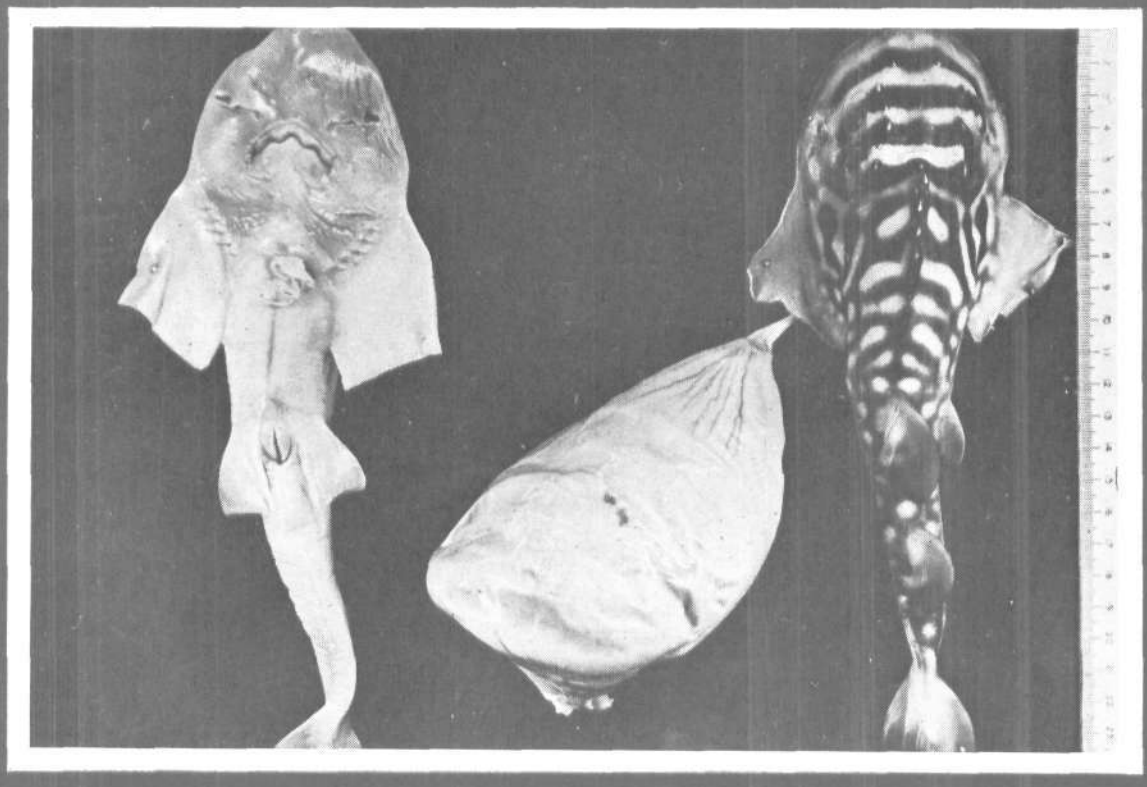
ISSN 0254-380 X

भाकृ अनुप
ICAR

समुद्री मात्स्यिकी सूचना सेवा
MARINE FISHERIES INFORMATION SERVICE

No. 146 JANUARY, FEBRUARY, MARCH 1997



तकनीकी एवं विस्तार अंकावली
TECHNICAL AND EXTENSION SERIES

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INDIAN COUNCIL OF AGRICULTURAL RESEARCH

PRAWN FARMING IN ANDHRA PRADESH — A RETROSPECT

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India with 2 million hectares of brackish-water low lying areas along her coasts offered immense potential for developing prawn farming. This advantage coupled with the technology available in the country and elsewhere in the world attracted the entrepreneurs of every shade and size into this industry and as a result vast areas of the coastal lands have been brought under prawn farming in most of the maritime states.

Andhra Pradesh became the forerunner in this venture due to various technical advantages over the other states. India produced about 82,910 t of prawns by culture from an area of 1,07,700 ha in 1994-'95 which valued at Rs. 1,658 crores. More than 50% of it was produced in Andhra Pradesh. Almost 90% of the semi-intensive and intensive farms of the corporate companies are located in Andhra Pradesh. These figures indicate the magnitude of the prawn culture industry in the state. However, the development in prawn culture has been haphazard, unscientific and without any respect for the ecosystem. As a result of the unscientific expansion of prawn farming there was a crisis in 1994 caused by disease and it still haunts the prawn farming industry. It is high time to take stock of the situation and see where we have failed and how it can be rectified.

Consultants

The major problem of the industry was created by the socalled consultants who infiltrated from freshwater fish culture, agriculture and veterinary fields into prawn culture. These people having very little knowledge about the basic principles of life of prawns and brackishwater aquaculture prescribed unscientific procedures to the farmers.

Soil tests

The first extravagant step suggested to the prospective farmer is the soil tests. Sometimes several chemical parameters are indicated for the soil testing that if one goes for all these tests a lot of money would have to be spent for this purpose. In fact prawns are greatly influenced by chemical properties of the water taken into the pond rather than the chemical properties of the soil. If at all there is any influence of the soil chemicals they get nullified due to the frequent water exchange.

It is true that physical properties of the soil influence the economy of prawn farming systems. Soil should be suitable for bund construction and should not give scope for seepage. Soil with more proportion of sand and gravel should not be used for prawn farming since expenditure on bund laying and maintenance and controlling of seepage is abnormally high leading to lesser returns on the investment. The best soil for pond construction is with a composition of 55-60% sand, 20-25% clay and 10-20% silt.

Pond design

Even the pond design in most of the farms is not suitable for proper drainage. Maximum importance should be given for drainage during designing a farm. The central drainage system where water is taken out from the centre of the pond is the best.

Liming

Another practice prevailing in Andhra Pradesh is the application of lime in the prawn fields. It is certain that almost 90% of the people who advocate liming are ignorant of the basic properties of brackishwaters. Lime should be used only to neutralise the acid soils. Surveys conducted in the past indicated that acid soils are rare along our coasts. Some people claim that the lime acts as a bactericide and fungicide for which there is no scientific evidence. It was observed that the recent crisis of disease may be due to high pH as a result of continuous liming of ponds. It is better that we do away with this liming practice.

Fertilizers

The importance of fertilizers both organic and inorganic is over emphasized in prawn farming. Such ideas are adopted from freshwater fish culture. One should not forget that brackishwater prawn culture is entirely different

from carp culture in freshwater ponds. The fundamental difference in the practices is that in freshwater fish culture the pond water is rarely exchanged but mostly replenished. So whatever fertility derived from fertilizers is retained in the farm and does not go waste. Contrastingly in brackishwater prawn farming water is exchanged whenever there is a chance to do it and so whatever fertility derived from fertilizers goes out of the farm and adds to the pollution of the adjacent brackishwater ecosystem. It is argued that fertilizers are needed to increase phytoplankton production so that prawn can feed on phytoplankton.

There is a basic difference between a penaeid prawn and a carp in feeding. Carp is a plankton feeder and can effectively utilise both phytoplankton and zooplankton as food. A penaeid prawn cannot feed on phytoplankton and its ability to feed on zooplankton is limited since its feeding organs are not designed to catch microscopic prey.

Due to these reasons it is suggested that there should not be any sort of fertilization of the prawn farm. Infact most of the fertilizers such as cowdung, chicken manure etc. contribute to the deterioration of the water quality by increasing the concentration of ammonium compounds which are lethal to prawns.

Feed pellets

In the market many brands of feed pellets either Indian or imported are available and most of these are giving good FCR. However, when they are stored for longer time the results are negative and sometimes disastrous. Farmers should avoid using such outdated stock of feeds in the ponds. Unfortunately most of these companies do not indicate correct packing date on the bags.

Some of the feed companies claim that their feeds can protect the prawns from disease. Till date there is no feed that can prevent diseases in aquaculture system. In fact this is only taking the farmer for a ride.

A survey of the feeding practices in prawn farm indicated that most of the farmers resort to overfeeding. Although farmers use check trays to formulate feeding schedule many a time these check trays give wrong indications leading to overfeeding and consequent feed wastage and deterioration of the water quality. In most of the cases where deep discolouration was observed, it was due to feed wastage and consequent bloom of phytoplankton. There is a simple underwater device to examine the feeding behaviour of prawns in the ponds. This device is called 'snorkel' and consists of a water tight head gear with a glass in front of the eyes and a bent pipe to help in the respiration of the observer when he is below the water surface. The person can observe behaviour of prawns in the ponds for about half an hour. Based on these observations feeding can be regulated so as to maintain optimum dosage of feed and feeding schedule.

