A Study on Copepod Parasites of Mangrove Fish *Polynemus Tetratadactylus* (SHAW 1804) from Andhra Pradesh - East Coast of India

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Short title: “Copepod parasites of *Polynemus tetratadactylus*”

Abstract: Anthropogenic activities in and around the estuaries are causing deterioration and depletion of fishes. In addition to this, fishes are prone to secondary infections by microbes and parasites. Three species of copepod parasites were recorded viz., Lernanthropus polyenii, Caligus phipsoni and Parapetalus hirsutus. The host parasite interaction, their prevalence and mean intensity of total and individual parasites was studied and recorded. Prevalence was found to be as high as 94.1% and the mean intensity is being 1.58 indicating that copepod infection is not intense. Usually they cause minor harm to their hosts when present in small numbers. However, in case of heavy infections severe damage to skin, muscles, and gill tissue accompanied with secondary infections, and resulting in decreased nutritive value of fish. Good environment management is crucial to avoid occurrence of parasites.

Keywords: *polynemus tetratadactylus*, *Lernanthropus polyenii*, *Caligus phipsoni*, *Parapetalus hirsutus*, Andhra Pradesh, East Coast of India.

1. Introduction

Pallamkurru is the place on the banks of river Godavari, which flows eastward through the state of Andhra Pradesh and joins the Bay of Bengal. The river forms an estuary which is a source of livelihood for the rural fisherman folk in that area. This major source in recent times has been prone to pollution due to various anthropogenic activities, thus affecting the health of fishes, leading to their deterioration and mortality. Fish prone to pollution become vulnerable to infections from microbes and parasites, resulting in the decline of fish production, leads to poor economic condition of fishermen. Parasites and microbes are responsible for poor growth, low survival rate, decreased reproductive capacity and mortality of the fish. The parasites of estuarine fishes of Andhra Pradesh, east coast of India, have been extensively studied.

Copepods are typically small and inconspicuous aquatic crustaceans, but they are extremely abundant [Boxshall, 2005]. The copepods in general are small to microscopic with both free living and parasitic forms [Heckmann, 2003]. More than 2000 species of copepods parasitize marine and freshwater fishes and most are ectoparasitic; they are found all over the external surface of the host body, as well as in more sheltered microhabitats that are permanently directly connected to the external environment, including the external nostrils, eyes, oral and branchial cavities, gills and cloaca [Boxshall and Halsey, 2004], which cause extensive damage to fishes. Copepods can be found as parasites across the entire range of cnidarian groups from the hard corals and sea anemones to the medusae and siphonophores [Humes 1985]. Relatively few species of copepods make use of host groups such as the Nemertea, Platyhelminthes, Bryozoa, Phoronida, Echiura, Brachiopoda, Enteropneusta, Hemichordata, Vestimentifera and Sipuncula [Boxshall and Halsey 2004].

Many fish parasites are known as causative agents for disease problems and outbreaks within mariculture facilities [Palm 2004; Ruckertz et al., 2008, 2009]. The occurrence of fish parasites is closely related to the distribution of their final and intermediate hosts [Collard 1970; Hine and Kennedy 1974]. Their abundance is also influenced by further biotic and abiotic factors, such as the fish feeding ecology [Palm et al., 1998; Walter et al., 2002], water temperature [Rohde et al., 1995], salinity [Roubal 1997], temperature [Collard 1970; Palm 1999] and pollution [Galli et al., 2001]. The close relationship of a highly diverse parasite fauna to its hosts and the environment opens up the opportunity to utilise these organisms as biological indicators. Therefore, fish parasites have already been applied to indicate the ecology of their hosts (e.g. feeding, Palm 1999) migration and recruitment, [Williams et al. 1992; Moser 1991] or the conditions of the environment e.g. water quality, [MacKenzie et al., 1995; Galli et al. 2001] pollution, [Sures and Reimann 2003:] environmental stress, [Khan and Thulin 1991;] Landsberget al. 1998). Thus, fish parasites are an important component of the aquatic biodiversity that can be utilised as biological indicators to describe not only the fish health but also the status of any aquatic environment.

No substantial work has been carried out on copepod parasites of *Polynemus tetratadactylus* from Pallamkurru, Andhra Pradesh East Coast of India, inspite of their nutritive value and economic value. The current study is adjunct our information on fish parasites of fishes of Pallamkurru, Andhra Pradesh, East Cost of India. A prominence is given on brief diagnosis and infection levels of the ecto- and endo-
Prevalance Mean intensity of parasites was studied individually and collectively. Host infected with parasite species, prevalence and mean intensity was given in Table 1 and graphically represented in graph 1.

### Table 1: Prevalence (P in %), mean intensity (mI), No. of fish infected and parasites collected in parentheses for copepod parasites of the dissected fish species

<table>
<thead>
<tr>
<th>No. of fish infected</th>
<th>Name of the parasite</th>
<th>No. of parasites collected</th>
<th>Prevalence %</th>
<th>Mean intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Lernanthropus polynemi</td>
<td>56</td>
<td>40.1%</td>
<td>1.3</td>
</tr>
<tr>
<td>32</td>
<td>Caligus philpsoni</td>
<td>44</td>
<td>31.3%</td>
<td>1.3</td>
</tr>
<tr>
<td>23</td>
<td>Parapatelus hirsutus</td>
<td>52</td>
<td>22.5%</td>
<td>2.2</td>
</tr>
</tbody>
</table>

The parasitic copepods obtained in the host *Polynemus tetractylus* are described briefly.

