Epibiont parasites of freshwater prawn *Macrobrachium rosenbergii* in relation to the water quality parameters, West Bengal, India

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***Abstract* – The protozoan parasites *Zoothamnium* sp., *Epistylis* sp., *Vorticella* sp., and *Acineta* sp., are common in freshwater, brackish water and even in marine water. The cultured and wild prawns are mostly infected. Heavy infestation is found in freshwater cultured prawns like *Macrobrachium rosenbergii* but month wise studies in West Bengal and India is limited. *Zoothamnium* sp. was found high in year around with greater prevalence and mean intensity in post monsoon and summer months. Though *Vorticella* sp. and *Epistylis* sp. were lower than *Zoothamnium* sp. but same trends were observed as it. *Acineta* sp. was almost same in year around with peak in November. The parasites found mostly segregated in different months but higher from post monsoon to summer months. The study will help the farmers to take possible preventive measures against the Epibiosis of freshwater prawns prior to its maximum intensity.**

Keywords – Epibionts, epibiosis, parasites, prawns, *Macrobrachium rosenbergii*.

INTRODUCTION

Giant freshwater prawn (*Macrobrachium rosenbergii*) or Scampi is an important commercial species due to the property of food supply as well as valuable export product. In West Bengal, the Giant freshwater prawns are mainly distributes in southern regions where the environmental conditions are favorable for the growth of scampi. Increasing demand of this species for domestic consumption and export markets has increased remarkably scampi cultured system with large scale, high stocking density and intensive feeding. Consequently the cultivation of the species is being expanded to the culture in rice fields to the intensive prawn farms. Hence the disease is inevitable in these uncontrollable culture models. Crustaceans from culture ponds and natural habitats in freshwater zones, serves as hosts for a wide range of protozoan parasites, some of which cause considerable pathogenicity by affecting the growth and reproductive performance to the hosts. The current study deals with the common epibiont parasites of the freshwater prawn in West Bengal and their monthly prevalence. Though the epibiont parasites with low intensity of infection do not harm their host directly, but if these are heavily infested, may prove problematic in aquaculture as they interfere with physiological activities like respiration (gills are favorable attachment site to them because with inflow of water lots of food particles come there for them), locomotion (swimming legs and walking legs are another favorable attachment organs due to the same reasons as gills), feeding and molting of prawns and ultimately causing stress to them, create favorable conditions for secondary pathogens and possibly death to the host. [1, 2, 3]. In view of these implications in aquaculture, it is necessary to recognize them early and controlled.

MATERIALS AND METHODS

Sample collection

Samples of *Macrobrachium rosenbergii were* collected from different culture sites of North and South 24 Parganas Districts of West Bengal, India, monthly during the period of 2021 to 2022. Sufficient numbers of *Macrobrachium rosenbergii* were collected throughout the year. Although per month 30 samples were collected for anatomical study, monthly prevalence of parasites, mean intensity of the parasites. The live crustaceans was packed in 50% pond water where they live and 50% groundwater in double plastic bags with the airspace in the bag filled with oxygen. The bags were sealed tightly with rubber bands or rubber rings and packed inside a foam box/thermocol box. A small amount of ice was added to keep the water cool, especially if a long transport time was expected. In some cases when the suitable packaging of live specimen is not available, the specimens were fixed in Davidson's AFA fixative.

Examination of Prawns for Parasites

Skin, exoskeleton and gills are examined thoroughly with naked eye to find any discoloration or dark spot, and then gills of prawns were removed by fine scissor. If the prawn is small, the whole gills were removed and examined. In case of larger specimen, the part of gills or few filaments were taken to the slide for examination. Saline solution was added over the dissected gills followed by the cover slip. The gills were examined with 100X of compound microscope (Labomed monocular CF-100). If any epibiont parasite found, it had been examined with 400X and 1000X also. Simultaneously the photographs and video were recorded through the camera (Tuscen) attached with the microscope. Similarly other favorite attachment sites of the specimen were thoroughly examined such as: exoskeleton, mouth and legs. If any algal growth was seen in the exoskeleton/ legs or mouth, then it was taken separately with saline solution for examination.

