

## Host-Parasite Interaction of a Gill-Infecting Didymozoid in the Pazhayar, Southeast Coast of India

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**Abstract:** Trematodes of the family Didymozoid are parasites of marine fishes. The infection effects of the parasitic digenean trematode on the gill region of the fish *Rastrelliger kanagurta* were examined.

**Key words:** Didymozoid % Infected Gill % *Rastrelliger kanagurta* % Trematode

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### INTRODUCTION

Flesh quality is a concern to any industry that sells a fresh meat product. Poor muscle quality of fish has been attributed to many factors, including processing problems, high fat feeds, stress and quality of the fish at harvest [1]. Parasites have also been considered a factor critical in influencing conventional seafood quality and price [2, 3]. Both have a long history of infection of large areas of muscle in a variety of fish species worldwide [4-8]. Deterioration of fish condition and loss of marketability have been related to extensive fish muscle degeneration, parasite invasion and chronic inflammatory reactions. Further recorded emerging zoonoses and allergies associated with the presence of these helminth parasites in fish muscle, underlining the economic and public health importance of instituting control measures for edible seafood during inspections [9].

Parasites are prevalent in many animal groups and affect their hosts in various ways to increase their own fitness [10-14]. *Scopimera globosa* is a common second intermediate host of a digenean trematode, *Gynaecotyla squatarolae* [15, 16].

One of the most prevalent and abundant parasites acquired during the feeding and migration of bluefin tuna are digenea of the family Didymozoidae. As tuna caught for cage rearing are mostly immunocompetent adult individuals [17, 18] that through natural selection have survived various parasite challenges, only a low percentage of mortality in captivity has been observed [19-21]. However, with the tendency to prolong the rearing period to up to 2 years [22], the impact of Didymozoidae distributed in diverse host tissues has to be accurately identified and quantified.

*Haliotis asinina* are abundant on Heron Island Reef [23] and a small number of this abalone are infected by digenean trematodes in the area of the conical appendage (digestive gland and gonad). Infection appears to result in almost complete castration of both males and females, although the parasites themselves have not been detected in the gonad [24]. Castration through digenean parasitism is common in molluscs and may affect growth [25-29].

Provides data on the host-parasite interactions of a muscle-infecting didymozoid in the eastern stock of Atlantic mackerel are addressing the molecular characterization of the parasite, analysing prevalence data and investigating the ultrastructure of host-parasite interactions [30]. The occurrence of *Didymosulcus palati* [31, 32] originally described in the Pacific Ocean and of *Didymosulcus philobranchiarca* [31,32] found in the Pacific and Indian Oceans.

In view of the above, the purpose of this study was to characterize the composition of Didymozoid digeneans hosted by *Rastrelliger kanagurta* in Pazhayar, Southeast coast of India and to evaluate some of the ecological implications for its parasite community.

### MATERIALS AND METHODS

A total of 60 specimens of *R. kanagurta* were examined between June and July 2010. The area of capture was the Pazhayar (Lat 11° 21' 32.27" N; long 79° 49' 24.92" E) Southeast coast of India. Parasites were extracted from the gill region and were subsequently relaxed in hot saline solution. They were fixed, conserved in 5% formalin and stored in 70% alcohol.



Fig. 1: Didymozoid digenean on gill arch of *R. kanakurta*

## RESULTS

**Type-Host:** Small, opaque-white to yellow cysts is found on the first gill arch of affected *Rastrelliger kanagurta* (Fig. 1).

**Type-Locality:** Pazhayar (Lat 11° 21' 32.27" N; long 79° 49' 24.92" E).

**Site:** Gill region.

**Size:** Didymozoid digeneans are long, up to 80 cm, parasitic flatworms that form capsules or cysts on the gills of the host fish.

**Effects on Host:** Most common effect on affected fish is epithelial cells on the gill lamellae, damage to the gill epithelium and respiration is affected.

**Distribution:** It has been recorded in *Epinephelus coioides*, *E. malabaricus*, *E. tauvina* and *Epinephelus* sp. in Indonesia, Kuwait, Malaysia, Myanmar, the Philippines and Thailand. The range of host fishes is here extended and now includes *R. kanagurta* and the distribution of this species is here extended to the Vedaranyam coast, Southeastern coasts of India.

## DISCUSSION

Although trematodes are the most prevalent and conspicuous helminth parasites that infect mackerel [33,34], neither histopathological nor host tissue reactions have been studied. Tissue infected by didymozoids

usually reveals little or even no tissue reaction [8, 35]. According to [30], live adult didymozoids of *Halvorsenius exilis* commonly found in eastern Atlantic mackerel occur only in young fish, whereas egg aggregations (which are retained in utero until the death of the worm) are found in older fish (3-group) from the western English Channel.

Once the adult parasite leaves the fish muscle tissue or dies, late stages of encapsulation are common, in association with worm fragments and residual eggs. Such a strategy developed to avoid destruction by the host response has been suggested for other helminthes [36, 37] and for trematode infections of long duration in fish hosts [38,39]. Clearly, more research on cytochemical identification and biochemical characterization of such toxic secretions from our material is required.

*Didymosulcus palati* was first identified by [31] in hard denticle palate and partly in the tooth plate of gill arches of *Thunnus albacares* (=Neothunnus macropterus) from Hawaii, Pacific Ocean. In the present study, Didymozoid digeneans were found in gill arches in the host species of *R.kanakurta*. *D. philobranchiarca* was originally described on gill arches of *T. albacares* (=Neothunnus macropterus) and *T. obesus* (= Parathunnus sibi) from Hawaii by [31], in the genus *Didymocystis* and later transferred to *Didymosulcus* by [32]. This species was also reported in *T. obesus* and in *Thunnus alalunga* from Indian Ocean by [40].

These results differed from those obtained by other investigators who reported that tissue infected with didymozoids usually presents little or even no tissue reaction or damage [8, 30]. Also observed eggs masses, hemorrhages and lymphocyte infiltration in the connective tissue surrounding the parasitic nodules in the operculum of tuna fishes parasitized with didymozoids [41, 42]. In the present study, infected with didymozoids the most common effect on affected fish is epithelial cells on the gill lamellae, damage to the gill epithelium and respiration is affected.

The presence of a didymozoid species in the muscles of a marine fish in Japan and identified it as the adult worm of eggs found in human feces transmitted through fish consumption [43]. Heavy infections can reduce the commercial value of tuna fish, manly because of macroscopic alterations that make the flesh unappealing to eat [4, 35, 42, 44]. Despite its common occurrence in the Indian waters, the parasite fauna on Indian fishes as already recorded by [45-49]. Recorded emerging zoonoses and allergies associated with the presence of helminth parasites in fish muscle, emphasizing the economic and public health importance of instituting control measures for edible seafood during inspections [9]. In this respect,

the increasing consumption of raw or uncooked fish in India associated with the occurrence of these parasites in R.kanakurta fish may represent a risk factor of human infection.

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