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Survey of parasitic fauna of different ornamental freshwater fish species in Iran

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Abstract

Parasitic diseases are harmful and limiting factors in breeding and rearing ornamental fish industry. In this study, 400 apparently healthy ornamental fishes from five species (each species 80 specimens) including: Goldfish (*Carassius auratus*), guppy (*Poecilia reticulate*), angelfish (*Pterophyllum scalare*), discus (*Symphsodon discus*) and sailfin mollies (*Poecilia latipinna*) was obtained from a local ornamental fish farm in the north of Iran during 2011 to 2012. The primary purpose of this study was to determine the parasitic infections of aquarium fish in Iran. For this purpose, fish were first examined for ectoparasites using wet mount under a light microscope. Then, the alimentary ducts of fish were observed under light and stereo microscope. In survey of different infection rates for different parasitic infections in examining fish: *Dactylogyrus* sp., *Gyrodactylus* sp., *Ichthyophthirius multifiliis Trichodina reticulata*, *Capillaria* sp. and *Lernaea cyprinacea* were collected from five species. All five fish species had Monogenea (Gyrodactylidae and Dactylogyridae) in their skins and gills, the highest prevalence was observed in *C. auratus* and the lowest was in *P. scalare* and *S. discus*. Also, *Capillaria* sp. was reported as a first record from the abdominal cavity of *P. scalare* in Iran. Our findings revealed that the protozoal infections are very common among aquarium fishes. Although, no gross pathology was observed among infected fishes, but it is likely that in case of any changes in the environment, then parasitic infections could be harmful.

بررسی فون انگلی گونه های مختلف ماهیان آکواریومی آب شیرین در ایران

چکیده

بیماری‌های انگلی از جمله عوامل مضر و محدود کننده صنعت تکثیر و پرورش ماهیان زینتی محسوب می‌شوند. هدف از این مطالعه بررسی آلودگی انگلی ماهیان آکواریومی در شمال ایران بود. در این مطالعه، نمونه برداری از ۴۰۰ ماهی آکواریومی به ظاهر سالم از پنج گونه (هر گونه ۸۰ نمونه) شامل: ماهی حوض (*کاراسیوس اوراتوس*)، ماهی گوپی (*پویسیلیا رتیکولاتا*)، ماهی آنجل (*پتروفیلیوم اسکولاره*)، ماهی دیسکاس (*سیمفسدون دیسکاس*) و ماهی مولی (*پویسیلیا لاتیپینا*) از مزارع ماهیان زینتی در استان مازندران طی سال های ۱۳۹۱ تا ۱۳۹۲ صورت گرفت. این مطالعه با نمونه برداری از اندام های مختلف صورت گرفت. بدین منظور، ابتدا لام مرطوب از اندام های خارجی ماهیان تهیه و در زیر میکروسکوپ نوری مورد بررسی قرار گرفت. سپس دستگاه گوارش این ماهیان باز شده و وجود انگل بوسیله لوپ چشمی و میکروسکوپ نوری مورد بررسی قرار گرفت. در طی این مطالعه از ۵ گونه مورد بررسی انگل های *داکتیلوژیروس*، *ژیرودактیلوس*، *ایکتیوفتیریوس مولتیفیلیس*، *تریکودینا رتیکولاتا*، *کاپیلاریا* و *لرنه آ کاپرینا سه آ* مورد شناسایی قرار گرفتند. در بین ماهیان مورد مطالعه، بیشترین شدت آلودگی در ماهی حوض و کمترین میزان آلودگی در ماهیان آنجل و دیسکاس مشاهده شد. انگل *کاپیلاریا* برای اولین بار از ماهی آنجل در ایران گزارش شد. نتایج مطالعه حاضر نشان داد که آلودگی تک یاخته ای در ماهیان آکواریومی شایع بود. هر چند که در ماهیان مورد مطالعه ضایعه پاتولوژی مشاهده نشد، ولی تغییر در هر یک از شاخص های محیطی باعث می گردد این ضایعات آسیب رسان گردند.

