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Research Note

Co-infection of Yellowtip Halfbeak Fish (*Hemiramphus marginatus)* with Isopod and Copepod Parasites from the Coromandal Coast, India

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Parasitic fish diseases constitute one of the most important problems in fisheries sector. Among fish parasites, cymothoids are obligatory parasites, infesting mostly commercially important fishes. They are protandric hermaphrodites and blood suckers, living on the skin, gill filaments, or in the mouth of the fishes. These parasites retard growth and cause emaciation followed by death. Pathological conditions resulting from parasitic diseases assume high magnitude of epidemics under crowded and other unnatural conditions among fish.Isopod parasite of the family Cymothoidae under order Beloniformes have been reported from about 350 fish species and over 80% of these occurrence are from tropical and subtropical seas, majority being from the Indo-Malaysian archipelago (Lester, 1995). They are blood-feeding and ectoparasitic on marine, freshwater and brackishwater fish. Their life cycle involves only one host (holoxenic cycle) (Trilles, 1994). Such parasitic isopods are usually large in size, producing serious deleterious effects on the host fishes (Trilles & Hipeau-Jacquotte, 1996).

Approximately 10,000 species of copepods have been described out of which 2,000 species are reported to be parasites of fish. Among the copepod parasites, those belonging to Pennellidae are widespread and gonochoristic in marine fishes. All species of this family are known to depend on fish for larval development, and have a life cycle involving two hosts (dixenic cycle) (Raibaut, 1996). Some of them penetrate only to a short distance on fish tissues; others burrow deeply into all organs, seeking areas rich with blood supply (Natarajan, 1973). Most of these parasites cause localized changes in adjacent tissues and responsible for reduced gonad development (Raibaut, 1996).

Isopods and copepods have been reported parasitizing several fishes of Parangipettai coastal waters in India (Rajkumar et al., 2004). Double parasitism in Commerson's Anchovy (*Stolephorus commersonii)* is also reported from Parangipettai coastal waters (Rajkumar et al., 2006). Gopalakrishnan et al. (2010) reported double parasitism (isopod Cymothoidae and copepod Pennellidae) on the black-barred halfbeak fish, *(Hemiramphus far)* from southeast coast of India. In the present study an attempt was made to study the parasite infection in yellowtip halfbeak fish *Hemiramphus marginatus*, which occupy similar food niche in this ecological region.

Yellow tip halfbeak fish, *Hemiramphus marginatus* (Hemiramphidae), were collected from gill net landings from the inshore waters off Chennai (Coromandal coast of India) during September 2011 and transported to the laboratory. The fishes were examined for the presence of different parasites. The parasites were collected from gills and body surfaces of fish and preserved in 70% ethanol (w/v). The Isopod parasites were identified according to Bruce (1986), Trilles (1994), and Kirtisinghe (1932) whereas

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methods described by Gnanamuthu (1953) were followed for the identification of parasitic copepod. The taxonomic classification of the host, halfbeak fish was carried out following Fischer et al. (1974) and Froese & Pauly (2008).

Parasite infestation was observed in 60% of fishes collected and the number of parasites per fish ranged from 1 to 3 with a mean of 1.73 ± 0.59 (Table 1). Double infection of an isopod (Cymothoidae) and a copepod (Pennellidae) was observed in yellowtip halfbeak fishes of size ranging from 265 to 310 mm and mean total length TL of 287.13 ± 14.15 mm (Table 1, Fig. 1). The weight of the fish varied from 53-93 g with average of 75.06 ± 11.88 g. The cymothoid isopod was identified as *Mothocya plagulophora* and both sexes of this species were found to co-habit as pairs in the gill region. *M. plagulophora* was first described as *Irona vatia* by Schioedte et al. (1884) and *Irona far* by Nair (1950). The taxonomic position of *M. plagulophora* was clarified by Bruce (1986). Until now, *M. plagulophora* has been reported only from *Hemiramphus far* (Trilles, 1994). The size of adult parasite varied from 23 to 28 mm with mean length of 25.63 ± 1.80 mm. Similarly, weight of parasites varied from 0.52 to 0.72 g with mean weight of 0.62 ± 0.060 g (Table 2, Fig. 2). The mean egg diameter, length of larvae and adult isopod parasites were 1.76 ± 0.10, 2.62 ± 0.051 and 3.16 ± 0.408 mm respectively.

