Studies on the Prevalence of Sacculina Spp. Infestation in Portunus Sanguinolentus (Herbst, 1783) from Parangipettai Coastal Waters, Southeast Coast of India

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Abstract

The presence of the external sacs on parasitic barnacles is the most unusual characteristic found in these genera. This barnacle belongs to genus rhizocephala that parasitizes crabs. Parasitization by sacculinids induces severe modifications in morphology, behavior and reproduction of their host (Brachyuran crabs: Portunus sanguinolentus). The present field study was carried out two landing center from Annankoil and Mudasalodai during January 2011–December 2011. It was found that total catch of infected crab was 12.4% from Annankoil and Mudasalodai landing center. The frequently infected male and female crab ratio was 66.3% and 33.7%. External parasites were found on crabs ranging from 56 mm to 86 mm in carapace width.

Keywords: Portunus sanguinolentus; Sacculina granifera

Introduction

Biological invasions and world-wide translocation of species pose great threat to the global environment and its after effects are creating severe havoc in marine ecosystems, often alters its biodiversity [1]. Introduction of exotic species or the abrupt proliferation of parasites in marine realm is a great menace the present day world is facing. Though the effects of some introductions are undetectable, but the introduction of some species may have dramatic ecological and economic impacts [2,3]. Parasitism is a biological trait that is defined predominantly in ecological terms [4]. Parasites constitutes nearly more than half of all biodiversity [5], but are least studied. Parasitic infestation and its associated diseases are the single most important factor threatening the all biodiversity [5], but are least studied. Parasitic infestations caused by sacculinids in Brachyuran crabs is an havoc, that alters its morphology, physiology and reproductive pattern; which ultimately leads to population depletion of many crab species. Sacculina (Rhizocephala) parasites are known to sterilize decapods by altering their hormonal functions and generally cause abnormal host growth [7,8]. Rhizocephans cause castration, aneudysis, stunting and increased mortality to their crab hosts, and thus, can have direct and indirect effects on crustaceans fisheries [9,10].

Indian marine ecosystem is extremely diverse blessed with an extensive coastline of 8,118 km, with an Exclusive Economic Zone (EEZ) of 2.02 mn sq. km and a continental shelf area of 468,000 sq km. India is bestowed with multispecies-multi sector marine fisheries resources, with total fish production of around 3.16 million tonnes [11]. Among the total marine fish production crustaceans occupies 16% which are represented by shrimps, lobster and crabs, in which crabs fishery has a marked effect in the abdomen of crabs, which is termed as ‘externa’. Parasitic barnacles (Cirripedia: Rhizocephala) are responsible for reducing the value of commercial crustaceans [9,10,15]. Larval rhizocephalan parasites infect mainly on decapods and the net effect is often a castration of both sexes of the host [16]. The rhizocephalan Sacculina has a marked effect on gonad development and growth; Sacculina infection may cause degeneration of the gonads in both male and female crabs and also modifies the secondary sexual characteristics in the male crab; resulting in the acquisition of female characteristics [17–19]. The wide prevalence of parasites noticed in a particular environment during a particular period of time might be attributed to change in the environmental parameters like water temperature, dissolved oxygen, salinity, pH etc., which may have an impact on the proliferation and survival of these parasites. The infection rates were seasonal for both sexes and were normally higher in the adult female population [20].

Investigations pertain to the prevalence of Sacculina infestations are often restricted mainly to temperate species and very few are reported from tropical waters. Pioneering works about the prevalence and infestation of Sacculina spp. are by Day [18]; Boschma [21-24]; Philips

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Results

A total of 12,975 specimens of *Portunus sanguinolentus* were checked throughout the Study period of one year to find out the seasonal occurrence and host specificity of *Sacculina* infestation in Parangipettai coastal waters. Among the collected samples nearly, 12.4% of *P.sanguinolentus* crabs were infested by *Sacculina* castration. The infestation rate was varied among the seasons and also differs among the sexes of the host. The seasonal occurrence of *Sacculinidae* infestation was in the order that, Summer recorded the maximum (39.2%) followed by Postmonsoon (35.3%), Summer (33.7%) and Premonsoon (32.9%).

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| Infected crab | Postmonsoon | Summer | Premonsoon | Monsoon | Total |
|---------------|-------------|--------|------------|---------|-------|
| Male          | 220         | 280    | 5600       | 1325    | 12975 |
| Female        | 120         | 140    | 745        | 38      | 197   |

Table 1: Seasonal infestation rate of *Sacculina* spp. in *P.sanguinolentus*.

