

**ARGULUS FOLIACEUS INFECTION IN A GOLDFISH
(CARASSIUS AURATUS)**

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Abstract

Argulus foliaceus, or the fish louse, parasitize the skin or gill of the fresh water fish species. It causes pathological changes due to direct tissue damage and secondary infections. Clinical signs in infected fish include erratic swimming, poor growth and flashing. In the present study, *Carassius auratus* species (fantail goldfish), taken from a local pet shop with symptoms such as abnormal swimming, poor growth and death, were examined for ecto- and endoparasites. The parasites collected from the skin and fins of fish were identified as *A. foliaceus*.

Introduction

The genus *Argulus* (Crustacea: Branchiura), or fish louse, are common parasites of freshwater fish (1,2). These parasites are 5-10 mm in size and consist of a head, thorax and abdomen (2,3). The head is covered by a flattened horseshoe-shaped carapace, maxillipeds, peroral sting and basal glands. The thorax has four segments, each bearing a pair of swimming legs. The abdomen is a simple bilobed segment (2,3).

In its life cycle, mature females leave the host and lay several hundred eggs on vegetation and various objects in the water (2). Eggs are ovoid in shape and are covered by a gelatinous capsule. Depending on the temperature, 40-100 days are required for completion of the life cycle (2). Adults may live free from the host for up to 15 days.

Parasites insert a sting located pre-orally to inject digestive enzymes into the body (1). They then suck out the liquified body fluids using their proboscis-like mouth. Feeding can take place on the skin or in the gills of the fish causing intense irritation and tissue damage (1,5). Localised inflammation is often seen at the site. Opportunistic bacteria such as *Aeromonas* or *Pseudomonas* can sometimes infect these damaged areas leading to skin ulceration (1,5). In addition to physical damage, affected fish are subject to severe stress, which often leads to secondary parasitic infestations with a white spot and *Costia sp* (1).

Argulus sp. are found nearly worldwide with about 150 species known at present. Three species documented in Europe are *Argulus foliaceus*, *Argulus japonicus* and *Argulus coregoni*. *Argulus foliaceus* also occurs on brown trout, as well as perch, tench, carp, pike and bream. Table 1 shows the differences among these *Argulus* species.

In this study, a case of infection of *A. foliaceus* on goldfish is discussed.

Table 1. Differences among *Argulus* species.

<i>Species</i>	Length of body (mm)	Posterior lobes of cephalothoracic carapace	Abdomen	Posterior emargination of abdomen
<i>A. foliaceus</i>	6-7	Not extend beyond beginning	Round lobes	Not reach middle
<i>A. japonicus</i>	4-8	Extend beyond level of the middle of abdomen	Round lobes (though more pointed than <i>A. foliaceus</i>)	Reach middle
<i>A. coregoni</i>	12	Not extend beyond beginning of abdomen	Acuminate lobes	Reach beyond middle

Materials and Methods

The research material consisted of 22 fantail goldfish (*Carassius auratus*). Complaints of poor growth, abnormal swimming and death were received from a local pet shop. Fish samples were weighed, measured and thereafter body surface, gill, body cavity and internal organs were examined for ecto- and endoparasites. The parasites were fixed in 70% ethyl alcohol and identified using the characteristics given in keys by Bykhovskaya-Pavlovskaya et al., (2).

Results

The fish weighed 4.2-5.5 g and were 5.2-5.7 cm in size. Grey-blue points were observed on the skin and fins due to parasitic irritation and tissue damage. Parasites were collected from around the operculum and fins (Fig.1). The mean number of parasites per fish was 1-3. The parasites were 3510-6760 x 2340-5460 μm in size. Under the light microscope, these parasites were identified as *A. foliaceus* according to the rounded lobes of abdomen and the posterior emargination not reaching the mid-line, and posterior lobes cephalothoracic carapace not extended beyond the beginning of abdomen (Fig.2).

Eggs were recovered from the glasses surface of aquarium. The eggs were ovoid, 200-220 x 310-350 (mean 213-330) μm in size and covered by a gelatinous capsule (Fig.3). *Dactylogyrus sp.* was observed only in gill preparations.

Figure 1. *Argulus foliaceus* on the skin of goldfish.