Identification of Parasites

Live peritrichs obtained from infected hosts were observed and photographed using a compound microscope equipped with a digital camera. Images were captured electronically and measurements of the peritrichs were performed using Caliper pro software (Version 4.2) to identify the parasites separately. Drawings of specimens were based on micrographs, and those of stained specimens were made using a Camera Lucida mounted to a microscope. Drawings of the impregnated specimens were made with the help of Camera Lucida at 1000X magnification.

Water samples

Water samples of the ponds were collected, for the analysis of the physicochemical parameters including dissolve oxygen (D.O), pH, Dissolve oxygen was estimated by Winkler's method, while pH and salinity are measured by pH meter/pH paper. Temperature was recorded in the field by digital thermometer of pH meter. Sufficient number of the specimens were obtained throughout the year from different ponds of study areas or nearby markets of the study area. The month wise data of parasites from the prawns were recorded from the samples. Month wise recorded data were analyzed to find out the month wise parasitic intensity of the cultured prawns with temperature, pH and dissolve oxygen concentration (DO) of culture pond water. Month wise temperature data were collected from Meteorological Departments of Kolkata.

Statistical Analysis, Tables and Graphs

The data were statistically analyzed by statistical package SPSS version 21 and QP30 at 95% confidence interval. The tables and graphs were obtained by using Microsoft Excel Data Sheets.

RESULTS

During the study between May 2021 to April 2022, 360 prawns are inspected by random sampling (30 samples in each month) and four epibiont parasites are found under the genera of *Zoothamnium* sp. (Figure 1), *Vorticella* sp. (Figure 2), *Epistylis* sp. (Figure 3), and *Acineta* sp. (Figure 4). Of these parasites, Total Number of Parasites in year around found high in *Zoothamnium* and *Vorticella sp*. The mean intensity of the parasites also followed a pronounced seasonal pattern recording high after July to December, peak in August to October, showing a drop from December onwards (Table – 1). However, the prevalence of infection in *Zoothamnium* sp. is found higher in the month of September, though mean intensity of these is high in October (50.70). Though the prevalence in lower in March (53.3%), the mean intensity is found highest (58.80). On the other hand prevalence of *Vorticella* sp. is found higher in in September (86.7%), but mean intensity is high in March (72.33). The infection with *Epistylis* sp. is higher in November with 53.3% prevalence, but the intensity is high in February (63.60). The abundance suctorian *Acineta* sp. is almost same in year around, but the prevalence in higher in November (36.7%), and the intensity is high May (45.20). There is no correlation found with the water parameters dissolve oxygen and pH of that year as the "P" value of Pearson's Correlation Coefficient is found lower than 0.01. On the other hand there is no significant correlation found between average monthly temperature and the mean intensity of the parasites ($P<0.01$). Though in some months, especially after monsoon and summer the prevalence or intensity is high, but there is no such trends found with the season wise variations of the parasites. The trend of infection is mostly segregated year around.

Table - 1**: Parasites in *Macrobrachium rosenbergii* from May 2021 to April 2022**

	Zoothamnium		*Vorticella*		*Epistylis*		*Acineta*		Water Parameters (Average)		
MONTHS	**PR**	**MI**	**PR**	**MI**	**PR**	**MI**	**PR**	**MI**	**DO**	**pH**	**TM**
MAY	66.7%	34.05	46.7%	32.57	30.0%	27.56	16.7%	45.20	4.2	7.3	30
JUNE	71.4%	18.68	60.0%	13.76	31.4%	25.45	22.9%	31.25	4.1	7.8	29
JULY	60.0%	25.72	56.7%	11.24	42.0%	39.00	16.7%	44.40	5.3	7.1	30
AUGUST	90.0%	25.11	70.0%	24.71	43.3%	24.38	30.0%	24.56	5.0	7.2	30
SEPTEMBER	100.0%	33.93	86.7%	25.73	50.0%	16.07	30.0%	27.56	5.1	7.6	30
OCTOBER	90.0%	50.70	76.7%	28.57	40.0%	34.17	33.3%	35.00	4.8	7.1	25.5
NOVEMBER	90.0%	43.96	73.3%	25.68	53.3%	29.31	36.7%	38.09	5.5	7.8	23.5
DECEMBER	86.7%	44.31	70.0%	21.00	33.3%	28.70	16.7%	19.20	4.8	8.0	20
JANUARY	83.3%	24.48	50.0%	24.80	16.7%	44.20	30.0%	22.56	4.1	7.9	19
FEBRUARY	76.7%	25.09	40.0%	46.58	16.7%	63.60	26.7%	15.63	4.0	7.6	25.5
MARCH	53.3%	58.80	30.0%	72.33	20.0%	19.00	26.7%	19.38	4.5	7.6	27.5
APRIL	60.0%	43.33	60.0%	20.56	46.7%	21.07	33.3%	17.80	5.0	7.2	30
PR = Prevalence; MI = Mean Intensity; DO = Dissolve Oxygen; TM = Monthwise Average Temperature											

