishes of Iran

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ABSTRACT

This paper presents a total of 11 known crustacean parasite species from 51 host species belonging to 7 families, with 17 genera reported from cultured and wild fishes in three faunal regions of Iran. Among them, one belonging to Branchiura order, namely *Argulus foliaceus*, was found on *Capoeta capoeta* in Makoo Reservoir as well as on *Cyprinus carpio*, *Chalcalburnus* sp., *Hypophthalmichthys molitrix* and *Mastacembelus mastacembelus* in Zarivar Lake. The other 10 species belonging to Copepoda order include 1) *Ergasilus sieboldi*, found on the gills of 2) *Barbus sharpeyi*, *B. luteus*, *Aspius vorax* and *Cyprinus carpio*; 3) *E. peregrinus* on *Ctenopharyngodon idella* and *Leuciscus cephalus* in Khandaqloo Reservoir; 4) *Lamproglena compacta* and 5) *L. polchella* on the gills of infected fish species inhabiting Tigris, Caspian and Oriental Regions of Iran. 6) *Tracheliastes longicollis* on the fins of *Capoeta capoeta* and *Leuciscus cephalus*; 7) *T. polycolpus* on the fins of *Capoeta trutta*, *C. capoeta* and *Leuciscus cephalus* in water bodies situated in Azerbaijan Province (Caspian Region) and Kurdistan Province (Tigris Region), 8) *Achtheres percarum* on the skin and fins of *Sander lucioperca* and *Perca fluviatilis* in Anzali Lagoon and Sefid-rud River in North of Iran (Caspian Region); 9) *Pseudotracheliastes stellatus* on the skin of acipenserids in Caspian Sea and finally 10) the most economically significant parasite, *Lernaea cyprinacea*, which is commonly found on cultured cyprinids in ponds and natural water bodies. Furthermore, several unknown crustacean species belong to both orders identified to genus level, which need further study for a detailed description. Geographical distribution as well as host ranges of the mentioned parasites are presented and discussed.

Keywords: Crustacean, Freshwater fishes, Iran, Parasite.

INTRODUCTION

The objective of this review is to introduce crustacean parasite fauna of both cultured and wild freshwater fishes of Iran, southern Caspian Sea included. Host range, geographical distribution and economical importance of crustacean parasites of fishes in these water bodies of Iran are also presented and discussed.

Of the 26 families of fishes reported from inland waters, Iran, 17 families are presented by a single species and from the remainder only Cyprinidae, Balitoridae and Gobiidae bear more than 10 species.

Iranian freshwater ichthyofauna include both native and exotic (acclimatized) resident and/or anadromous fishes. The systematic existing diversity of native freshwater fishes in Iran is comprised of 169 species from 90 genera and 26 families. The Cyprinidae (Carp and carp-like taxon) with 37 genera and 82 species, bears the comparatively largest biodiversity, followed by Balitoridae (Hillstream loaches) with 1 genus and 21 species. With regard to exotic fishes, at least twenty nine species of fish have been introduced into Iran from other

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countries and perhaps twelve have become established and are now ineradicable (Coad, 1996e and Coad, 1996g). The most widespread exotic fish are common carp and Chinese carp which presently account for most of the fish meat production in Iran.

The common carp (*Cyprinus carpio*) is the main fish of Iranian carp farms but introduced Chinese carp (Grass carp, Silver carp, Big head carp) are also raised in polyculture. Herbivorous fishes were first imported from the Soviet Union and placed into Anzali Lagoon (Caspian water system) in 1971. Later on, between 1982 and 1984 millions of larvae of common carp as well as Chinese carp were brought in from Romania and in 1987, 800 breeders of the same species were imported from Hungary (Jalali & Molnar, 1990a).