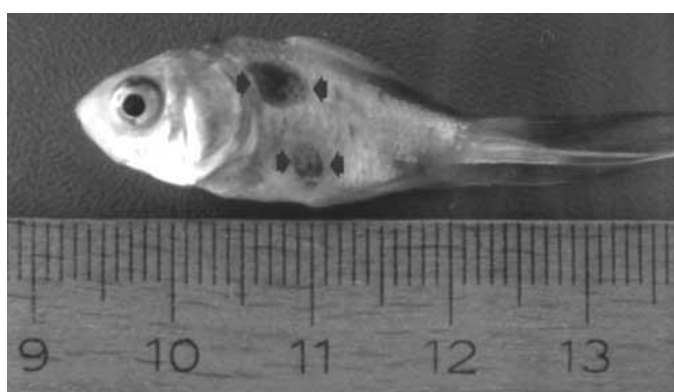
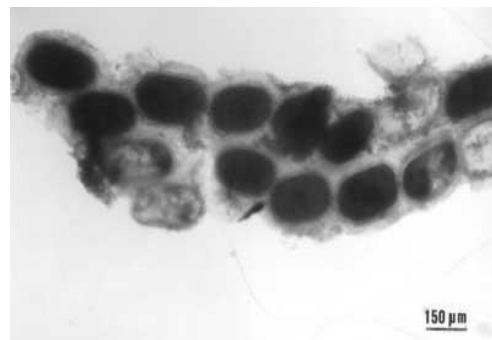
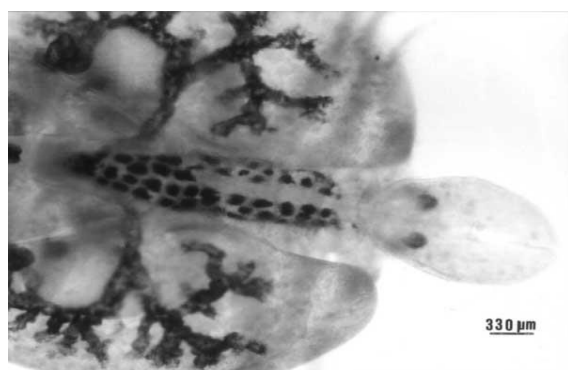


Figure 2. *Argulus foliaceus* with rounded abdominal lobes. **Figure 3.** Eggs of *Argulus foliaceus*.



Discussion

Argulus sp. were reported from different fish species worldwide (6,7) and also from some freshwater fish species in Turkey (8-12). In the present study, *A. foliaceus* was reported on *Carassius auratus*.

Associated with *A. foliaceus* infections was a degree of skin irritation manifested by flicking of the fins (1,5). This is often accompanied by increased mucus production over the skin surface and the appearance of small haemorrhages (5). In this study, it was observed that infected fish have generalized symptoms including lack of appetite and abnormal swimming. Grey-blue points were also observed on skin and fins. *Argulus foliaceus* was usually found in the vascular areas at the base of the fins and around the operculum.

It is known that *Argulus* infections lead to secondary parasitic infestation of the skin (1,3). Some authors reported that *Costia necatrix* accompanied by *A. foliaceus* in infected fish, and also *Trichodina sp.*, *Trichodinella sp.* and *Apiosoma sp.* were observed in skin and gills preparation (1,10). In this study, *Dactylogyrus sp.* was the only parasite observed in gill preparations.

There are several reports of hundreds of *Argulus* species occurring on a single fish, and Fryer (1982) stated that a tench in Europe was found with thousands *Argulus sp.* In this study, 1 to 3 parasites were found on the fish examined. This might be related to the early stage of infection. Pathogenesis was severe because these fish were small, despite a few parasites being found on the fish. Also aquarium fish were affected heavily by ectoparasites due to the very fine structure of the skin.

Treatment of *Argulus* species was accomplished using organophosphates, potassium permanganate (2-5 mg/l, bath) or dimilin (0.01 mg/l, bath) (14). The most effective treatment against *Argulus sp.* is with organophosphates (1). Organophosphates, usually 2-3 doses at one week intervals, are needed to treat the emerging larvae and juveniles. In the present study, it was recommend to the pet shop owner that disinfection of aquariums and equipment to completely remove eggs, and treatment of fish with trichlorfon (0.25 mg/l at temperatures below 27°C, or with 0.50 mg/l above 27°C). The bath was repeated twice a week and was found to be effective.

Although the source of contamination of the aquarium with *A. foliaceus* was not defined, live food was suspected.

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