Management of Fish seeds (Fry and Fingerling)

In fish life history, egg(fertilized) → Larva fry → fingerling → sub-adult/juvenile → adult. The larval stage ends when it fills up its air bladder with air, begins swimming in a fish-like manner and starts to eat external food that it becomes to fry. In addition to needing all the essential requirements of the larva e.g. adequate O_2, suitable temperature, removal of waste matter etc, the fry also requires external food which should be adequate both qualitatively and quantitatively. The early fry may still have a part of the yolk left and can draw on it for sustenance from 1-4days depending on the species. The fry spends this period and learns to find its own food. Fry are said to require a more precise and careful nursing to ensure their survival and proper growth. Authors have remarked that lack of suitable food caused high fry mortality. Fingerling is bigger than fry e.g. 5-10cm and it is the stage that is usually stocked. Management of these developmental stages is based on their fragility and difference in sizes in terms of their habitats, stocking density, feeding and control of their infections and diseases. These stages are crucial because there cannot be harvest without recruitment. Hence, these stages are called fish seed or recruits.

Fry are nursed in small earthen ponds which vary from 100-200m^2 for about 3-4 weeks to attain fingerling stage. Fingerlings are reared rather than nursed in bigger earthen ponds. The pond is usually prepared to have a standing crop of rotifers and must be checked to exclude cyclopoid copepods which are natural enemies of fry. Food is crucial for growth which must be observed daily. Fry have two sources of food during the initial stage – yolk and external food to ensure better survival. Maintain these. It is part of the management that mixing of different age groups of same species should be avoided and it is advisable to use a monoculture of fishseed.

The most commonly provided artificial feed is finely ground and sieved through 100-150µm mesh called starter food. After two weeks, the size of feed particles is increased. Cutting the grasses on the dyke and throwing them around the shallow part of pond helps to increase natural food production in the pond. After about one month, the young fingerling have to be removed from the small nursing pond and stock in a large pond. The artificial feeding continues but the size of food changes due to changes in the size of mouth. It is necessary to thin out the stock in order to provide sufficient space, O_2, food to the fast growing fingerling. Enemies of these stages must be managed too. These enemies change with the age of the fish. These are categorized as (i) enemies of fry (ii) enemies of advanced fry and (iii) of fingerlings.

Identify these enemies and treat adequately. For example enemies of fry include carnivorous Cyclops, insect and insect larvae (e.g. dragonfly), which predate largely on the fry. It has been stated that Cyclops are responsible for the highest mortality of fry at this stage next only to that caused by hunger. The advanced fry is less prone to predation by Cyclops since it is more agile and its skin in thicker and stronger. It is the insect larvae that pose greater danger at this stage followed by hunger if there is acute food shortage. O_2 deficiency may kill in heavily manured ponds. Abrupt changes in temperature and extreme cold may exterminate the fry population.

Enemies of the fingerling – Besides hunger, O_2 deficiency, sudden change in temperature, white spot disease caused by *Ichthyophthirius, Trichodina* and gill worm infections could exterminate the entire stock within a brief period in fingerling ponds.

Consult your note on Pathology for effective treatments. Preventive and control methods of these infections would be discussed during class interactions. Infection of a pond with any protozoan or bacteria or fungus can be diagnosed through certain indicative signs such as: (i) swimming of fry/fingerling in large school near the surface (ii) their accumulation below the water inlet (iii) the occurrence of dark specimens (iv) sudden occurrence of dead fish on the surface. It should pointed out that fish that die because of parasitic infection only float on the surface while those that die due to dietary factors remain at the bottom.

Procurement of feed and system of feeding

Intensive fish culture involves a high/heavy stocking of water impoundments/enclosures and the use of artificial/formula feeds to improve production. Fish feed provide nutrients for optimal growth and this rapid growth achieved implies that fish feeds are essential for the economic use of time. Through shortened grow-out periods, a fish farmer can effect two croppings within a year. The increased number of croppings of table-sized fish imply that more profit can be generated by the fish farmer. Therefore, feed of adequate nutritional value is the foundation on which fish farming is built. Good and high quality feeds improve the quality of the edible portion of fish, enhances high protein retention and gives the flesh a firm consistency and delicate flavor.

Types of foods: Based on the source of origin, there are natural food and artificial feeds. Natural fish food can be of animal origin which include zooplankton e.g. rotifers, protozoans, cladocerans, copepods, larger zooplankton (arrow worms, crustaceans etc, benthic invertebrates e.g. polychaetes, molluscs, insect larvae e.g. Chironomids and Chaoborids, forage fish and aquatic insects.

Natural food could be of plant origin as an phytoplankton e.g. diatoms, desmids, blue-green algae, unicellular, filamentous and colonial algae and aquatic macrophytes. Dead plants and animals (i.e. decaying organic matter called detritus) also constitute an important natural food source.

Artificial feeds: Under commercial culture condition involving high stocking densities of fish, natural foods become limiting. It is the artificial or supplementary diets that fill the shortcoming of natural foods.

Early efforts to provide supplementary diets for cultured fish were based on attempts to duplicate composition of natural foods. This was labour-intensive involving the growing of earthworm and insects, harvesting small fish or tadpoles or by processing agricultural slaughter house by-products not readily consumed by man. Such diets had a number of drawbacks e.g. poor growth and nutritional diseases which led to the development of dry or semi-moist feeds commonly used nowadays. Artificial feeds are available in

Type I – meals, pastes or cakes

Type II – pellets

Type III – semi-moist feed

Type I is for plankton feeders, algae grazers, fry, small fingerling. They may be prepared as dry meal, colloidal suspension or soft cakes. Fish consume them by direct capture or by filtering water.

Type II – This type is convenient for storage, transportation and dispensing in automatic feeder or self feeder. Many fish feeds are prepared in pellet forms which can be hard (sinking), expanded (floating-encapsulated) or soft pelleted. Hard pellets may be used for fish with a mouth size capable of ingesting them, the stomach capacity to store them and the peristaltic action and enzymatic ability to digest them. Uneaten pellets disintegrate slowly in water and hence cause less water pollution. To discuss the merits and demerits in class.

Floating or expanded feeds enable the fish farmer to observe fish feeding at the pond surface. