

Full Length Research Paper

Parasitic occurrence in the giant freshwater prawn *Macrobrachium rosenbergii* from coastal West Bengal, India

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In recent years, culture of *Macrobrachium rosenbergii* is expanding in India and West Bengal state in particular, due to its relatively fast growth rate, high market price and export demand. However, the detail study on parasitic diseases has received less attention on cultivable *M. rosenbergii* compared to the penaeid prawns. The present parasitic survey on *M. rosenbergii* from coastal West Bengal state in India encountered 14 species of parasites. Among the protozoan parasites, *Zoothamnium* sp., *Amphileptus* sp., *Dileptus* sp., *Chilodonella* sp., *Balladyna* sp., *Epistylis* sp., *Vorticella* sp. and *Gregarina* sp. were recovered; of which 4 were ecto-commensals and other 4 were endo-commensals. Metazoan parasites represented by *Myxobolus* sp., *Rhabdochona* sp., *Indocucullanus* sp., *Procamallanus* sp., *Cucullanus* sp. and *Acanthogyrus* sp; of which 1 were ecto-commensals and other 5 were endo-commensals. In West Bengal state, inland culture and capture based fishery activities, mainly rural based, are operated by poor farmers. Developing the right kind of intervention and management practice can prevent adverse impact of diseases and assist poor farmers for sustainable production.

Key words: *Macrobrachium rosenbergii*, epibionts, parasites, West Bengal.

INTRODUCTION

The giant freshwater prawn *Macrobrachium rosenbergii* has a wide distribution throughout the Indo-Pacific region and most favoured for farming in tropical and subtropical areas of the world (New, 2005). In India, its culture was developed few decades ago as an alternative to the *Penaeus monodon* and to compensate for the substantial losses due to the epidemics of white spot syndrome in penaeid shrimp farming, hypothesizing that *M.*

rosenbergii is resistance to white spot disease (Sahul et al., 2000). This freshwater palaemonid prawn is popularly known as 'scampi' in Indian trade, farmed chiefly in small to medium-sized earthen ponds in the states of West Bengal, Andhra Pradesh, Tamil Nadu and Kerala states in India (Nair and Salin, 2012).

In its culture and natural settings, crustaceans serve as hosts for a wide range of protozoan and metazoan

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parasites, some of them cause considerable pathogenicity by affecting the growth and reproductive performance of the hosts (Jayasree et al., 2001). In Asia, the viral, bacterial and parasitic infections of *M. rosenbergii* were found to be important causes of significant pond production losses (Chu et al., 2011). However, the study on parasites and diseases has received considerable attention on cultivable penaeid prawns and *Penaeus monodon* in particular, but non-penaeid prawns have received less attention in this regard. Viral diseases of the *M. rosenbergii* were extensively reviewed by Bonami and Widada (2011). Studies on protozoans and metazoans parasites from *M. rosenbergii* were carried out from various parts of the world (Beck, 1980; Rohde, 1984; Schuldt and Rodrigues-Capitulo, 1985; Areerat, 1988; Nash, 1989; Johnson, 1995; Johnson and Bueno, 2000; Rodriguez et al., 2001; Montoya, 2003) but majorities were focused either on individuals or groups of parasites. In India, several authors reported parasitic occurrences in *M. rosenbergii* (Santhakumari and Gopalan, 1980; Sankoli et al., 1982; Saha et al., 1988; Shanvas et al., 1989, Jayasree et al., 2001; Mariappan et al., 2003).

In recent years *M. rosenbergii* is expanding in India due to its relatively fast growth rate, high market price and export value. The total scampi production from India in 2010 to 2011 was about 8778 metric tons and the West Bengal state was the leading producer with a production of 2906 metric tons (MPEDA, 2011). In the year 2011 to 2012, India exported 2723 metric tons *M. rosenbergii* with an increase of 31.61% in quantity than the previous years (MPEDA, 2011). In view of the facts, information on parasites is essential to prevent any disease outbreak in culture setting and to draw sustainable management plan to avoid any parasitic outbreak. In continuation to the fact, an investigation of the ecto and endo parasites was carried out to benchmark the parasitic occurrences of farmed *M. rosenbergii* from two major prawn producing districts of West Bengal state in India.

