POND CULTURE

The paper discussed the extensive and semi-intensive methods of prawn culture. It reviewed the history of pond cultivation of *Penaeus monodon* during the last three decades and the major contributions to its culture, cultivation and production in the Philippines. It also touched on the market demand from Japan which at present is the main importer of Philippine prawns. The major discussion however dealt on the extensive and semi-intensive culture methods, the former being widely practised by prawn farmers and the latter being the most viable and more easily adaptable method for culture in ponds. Although the old practice of direct stocking of fry in grow-out ponds is convenient, it gives unreliable fry survival rates. Thus, the nursery system has been devised to improve fry survival. The different nursery systems were discussed in detail as intermediate holding systems of wild or hatchery-bred fry. The factors that affect prawn production in grow-out ponds were discussed for both extensive and semi-intensive culture methods.

In the workshop session, various constraints in prawn pond culture were emphasized including lack of appropriate knowledge on site suitability, pond design and construction, pond preparation, and pond management. Specifically, the following constraints were considered:

1. Site suitability

While there may be a "correct" salinity mix for raising prawns, it was agreed that the lack of freshwater sources is not a constraint. However, optimal yield may not be attained if the proper salinity requirement is not met. It was suggested that the physiological requirement of the animal be considered since an optimum salinity range exists for different aquaculture species. The fishfarmer may be better off economically in culturing different species rather than raising prawns where optimal yields are not produced. Corollary to this, it was suggested that fishfarmers having freshwater ponds should raise *Macrobrachium sp.* instead of *P. monodon.*

Another site suitability factor is accessibility of the ponds to the operator since success in pond operation rests substantially on proper management and close supervision.

2. Pond design and construction

Before redesigning ponds for prawn culture, it was suggested that pond owners look at existing designs. Owners should also consider whether to go into extensive, semi-intensive or intensive culture. For extensive culture, existing milkfish ponds may be suitable. For semi-intensive culture, a depth of at least 1 m above the highest tide line is preferred for ease in draining. The use of a pump, 2-gate system, and paddle wheel aerator was also recommended. Most semi-intensive ponds in Taiwan are smaller (less than 1/2 ha) and with concrete dikes. It was noted that one important factor in the success of the operation is close supervision by the owners.

On the reconstruction of leaking dikes, a practical hint offered was to use plastic sheets along the dike. Another was by digging a trench along the leaky area and using the excavated material as reinforcement for the dike. It was suggested that the proper soil type be selected for building dikes. In the long run, concrete dikes may be more economical than earthen dikes. There are two prevailing shapes of semi-intensive ponds used by SMC (square, 50 m 50 m, and rectangular, 1.2 ha in area). Survival rates attained with these shapes were not significantly different.

3. Pond preparation

For extensive culture, the traditional scheme of preparing milkfish ponds (drying, plowing, pH test, liming if necessary, application of organic and inorganic fertilizer) was recommended. The preparation of intensive and semi-intensive ponds follow a similar procedure: plowing and complete drying to avoid anaerobic decomposition were emphasized. Non-biodegradable pesticides must be avoided because they leave residues that might be accumulated by the animals. Biodegradable types coming from plant sources (such as rotenone derived from derris roots) are recommended but this natural pesticide is difficult to import. A practical method using ammonium sulfate and lime at a 1:5 ratio was also recommended.

4. Feeding management

No feeding is actually required in the extensive method of culture although some fishfarmers occasionally throw chopped unwanted fish species (trash fish) into their ponds. For semi-intensive culture, a scheme based on the average body weight and estimated survival, as practised at the Leganes Station of AQD was presented as follows:

Average Body Weight (ABW) 0.5-5 g - 10% estimated biomass at 90% survival

ABW 5-10 g — 8% estimated biomass at 80% survival
ABW 10-15 g — 6% estimated biomass at 70% survival
ABW above 15 g — 4% estimated biomass at 60% survival

Feeding was done twice a day at equal proportions for the daytime and night--time rations At SMC, feeding is administered five times a day. Nighttime (10 p.m.) ration constitutes 30-40% of the daily ration, the early morning (7 a.m.) ration 20-30% , while the late morning, mid-day and late afternoon

rations make up the rest. Daily rations were computed starting at 10% of the estimated biomass for the early growing period and gradually reduced to 4% during the first month of culture.

