

Problems of Diseases on Marine Fish and Prawn Farming in India

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The problems of diseases are of great concern to the fish cultivators and research workers. The disease in severe cases inflicts heavy losses on the fish crop by reducing the yield. Information regarding its identification, nature, extent of damage and control measures etc. is being briefly summarised in this article.

The marine fish and prawn diseases constitute one of the important factors in regulating the populations in natural environment and in impoundments. Symptoms of several diseases in fishes and prawns differ according to its nature and behavioural pattern. Generally fishes have very great resistance to diseases when compared to prawns so long as they are weakened by unfavourable food, lack of oxygen, extreme high temperature and salinity or other ecological influences. The term 'Disease', is used here in its broadest possible sense to include any departure from normal structure or function of the organism encompassing those states that result from activities of infectious agents, parasite invasion and genetic or environmentally induced abnormalities. Fish and prawn diseases may be caused by different groups of agents such as micro-organisms (Virus, bacte-

ria, fungi and certain protozoans), parasites (ectoparasites like monogenes, copepods, isopods, leeches and endoparasitic helminths), toxic substances, (pesticides and heavy metals), harmful temperature and other pathogenic conditions.

Fishes and prawns are particularly susceptible to infection only in enclosed artificial surroundings or with unnatural feeding and crowding. The need for much more investigations on diseases of fishes and prawns is stressed here because of increasing trend of aquacultural practices through the country. The following fishes and prawns are being cultivated in our coastal, estuarine, brackish and backwater areas.

HERBIVOROUS FISHES:

Milk fish, *Chanos chanos*, Mulllets, *Mugil cephalus*, *Liza macrolepis*, *Liza parsia* and *Liza tade*; Pearl spot, *Eetroplus suratensis*. Carnivorous fishes: *Latescalcarifer*, threadfin, *Eleutheronema tetradactylum* and the ox-eyed herring *Megalops cyprinoides*; Eels: *Anguilla bicolor*.

PRAWNS:

Penaeus mondon, *Penaeus indicus*, *Penaeus semisulcatus* *Penaeus, merguensis*, *Metapenaeus monoceros*, *Metapen-*

aeus dobsoni, *Metapenaeus effinis* and *Metapenaeus brevicornis*.

Many biological factors pose hazards to the successful rearing of healthy marine animal stocks. Among these pathogens such as protozoans bacteria, worms, crustacea, fungi and viruses are largely responsible for fish mortality. Other causes of debilitation and mortality include dietary deficiencies, wounds poisons and environmental factors such as temperature and salinity. The approach to fish disease necessarily must bear such similarity to the practice of human medicine. More existing data on marine fish pathology have been accumulated through the study of marine aquaria although similar diseases are showing up as problems among the limited number of marine species so far undergoing cultivation. Granted that the infant body of knowledge of marine animal pathology is largely limited to marine fishes held in captivity or reared under hatchery conditions and that it may therefore prove to have limited pertinence to fish reared in the somewhat dissimilar environment of open sea mariculture and coastal aquaculture.

Many diseases are characteristic in enclosed body of water where abnormal conditions are more readily observed and examined than in the open sea. Microbial diseases are those of bacterial fungal and protozoal etiology. They include the infectious diseases of fishes, caused by parasites capable of destruction of host tissue and multiplication within the host.

Viruses best known in marine fishes are suspected or known etiological agents of several neoplastic, hyperplastic and hypertrophic disease. Lym-

phocystis disease and certain papillomas have long been felt to be viral origin, based on epizootiological and transmission studies and on the presence of inclusion in affected cells. A remarkable tumorous growth in eels is aptly labelled "cauliflower disease". This common chronic fibroepithelial tumor, often of dramatic proportions occurs principally in the head region of *Anguilla anguilla*.

Reports of bacterial epizooties in marine fishes are surprisingly infrequent and in fact relatively few bacterial pathogens have been recorded from natural population of marine fishes and where in the enclosed body of water, the attack of bacterial pathogens on the cultivable fishes and prawns is very high. Of all the known bacterial diseases of marine fishes, none has a long or more fascinating history than the red disease of eels caused by *Vibro angillarum* Burgman. This disease occurs during the warmer months in brackish and salt water. Infection may occur through gills or digestive tract. Bacterial dermatitis sometimes accompanied by ulcerations and fin rot and usually associated with pseudomonas reported from wild population of marine fishes. Eye disease of fishes are also caused by a vibrio. The diseases were characterised by initial destruction of the eyes followed by bacteria and death.

Critical problems in the study of bacterial pathogens of fish, as may be deduced from the preceding, are the correct identification of the infectious agent and the determination of its role as primary or secondary invader. Bacterial pathogens most commonly reported from the sea fishes are species of pseudomonas, vibrio or Mycobacte-

rium. Many of the bacteria normally present in sea water or polluted water or on the surface of fish, can invade and cause pathological effects of fish, are injured or subjected to other severe environmental stresses. Reports of fungus pathogens of marine fishes are scarce in the scientific literature. Brackish water fishes may be parasitised by the saprolegniaceae.