Crustacean parasites from Iranian fishes were first recorded by Mokhayer (1985) as: *Pseudotracheliastes stellatus* on the skin and fins of acipenserids in the Caspian Sea; *Lernaea cyprinacea* on the eyes, ventral and caudal fins of mosquito fish, *Gambusia* sp.; others on cyprinids from cultured fish farms situated in Caspian Basin; *Lamproglena polchella* on *Barbus brachycephalus* and *Achtheres percarum* on the gills of *Sander lucioperca*. Following a brief study of crustacean parasites, Jalali (1987) reviewed the literature on cultured fishes of Iran. Attempts to identify economically important parasites were followed up by Molnar and Baska (1993), who reported *Caligus sp*. on the fins of *Liza abu* and were continued by Sharif Rohani (1994); Jalali (1998); Asadzadeh Manjili *et al*. (2000); Barzegar and Jalali (2000); Mirhashemi Nasab and Pazooki (2003); Pazooki *et al.* (2005), Barzegar *et al* (2004); Jalali & Barzegar (2005); and Jalali & Barzegar (2006). These reports cover several crustacean parasite species of genera *Lernaea*, *Lamproglena*, *Ergasilus*, *Tracheliastes*, and *Argulus spp*. from various freshwater fishes of Iran.

Of the neighboring countries, the former Soviet Union has crustacean parasitic infections of both cultured and wild freshwater fishes studied by Mikhailov (1975) in Azarbijan; Osmanova (1971) in Uzbakistan and, Izyumova (1987) as well as Gussev (1985) in Russia. These report several crustacean parasite species causing dangerous diseases and mortality in cultured fishes. As to the west of Iran, Oktener (2003) reports on ten species belonging to 5 genera of crustacean parasites on 17 endemic fish species in Turkey.

MATERALS AND METHODS

Collection of data for preparation of the present review primarily originated from fish health studies in different natural and man made lakes during comprehensive studies of freshwater bodies including Hamoon Lagoon, Kaftar Lake, Zarivar Lake and Vahdat Reservoir (Sharif Rohani, 1994; Barzegar & Jalali, 2000 and Jalali & Barzegar, 2006) in Iran (Figure 1). Further data was gathered from related papers published in reliable scientific research journals and creditable research work of fisheries research organizations or universities of Iran. Crustacean parasites from our research work (see tables) are referred to as present work. Those not published yet were collected recently from various locations on examined fish including skin, fins, gills and buccal cavity, fixed according to Fernando *et al* (1972).

Identification of parasite specimens was carried out in accordance with the keys presented by Gussev (1987) and the host species were identified with the help of Dr J. Holcik.

The geographical abbreviations are: Ri, River; Lag, Lagoon; La, Lake; and Res, Reservoir.

RESULTS

The majority of parasite species reviewed in the present study belong to Copepoda and only three species were recorded from Branchiura (Tables 1 to 8). Host families, genera and species of crustacean parasites in Iranian

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Figure 1. Twenty six ecological basins of Iran (Armentrout 1981).

freshwaters as well as in Caspian Sea are shown in table 9. These parasites have been collected from several host fishes in different rivers and lakes from all the three ecological regions of Iran (Figure 1).

In addition to the known species, several unknown ones were found on fishes in some areas of Iran which require further study for precise identification.

DISCUSSION

The crustacean parasites of freshwater fishes in Iran comprise species belonging to Copepoda and Branchiura; Copepoda with 8 species (72.7%) from 39 fish hosts and the rest Branchiura (27.3%) from 12 fish hosts (Table 9). On the generic level, collected data shows *Lernaea* spp. with 26 fish hosts in three regions of Iran, bears the largest host ranges and *Caligus lacustris*, with one host, has the least host range among crustacean parasites in freshwater fishes of Iran.

Notably, *Lernaea cyprinacea* possesses the widest host range and is found on the skin and fins of 14 cultured as well as on wild fish species from 13 genera and 4 families living in both ponds and natural water bodies, lakes and reservoirs (Table 9). Other species of *Lernaea* differ from *L. cyprinacea* in shape and size of dorsal and ventral branches of holdfast (Table 1-2), and few have been identified to genus level. In view of economic importance, *Lernaea cyprinacea*, as a parasite of cyprinid cultured fishes, is the most harmful species and has endangered the success of market fish production in Iran during the last three decades or more (Jazebizadeh, 1983; Mokhayer, 1985; Jalali, 1998 and Jalali & Barzegar, 2005).

Lerneasis is not only seen as epizootic in the natural ecosystem of lakes and reservoirs. These water resources are occasionally utilized also for fish culture. The most important report was carried out on the Zarivar Lake in the west part of Iran, showing heavy parasitic infesta-

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Table 1. *Lernaea* spp. on the freshwater fishes of Iran.