The parasitic copepod was identified to be *Lernaeenicus hemiramphi*. *L. hemiramphi* was first described and reported from *Hyporhamphus xanthopterus* (as *H. xanthopterus*) (Hemiramphidae) fished from the Ceylon coast by Kirtisinghe (1932). Later, it was re-described by Gnanamuthu (1953) and John & Nair (1975) from specimens obtained from *H. far* caught along the Madras coast. This species appeared to be specific to Hemiramphidae. However, Shiino (1965) reported *L. hemiramphi* from *Coryphaena* sp. (Coryphaenidae) caught from Hawaiian waters. Both the parasites *M. plagulophora* and *L. hemiramphi* recorded in the present study were attached to the host fish (Fig. 1). Two of the *L. hemiramphi* (17-22 mm) were found on the anterior side of the belly surface of the halfbeak fish, just behind the dorsal fin and burrowing deep into the musculature of its hosts. Similarly, the other parasite was found on the posterior side of the body, just near to caudal peduncle region (Fig. 1). As described earlier, both the parasites reported here feed on blood (Trilles, 1994) and the copepod parasite identified in this study was reported to be a female. The total body length was in the range from 17-22 mm.

Table 1. Morphometric characteristics of yellow tip halfbeak fish, collected from Chennai Coast (Coromandal Coast)

Parameters	Mean ± S.D.
Total Length in mm (From snout to lower caudal end)	287.13 ± 14.15
Total Length in mm (From snout to upper caudal end)	275.8 ± 13.65
Weight (g)	75.06 ± 11.88
Maturity stage	F1: 53.3% F2: 6.6% M1: 33.3% M4: 6.6%
Number of parasites per fish	1.73 ± 0.59

M1= Male Stage I, F1= Female Stage I, F2= Female stage II, M4= Male Stage-IV

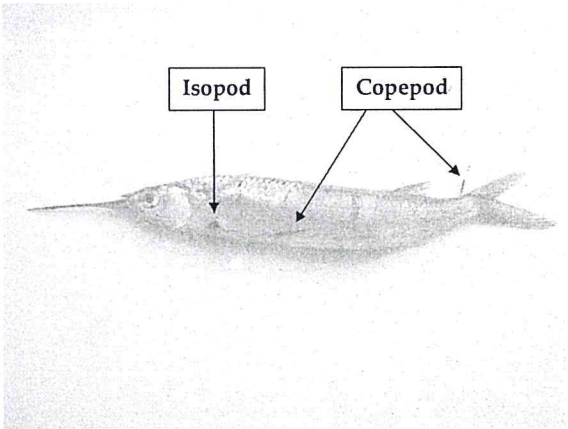

Fig. 1. Parasitic Isopod, *Mothocya plagulophora* and Copepod *Lernaeenicus hemiramphi* attached to Yellow tip halfbeak fish (*Hemiramphus marginatus)*

Total number of eggs per adult isopod parasite varied from 450-600 with a mean of 526 ± 55.09. Total number of larvae per adult parasite were varied from 391-420 with mean 402.2 ± 36.93. Total number of II stage larvae per adult parasites varied from 350-450 with a mean of 414.2 ± 37.85. In all cases, the isopods were attached to the antero-ventral portion of the gill filaments, with their head always facing to the ventral side of the host. In most

cases, the parasite was located between the second and third branchial arches, attached either to the vomerine arch or to the internal wall of the branchial operculum. Such infections may induce severe damages to the host's gills particularly in the area on which the female isopods rest their brood pouch (Fig. 3). It was reported that infected Fish harboured one to three cymothoid parasites in the branchial cavity. Regarding their sex distribution, it could be two females, two males or a pair of females with a single male (Trilles, 1994).

A common hyper-infection with two to three different parasites has been reported on flying fish (Wilson, 1917). They are correlated with the size of the host fish. Single and double parasitism by large isopods and copepods are rare on very young fishes, and several isopods and copepods are not able to attach when the fishes are too big (Tucker et al., 2002). Further, double parasitism on *H. far* was correlated with the availability of numerous parasitic larvae (such as Cymothoid larvae) in the environment depending upon the water temperature for the development (Trilles, 1994). Putz et al. (1964) reported that temperature (23–30°C) plays an important role for parasite development.

