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Original Article

Parasitic Infection of an Endemic Fish *(Blicca bjoerkna)* and an Exotic Fish (*Hemiculter beucisculus)* In Anzali Lagoon, Caspian Sea, Iran

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ABSTRACT

Background: In Anzali Lagoon, there are some endemic and exotic fishes. The present study was conducted to compare the parasitic fauna of *Blicca bjeorkna*, as an endemic fish and *Hemiculter leucisculus*, as an introduced fish to the lagoon.

Methods: A parasitological investigation was done on 78 specimens of *B. bjoerkna* and 114 of *H. leucisculus*. The fishes were collected from August 2009 to April 2010 by the electro fishing from Anzali Lagoon.

Results: Eleven parasites species were found in 192 fish samples. The prevalence and mean intensity of parasites in each host were as follows: Parasites from *B. bjorkna* were *Trichodina perforata* (53.85%); *Myxobolus musayevi* (27.19%, 1±0.79); *Dactylogyrus difformis* (88.05%, 8±7.24) and *D. sphyrna* (5.18%, 0.95±0.51), *Diplostomum spataceum* (98.72%, 9.51±9.01), *Posthodiplostomum cuticula* (15.38%, 4.25±2.5), *Ripidocotyle* sp. (1.28%, 2±0.74); *Contracaecum osculatum* (17.95%, 1.64±0.79), *Philometra rischta* (12.8%, 1.4±0.54), and *Raphidascaris acus* (1.04%, 0.03±0.26). The *H. leucisculus* were infected with *T. perforata* (27.19%), *D. spataceum* (7.89%, 1.33±0.54), *Ps. tomentosa* (7.02%, 1.62±0.49) and *R. acus* (0.88%, 3±0.28). *B. bjoerkna* was presented as a new host for *M. musayevi* and *C. osculatum*, while *H. leucisculus* was introduced as a new host for *T. perforata* and *Ps. tomentosa*.

Conclusion: The prevalence of parasites was significantly more in native fish than that of exotic fish ($P<0.05$). This reduction in parasitic infection in *H. leucisculus* may be due to its immune system resistance, well adaptation to the new environment, host-specific limitation for endemic parasites and disability of introduced parasite to complete its life cycle in the new host as well.

Keywords: Parasites, *Blicca bjeorkna*, *Hemiculter leucisculus*, Lagoon, Iran

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Introduction

Anzali Lagoon is a very important reservoir in the Caspian Sea Fauna Region (North of Iran), there are some fish parasites recorded from this area such as: *Diplostomum spathaceum* from *Esox lucius, Perca fluviatilis, Carassius carassius, Ctenopharyngodon idella, Cyprinus carpio, Hypophthalmichthys molitrix, Tinca tinca,* and *Abramis brama; Raphidascaris acus* from *Esox lucius, Abramis brama, Tinca tinca, Carassius carassius* and *Perca fluviatilis*. There some more parasites from different fishes such as: *Tetraonchus menonteron* and *Gyrodactylus elegans, Eustrongilides excisus, Rhabdochona hellichi* from *Esox lucius, Chalcalburnus chalcoides* and *Cucullanus mulleri* from *Carassius carassius, Anisakis schupakovi* from *Silurus glanis, Argulus foliaceus* from *Hypophthalmichthys molitrix, Piscicola geometra* and *Asymphylodora tincae* from *Tinca tinca* (1).
A number of exotic fish species were introduced in Iranian freshwaters. These species encompass 18.7% from the 81% of the fish inhabiting in south part of the Caspian Sea. *Hemiculter leucisculus* (Saw belly) is one of these species with low economic value. This species might be accidentally transferred to this region with fertilized egg and or larvae of Chinese carp for aquaculture, the place and origin of this fish is Yunnan, south- west of China (2-5).
None-indigenous fish may have undesirable effects on endemic fish species, including destruction of habitat and water quality, predation, aggressive behavior such as fin nipping, retardation of reproductive activity, food competition, and introduction of parasites and disease to the new environment. Levels of parasitism and parasite diversity were significantly greater in native fishes than in exotic species, and this may contribute to an enhanced demographic performance and competitive ability in invading exotics. Levels of parasitism and parasite diversity in native fishes were negatively related to habitat disturbance, in particular to a suite of factors that indicate increased human use of the river and surrounding environment (6-11).
Native parasites infecting exotic fish will increase their bio-potential through a vast host range. The exotic fish may play as a reservoir role for maintenance of parasite (8).
The aims of this study were to survey the parasite fauna on *Blicca bjeorkna,* as a native fish, and *Hemiculter leucisculus,* as an exotic fish, and to compare the prevalence of parasitic infection in these two species.