1-1: *Lernaea* spp.

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Abramis brama*	Skin & Fin	North of Iran	Caspian	Jalali (1998)
2	*Acanthalburnus urmianus*	Skin & Fin	Mahabad Res	Uromia	Mirhashemi Nasab & Pazook (2003)
3	*Aristichthys nobilis*	Skin & Fin	North of Iran & Khuzestan	Caspian & Karoon	Jalali (1998)
4	*Aspius vorax**	Gill	Karoon Ri	Karoon	Molnar & Baska (1993)
5	*Blicca bejoerkna*	Skin & Fin	Boojagh Lag	Caspian	Khara et al (2004)
6	*Barbus* sp.*	Skin & Fin	Doghab Ri	Caspian	Mokhayer (1985)
7	*Barbus lacerta**	Gill	Vahdat Res	Tigris	Jalali & Barzegar (2005)
			Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
8	*Barbus luteus*	Gill	Karoon Ri	Karoon	Molnar & Baska (1993)
		Gill	Zarineh-rud Ri	Uromia	Jalali (1998)
9	*Capoeta capoeta**	Gill	Doghab Ri	Caspian	Mokhayer (1985
		Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
10	*Capoeta trutta**	Gill	Vahdat Res	Tigris	Jalali & Barzegar (2005)
11	*Carassius* sp.*	Gill	Anzali Lag	Caspian	Asadzadeh Mangili et al (2000)
12	*Carassius auratus gibelio**	Gill	Anzali Lag	Caspian	Jalali (1998)
13	*Carassius carassius*	Skin & Fin	All regions of Iran	All basins	Jalali (1998) Jalali (1998) Sharif Rohani (1994)
14	*Ctenopharyngodon idella*	Skin & Fin	North of Iran & Khuzestan	Caspian & Karoon	Jalali (1998)
		Gill	Sefid-rud Ri	Caspian	Naem, et al (2000)
		Skin	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
		Skin & Fin	All region of Iran	All basins	Jalali (1998)
		Gill	Sefid-rud Ri	Caspian	Naem, et al (2000)
		Gill	Zarineh-rud Ri	Uromia	Jalali (1998)
15	*Cyprinus carpio**	Gill	Anzali Lag	Caspian	Asadzadeh Mangili et al (2000)
		Skin & Fin & Eye	Hamoon Lag	Sistan	Sharif Rohani (1994)
		Skin & Fin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
		Gill	Zarivar La	Tigris	Jalali & Barzegar (2006)
16	*Esox lucius**	Gill	Anzali Lag	Caspian	Asadzadeh Mangili et al (2000)
17	*Gambusia affinis*	Fin	Fish pond in north of Iran	Caspian	Mokhayer (1985
18	*Hypophthalmichthys molitrix**	Gill	All area of Iran	All basins	Jalali (1998)
			Anzali Lag	Caspian	Asadzadeh Mangili et al(2000) Sharif Rohani (1994)
19	*Leuciscus cephalus**	Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
			Khandaghloo Ri	Caspian	Pazooki, et al (2005)
20	*Mastacembelus mastacembelus**	Gill	Zarivar La	Tigris	Jalali et al., 2008
21	*Oncorhynchus mykiss*	Skin	Sistan Chah nimeh	Sistan	Sharif Rohani (1994)
22	*Rutilus rutilus*	Skin	Boojagh Lag	Caspian	Khara et al (2004)
23	*Schizocypris altidorsalis*	Skin	Hamoon Lag	Sistan	Sharif Rohani (1994)
24	*Schizothorax zarudnyi*	Skin	Hamoon Lag	Sistan	Sharif Rohani (1994)
25	*Silurus glanis**	Gill	Zarineh-rud Ri	Uromia	Jalali, 1998
26	*Tinca tinca**	Gill	Anzali Lag	Caspian	Asadzadeh Mangili et al (2000)

* *Lernaea* spp. which can only be found on gills

tion and pointing out to huge losses in the fish population of this lake to the extent that a substantial number of fish were unstable. Infestation likely resulted from a transfer of common carp fingerlings to the lake, with hybernating forms of parasites on them.

In epizootiological studies carried out by authors on 1094 silver carp fingerling

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Table 1 Continued.