MATERIALS AND METHODS

The present study was done during the period of May to July, 2014. Live *M. rosenbergii* (n = 75) (length: 3.95-8.25 inch; weight: 35.6-102.05 g) was randomly sampled from different freshwater as well as brackish water impoundments of South and North. 24 Parganas districts of West Bengal were brought to the laboratory in oxygenated polythene bags for detail investigations. The water quality parameters of the water bodies like temperature, salinity, dissolved oxygen and pH ranged from 28.5 to 32.5°C, 0 to 5 ppt, 3.5 to 7.5 ppm and 7.8 to 8.5 respectively. The stocking density of the prawn in this traditional farming system was generally 5 to 10 pcs/m². All prawns were dissected, and scrapings from cuticles, appendages, gills, digestive tracts, intestine and hepatopancreas were taken on clean slides with saline solution (0.75% NaCl) and examined (Mondal et al., 2014). The smeared slides were air dried, fixed in acetone free methanol and stained with Giemsa (HiMedia, Mumbai) (Chakraborti and Bandyapadhyay, 2010). Standard methods were employed for fixation and staining of parasites. The

prepared slides were examined under Carlzeiss stereo microscope using 10x, 40x and 100x objectives. The identification of parasites was done based on Couch (1983), Kabata (1985), Lightner (1996) and Mehlhorn (2008). After that, the slides were deposited at the Laboratory of Aquaculture Management and Technology, Vidyasagar University, India.

RESULTS AND DISCUSSION

During the present investigation, a total 14 species of parasites were recorded from different organs of *M. rosenbergii* (Table 1, Figures 1 and 2). Protozoans belonging to two groups were mainly encountered, namely the epibiotic ciliates and the gut dwelling gregarines (Chakraborti and Bandyapadhyay, 2011). Among the 7 ciliates, peritrichous ciliates belonging to the genera *Zoothamnium*, *Epistylis* and *Vorticella* were found to predominant in pleopods, uropods, gills and intestine. 1 species of gregarines were found to restrict in intestine. Among the observed protozoan parasites, 4 were ecto-commensals and other 4 were endo-commensals. Among the 6 metazoan parasites, 4 species belonging to phylum nematode was predominant only in digestive tracts. 1 species of cnidarian ecto-commensal and acanthocephalan endo-commensal, respectively were also encountered during the present parasitic survey.

A wide variety of epicomensal have been reported from the gills and external surfaces in postlarval and adult fresh water prawn (Johnson and Bueno, 2000). Ciliate infections, in particular *Zoothamnium*, *Epistylis* and *Vorticella* were recorded earlier from penaeid as well as non-penaeid prawns and from several geographical regimes (Brock, 1983; Colorni, 1985; Overstreet, 1987). In consistent with the present findings, several authors reported peritrichous ciliates from India dealing with their occurrence, pathogenicity and epizootiology (Rajendran et al., 1982; Felix et al., 1994; Nandi and Das, 1995; Rajendran, 1997; Jayasree et al., 2001; Chakraborti and Bandyapadhyay, 2011). The heavy infections of ectosymbionts peritrichous ciliates ultimately causing death to the host was discussed by Overstreet (1973).

The seasonal incidence of *Zoothamnium* infections and their relation with salinity and rainfall was also discussed by Jayasree et al. (2001). Gut dwelling gregarine parasites are all pathogenic to the decapod crustaceans and may lead to reduced absorption of food or occasional intestinal blockage and possibly mortality of their host (Sprague and Couchi, 1971; Lightner, 1993). The infection rate with gregarinids is high in summer than winter as discussed by Timofeev (2001). In India, Jayasree et al. (2001) reported two species of gregarines from *Metapenaeus dobsoni* but those were completely absent in *M. rosenbergii*. Nematode infection recorded rarely from *M. rosenbergii* (Nash, 1989). It is contacted through foraging on infected copepods that serve as intermediate hosts for these helminths. There is thus every potential for some human helminth infections to be

Table 1. The detail lists of parasites recovered from *Macrobrachium rosenbergii* and their site of infection.