Materials and Methods

A parasitological investigation was done on *Blicca bjeorkna*; the local name is Sim Parak (n= 78, Fig.1) and *Hemiculter leucisculus*; the local name is Tiz Kooli (n=114, Fig. 2). The fishes were collected from August 2009 to April 2010 by the electro fishing from same locality of Anzali Lagoon. The live specimens were transferred to Iranian Aquaculture Research Center (Guilan, Anzali) and were kept in aquariums. Parasitological studies implemented for protozoa and Monogenea on fresh smears of gills, eyes, skin, and fins by stereo and light microscope. Examined fish were fixed in formalin (10%) and transferred to Aquatic Research Laboratory (Shahid Beheshti University) for further study of other metazoan parasites. The parasites were identified according to key of Moravec 1994, 1998, Bykhovskaya 1964, Shulman 1984 and Lom & Dykova 1992 (10, 12-16).

Statistical analysis

Statistical analysis was performed by the software package of SPSS. Data were subjected to the analysis of variance (ANOVA). Significant differences in prevalence and mean intensity of parasitism between exotic and endemic fish was detected by Chi square test when $\alpha = 0.05$.

Results

Eleven parasite species were found in both of fishes (Fig. 3 and 4, Table 1). One hundred percent of *Blicca bjeorkna* and 49.12% of *Hemiculter leucisculus* were contaminated by various parasites. Presented findings showed a significant difference in prevalence of parasitic infection between exotic and endemic fishes ($P<0.05$). The endemic fish was infected more than exotic fish and more parasites diversity was observed in endemic fish than exotic species. Some of parasitic species were seen in both fishes, but some others were only in *B. bjoerkna* or *H. leucisculus*. More specific parasites were found in *B. bjoerkna* whereas they were not identified in *H. leucisculus*.

B. bjoerkna was presented as a new host for *M. musajevi* and *C. osculatum*; and *H. leucisculus* was introduced as a new host for *T. perforata*, *Ps. tomentosa* and *R. acus*.

Fig. 1: *Hemiculter leucisculus* (Tiz kooli)

Fig. 2: *Blicca bjoerkna* (Sim Parak)