واژه های کلیدی: ایران ، فون انگلی، ماهیان زینتی

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Introduction

Aquarium fish trade is a very important sector all over the world.[1] The global trade in ornamental fish, associated aquarium and pond accessories is more than 7×10^9 USD each year. They are a significant source of overseas benefit for many rustic communities in Africa, south America and south-east Asia.[1] Thousands types of aquarium fish (commonly, poeciliids, guppy and cichlids) are collected and maintained by hobbyists.[1] The biggest portion of the aquarium fish industry is the freshwater aquarium fish sector. Cultivation and propagation of ornamental fishes have been increased in the recent decades in Iran, for its beautiful appearance, the small size and easy maintenance.[1]

Although this worldwide interest in ornamental fish has led to development in their cultivation techniques, there are still many difficult-to-culture species with high demand. Ornamental fish pathogens spread very rapidly in the world because of their commercial benefits. Consequently, routine infectious disease controls are very important for risk analysis and precaution steps. Parasites are harmful and limiting factors in breeding and rearing ornamental fish industry.[2] From economic aspects, parasitic diseases in fish have a particular importance, because of causing sterility, discoloration, change of body shape and decreased growth and weight of fish.[3] Therefore, knowledge about fish parasites is crucial for successful aquaculture. For this reason, we aimed to isolate and identify the parasitic fauna of five species of ornamental freshwater fish in northern Iran.

Materials and Methods

A total number of 400 apparently healthy ornamental fishes including Goldfish (*Carassius auratus*; n = 80), guppy (*Poecilia reticulate*; n = 80), angelfish (*Pterophyllum scalare;* n = 80), discus (*Symphsodon discus;* n = 80) and sailfin mollies (*Poecilia latipinna*; n = 80) were obtained from local ornamental fish farms in Mazandaran province (North of Iran) between 2011-2012, (Table 1). Live fishes were transferred to fish diseases laboratory at the Caspian Sea Ecology Research Center using portable air pump.

The external surface, abdominal cavities and digestive tracts were examined for presence of parasitic fauna. Fish were first examined for ectoparasites using wet mount under a light microscope (Olympus, Tokyo, Japan).[1] Then, the alimentary ducts of fish were observed under light and stereo microscope. Parasites of alimentary tracts were counted and fixed in 70% ethanol, and for examination, they were cleared using glycerine.[2] Identification of the parasites was carried out using the identification keys.[2,4,5]

Table 1. The geographical distribution of sampling in each examined fish species in the Mazandaran province, Iran.

Fish species	Region/Location of sampling
Pterophyllum scalare	Sari, Tonekabon
Carassius auratus	Babolsar, Amol, Sari
Symphsodon discus	Feridonkenari, Tonekabon
Poecilia latipinna	Joibar, Sari, Babol
Poecilia reticulata	Tonekabon, Sari, Babolsar

Results

During the sampling, the water temperature was 25 ± 3 ˚C, dissolved oxygen was 4.60 ± 0.50 mg L^{-1} and pH was 7.20 ± 0.60, respectively. Of all examined fishes, 380 fishes (95.00%) were infected by at least one parasite. One nematode (*Capillaria* sp.), two protozoa (*I. multifilis* and*, Trichodina reticulata*), two monogeneans (*Dactylogyrus* sp. and *Gyrodactylus* sp.) and one Crustacea (*L. cyprinacea*) were identified (Figs. 1 to 5 and Table 2). The hemorrhagic areas on the skin and gills, fins bleeding, scales losing and fin rot was observed in infected fish.

Fig. 1. *Trichodina reticulata* isolated from discus (400×).

Fig. 2. Two pairs of anchor hooks (arrow) of *Gyrodactylus* sp. isolated from guppy (100 ×).

