

Infestation of isopod parasites in commercial marine fishes

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Crustacean ectoparasites on marine fishes are diverse. Many species of fishes are infected by cymothoids (Crustacea, Isopoda, Cymothoidae). They are blood-feeding; several species settle in the buccal cavity of fish, others live in the gill chamber or on the body surface including the fins. Their life cycle involves only one host (Holoxenic cycle). Isopods form an Order in the crustaceans. The name Isopod refers to all legs being similar in size and shape. Isopods are associated with many species of commercially important fishes around the world and cause significant economic losses to fisheries by killing, stunting, or damaging these fishes. They can also kill or impair immature fishes so that they do not survive. Isopods serve as important food items for a variety of animals. They are commonly seen as parasites on teleosts in tropical and subtropical waters (Brusca 1981; Bunkley-Williams and Williams 1998; Ravichandran et al. 2000; Ravichandran 2007). They resemble free-living isopods except for their hook-like legs. The stages normally found are the non-swimming, permanently attached mature females, often with a small male nearby.

Fish-parasitic isopods are alleged to indicate tropical fishes which are free of ciguatera (fish poisoning toxins). This is not proven. Approximately 4,000 species have been described, and more than 450 species are known to parasitize fishes. They vary from 0.5 to 440 mm in length. The largest species on earth occurs off Puerto Rico (Bunkley-Williams et al. 2006).

Parasite body is usually dorso-ventrally flattened (depressed) with a head, fused with the first thoracic

segment (cephalothorax), thorax and abdomen. The thorax has seven segments and abdomen six (often fused into two to five). One pair of thoracic appendages modified into mouthparts, and seven pairs are unmodified. The abdomen has six pairs of appendages, and ends in a terminal shield (pleotelson). Eggs, larval forms and juveniles develop in a brood pouch beneath or in the female (Figs. 1, 2, 3). Free-swimming juveniles develop into adults. Sexes are separate in some isopods, while others begin life as males and turn into females (protandrous hermaphrodites). They are common in most environments, including dry land. They parasitize fishes, crabs, shrimp and other isopods. Fish-parasitic isopods vary from accidental, or temporary, to permanent parasites. A broad range of food habits occur. The fish-parasitic forms feed on blood or ooze from wounds. Isopods have been accused of directly transmitting lymphocystis disease, but this is unlikely considering their feeding habits and behavior. As cymothoids penetrate the skin with their pereopods and mouthparts, and the tissue-inhabiting forms maintain a small opening to the outside, secondary infections occur. The wounds they cause may provide entry points for microbial diseases. Pathogenic microorganisms in the aquatic habitat pose problems to the economic important fishes due to their secondary invasion on the body of the fish, which got isopod parasitic infestation primarily (Ravichandran et al. 2001; Ravichandran and Ajith Kumar 2008).

The parasites occupy the entire branchial chamber of the host may produce pressure on the gill surface and thus affecting the efficiency of respiration. Although, the infestation may cause immediate death, it will affected the normal growth of the host fishes particularly degeneration of sexual organs. They may lead to economic loss of fishes. In general parasitic infection of fin and shell fishes mainly depend upon host factors such as age, size, sex, maturity,

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Fig. 1 Attachment of isopod parasite *Joryma brachysoma* in the buccal cavity of *Rastrelliger kanagurta*



Fig. 2 Infestation of isopod parasites *Joryma tartoor* in the branchial chamber of *Ilisha melastoma*

stage, behavior, feeding and breeding, life cycle and particularly factors.



Fig. 3 Dorsal and ventral view isopod parasite *Joryma tartoor*

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