In some fishes, parasitic associations are possible, but rare, including simultaneous associations of several large parasites (Trilles et al., 1996). Cymothoids and Digeneans are frequently associated with fish. This is the first report on the occurrence of an infection by two parasitic crustaceans in the halfbeak fish from the southeastern coast of India. Such double parasitism, involving a branchial cymothoid and a pennellid copepod, is probably uncommon, but not accidental. Cymothoids infect several species of fish. Mance (juvenile parasitic stages of cymothoid) feed voraciously and easily kill fry and fingerlings. Adults

Table 2. Morphometric characteristics of eggs, larvae and juveniles of the parasite *Mothocya plagulophora* isolated from yellow tip halfbeak fish

Parameter	Range	Mean ± S.D.
Diameter of Eggs (mm)	1.56-1.88	1.76 ± 0.10
Length of larvae with compound eyes and without appendages (mm)	2.56-2.72	2.62 ± 0.051
Length of juveniles with compound eyes and developed appendages (mm)	2.5-4.0	3.16 ± 0.408

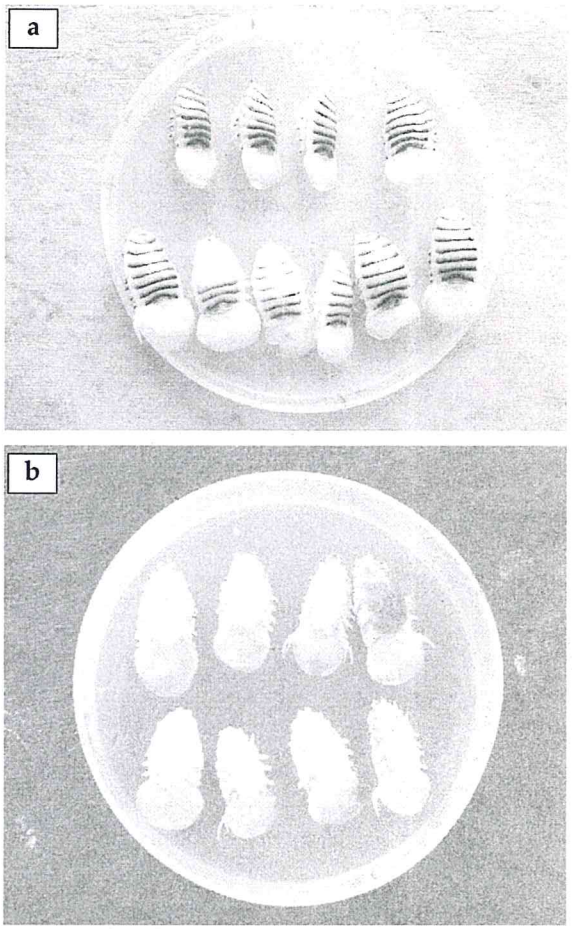

Fig. 2. Gravid female parasitic isopods with embryos and larvae attached to brood pouch or marsupium isolated from Yellowtip halfbeak fish. (a. dorsal view & b.ventral view)

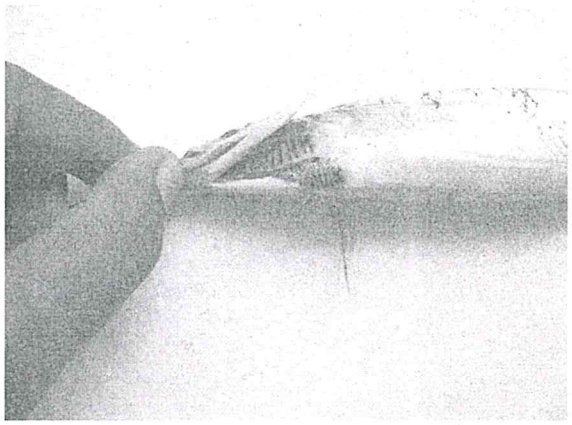

Fig. 3. Male and Female of adult *Mothocya plagulophora* on the gill surface of the *Hemiramphus marginatus*

parasite which are permanently attached to the hosts, result in stunted growth and also affect reproduction. Parasites in the gill chamber are usually associated with deformed gills. This may lead to severe economic loss in the commercial species of the marine fishes of India.

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