Journal of the Indian Fisheries Association
18, 1988, 289-298

DISEASES AND PARASITES OF PENAEID PRAWNS OF INDIA - A SHORT REVIEW

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ABSTRACT

The diseases caused by bacteria, fungi, protozoa and metazoa as well as by other biotic and abiotic agents reported in the penaeid prawns of India are reviewed.

INTRODUCTION

During the past two decades there has been considerable advance in the developed countries in the knowledge of diseases affecting the principal commercial species of penaeid prawns, their diagnosis and control. However, information on the diseases affecting the penaeid prawns of India is limited to a few descriptions and lists of parasites, and their biological consideration. As India is poised for large-scale development of aquaculture of prawns with a stress on semi-intensive and intensive culture sytems, it is natural to expect increasing hazards of diseases in these systems. Even in the natural population, the wide fluctuation of the catch often assigned to natural mortality might be due to some unrecognised or hitherto not reported disease incidence. Since a knowledge of diseases, their causative agents and etiology is basic to control, and since this aspect is emerging as an important field of investigation, a brief review of the works carried out on the diseases of the panaeid prawns in the country is attempted in this paper.

PRINCIPAL DISEASES OF PENAEID PRAWNS OF INDIA

Organisms belonging to different groups such as Viruses, bacteria, fungi, protozoa, trematodes, castodes, nematodes

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and parasitic crustaceans cause disease in penaeid prawns. Apart from these, dietary deficiencies, encironmental stress as well as pollution, and toxic algal blooms also bring forth diseases.

Viral diseases : Among the infectious diseases of cultivated penaeid prawns, those resulting from viruses are important. Although five diseases of viral etioloty, namely, *Baculovirus penaei* (BV), *monodon baculoviru*(MBV), baculoviral midgut gland necrosis virus (BMNV), infectious hypodermal and haematopoietic necrosis virus (IHHNV) and Hepatopancreatic parvo-like virus (HPV), have been described from the penaeid prawns of northern Gulf of Mexico, Pacific coast of Central America, Hawaii, Tahiti, Japan, Taiwan, Philippines and Kuwait, no viral disease has so far been reported from the penaeid prawns of India.

Bacterial diseases : The noteworthy bacterial diseases affecting the penaeid prawns in India are the myxobacteriosis, pseudomonasis (haemorrhagic septicaemia), staphylococcosis, flavobacteriosis, vibriosis, enteric bacterial infection and muscle necrosis. The myxobacterial infection caused by *Chondroccocus* sp and *Flexibacter succinicans* is reported in *Penaeus indicus*, *P. monodon*, *Metapenaeus affinis* and *M. dobsoni* cultured in earthern ponds in the brackishwater areas (Mahadevan *et al.*, 1978; Pillai, 1984). Patches of lesions are seen on the body of the infected prawns.

Describing a 'red rostrum' condition in *P. indicus*, Mahadevan *et al.* (1978) isolated the bacterium, *Pseudomonas fluorescenes* from the affected prawns and named the syndrome as haemorrhagic septicaemia. Recently, Soni (1986) encountered a similar condition in *P. indicus* (117-153 mm) collected from the culture ponds in the Vypeen Island near Cochin and observed that this condition did not seem to have any significant impact on the prawns and that its etiology was still not clearly established. However, it was interesting that the specimens with 'red rostrum' were collected from the culture ponds when the diatom, *Peridinium* sp was found abundant in the pond water.

Brown spot disease, also known as 'shell disease', 'burned spot disease' or 'rust disease' has been reported in *P. indicus* by Lakshmanaperumalsamy *et al.* (1982). Several chitin destroying bacteria such as *Beneckia*, *Vibrio*, *Pseudomonas* and *Aeromonas* are known to cause brown spot disease (Chandramohan *et al.*, 1980). The disease is characterised by brown to black spots and necrotic lesions on the exoskeleton. Observing the disease in juveniles and adults of both the sexes of *P. indicus* ranging in size from 47 to 163 mm, Soni (1986) opines that the lesions result from

mechanical injury rather than from primary bacterial infection. Damage to the exoskeleton results from cannibalism, injuries during ecdysis or imperfect ecdysis, aggressiveness and excessive handling. Bacterial accumulation in the melanised lesions would have occurred after the epicuticle disrupted due to damage. Although non-infectious and non-fatal, the progressive destruction of the cuticle would result in loss of haemolymph and osmotic balance, and the prawn becomes more susceptible to secondary pathogens. In serious cases, these conditions may lead to the death of the prawn.

