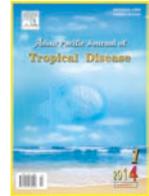




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Isopods parasites infection on commercial fishes of Parangipettai waters, southeast coast of India

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PEER REVIEW

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Comments

In general, it is a good study which shows the importance of infection of fishes with isopods in southeast coast of India. The authors investigate the prevalence of isopods in marine water fishes and the effect of this infection on the normal growth of the host.

Details on Page S271

ABSTRACT

Objective: To examine the effect of six different isopods from five different food fish species.**Methods:** The specimens were collected directly from the trawlers landed at Parangipettai coast during the year of 2012 (January–December). Isopods were removed from the body surface and buccal cavities of the fish hosts and immediately preserved in 70% ethanol. Data regarding the prevalence of isopod parasites was calculated and site of attachment.**Results:** During the study period, 310 fishes were collected and examined for parasites infection, and it includes five different species. Among the examined fishes, 106 fish were infected among the total number of 120 collected parasites. The occurrence of isopod infection in all the infected fishes was 34.19%. The occurrence of *Liza parsia* was 25%, *Thryssa dussumieri* was 36%, *Sardinella albella* was 17.5% and *Otolithes cuvieri* was 65%. The maximum isopoda parasite infected noticed *Otolithes cuvieri* and minimum value was recorded in *Sardinella albella*.**Conclusions:** This is the new host for the parasite *Nerocila phaeopleura* in *Liza parsia*. Thus parasitic attack the growth and normal function of the fishes will suffer and lead to economic loss or the marketability may reduce then. In along the lifespan, the host population was may be affected by the parasitic outbreak.

KEYWORDS

Food fishes, Isopod parasite, Cymothoids, *Nerocila phaeopleura***1. Introduction**

Parasite diseases pose great problem in the culture and captive maintenance of marine water fishes[1]. Among marine fish parasites, nearly 25% are crustaceans, mainly represented by copepod, brachiura and isopod[2]. Marine isopods play an important role in the food web, in particular in removing decaying material from natural or altered environments and they also represent an important factor of economic unbalance[3]. They occur in marine, estuarine and freshwater habitats, especially in the near-shore coastal environment[4]. They occur on fish host on the outer body or fins, in the mouth, gill chambers, or nostrils, or occasionally in self-made pockets in the flesh of their hosts[5]. Isopods 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[6]. Isopod crustaceans are part of the greatest fish ectoparasite group and are easy to identify due to their size, morphological aspects and because they are easily found on the outer part of fish bodies[7]. According to the marine species of the order, Isopoda are classified into 12 suborders among which the suborder Cymothoida includes 29 families. Among the families of the suborder Cymothoida, the family Cymothoidae included 43 genera and 358 species[8]. Most of the fish species are infested by cymothoid isopods position on the host (buccal, gill, burrowing or external), and general body shapes have long influenced interpretation of the relationships of cymothoid genera[9].

Nerocila is a large genus of the family Cymothoidae including at least 65 species living attached on the skin or on the fins of fishes. *Nerocila phaeopleura* (*N. phaeopleura*),

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all the appendages are highly modified to hold the body surface and tearing the body muscles of host fish strongly^[10]. As already reported by Bruce NL^[11], several species are morphologically highly variable and their identification is often difficult. The variability was particularly studied in *Nerocila armata* and *Nerocila orbignyi* (*N. orbignyi*)^[12], *Nerocila excisa*^[13], *Nerocila sundaica*^[14], *Nerocila acuminata*^[15], *Nerocila arres*, and *Nerocila kistra*^[16], and *N. orbignyi*, *Nerocila monodi*, and *N. phaeopleura*^[11]. Several parasitic isopods from Parangipettai like cymothoids from different food fishes via: *Chirocentrus dorab*, *Sardinella longiceps*, *Sardinella sidensis*, *Sardinella brachysoma*, *Dussumieria acuta*, *Thryssa dussumieri* (*T. dussumieri*), *Thryssa mystax* and *Scomberomorus guttatus*^[17]. Further observed an infection by *Cymothoa indica* on the spot tail needlefish *Strongylura strongylura*^[18]. Many works have been done on isopods parasites infection potential of different marine fishes whereas no attempt has made of in the case of fishes. Hence, the present study deals with the isopods parasites infection on selected commercial fishes of Parangipettai coastal waters, southeast coast of India

2. Materials and methods

The specimens were collected directly from the trawlers landed at Parangipettai (Lat 11°29' N; 79°46' E southeast coast of India) from January–December, 2012 (Figure 1). A total of 5 commercial food fishes infected with isopod at Parangipettai landing center. They were brought in the laboratory for further study. Isopods were removed from the body surface and buccal cavities of the fish hosts and immediately preserved in 70% ethanol. The total length of the fish hosts and isopods was measured and all measurements were in millimeters. Mouth parts and appendages were carefully dissected using dissecting needles and forceps. Host nomenclature and fish taxonomy are according to Fish Base^[19]. Data regarding the total length, with weight and sex of host fish were recorded.