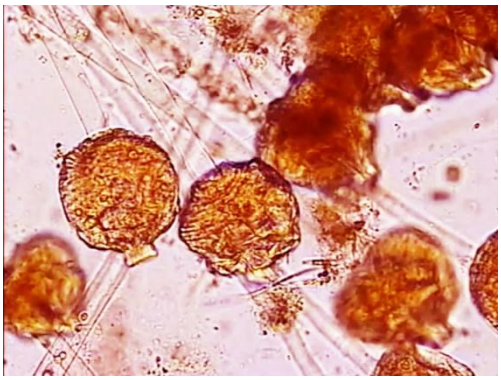

Figure – 1: *Zoothamnium* sp.

Figure - 2: *Vorticella* sp.

Figure – 3: *Epistylis* sp.

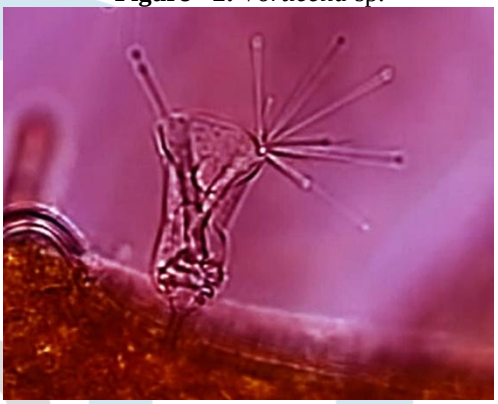

Figure – 4: *Acineta* sp.

DISCUSSION:

Seasonal variations are noted in the occurrence of these four parasites. Seasonal infections are peak during and after monsoon months. Thus the infections seem to be governed directly by the seasonal variations after monsoon months. Ciliate infections were rampant in monsoon and post monsoon months [4]., where some researchers [1, 3, 5, 6] found *Zoothamnium* infections to be high in summer months and low in winter months as these study has shown.

Though, infection with *Vorticella* spp. is occasional [4]. Current study showed that in West Bengal *Vorticella* infection is common and found on gill and appendages of prawns in regular interval. The prevalence and intensity of the parasite is high after July, peak in August and September, and rampant up to January. Though March is another month where it gets supported by unknown reasons. Such intensity of these parasites was not recorded earlier in any study in India and World.

Epistylis spp. is reported but not common in earlier report [4]. But current study showed that this parasite is also common in two districts of West Bengal. But this parasite show its peak season in September, October, November but intensity of infection is high in February. *Epistylis* sp. has been reported as a very common species in freshwater environments, occurring as an epibiont on aquatic plants, and present in wastewater treatment systems [1, 3, 4]. Though here in two districts of West Bengal, *Epistylis* spp. is common in freshwater prawns cultured in Wetlands, small farms, where there is a chance to mix the wastewater to the cultured water.

The suctorian *Acineta* sp., are almost same throughout the year with little more abundance in post monsoon months. However the factors governing their distribution in different season is not clearly know as because no correlation found with any parameters, However, this is clear that the infections of those parasites are segregated, reaching peak occurrence at different times of the year after monsoon months. There is a possible chance to increase the intensity of infection after monsoon because lots of waste water mixed in cultured ponds in monsoon and these parasites are common in waste water [9]. The summer and winter months are another favorite season for these parasites as because lots of farms, wetlands depend upon the waste water for the source of water in culture ponds [1, 3, 7, 8, 9].

CONCLUSION

Epibiont parasites have been found in prawns, and the present study with monthly prevalence and parasitic intensity year around with proper diagnosis is important for effective treatment. Aquaculture is a high-risk industry and, where local economies become dependent on it, the financial vulnerability is high. Disease is perhaps a major threat to intensive rearing operations.

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