Discussion

The overall prevalence of *Sacculina* infestation in *P. sanguinolentus* found in this study is compared with works done elsewhere. Nearly, 12.4% of *Sacculinidae* infestation was reported among the population of *P. sanguinolentus* which were checked for a period of one year. Among males, infestation prevalence was more in Summer; whereas as in the case of infected female crabs the prevalence was more in Monsoon. This clearly shows that infestations of *Sacculinidae* is irrespective of the seasons and are found throughout the year. The data were pooled up season wise that shows that infestation in males (66.3%) are higher than the female crabs (33.7%) (Table 2). Among the infected males, prevalence was maximum in Summer (67.4%) followed by Monsoon (67.1%), Postmonsoon (64.7%) and Monsoon (60.8%) respectively. Among females, infestation rate lies from 32.9% to 39.2% among the seasons in such a fashion that; Monsoon season observed higher prevalence of 39.2% followed by Postmonsoon (35.3%), Summer (33.7%) and Premsoon (32.9%).

![Image](Image355x505 to 436x561)

Figure 1: infected and non infected *P.sanguinolentus* (Herbst, 1783) crabs.

![Image](Image355x575 to 438x632)

Table 2: *Sacculina* spp. infestation rate in male and female crabs of *P.sanguinolentus*.
Many reasons have been attributed to the temporal and spatial prevalence of *sacculind* castration in marine crabs. George [48] observed that 20% of the examined crabs from Madras coast were infested by *rhizocephalan* parasite. According to Nair et al. [45], 169 out of 193 specimens of *Portunus sanguinolentus* had parasites of *Sacculina*. Grothers [49] suggested that infected hosts are more sluggish and are easily caught, and that passive fishing methods under estimate the true prevalence of parasites. Phang [50] accounted a prevalence range between 24% and 68% of *Thompsonia* sp. in *P. pelagicus* from Singapore and Perry (1984) pointed out that over 50% of blue crabs from a single population in the Gulf of Mexico were infected with *rhizocephalan* parasite. Hawkes et al. [51] reported nearly 76% prevalence of the *rhizocephalans* in blue king crabs from Glacier Bay. Potter et al. [28] documented the higher occurrence of *Sacculina granifera* in the warmer months in Western Australia. Host density may affect prevalence of parasites and it was found that the locality with the highest abundance of hosts naturally had more parasitic infestation [52,53]. Hoeg [16] revealed that *rhizocephalans* are parasitic sterilizers and at high prevalences they must therefore exert a strong selection pressure on the host.

Pillai and Thirumilu [14] observed that more specimens of *P. sanguinolentus* were infected with *Sacculina* spp. when compared to other crabs in Chennai coast. They reported that *Sacculina* were first observed in crabs in the month of June, and later it was found to be prevalent in almost all the months. Only few authors investigated and discussed the parasitic infested rates and its host specificity of marine crabs. Pillai and Thomas (1972) observed that 12.2% of the total population of *Portunus pelagicus* was infested with the *rhizocephalan* parasite in the Gulf of Mannar. They suggested that infested parasite showed prefert female host specificity and nearly 28.1% of the female crabs were infested. Johnson et al. [27] analyzed that 50% of the population of blue king crab, *Paralithodes platypus* were infected with *rhizocephalan* parasite. They revealed that both males and females were infested, but parasitic infection was strongly related to ovarian abnormalities.

Sumpton et al. [20] reported that the infection rates in Moreton Bay, Australia were seasonal for both sexes of *P. pelagicus* with higher prevalence in the adult female population in such a way that nearly 20% of adult females carried externae during the summer months. Werner [33] explained that higher incidences of infestation were found more frequently on males than the females. Galil [40] suggested among the parasitic infected crabs, the percentage of males were found higher and with an increase in the prevalence of infestation. Based on the present investigation, it is evinced that *Sacculina* infestation exhibits no clear specificity on sex wise and seasonal wise, we found in considerable quantities round the year with slight increase in warmer months. From the present investigation, the higher prevalence of *Sacculina* spp. in *P. sanguinolentus* in Parangipettai coast pose an alarming situation and also put forth the query about the sustenance of crab fishery and its future stock; as this will pave way to the occurrence of parasitic castration that indeed negatively affects its reproductive capacity and future recruitment. This study will serve as a baseline platform for a detailed and thorough investigation aiming to understand the rate of *sacculind* infestation in *Brachyura* crabs and its effect in future stock of crab population.

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