Vitamins

Most of the brands of pelleted feeds advertise that their feeds contain all the required vitamins for prawns. There has not been any specific work on the vitamin requirements of *Penaeus monodon*. Whatever knowledge available on vitamin requirements of prawns is the work based on *P. japonicus*. It is widely known that most of the synthetic vitamins are highly soluble in water and hence only a fraction of the vitamin content of the pelleted feed reaches the prawns.

Water management

It was observed that our practices are not very conducive for sound water management. The major factors governing the water quality include depth, transparency, temperature, salinity, dissolved oxygen, pH, plankton, ammonia and hydrogen sulphide.

A prawn pond should have water column of one metre and the level should be adjusted by intake of water. If the depth is too low the temperature of water may raise to harmful levels affecting the growth and survival of prawns. If the depth is too much it would hamper biochemical release of waste products settling at the bottom as a result of prawn metabolism. This will also result in stratification of the water column effecting release of ammonia and hydrogen sulphide from the metabolites resulting in decreasing level of dissolved oxygen.

Transparency

Transparency of water can be measured with the help of a simple device known as Secchi disc. Shrimp ponds should have an optimum

Secchi disc visibility of 30 cm. Phytoplankton should be maintained at this level so that dissolved oxygen and other factors are maintained at optimum levels.

Temperature

The temperature has an effect on the chemical and biological processes taking place in the water. The temperature range of 25-30°C is ideal for prawn farms. Exchange of water may be done late in the evening or in the early morning hours to avoid fluctuation in temperature and stress to prawns.

Salinity

P. monodon can survive in a salinity range of 1-55 ppt. However, the ideal salinity for the culture of this species is 15-20 ppt. At 15 ppt, saline water has maximum capacity to absorb oxygen from the atmosphere. Hence it should be the aim to take advantage of this situation to have good oxygen level.

Dissolved oxygen

The most important factor determining the quality of water is the amount of dissolved oxygen in it. Although *P. monodon* can survive even under anaerobic conditions for shorter duration it is not desirable to allow oxygen concentration to go down below 3.5 ml/l in the prawn culture ponds. It is always better to keep the dissolved oxygen level around 5 ml/l. During day time phytoplankton consume carbondioxide and release oxygen. This process is reversed during night and overcast days. Too much of phytoplankton in the water would lead to oxygen deficiency during night.

pH

In natural brackishwater the pH is around 7-8. Prawns grow better in water of 7.3 to 8 pH. Hence we need not add any chemicals to maintain the pH to any level. If one resorts to fertilizers, liming or any other such practices the pH will increase resulting in bad water quality. Higher pH hampers dissociation of ammonium and would lead to ammonia poisoning. Ammonium compounds are the major excretory products and may reach harmful concentration in water at higher pH levels.

As ammonia concentration increases in the water, ammonia excretion by prawns decreases resulting in higher levels of ammonia in blood and other tissues. This leads to mortality of the stock. The prawns can tolerate ammonia concentration of 0.4 mg/l at a pH of 7.5 but with increasing pH the lethal effect of ammonium increases and at a pH level above 9 even 0.002 mg/l of ammonia can kill the prawn stock.

Aeration

To maintain all these factors at optimum limits water exchange has to be undertaken whenever it is possible to the maximum extent. In the case of high density stocking aeration has to be given. Aeration by any means increase the carrying capacity of an aquatic ecosystem. There are various types of aeration systems which can be broadly divided into 'diffusion' type and 'churning' type. Diffusers are ecofriendly and maintain good water quality. Even the outgoing water from the pond will be sufficiently clean so that it will not pollute the adjacent brackishwater ecosystem. Unfortunately a type of churning aerators–the paddle wheel aerators–have become very popular in India and particularly in the Andhra Pradesh. This paddle wheel aerator has the dubious distinction of creating maximum pollution in the prawn farming areas. These aerators were mainly responsible for the doom of prawn culture in Thailand, Taiwan and other far east countries. So it is high time to do away with the paddle wheel. Infact the crisis in prawn culture industry since 1994 has been due to this aeration system. In this system all the polluted water is released into the drains polluting the entire environment. Since most of these prawn farms have to take water from the same ecosystem they get easily polluted.