1-2: *Lernaea cyprinacea* Linnaeus, 1758

No	Host(s)	Microenvironment(s)	Locality(ies)	Regions	Reference(s)
1	*Aphanius vladykovi*	Skin	Behesht abad Ri	Karoon	Barzegar et al (2004)
2	*Aristichthys nobilis*	Skin	Ponds in the north of country	Caspian	Jalali (1998)
3	*Capoeta aculeata*	Skin & Fin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
4	*Capoeta damascina*	Fin	Behesht abad Ri	Karoon	Barzegar et al (2004)
		Fin	Chaghakhour Lag	Tigris	Fadaei fard et al (2001)
		Skin & Fin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
5	*Ctenopharyngodon idella*	Skin	Hamoon Lag	Sistan	Molnar & Baska (1993)
		Skin	Zarivar La	Tigris	Molnar (1990)
		Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)
6	*Cyprinus carpio*	Gill & Skin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
		Skin	Vahdat Res	Tigris	Present study
7	*Chalcalburnus mossulensis*	Skin & Fin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
8	*Chondrostoma regium*	Skin & Fin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
9	*Gobio* sp.	Skin	Hamoon Lag	Sistan	Molnar (1990)
10	*Hypophthalmichthys molitrix*	Skin	Ponds in the north of country	Caspian	Jalali (1998)
11	*Leuciscus persidis*	Skin & Fin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
12	*Mastacembelus mastacembelus*	Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)
13	*Pseudorasbora parva*	Skin & Fin	Kaftar La	Neyriz	Barzegar & Jalali (2000)
14	*Schizothorax* sp.	Skin	Hamoon Lag	Sistan	Molnar (1990)

specimens from Raja-ii Fish Farm (Caspian Basin), the prevalence rate of lerneasis was about 47%, with up to 15 parasite specimens having been found on some of them, resulting in an average weight of an infested fish at 26-31 percent lower than that of a healthy one.

In several cases the heads of the parasitized specimens penetrated into the body cavity and embedded itself into the liver in silver carp fingerlings (Jalali, 1987).

In spite of fish health control efforts, between the years 1980 and 1982 a heavy infestation of lerneasis occurred among common and Chinese carp fingerlings. Hibernated forms of parasite were transmitted to natural lakes, reservoirs and other private fish farms, giving rise to a severe case of epizootic infestation in the above mentioned water bodies (Jalali, 1998 and Jalali & Barzegar, 2006). The appearance of heavy lerneasis infestation in fish ponds happened in the early stages of polyculture in Iran, with the ecological balance now favoring *Lernaea* spp. life span in pond ecosystems.

Argulus spp. are another group of crustacean parasites found on the skin, fins and gills of different genera of various freshwater fish families in Iran. Among them, *Argulus foliaceus* was reported on the skin of common carp in Anzali Lagoon in Caspian Basin (Asadzadeh Mangili *et al*, 2000) and on some cyprinid fish species in Zarivar Lake and also in various other parts of Iran (Jalali & Barzegar, 2006 and Asadzadeh Mangili *et al*, 2000). Tables 2-1, 2-2 and 2-3 show 12 fish species served as hosts for *Argulus* spp. in Iran.

The remaining crustacean parasitic species were mostly found on fish species inhabiting natural water bodies or reservoirs. Among 3 species belonging to genus *Ergasilus*, 2 species have been identified to species level, namely *E. peregrinus* and *E. sieboldi*. Species differentiation in reports were not sufficiently detailed, but apparently 16 fish species were infested with *Ergasilus* spp. in Iran (Table 3 & 9). Similarly, 3 species of genus *Lamproglena* were found in the gills of mostly cyprinids in natural lakes and reservoirs. Of them, two species were recorded

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Table 2. *Argulus* spp. on the freshwater fishes of Iran.