Figure 1. Map shows the study area.

3. Results

A total number of 310 fishes were collected and examined for parasites infection. It includes five different food species. Among the examined fishes, 106 fish were infected among the total number of 120 collected parasites. The prevalence of isopod parasites was calculated (Table 1). The measurements of the fish hosts and isopods are shown in Figure 2.

Table 1

Prevalence of isopods parasites in marine food fishes.

| Name of host | No. of examined | No. of infection fish | Prevalence (%) |
|----------------------|-----------------|-----------------------|----------------|
| <i>L. parsia</i> | 60 | 15 | 25.00 |
| <i>T. dussumieri</i> | 50 | 18 | 36.00 |
| <i>S. albella</i> | 120 | 21 | 17.50 |
| <i>O. cuvieri</i> | 80 | 52 | 65.00 |
| Total | 310 | 106 | 34.19 |



Figure 2. The isopods parasites infected in marine fishes at different body parts.

A and B: *N. phaeopleura* parasite affected in the caudal region of *L. parsia*, indicating the infected part. C and E: *N. phaeopleura* parasite affected in the pectoral fin region of *S. albella* and *T. dussumieri*. G and H: *Cymothoa bosii* and *Cymothoa crenita* parasites affected in the gill regions of fish *O. cuvieri* (I) indicate the parasites.

The total prevalence of isopod infection in four different fishes was 34.19%. The prevalence of *Liza parsia* (*L. parsia*), *T. dussumieri*, *Sardinella albella* (*S. albella*) and *Otolithes cuvieri* (*O. cuvieri*) was 25.00%, 36.00%, 17.50% and 65.00%. The maximum isopod parasites infected noticed in *O. cuvieri* and minimum value was recorded in *S. albella* (Table 1).

The study period was noticed *N. phaeopleura* maximum attached only body surface of *S. albella*, *T. dussumieri* and *L. parsia*. The *Cymothoa* sp. was attached by gill and buccal cavity of *O. cuvieri* fish (Table 2). The total of infection *Nerocila* sp. was 17.41% and *Cymothoa* sp. 16.77%.

Table 2

The attachments of isopods parasites in marine food fishes.

| Host | Parasites Species | Site of attachment |
|----------------------|-------------------------|------------------------------------|
| <i>Liza parsia</i> | <i>N. phaeopleura</i> | Body surface (Caudal pedangel) |
| <i>T. dussumieri</i> | <i>N. phaeopleura</i> | Body surface (Nearby pectoral fin) |
| <i>S. albella</i> | <i>N. phaeopleura</i> | Body surface (Nearby pectoral fin) |
| <i>O. cuvieri</i> | <i>Cymothoa bosii</i> | Gill (inside of 1st gill arch) |
| | <i>Cymothoa crenita</i> | Gill, Buccal cavity |

4. Discussion

Parasitic isopods are likely the dominant group of crustacean ectoparasite of fish in tropical seas^[20]. Recently the parasites have been recognized as an important component of global biodiversity and research efforts directed and documented towards the parasitic species diversity has increased^[21]. Parasites affected fish health, growth, behavior, fecundity and mortality and also regulate host population dynamics and their community structure^[22]. These parasites 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). Parasites can substantially alter host fitness by negatively affecting physiological, behavioural and morphological traits^[23]. Isopods associate with many species of commercially important fishes around the world and cause significant economic losses to fisheries by killing, stunting, or damaging these fishes^[24]. The cymothoid isopods are potentially economically important parasites as they have been shown to cause detrimental effects on fish in captivity including growth inhibition, anaemia and death in smaller fish^[25]. Like most isopods, cymothoids are considered to feed principally on host blood, but they may consume the mucus, epithelium and subcutaneous tissues of their hosts^[26].

In the present study, totally isopod infection in all infected fishes were 34.19%. The occurrence of *L. parsia* was 25%, *T. dussumieri* was 36%, *S. albella* was 17.5% and *O. cuvieri* was 65%. The total of infection affected by *Nerocila* sp. was 17.41% and *Cymothoa* sp. was 16.77%. The *Livoneca redmanni* affected the Brazilian coastal waters the prevalence was 5.9%^[27]. The *Anilocra nemipteri*, its fish host at Lizard Island, Great Barrier Reef, prevalence of it was 4.3%^[28]. A low prevalence of 14% and a prevalence in *Cymothoa* sp. have been found in Seagara Anakan lagoon^[29]. The overall prevalence reached 8.74%. A maximum prevalence was observed in *Nerocila depressa* parasitizing *Sardinella gibbosa* ($P=12.5\%$) and a minimum prevalence in *Nerocila sundaica* parasitizing *Ilisha melastoma* ($P=3.84\%$)^[30]. The isopod parasite *Ceratothoa oestroides* was found in gilthead sea bream from Astakos at a prevalence of 31.2%^[31]. The result of the present study clearly shows that the isopod infected fishes is higher and lower than the previously reports. Hence it could be concluded that the maximum isopoda parasite infected noticed in *O. cuvieri* and minimum was recorded in *S. albella*.