Decay of body surface caused by *Staphylococcus aureus* and *Flavobacterium ulginosum* in *P. indicus* and *P. monodon* has been described by Pillai (1984).

Among the bacterial diseases, vibriosis caused by *Vibrio anguillarum* is the most important disease found in *P. indicus* cultivated in the brackishwater fields (Mahadevan *et al.*, 1978; Pillai, 1982). The prawns infected by this bacterium develop white patches on the abdomen, reddish discolouration of the rostrum and telson, often leading to disintegration of these organs. In acute cases, the prawn becomes emaciated with softening of the muscle and thinning of the carapace and the abdominal cuticle.

The bacterium, *Escherichia coli* is found to infect generally the larvae of *P. indicus*. It causes disintegration of appendages, uropod and telson.

Drying, cleaning, disinfection and sterilisation of hatchery and nursery site and equipments would help to reduce considerably the bacterial infection. Use of certain antibiotics such as furacin, furanace, chloramphenicol and oxytetracycline either by direct addition to the medium or by incorporating in the feed has been found to be effective in treating the bacterial diseases. Soluble copper compound (cutrine-plus) and potassium permanganate could be used in treating the filamentous bacterial infection.

Fungal diseases : Like viruses and bacteria, several species belonging to phycomycetous fungi and a single genus of the imperfect fungi form an equally important group causing disease in the different life stages of penaeid prawns. The reports on the diseases brought out by this group among the Indian penaeid prawns are however only a few. Large scale mortality of larvae and juveniles (79-88 mm) of *P. monodon* raised in the hatchery has been reported due to heavy infection by the fungus, *Lagenidium*

sp. The source of the fungus was found to be from the sea water supply and from the culture tanks (CMFRI Report, unpublished).

Gopalan *et al* (1980) reported two species of fungi, *Saprolegnia parasitica* and *Leptolegnia marina* on *P. monodon* caught from the backwaters of Cochin. *L. marina* was found to be attached the exoskeleton and causes necrotic lesions. It is significant that *S. parasitica* which is a freshwater species and *L. marina* a marine form have been found together in *P. mondoon* obtained from the backwaters.

Deep mycosis produced by *Penicillium* sp in *P. monodon* larvae has been observed by Pillai (1982, 1986). This disease brings forth decay of appendages and weakness to the larvae.

Application of chemicals such as malachite green oxylate (0.006 ppm) or trifluralin (0.01 ppm) or firance, and antibiotics gallymycin and fungicide, trifluralin are used to control the fungal diseases.

Protozoan diseases : The ciliate infestation reported from the Indian penaeid prawns *(P. indicus, P. monodon, P. semisulcatus, M. affinis* and *M. dobsoni)* are *Zoothamnium rigidium, Zoothamnium* sp, *Stenctor coerulens* and *Epistylis* sp (Santhakumari and Gopalan, 1980; Issac Rajendran *et al.*, 1982; and Soni, 1986). The prawns with heavy infestation show a fuzzy appearance on the surface of gills, appendages and the carapace. While low infestation may not be fatal to the population, heavy infestation leads to mortality. The gills are the most favourable site of attachment. Filamentous bacteria are also found accompanying the ciliate infestation. Mortality of the infected population is attributed to anoxia. Issac Rajendran *et al* , (1982) noticed the infestation of *Zoothamnium* and *Epistylis* sp in *P. mondon* farmed in a pond at Madras which was not flushed with tidal water for 20 days resulting in depletion of dissolved oxygen level to a level of 1.0 ppm. These authors further observed that the infestation could be controlled by improving water quality by frequent changes of fresh tidal water over a period of 7 to 15 days.