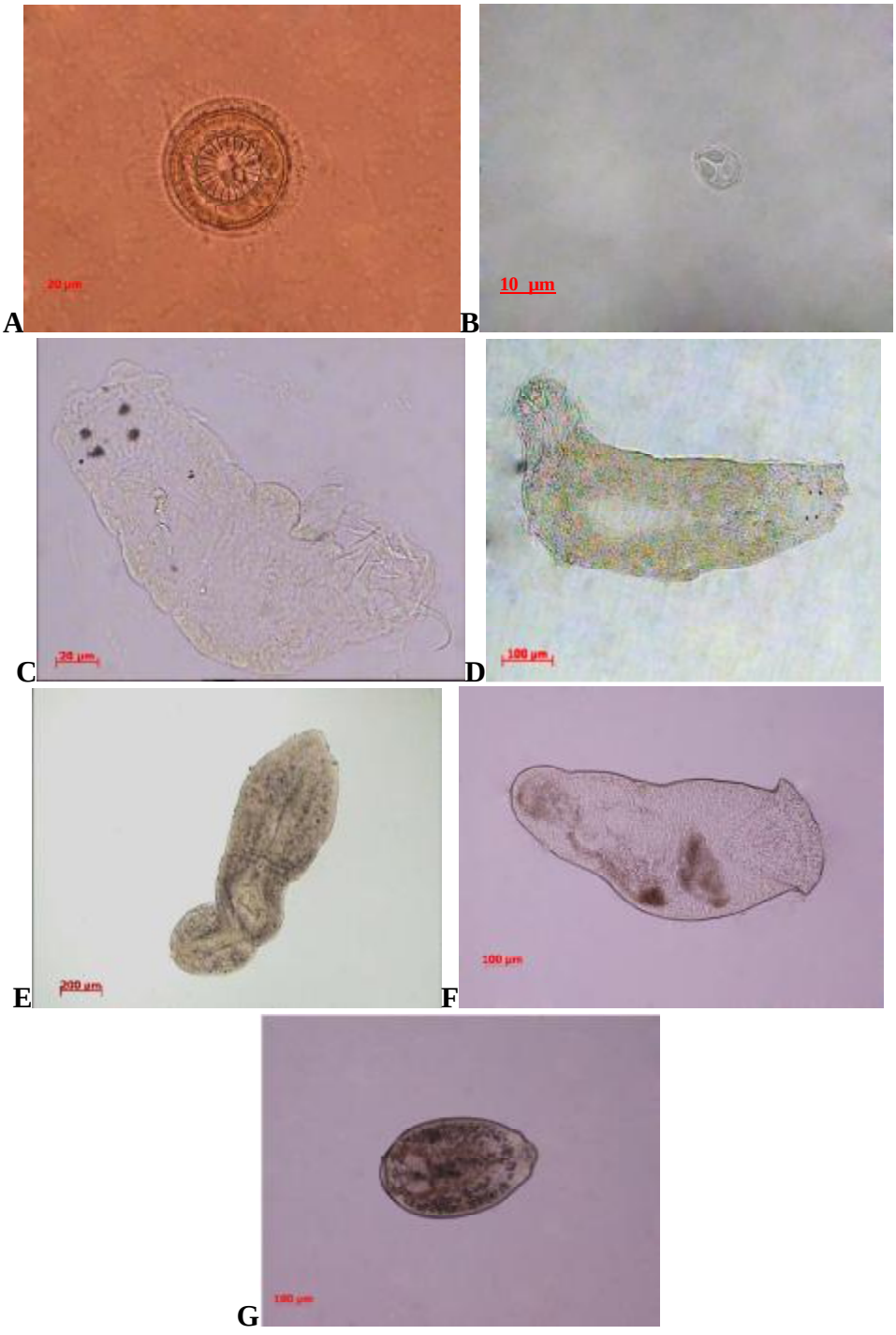

Fig. 3: A. *T. perforata* from skin, gills and fins. **B.** *Myxobolus musajevi* from gills. **C**. *Dactylogyrus differmis* from gills. **D.** *Dactylogyrus sphyrna* from gills. **E.** Metacercaria of *Posthodiplostomum cuticula* from skin and fins. **F.** *Rhaphidocotyle sp*. from gills. **G.** Metacercaria of *Diplostomum spataceum* from the eyes