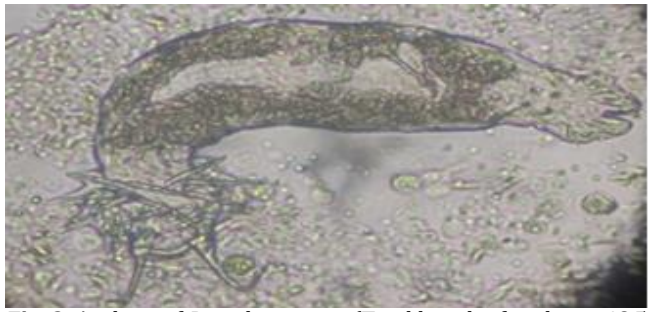

Fig. 3. Anchors of *Dactylogyrus* sp. (Total length of anchor = 48.5 µm) isolated from Goldfish (100 ×).

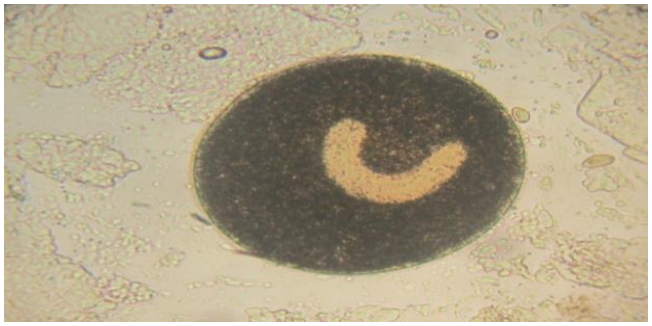

Fig. 4. Large horseshoe-shaped macronucleus of *Ichthyophthirius multifiliis* isolated from discus (100 ×).

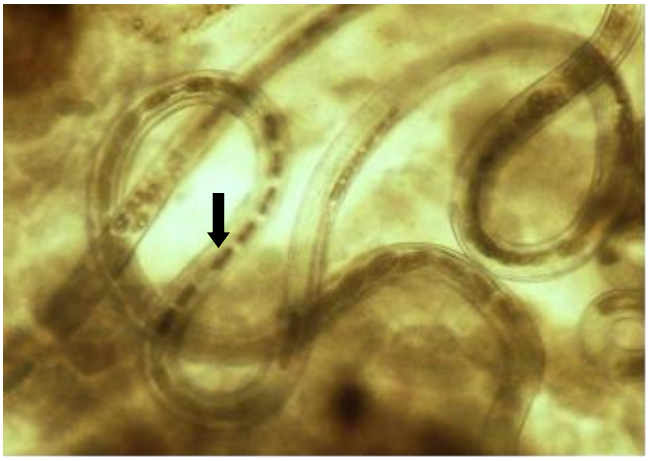

Fig. 5. A female of *Capillaria* sp. with barrel-shaped eggs (arrow) in intestine of angelfish (100×).

Discussion

During the previous decades, fish parasites identification have become increasingly visible , because of the growth of freshwater ornamental fish industries throughout the world.[2] Parasitic diseases affect physiologic and biologic characteristics, caused mechanical damage and economic losses in ornamental fish industries.[2]

Different parasite species were reported from various ornamental fish species around the world. *Tetrahymena* sp. was collected from gills of *Carnegiella strigata*, *Piscinoodinium pilullare* from the skin of *Carnegiella martae, Trichodinids* spp. from the skin of *C. strigata*, also *Nannostomus and Procamallanus* sp. was isolated from the intestine of *Paracheirodon axelrodi*.[8] Koyun reported *Gyrodactylus katharine* and *Gyrodactylus carassii* from the gills of *C. carassius*,[9] *Ichthyobodo* sp., *I. multifiliis*, *Chilodonella* sp., *Trichodina* spp from the skin., *Dactylogyrus extensus*, *Gyrodactylus bullatarudis*, *L. cyprinacea*, *Argulus foliaceus*, *Argulus japonicus* and *Capillaria* sp. from the external parts of goldfish, guppy and cichlids.[10] *Ambiphyra* spp. was reported from the skin of guppy,[11] and also, *Oodinium pillularis* was isolated from the skin of Poecilidae.[12]

In Iran, there were also many reports of parasite fauna from ornamental fishes for example, Meshgi *et al.* reported *Dactylogyrus rotator*, *Chiloldonella* sp., *Hexamita* sp., *Ictyobodo necator, I. multifiliis, Microsporidium, Myxosporida* sp., *Tricodina* spp., and *L. cyprinicea* from Aquarium fishes around Tehran.[1]

Table 2. Parasitic fauna in ornamental fish in Mazandaran province according to this study.