Microsporidia constitute a remarkable group of protozoan parasites occurring in almost all the major animal phyla. They are intracellular parasites and multiply by spore formation. The disease caused by these parasites is known as 'cotton' or 'milk shrimp' disease. In India, this disease is reported in the natural population of *P. semisulcatus, P. indicus, M. affinis, M. monoceros* and *M. brevicornis* from off Madras, Tuticorin,

Mandapam, Rameshwaram and Cochin. (Subrahmanyam, 1974; Thomas, 1976; Santhakumari and Gopalan, 1980; Gopalan *et al.*, 1982; Palaniappan *et al.*, 1982; and Soni, 1986). Both the sexes are affected by the parasite and in certain seasons, 0.5 to 2% of the catch has been found to be infected, causing considerable loss of production and value of the species. The infected prawns are encountered throughout the year with increased incidence during the monsoon season. Subrahmanyam, (1974) and Santhakumari and Gopalan (1980) found spores of microsporidia resembling to those of *Nosema nelsoni* in the muscles of *M. monoceros*. Thomas (1976) reported still another microsporidian similar to *Thelohania duorara* from *P. semisulcatus* in the Gulf of Manar and Palk Bay. On the basis of a detailed study on the nature, structure and characteristics of the different developmental stages and spores through light and electron microscopy and histological techniques of the microsporidians collected from *P. semisulcatus* and *M. affinis*, Soni (1986) described three new species, one each assigned to the family Thelohaniidae and Pereziidae and the third one to a new designated as *Sulcovaria*. *Thelohania semisulcata* Soni infecting *P. semisulcatus* is found to be highly pathogenic, affecting the organs such as gonad, hepatopancreas, body muscle, midgut, heart, optic nerves and gills. The host response to the infection appears to be least developed as the pathogen does not elicit any significant inflammatory response in the host. The nature of infection is initially through the sub-mucosa of the midgut, subsequently spreads to the organs, finally leading to the death of the host. Unlike *T. semisulcata*, *Sulcovaria mannarensis* (Soni) is found to be site specific, infecting only the ovary of *P. semisulcatus*, *Perezia affinis* Soni, is found to infect the body muscle, gonad, and digestive tract of *M. affinis* and *P. semisulcatus*.

Important chemicals found to be effective in treating ciliates and other protozoan epicommensals are glutaraldehyde at 2 ppm; chloramine T., quinine sulphate or quinine bisulphate at 5 ppm; quinacrine hydrochloride at 0.6 ppm and formalin at about 25 ppm. Disinfection of the closed system where prawns are cultured with a commercial bleach or disinfectant containing iodine is recommended to prevent or treat microsporidian contamination.

Metazoan parasites : The metazoan parasites of penaeid prawns comprise of helminth parasites such as digenetic trematodes, cestodes and nematodes, and bopyrid isopods. An unidentified helminth parasite embedded in the hepatopancreas and causing abnormalities of the midgut wall in *P. semisulcatus* caught off Mandapam in the Palk Bay has been reported by

Soni (1986). Large number of metacercarial cysts in *M. monoceros* collected from the Cochin backwaters were recorded by Gopalan *et al* (1982) and Syed Ismail Koya and Mohandas (1982). Small, oval-shaped metacercarial cysts attached externally on the antennae and other appendages of *P. indicus* (11 to 33 mm) and *P. semisulcatus* (9 to 33 mm) postlarvae and juveniles from the mudflat near Pamban in the Rameshwaram Island was observed by Soni (1986).

Isopod bopyrid parasites infesting the branchial chamber or attaching to the appendages have been reported in *M. monoceros*, *M. dobosoni*, *P. stylifera*, *P. sculptilis*, *P. semisulcatus*, *P. monodon*, *P. merguiensis*, *P. indicus*, *P. japonicus*, *Metapeneopsis banbata*, *M. brevicornis*, *M. lysianassa* and *Solenocera crassicornis*. In the parasitized specimens, the primary and secondary sexual organs remain imperfectly developed or rudimentary or in degenerated condition irrespective of the size of the prawn and its maturity condition (Chopra, 1923, Menon 1953; Thomas, 1977; Lalitha Devi, 1982; Soni, 1986).