**Lernanthropus polynemi** Richiardi (1881) (Figure a), they measure 4.86 – 5.1 mm in length. Cephalothorax longer than broad and antennular lobe not projecting, anterolateral lobe well developed, margins of the cephalothorax hairy, anterior division of the trunk circular and demarcated from the dorsal plate by a distinct constriction. Dorsal plate large, longer than broad, narrower anteriorly and gradually widening posteriorly. Genital segment completely fused with the abdomen. Abdomen broader than long, caudal rami has long, proximally broad and narrowing toward the tip.

**Caligus philpsoni** Bassett-Smith, (1898) (Figure b), they measure 2.26 – 2.37 mm in length. Cephalothorax circular with projecting frontal plates, lunules large, posterior median lobe broad and overlaps on fourth thoracic segment. Posterior sinuses open. Fourth thoracic segment roughly triangular. Cephalothorax measures 0.97-18x0.92-1.13 mm. Genital segment is inverted ‘U’ shaped, longer than broad with a short anterior neck and round postero-lateral lobes. Genital segment measure 0.65-0.73x0.45-0.68mm Abdomen large and one segmented and measures 0.32 – 0.47mm, caudal rami rectangular, inner surface hairy with three long short plumose setae.

**Parapatelus hirsutus** Bassett-Smith (1898) (Figure c), parasites measure 3.81-4.86mm in length. Cephalothorax longer than broad, lunules small, posterior median lobe is broader than the lateral lobe. Posterior sinuses slightly open, fourth thoracic segment broad, genital segment heart shaped, broader than cephalothorax and abdomen. Postero laterally expands with lateral ends and overlaps the abdomen. Abdomen one segmented, circular and postero-laterally forms small lobes, caudal rami longer than broad with three short and three long plumose setae, inner margins hairy.
from them Polynemus plebius and Eleutheronema tetradactylum. It is common parasite of this host from east coast of India as also reported by Wilson (1912). In the present study 23 parasites have been collected from Polynemus tetradactylus. Prevalence and mean intensity of parasite infection gives an overall view of host parasite relationship. Prevalence gives an idea of level of parasitisation in host species i.e. Polynemus tetradactylus. The present finding states that the prevalence is less for Parapetalus hirsutus (22.5%) and Caligus phipsoni (31.3%) than Lernathropus poly nemi (40.1%). Overall prevalence of 94.1% is considered as high. Mean intensity is same for Lernathropus poly nemi and Caligus phipsoni i.e. 1.3, it is slightly higher for Parapetalus hirsutus of 2.2. The overall mean intensity is 1.58 which is less. This indicates though 96 fishes infected with copepod parasites are 94% the number of parasites occurring in each fish is less. It is a good sign because the health condition of host depends on the number of parasites present in it.

From the previous study, copepods feed by browsing on the fish gill epithelium or by ingesting blood from ruptured blood vessels (Nike, et.al 2014). High infection of these parasites may lead to the death of fish (Kabata, 1979). Study of these parasites is very important because parasites (copepod) can be as indicator the environment health (Nike et.al, 2014).

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References


4. Discussion

The extraordinarily high biodiversity of the marine fauna in the Indonesian Archipelago is a result of its geographical location and geological history (Froese et al. 1996; Tomascik et al. 1997). Although, less than 10% of the Indonesian marine and brackish water fish species have yet been studied for parasites, this group of organisms appears to be highly diverse. The genus Lernathropus was erected by de Blainville (1822) with Lernathropus munkaas type species. In 1881 lernathropus poly nemiwas reported by Richiardi from Eleutheronema tetradactylum. It was also reported by Bassett-Smith (1898) as lernathropus trifoliatus and lernathropus lappaceus by Wilson (1912). Later Piasecki and Hayward (2002) synonymized these two species as lernathropus poly nemi. Yuniar et al. (2007) reported this parasite from Indonesia in Eleutheronema tetradactylum. In this study 56 parasites were collected from host Polynemus tetradactylus. The genus Caligus phipsoniwas first hoist by Bassett-Smith (1898) from India in Cybium guttatum. Later Wilson (1912) reported it from Polynemus tetradactylus. Wilson (1923) from Plectropoma cyanostigma, Yamaguti (1963a), Margolis et al., (1975), Yuniar et al., (2007) has reported Caligus phipsoni. In the present study 44 parasites were collected from both male and female fish. It is a common parasite from east coast of India in Polynemus tetradactylus.

The genus Parapetalus hirsutus erected by Bassett-Smith (1898) as Caligus phipsoni from polynemus tetradactylus from India. These were reported by Wilson (1923) as Parapetalus hirsutus. Kitisinghe (1950) Shen (1957b), Pillai (1962), Yamaguti (1963a), Yuniaret al., (2007) reported

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