2-1: *Argulus* sp.$_1$

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Aspius vorax*	Skin	Hooro-lazim Lag	Karoon	Jalali (1998)
2	*Barbus luteus*	Skin	Hooro-lazim Lag	Karoon	Jalali (1998)
3	*Barbus* sp.	Skin	Doghab Ri	Caspian	Mokhayer (1985)
4	*Barbus grypus*	Skin	Hooro-lazim Lag	Karoon	Jalali (1998)
5	*Barbus sharpeyi*	Skin	Hooro-lazim Lag	Karoon	Jalali (1998)
6	*Barbus xanthopterus*	Skin	Hooro-lazim Lag	Karoon	Jalali (1998)
7	*Capoeta* sp.	Skin	Doghab Ri	Caspian	Mokhayer (1985)

2-2: *Argulus* sp.$_2$

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Chalcalburnus* sp.	Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)
2	*Cyprinus carpio*	Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)
3	*Hypophthalmichthys molitrix*	Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)
4	*Mastacembelus mastacembelus*	Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)

2-3: *Argulus foliaceus* Mueller, 1785

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Capoeta capoeta*	Skin	Makoo Res	Caspian	Press comm. (2000)
2	*Chalcalburnus* sp.	Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)
	Chalcalburnus chalcoides	Fins	Valasht La	Caspian	Miar et al (2008)
			Zarivar La	Tigris	Jalali & Barzegar (2006)
3	*Cyprinus carpio*	Gill & Skin	Anzali Lag	Caspian	Asadzadeh Mangili et al (2000)
			Hooro-lazim Lag	Karoon	Jalali (1998)
4	*Hypophthalmichthys molitrix*	Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)
5	*Mastacembelus mastacembelus*	Gill & Skin	Zarivar La	Tigris	Jalali & Barzegar (2006)

as *L. compacta* and *L. polchella*. The third species needs further study for a detailed description. In total, 8 fish species were found to be infected by 3 *Lamproglena* spp. in Iran (Table 4 & 9) (Mokhayer, 1985; Abdi, 1995; Pazooki *et al*, 2005 and Sharif Rohani, 1994).

Tracheliastes longicollis and *T. polycolpus*, were found on the fins of *Capoeta* spp. and *Leuciscus cephalus* in rivers and reservoirs situated in north-west Iran (Table 5). Seemingly there is another species, found in Doghab River, which was not sufficiently studied (Mokhayer, 1985, Pazooki *et al*, 2005 and Mirhashemi nasab & Pazooki, 2003).

Skin and fins of *Sander lucioperca* and *Perca fluviatilis* were infected with *Achtheres percarum* in Sefid-rud River and in Anzali Lagoon. This is the only species from genus *Achtheres* in Iran (Table 6). The only *Caligus* species, namely *C. lacustris*, was found on the fin of *Liza abu* which inhabits in Karoon River (Karoon basin) (Table 7) (Mokhayer, 1985).

There has been little published work on the crustacean parasites of the Caspian Sea fishes in Iran and the only Copepoda parasite found is known as *Pseudotracheliastes stellatus*, infecting skin and fins of acipenserids namely *Huso huso*, *Acipenser guldenstaedti* and *A. stellatus* (Table 8) (Mokhayer, 1985).

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Table 3: *Ergasilus* spp. on freshwater fishes of Iran.

3-1: *Ergasilus* sp.

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Aspius vorax*	Gill	Karoon Ri	Karoon	Molnar (1990)
2	*Acanthalburnus urmianus*	Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
3	*Barbus* sp.1	Gill	Sefid-rud Ri	Caspian	Mokhayer (1985)
4	*Barbus* sp.2	Gill	Karoon Ri	Karoon	Molnar (1990)
5	*Barbus* sp.3	Gill	Karoon Ri	Karoon	Molnar (1990)
6	*Barbus grypus*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
7	*Barbus lacerta*	Gill	Vahdat Res	Tigris	Present study
8	*Barbus luteus*	Gill	Karoon Ri Lag	Karoon	Molnar (1990)
9	*Barbus xanthopterus*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
10	*Capoeta capoeta*	Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
11	*Ctenopharyngodon idella*	Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
		Gill	Hamoon Lag	Sistan	Sharif Rohani (1994)
12	*Leuciscus cephalus*	Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)
13	*Liza abu*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
14	*Silurus glanis*	Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki, 2003

3-2: *Ergasilus peregrinus* Haller, 1865

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Ctenopharyngodon idella*	Gill	Khandaghloo Res	Caspian	Pazooki, et al (2005)
2	*Leuciscus cephalus*	Gill	Khandaghloo Res	Caspian	Pazooki, et al (2005)

3-3: *Ergasilus sieboldi* Nordman, 1832

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Aspius vorax*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
2	*Barbus luteus*	Gill	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki, 2003
3	*Barbus sharpeyi*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
4	*Cyprinus carpio*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
		Gill	Hamoon Lag	Sistan	Sharif Rohani (1994)

Study of host ranges of crustacean parasite species in Iran includes data from 51 freshwater host species, (a little more than 30% of Iranian freshwater fish species) and 17 freshwater genera (fewer than 19% of known Iranian freshwater fish genera), constituting an insufficiently comprehensive investigation of species composition and diversity of crustacean parasites of Iran.