Diseases caused by environmental stress : Stress conditions such as supersaturation of gasses, low dissolved oxygen level, sudden temperature and salinity changes, overcrowding and rough handling lead to unhealthy state in prawns, and in severe cases, leads to large-scale mortality. Tail necrosis, where the colour of the sixth abdominal segment, telson and uropods become opaque white and finally pinkish brown has been reported in *P. indicus* by Soni (1986). The causative factor for this condition was the wide variation found in the water quality between the pond water from where the prawns were collected and the rearing medium in the laboratory.

The 'soft-shell' phenomenon is an important disease syndrom reported in *P. indicus*, and *P. monodon* farmed in coastal waters. The prawns affected by this syndrome appear emaciated; the cuticle covering the cephalothorax and abdomen, except the rostrum becomes thin, fragile and soft to touch; the intestinal tract in the abdominal region appears undulating. This condition in prawns, occur during adverse ecological conditions measured by increase or sudden decrease of temperature and salinity of the pond water, high soil pH and highly negative Eh, which in turn affect the available quality of food organisms in the pond and the physiological processes of the prawn interfering the nutritional pathway and chitin synthesis (Rao, 1983, 1987). While Rajamani (1982) studied the protein and non-protein nitrogen content of the 'soft' prawn while Soni(1986) observed the histolo=-gical characteristics of the hepatopancreas and midgut. The control

measures suggested are to ensure better water exchange in the pond during summer (March-May), to feed the stocked prawns with protein rich compounded feed, and to remove periodically the organic debris and metabolites from the pond bottom.

Toxic diseases : The toxic diseases manifest mainly from two sources i.e. toxigenic algas and pollution of water (by pesticides, industrial chemicals, chlorinated hydrocarbon, petroleum, oil products and certain heavy metals. Although blooms of diatoms, certain dinoflagellates and filamentous blue green algae occur in the culture systems, no document on the diseases caused by this group on the Indian penaeid prawns is available. Similarly, there is little information on the toxic effect of pesticides, petroleum, heavy metal pollutants and chemotherapeutic chemicals on the Indian penacid prawns.

Other diseases : Prawns are also found to be susceptible to other diseases and abnormalities such as tumour-like growth, hamartoma, blisters, "golden" shrimp, blue , blue or white eye disease, amoe of larvae, larval encrustation, multifocal opacities, gut and nerve syndrome (GNS), red disease, nerve disease syndrome, aflatoxicosis and fatty infilatration of hepatopancreas. Among these, tumour-like growth has been reported by Soni (1986) in *P. indicus*. The tumour-like growth was observed on the distolateral side of the carapace as a bilobed swelling.

GENERAL REMARK

The foregoing review indicates that the information available on the diseases of penaeid prawns of the country is scanty. Besides, the cases which are documented are not comprehensive. This situation necessitates considerable research input to survey the diseases that occur in the hatcheries and tended stocks and in the specialised fields of mycology, bacteriology and pathobiology of affected prawns. Very little is known at present of the toxic response of penaeids to biotic and abiotic factors. It is imperative that studies are carried out on pathogenesis of diseases and mechanism of pathogenesis. In recent years, considerable importance is given towards the health status of cultured organisms and to emphasis on diagnosis, prevention and control of diseases. Fish and shellfish immunology and chemotherapy are emerging as important means of disease control. A knowledge of all these aspects are particularly relevant for the development of aquaculture of penaeid prawns on sound scientific basis in the country.

ACKNOWLEDGEMENT

The authors are grateful to Dr. P.S.B.R. James, Director, Central Marine Fisheries Research Institute, for the kind encouragement and advice. The Senior author recalls the short, but memorable opportunity came across in his career to work under the guidance of Dr. S.Z. Qasim and to learn certain aspects of fisheries research and development.

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