5. Water management

Water management for the extensive culture method relies mainly on tides. Pumps are a must for semi-intensive and intensive methods where water may have to be changed even at neap tide. The use of bagnets or other means of filtering water was recommended to prevent entry of predators.

Prospective farmers were urged to invest in essential instruments (such as a refractometer) and to teach their caretakers proper water management. At SMC, aeration is used for stocking densities as high or higher than 60,000/ ha. A threshold of 4-5 ppm dissolved oxygen is required for growth by most organisms. Dissolved oxygen levels in ponds must not be allowed to dip below 4-5 ppm because below this level food consumption, which affects growth rate, decreases.

6. Diseases

Preliminary results of a study on soft-shelling going on at SEAFDEC AQD were presented. Four factors have been recognized as possible causes of soft-shelling, namely, nutritional, microbial (chitinoplastic bacteria), environmental (e.g. calcium levels, oxygen, salinity), and chemical pesticides as possible inhibitors of chitin synthesis.

A survey of ponds in Iloilo, Capiz and Aklan that have produced some soft-shelled prawns indicated the following general characteristics: low dissolved oxygen (4-6 ppm), high salinity (32-40 ppt), insufficient pond preparation (no liming, no mineral fertilization, use of non-degradable pesticides, and infrequent water exchange at 1/2 to 1 1/2 month intervals), insufficient natural food, the use of pesticides in adjacent agricultural areas, and low organic matter (less than 7%) and total nitrogen (less than 1%) content of pond soil. In SMC, well-managed intensive systems yield less than 3% soft-shelled prawns at harvest.

7. Manpower

The SEAFDEC AQD training program on pond management for caretakers was highly recommended to pond owners for their pond aides. SMC estimates indicate that for every 5 ha of intensive culture pond, two technicians (one for water management, one for feeding) and three labor aides are sufficient.

In the ensuing discussion the characteristic of a suitable site was assessed. Appropriate pond design was discussed. For the other areas in pond management, it was claimed that the information are already available to fishfarmers.

Specifically, the following recommendations were made:

1. Characteristics of a suitable site

a. For extensive culture, a source of brackish water is necessary.
b. For semi-intensive culture system, a controlled environment is desirable. The use of pump and properly engineered systems are recommended.
c. The intensive culture system requires a large capital. Like the semi-intensive system, a controlled environment is needed.

2. Proper pond design

For extensive culture, existing milkfish ponds are sufficient. For semi-intensive culture, 2-gate and 2-canal systems are recommended in order to accelerate water change.

3. Feeding

For extensive culture, the fishfarmers receive inconsistent information on what natural food is best for prawn. Some claim ***lablab,*** some *lumot,* and still others claim ***kusay-kusay (Rupia sp.),*** an aquatic grass, as the best natural food. Researchers were urged to provide consistent information to the farmers.

The history of the prawn industry in Taiwan and Japan can provide practical hints for the development of the local industry. Taiwan started with the extensive method in basically the same manner as the Philippines but has gradually shifted to the semi-intensive method with the use of formulated feeds. Government support for the prawn industry in Taiwan has contributed significantly to the now advanced Taiwanese technology.

The final discussion focused on an ongoing physiological study at the SEAFDEC AQD. The composition of the hemolymph of prawn is being studied as the animals are placed at different salinities. There are indications that the prawn possesses regulatory mechanisms which compensate for gradual changes in environmental salinity, although not as efficient as those of milkfish. Large and sudden alterations in salinity can change the character of the hemolymph and threaten the life of the prawn. The best salinity is between 16 to 24 ppt. At this salinity range, the prawn need not spend a lot of energy regulating the inorganic ion content of its blood because it is similar to that of its environment. However, it was noted that changing the salinity under laboratory conditions is different from a change in salinity in ponds. In ponds, a change in salinity may also bring about a change in the population organisms in the pond, thereby affecting the nutrition of the animal.