Host	Parasites	Infected organ	Infected fish (%)	Range of infestation/Infection
Pterophyllum scalare	*Dactylogyrus* sp.	Gills	35.00	1-4
	Gyrodactylus sp.	Skin	5.00	1-4
	Ichthyophthirius multifiliis	Skin	15.00	1-11
	Trichodina reticulata	Skin/Fin	25.00	1-6
	Capillaria sp.	Intestine	22.50	1-3
Carassius auratus	*Dactylogyrus* sp.	Gills	28.75	1-4
	Gyrodactylus sp.	Skin	72.50	1-8
	Ichthyophthirius.multifiliis	Skin	87.50	1-16
	Trichodina reticulate	Skin	20.00	1-14
	Lernaea cyprinacea	Skin/Fin	30.00	1-3
Symphsodon discus	*Dactylogyrus* sp.	Gills	7.50	1-2
	Gyrodactylus sp.	Skin	13.75	1-2
	Ichthyophthirius multifiliis	Skin/Fin	10.00	1-8
	Trichodina reticulate	Skin/Fin	6.25	1-4
Poecilia latipinna	*Dactylogyrus* sp.	Gills	16.25	1-2
	Gyrodactylus sp.	Skin	28.75	1-5
	Ichthyophthirius multifiliis	Skin/Fin	12.50	1-4
	Trichodina reticulata	Skin/Fin	12.50	1-7
	Capillaria sp.	Intestine	1.25	1-2
	Lernaea cyprinacea	Skin/Fin	5.00	1
Poecilia reticulata	*Dactylogyrus* sp.	Gills	17.5	1-3
	Gyrodactylus sp.	Skin	21.25	1-2
	Ichthyophthirius multifiliis	Skin/Fin	6.25	1-6
	Trichodina reticulata	Skin	15.00	1-9
	Capillaria sp.	Intestine	2.50	1
	Lernaea cyprinacea	Skin/Fin	1.25	1-2

Ichthyophthirius multifiliis, Gyrodactylus sp., *Dactylogyrus* sp.*, Trichodina* spp., *Argulus coregoni*, *A. japonicas*, *A. foliaceus* was reported from *C. auratus.*[13] Also, *I. multifiliis, Dactylogyrus* sp.*, Microsporidian* sp. and *Ichthyobodo* sp. were reported from angelfish in the Mazandaran province.[14]

In this study, *I. multifiliis* had the highest infection rate in *C. auratus*. The highest prevalence of Gyrodactylidae and Dactylogyridae were observed in *C. auratus* and the lowest in *P. scalare* and *S. discus*, respectively.

In our study, *Capillaria* sp. was reported for the first time from *P. scalare* in Iran. This nematode may cause high mortality in aquarium fishes. Rahmati-holasoo *et al.* showed that infection with *Capillaria* sp. could cause a great loss in ornamental fish from Cichlidae in Iran. [15]

It seems that many factors such as water quality, fish density, diet, physiology of host and parasite life cycle may have contributed to the severity and type of these parasites.[2] Given the important role of risk factors, reducing stressful situations through improved management and environmental conditions such as improved water quality and switch on time, reduction of organic matter, avoiding excessive density of fish and unnecessary manipulation and using appropriate disinfectants in farms can be useful to control and reduce economic losses caused by parasitic disease in ornamental fishes.

The identified parasites in this study have not been reported as a parasitic problem in Iran. However, the rate of infection in these aquarium fishes was low. The possibility of transmition of contamination to the native aquarium fishes, even farmed fishes should be taken into consideration.

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