S/N	Groups	Parasites	Organ specificity
Protozoan			
1		<i>Zoothamnium</i> sp.	Gill, appendage
2		<i>Amphileptus</i> sp.	Gill
3		<i>Dileptus</i> sp.	Intestine
4	Ciliates	<i>Chilodonella</i> sp.	Gill, appendage
5		<i>Balladyna</i> sp.	Gill, appendage
6		<i>Epistylis</i> sp.	Intestine
7		<i>Vorticella</i> sp.	Intestine
8	Gregarines	<i>Gregarina</i> sp.	Intestine
Metazoan			
9	Myxosporadians	<i>Myxobolus</i> sp.	Gill
10		<i>Rhabdochona</i> sp.	Intestine
11	Nematodes	<i>Indocucullanus</i> sp.	Intestine
12		<i>Procamallanus</i> sp.	Intestine
13		<i>Cucullanus</i> sp.	Intestine
14	Acanthocephalan	<i>Acanthogyrus</i> sp.	Intestine

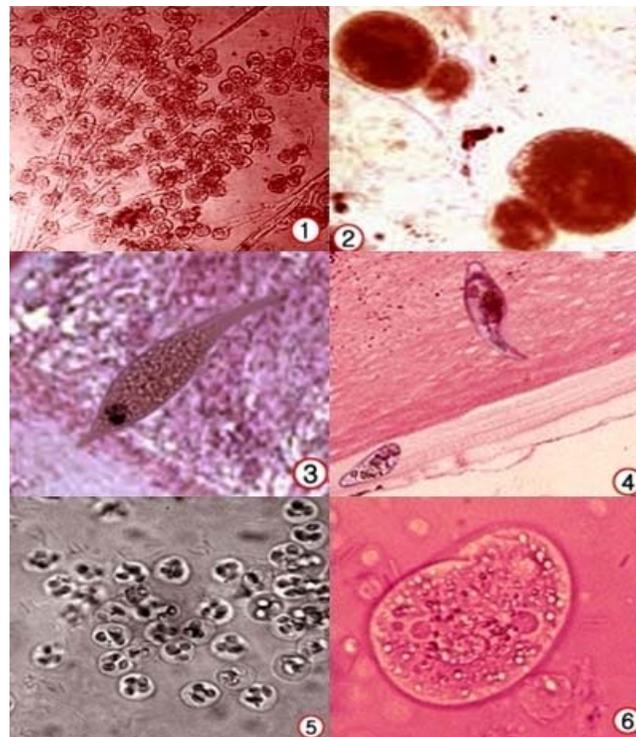


Figure 1. (1) Colonies of *Zoothamnium* sp. attached to the gills, 150x; (2) *Gregarina* sp. attached in the intestine, 150x; (3) *Amphileptus* sp. attached in the gill, 150x; (4) *Dileptus* sp. attached in the intestine, 150x; (5) *Myxobolus* sp. attached in gill, 150x; (6) *Chilodonella* sp. attached to the appendages, 150x.



Figure 2. (7) Colonies of *Balladyna* sp. attached to the appendages, 100x; (8) *Rhabdochona* sp. attached in the intestine, 100x; (9) *Indocucullanus* sp. attached in the intestine, 150x; (10) *Procamallanus* sp. attached in the intestine, 150x; (11) *Cucullanus* sp. attached in intestine, 150x; (12) *Epistylis* sp. attached to the intestine, 150x.

carried through freshwater prawns as described by Sen-Hai and Kenneth (1994).

Conclusion

The present study demonstrated that the giant freshwater prawn *M. rosenbergii* serve as hosts for a wide range of epibionts and parasites. Diseases are the most serious limiting factors in fishery sector and prime cause for chronic mortalities and poor growth which affects yield and marketability of aquatic animals. The floodplain wetlands in West Bengal are mostly eutrophicated and clogged with aquatic vegetation resulting sub-optimal water quality, which ultimately affected the general health condition of the aquatic animals. However, the finding of the present study will serve as a baseline for designing parasite specific extensive study in future. In West Bengal, inland culture and capture based fishery activities were mainly rural based and operated by poor farmers. Developing better management practices through

pre-stocking pond management, stocking of specific pathogen free seeds, water quality management, better feed management etc can prevent adverse impact of diseases and assist poor farmers for sustainable production.

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Conflicts of interest

The authors declared that they have no conflicts of interest.

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