According to the data in the above mentioned published works, it can be concluded that crustacean parasitic fauna composition in Iran and neighboring countries is almost the same at the generic level and with few exceptions, species composition is also similar.

The freshwater fish of Iran are a complex mixture, but they appear to be mainly Palaearctic in origin despite the presence of some from Ethiopian and Oriental regions. The crustacean parasites reviewed in this study tend to exhibit similar regional origins, as most of them are widely distributed in the Palaearctic.

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Table 4. *Lamproglena* spp. on freshwater fishes of Iran.

4-1: *Lamproglena* sp.

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Aspius vorax*	Gill	Karoon Ri	Karoon	Molnar (1990)
2	*Liza abu*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)

4-2: *Lamproglena compacta* Markevich, 1936

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Aspius vorax*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
2	*Barbus xanthopterus*	Gill	Hoorol-azim Lag	Karoon	Jalali (1998)
3	*Capoeta* sp.	Gill	Mahabad Res	Uromia	Abdi, et al (1995)
4	*Capoeta capoeta gracilis*	Gill	Sajasar-rud Ri	Caspian	Pazooki, et al (2005)
5	*Leuciscus cephalus*	Gill	Khandaghloo Res	Caspian	Pazooki, et al (2005)
6	*Schizocypris altidorsalis*	Gill	Hamoon Lag	Sistan	Sharif Rohani (1994)

4-3: *Lamproglena polchella* Nordman, 1832

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Barbus brachycephalus*	Gill	Sefid-rud Ri	Caspian	Mokhayer (1985)

Table 5. *Tracheliastes* spp. On the freshwater fishes of Iran.

5-1: *Tracheliastes* sp.

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Barbus* sp.	Fin	Doghab Ri	Caspian	Mokhayer (1985)
2	*Capoeta* sp.	Fin	Doghab Ri	Caspian	Mokhayer (1985)

5-2: *Tracheliastes longicollis* Markevich, 1940

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Capoeta capoeta gracilis*	Dorsal and Caudal fin	Sajasar-rud Ri	Caspian	Pazooki, et al (2005)
2	*Leuciscus cephalus*	Fin	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)

5-3: *Tracheliastes polycolpus* (Nordmann, 1832)

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Capoeta* sp.	Fin	Mahabad Res	Urmoia	Abdi et al (1995)
2	*Capoeta trutta*	Fin	Vahdat Res	Tigris	Present study
3	*Capoeta capoeta*	Fin	Mahabad Res	Uromia	Mirhashemi nasab &
		Fin	Zarineh-rud Ri	Uromia	Pazooki (2003)
					Jalali (1998)
4	*Leuciscus cephalus*	Fin	Mahabad Res	Uromia	Mirhashemi nasab & Pazooki (2003)

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Table 6. *Achtheres percarum* (Nordmann, 1832) on the freshwater fishes of Iran.

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Sander lucioperca*	Skin & Fin	Anzali Lag	Caspian	Mokhayer (1985)
		Skin & Fin	Sefid-rud Ri	Caspian	Mokhayer (1985)
2	*Perca fluviatilis*	Skin & Fin	Anzali Lag	Caspian	Mokhayer (1985)

Table 7. *Caligus lacustris* (Steenstrup & Lucken, 1861) on the freshwater fishes of Iran.

No	Host(s)	Microenvironment(s)	Locality(ies)	Region(s)	Reference(s)
1	*Lisa abu*	Fin	Karoon Ri	Karoon	Molnar & Baska (1993)

Table 8. *Pseudotracheliastes Stellatus* (Markevich, 1956) on the Caspian Sea fishes.