Protozoans are the most serious pathogens of marine fishes and prawns. Among protozoans, heavy infection of Myxosporidea may cause enlargement, discoloration and disruption of the function of the organ. Gill invading myxosporidea are not usually of serious consequence to marine fishes and prawns. An epizotic of *Myxobolus exiguus* in the gills of mullet *Mugil cephalus* caused heavy mortality. Mechanical disruption of gill function, caused heavy infection with myxosporidean cysts, was considered the cause of death. No abnormalities were noted in the viscera. Several species of Myxosporidea invade the cranial cartilages of fishes. Erosion and in some instances hypertrophy of head cartilage results several serious diseases of marine cultivable fishes and prawns result from microsporidean invasion. Heavy infections have been reported to prevent reproduction by mechanical occlusion of the vent and lesser infection cause deleterious effects to the digestive organs and gonad and impair other metabolic functions.

Among parasites, the invasive diseases include those caused by the larger parasites those that are non multiplicative in the fish host once invasion has occurred. Of primary concern in marine fishes are the various

parasitic worms and the tissue invading copepods, parasitic cirripedia and Isopoda and lampreys which although of occasional concern probably do not often exert serious effects on marine fish populations.

The helminths-trematodes, cestodes, nematodes and acanthocephala are common parasites of marine fishes. Adults occur in the digestive tract, but larvae are usually found in the flesh or liver in the viscera. The effects of larvae on the host include growth retardation, tissue disruption, metabolic disturbances and even heavy infestations.

Adult digenetic trematodes are common in the digestive tracts of marine fishes and particularly reported from eels. Among monogenic trematode parasitic on gills and body surfaces of marine fishes, a number become serious parasites in aquaria where conditions for reinfestation are optimum. Only rarely and under unusual conditions, have members of this group been demonstrated to be pathogenic to fish in natural habitats. Adult cestodes are common and occasionally harmful digestive tract parasites of fishes. Larval tape worms occur frequently in the viscera and flesh of marine and estuarine fishes. Adult cestodes may occur in significant numbers in the digestive tract of fishes although their prevalence in marine teleosts is low in comparison with that of other helminths. The nematode parasites of marine fishes have received attention of primarily because certain larvae that infest the flesh and viscera reduce the commercial value of the fish. Adult nematodes inhabitants of the digestive tract and gonads occur in many species of marine fish. Acanthocephala, the spiny headed worms

are represented as adults and as larvae in marine fishes. Larval acanthocephala are common in the viscera of many marine teleosts.

Marine fishes are parasitized by a variety of copepods of the genus *Caligus* and *Lerneopoda*. Parasitic copepods other than tissue invading forms may occasionally damage marine fishes. Surface abrasions and lesions caused by these parasites can be of serious consequence to the fishes such as grey mullets directly or as a route of entry for secondary invaders.

In addition to abnormalities which can be associated with particular disease causing organisms, marine fishes offer numerous examples of physiological or structural defects or conditions which may have genetic or other causes. A number of inherited abnormalities of fishes have been observed including defective spinal columns, pigmented tumors, cataracts, kidney tumors and association of certain pigment producing genes with physiological disturbances. Physiological abnormalities in the larvae are less easily identical except as they are reflected in lack of growth and death of individuals. Abnormal conditions in larval fishes are undoubtedly genetic and some due to environmental variations.

Increasing levels of pollution in the marine, estuarine and brackish water environment in addition to killing fish and destroying habitats may produce abnormalities. On an interesting comparison of marine fishes taken in polluted and unpolluted areas, there are changes in consistency of flesh reduced weight, external lesions, exophthalmia and papillomas as characteristic of fishes from crossly polluted waters. External lesions on Mulletts were produced experimentally by introducing between effluent diluted with sea water.

Diseases may cause continuous subtraction of individuals by weakening and disorienting infected fish reducing their ability to escape predators and survive variations in the physical environment; by blinding fish; by making

of infected fish more conspicuous or by altering behaviour in ways that render fish more vulnerable to predation. Protozoans, helminth and copepode parasites of the cultivable marine fishes and prawns although not often direct cause of death can act to weaken or slow the host and or also of great economic significance.

Economic effects of diseases in cultivable marine fishes and prawns may be categorized as follows: reduction in numbers of food fish available to harvestable fisheries, weight loss of individuals, rejection by consumers and subsequent loss of interest in fishery products as good and indirect efforts either favourable or unfavourable on survival of other species in a food chain. The resistance to fish disease involves a complex of interacting factors, including individual variability, species characteristics, seasonal influences and nutritional effects.

Knowledge is still rudimentary in the field of disease control for captive marine fishes and prawns. Methods developed for freshwater purposes and especially for hatcheries are not directly transferable to sea water where the pH and salt content may change the characteristics of antibiotics and other chemicals used in disease therapy. However, there is a growing interest in developing control measures for mariculture. Bacteria, protozoa and monogenetic trematodes comprise the most serious menaces to captive and cultured species and outbreaks of each have caused severe mortalities. Other pathogens and viruses in particular may be important but their roles have not yet been determined.

Extrapolating from present knowledge, several potential means of controlling disease in open sea mariculture crops and these means may apply to any form of coastal aquaculture. Obviously, none of these methods has yet been attempted in the open sea or coastal regions. They all represent avenues for further research and development in fish and prawn farming. ●