Diffusion type aerators allow the faecal matter of the prawn and the feed remains to settle to the bottom where they are allowed to undergo bacterial degradation resulting in purification of the water column apart from supplying much needed oxygen to the prawns. Bacterial colonies so formed will be used by the prawns as feed. In this system it is not necessary to exchange water frequently except for the maintenance of required salinity. Although initial investment will be a little bit higher as compared to paddle wheel aerators it is better for a sustained development of prawn culture.

Disease and antibiotics

Most of the diseases of prawns are due to poor water quality in the farm and the feeder

channels. Some of the pharmaceutical companies came up with medicines to cure diseases. Most of these claims have no scientific basis. In aquatic system if the stock gets infected, it is difficult to save it from disease except from individual treatment of animals. Prawns being small animals it is difficult to give individual treatment. If we have to add medicines to kill the germs in the ponds heavy quantities are to be used which becomes very costly. Inspite of adopting these procedures there is no guarantee that the disease can be completely eradicated from ponds since feeder channels infested with these species can infect the water in the pond. If there is any doubt of the disease the best thing to do is to harvest the stock and dry the ponds.

A variety of antibiotics are being used to save the crop from disease. Most of these antibiotics are incorporated into the feed pellets. These antibiotics are leached out into the pond water before the animal feeds on the pellets. As a result only a negligible portion of the antibiotics reaches the prawns and the rest goes as waste in the water medium. Whatever is lost in the water medium is responsible for the development of resistent varieties of disease creating organisms.

Probiotics

There are certain bacteria, plants and animals which can reduce pollution levels in the prawn farms. In fact some of them are always present in the prawn farms and are helpful in decomposition of the waste material in the ponds. Since waste material load is more than what existing organisms can handle, it may become necessary to supplement with some more organisms so that maximum amount of waste is treated in the ponds to have favourable habitat for prawns.

Now a number of bacterial mixtures are available in the market to serve this purpose. However, the cost of these mixtures is prohibitive and not advised in commercial operations. The best alternative is to introduce animals like mussels and clams which are good filter feeders of phytoplankton and other suspended particles. A judicious application of this system will go a long way in sustaining prawn farming at economic levels.

The 1994 debacle

In 1994 there were heavy rains at the end of October all along the coastal Andhra and most of the estuarine creeks were flooded with freshwater. The prawn farmers were afraid of taking this water and hence there was no water exchange for 10-20 days. Lime was sprayed indiscriminately assuming that it would maintain the water quality. The occurrence of disease was noticed and a variety of chemicals, bleaching powder, iodine, copper sulphate and formalin, to name a few, were sprayed in the farms. There was no use and the farms were affected one after the other and about 60% of the crop to be harvested in November and December was lost.

Various agencies came up with claims that they found out the pathogens responsible for the disease. First it was the turn of the bacteriologists who claimed that bacteria were responsible for the disease as they could find 5-6 species of bacteria in the culture of affected animals tissues. Then came the claim of virologists since a number of viruses were isolated from the infected samples. Finally it was accepted by the majority that it was 'white spot syndrome' (WSS). A world renowned virologist was called to India to examine the samples and give his opinion on the subject. He accepted that it was white spot syndrome but could not pin point the virus responsible for the disease.

Another version, the most plausible one, was that mortality was due to ammonia poisoning as a result of increase in pH due to limited exchange or no exchange of water causing building up of load of waste products in the ponds. The bacteria observed in the cultures of white spot tissue were only saprophytes browsing on the dying prawns.

The future

The foregoing analysis gives an insight into the various procedures followed in Andhra Pradesh for prawn farming and their merits and demerits. It is for the farmers and entrepreneurs to realise the need to take care of the different factors like location, soil characteristics, pond design, water quality, management, appropriate method of aeration, nutritional quality, dosage of feed and farm management which determine the yield from culture practices. Through improved culture practices and regular monitoring of the environmental and biological parameters, there are very good prospects for raising prawn production from coastal aquaculture in Andhra Pradesh from the present level.