No	Host(s)	Microenviron-ment(s)	Local-ity(ies)	Region(s)	Reference(s)
1	*Huso huso*	Skin	Caspian Sea	Caspian	Mokhayer (1985)
2	*Acipenser gueldenstaedti*	Skin	Caspian Sea	Caspian	Mokhayer (1985)
3	*Acipenser stellatus*	Skin	Caspian Sea	Caspian	Mokhayer (1985)

Table 9. Host families, genera and species of crustacean parasites found in freshwater and Caspian Sea fishes of Iran.

	Parasites	Family	Genera	Species
Branchiura	*Argulus foliaceus*	Cyprinidae Mastacembelidae	5	5
	Argulus sp.$_1$	Cyprinidae	3	7
	Argulus sp.$_2$	Cyprinidae Mastacembelidae	4	4
Copepoda	*Lernaea cyprinacea*	Cyprinidae Gobiidae Cyprinodontidae Mastacembelidae	13	14
	Lernaea spp.	Cyprinidae Gobiidae Cyprinodontidae Mastacembelidae Salmonidae	21	26
	Ergasilus peregrinus	Cyprinidae	2	2
	Ergasilus sieboldi	Cyprinidae	3	4
	Ergasilus sp.	Cyprinidae Siluridae Mugilidae	5	14
	Lamproglena compacta	Cyprinidae	5	6
	Lamproglena polchella	Cyprinidae	1	1
	Lamproglena sp.	Cyprinidae Mugilidae	2	2
	Tracheliastes longicollis	Cyprinidae	2	2
	Tracheliastes polycolpus	Cyprinidae	2	4
	Tracheliastes sp.	Cyprinidae	2	2
	Achtheres percarum	Percidae	2	2
	Caligus lacostris	Mugilidae	1	1
	Pseudotracheliastes Stellatus	Acipenseridae	2	3

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انگل‌های سخت‌پوست ماهیان آب شیرین و دریای خزر در ایران

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چکیده

در بررسی حاضر تعداد ۱۱ گونه انگل سخت‌پوست از ماهیان پرورشی و وحشی در سه منطقه جغرافیایی زیستی ایران گزارش می‌شود. در میان آنها یک گونه *آرگولوس فولیاسئوس* متعلق به برانشیورا از سیاه‌ماهی در سد مخزنی ماکو و نیز از کپور معمولی، شاه‌کولی، کپور نقره‌ای و مارماهی خاردار در دریاچه زریوار یافت شده است. ده گونه دیگر متعلق به پاروپایان بوده و شامل ۱) *ارگازیلوس سیبولدی* در آبشش بنی، ۲)*باربوس لوتئوس*، شلج و کپور معمولی، ۳) *ارگازیلوس پرگرینوس* در کپور علفخوار وعروس‌ماهی رودخانه‌ای در سد مخزنی خندقلو، ۴)*لامپروگلنا کاماپاکتا* ۵) *لامپروگلنا پولچلا* از آبشش برخی ماهیان ساکن حوزه دجله، دریای خزر و اورینتال هستند.۶) *تراکلیاستس لانگی‌کولیس* از باله سیاه‌ماهی و عروس‌ماهی رودخانه‌ای، ۷) *تراکلیاستس پولی‌کولپوس* از باله سیاه‌ماهی تروتا، سیاه‌ماهی و عروس‌ماهی رودخانه‌ای در بدنه‌های آبی موجود در منطقه آذربایجان (حوزه خزر) و کردستان (حوزه دجله)، ۸) *اکترس پرکاروم* از پوست و باله سوف معمولی و سوف حاجی‌طرخان در تالاب انزلی و سفید رود در شمال ایران (حوزه خزر)، ۹) *سودوتراکلیاستس استلاتوس* از پوست ماهیان خاویاری در دریای خزر و بالاخره مهمترین انگل از نظر اقتصادی۱۰) *لرنئا سیپرینی‌سه‌آ* که به طور معمول در بیشتر گونه کپورماهیان پرورشی در استخرها و بدنه‌های آبی طبیعی یافت می‌شود. همچنین ۷ گونه سخت‌پوست ناشناخته متعلق به دو راسته فوق‌الذکر تا حد جنس شناسایی شده که نیاز به بررسی‌های بیشتر جهت شناسایی گونه‌های آنها می‌باشد. انتشار جغرافیایی و دامنه میزبانی انگل‌های ذکر شده نیز ارائه و تشریح شده است.

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