Main factors determining the fish parasite fauna as well as intensity and prevalence of infection in marine environments were studied^[32]. Significantly it showed that a number of Cymothoidea, including *N. orbigny* and *Nerocila bivittata*

are specific in their choice of host, whereas other genera are less specific^[33]. In the present study, the maximum affected was *Nerocila* sp. (17.41%) and minimum was *Cymothoa* sp. (16.77%). *Nerocila* sp. was affected by three different fishes and *Cymothoa* sp. was affected only by one fish. So *Nerocila* sp. was dominated and two genera of parasites could be similarly. *N. phaeopleura* which is being host specific, would thus seem to fit in with an apparently generic characteristic and it seems reasonable to assume that *Sardinella gibbosa* is the major host of the species in the South China sea.

Isopods associated with fishes are relatively poorly studied or even surveyed in many parts of the world^[34]. The information regarding cymothoid fauna of marine fishes from the Indian coasts is scanty^[17]. Most of the studies were from the east coast of India^[35,36]. The first records of *Nerocila depressa* were found attached to the bodies of *S. albella* from the estuarine coastal region of Trat Province, Thailand^[37]. *N. phaeopleura* isopod recorded for the first time from the marine fish *Rastrelliger kanagurta* from Parangipettai coast^[38]. In the present study, three different fishes (*S. albella*, *T. dussumieri* and *L. parsia*) were added as a new host for this parasite.

The study period was noticed *N. phaeopleura* maximum attached only body surface of *L. parsia*, *T. dussumieri* and *S. albella*. The *Cymothoa* sp. was attached in gill and buccal cavity of *O. cuvieri* and other fishes. The parasites *Cymothoa indica* mostly attach with buccal region and the branchial chamber of the (host fish) first gill arch^[25]. Probably all species of cymothoids are protandrous hermaphrodites, with the male larvae settling out of the plankton onto the mouth, body surface, body cavity, or gills of their host^[39]. 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, stage, behavior, feeding and breeding, life cycle and particularly factors^[40].

In general, parasitic infection of fishes mainly depends upon host factors such as age, size, sex, maturity, stage, behaviour, feeding and breeding, lifecycle, physico-chemical and particularly environment factors. The negative impact of parasites on host's growth and survival has been demonstrated for several parasite-host systems, both in aquaculture and in natural populations^[41]. However, host parasite relationships are generally very complex and difficult to clarify. With the exception of cases of mass mortalities caused by outbreaks of parasites, assessment of

the effects of parasite infection in natural fish populations is particularly difficult because of the presence of predators or scavengers which rapidly remove moribund or dead fish. The current investigated for the isopods parasitic infection is a commercial food fishes. This is the new host for the parasite *N. phaeopleura* in *L. parsia*. Thus parasitic affected the growth and normal function of the fishes will suffer and lead to economic loss or the marketability may reduce then. In long run, the population of the host may be affected by the parasitic outbreak.

Conflict of interest statement

We declare that we have no conflict of interest.

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Comments

Background

Parasitic infection of fishes with isopods constitutes a major problem in fish industry and causes a significant economic losses to fishers which includes killing, stunting and damaging of these fishes. These parasites occur on the outer body of fishes including fins, mouth and gill chambers.

Research frontiers

The aim of the study is to investigate the effect of six isopods from five different food fish species. The prevalence of isopod infection was 34.19%. The maximum rate of infection with *O. cuvieri* and the lowest with *S. albella* were studied.

Related reports

Parasitic infection poses a major problem in water fishes and the crustaceans constitute about 25% of these parasites which include copepod, brachiura and isopod (Mehlhorn, 1988; Eiras et al., 2000). Host nomenclature and fish taxonomy are according to Froese and Pauly, 2010. Data were depend on total length, weight and sex of host fish.

Innovations & breakthroughs

This study showed the importance of parasitic infection

of fishes with isopods which is 34.19%. The parasites will effect on the growth and normal function of the fishes which lead to economic loss and ultimately effect on the fishes population.

Applications

The study will be a guide for other researchers in the future in their study on parasitic infections of fishes specially in the field of epidemiology, prevention and control of these diseases. Meanwhile, it indicates the economic importance of these diseases on the economy of the country.

Peer review

In general, it is a good study which shows the importance of infection of fishes with isopods in southeast coast of India. The authors investigate the prevalence of isopods in marine water fishes and the effect of this infection on the normal growth of the host.

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