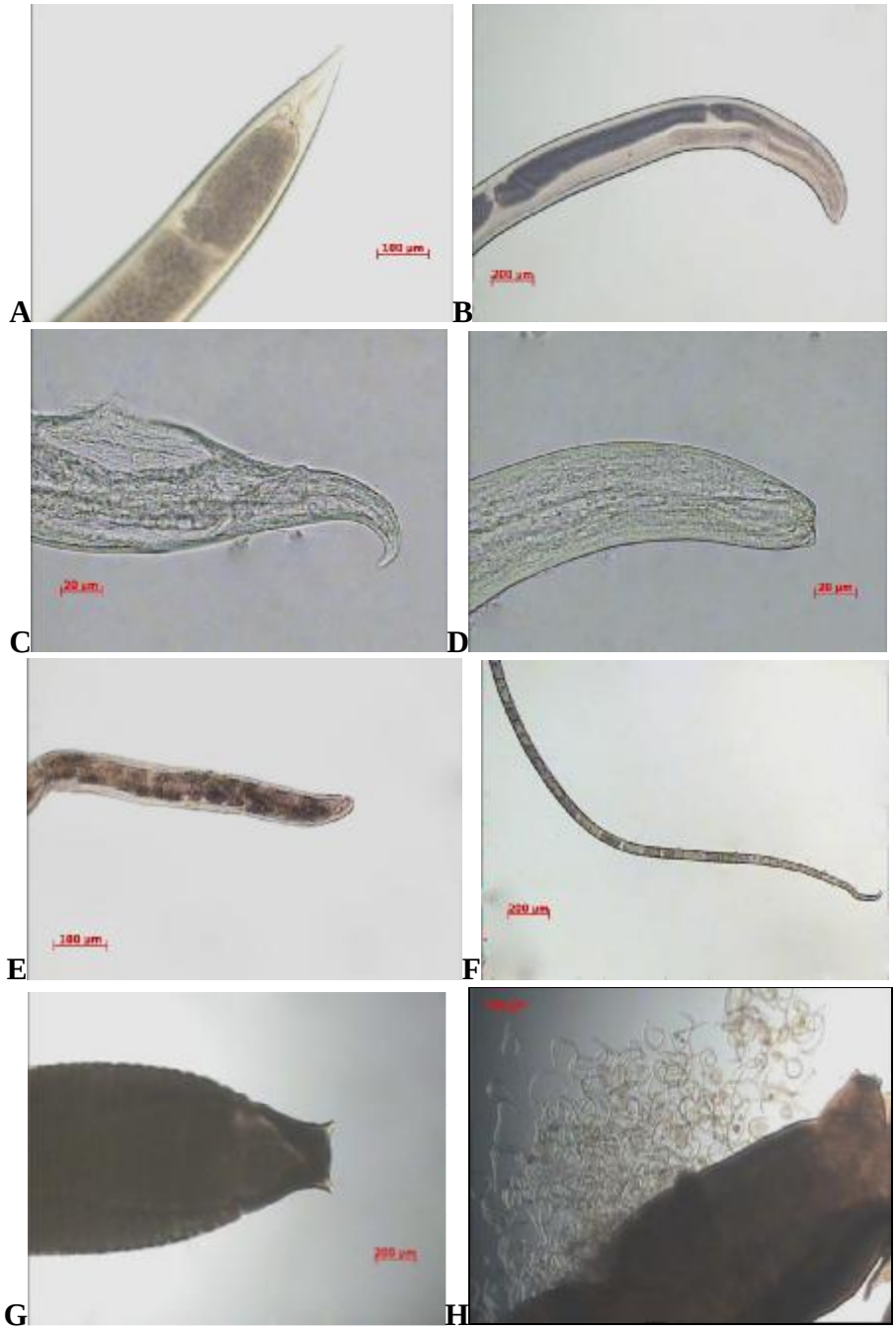

Fig. 4: A. posterior part of *Contracaecum osculatum*. **B.** anterior part of *C. osculatum*. **C.** posterior part of *Raphidascaris acus*. **D.** anterior part of *Rh. acus*. **E.** posterior part of *Pseudocapillaria tomentosa*. **F.** anterior part of *Ps. tomentosa*. **G.** posterior part of *Philometra rischta*. **H.** anterior part of *Ph. rischta* with released larvae

Table 1: Intensity and prevalence of parasite species of the host fishes in Anzali Lagoon

Parasite species	Hf	Efn	Ifn	Int±S.D.	Prv (%)
T. perforata	*B. bjoerkna*	78	42	*	53.85
	H. leucisculus	114	31	*	27.19
M. musajevi	*B. bjoerkna*	78	1	1±0.79	27.19
D. difformis & D. sphyrna	*B. bjoerkna*	78	69	8.058±7.24	88.46
Diplostumum spataceaum	*B. bjoerkna*	78	77	9.51±9.09	98.72
	H. leucisculus	114	9	1.33±0.54	7.89
P. cuticula	*B. bjoerkna*	78	12	4.25±2.5	15.38
Ripidocotyle sp	*B. bjoerkna*	78	1	2±0.74	1.28
C. osculatum	*B. bjoerkna*	78	14	1.64±0.79	17.95
Ph. rischta	*B. bjoerkna*	78	10	1.4±0.54	12.8
Ps. tomentosa	*H. leucisculus*	114	8	1.62±0.49	7.02
R. acus	*B. bjoerkna*	78	1	0.03±0.26	1.04
	H. leucisculus	114	1	3±0.28	0.88

Hf: host fishes, Efn: examined fish number, Ifn: infected fish number, S.D: standard deviation, Prv: prevalence (%), *: The number of parasites was not clear for calculated their intensity

Discussion

One of the factors affecting on specification of parasitic infection is origin of the fish species, whether native or exotic. Several investigations revealed that parasitic infection is more common in native fish species than exotic one (6). In a previous, parasitic species richness and parasitic diversity were significantly (P<0.05) more in native fish than in exotic one (9, 10). Some studies about roles of parasites in animal invasions and missing parasites in introduced species, demonstrated several reasons for reduced parasitic load of exotic species. Firstly, those parasites that contaminated the introduced exotic fish may not be able to continue their life cycle in the new environment. This reduced parasitic charge increased the competitive ability and the size of exotic species in comparison with native species (17, 18).

The second one is the absence of other required host (intermediate or reservoir host) in the new environment. Thirdly, the highly host specifications caused limitations in transfer of parasite from native fish species to the exotic ones. Conversely, parasites may transfer from exotic fish to the native ones. The parasite transfer is greater when it has

low host specifications and the hosts have close relationship (2). In a case, at which a parasite is introduced to a new host, this could damage the host even more because there is no identified relationship between the host and parasite. Furthermore, the host may not have enough defensive strength against the parasite (5, 7). In the present study, both the prevalence of parasitic infection and diversity were more in *B. bjoerkna* than in *H. leucisculus*. Parasites with low host specifications such as *T. perforata*, *Ps. tomentosa* and *D. spataceaum* were found in *H. leucisculus* can easily contaminate different host. The origin of fish is one of the most important and affecting factors on the prevalence of parasite infection. Other factors are included food diet, immune competence, and fish dispersion in its habitat. The exotic fish may have a role in maintenance of a parasite and transfer the infection to other host fish in the environment according to their immune system resistance. There are many parasites recorded from different fish species in Anzali Lagoon but there is not any comparative study between endemic and exotic fishes.

During this study, the examined fishes are introduced as new hosts: *H. leucisculus* for *Trichodina perforata, Dactylogyrus sphyrna, Pseudocapillaria tomentosa, Raphidascaris acus* and *B. bjoerkna* for *Myxobolus mosajevi, Contracaecum osculatum*.

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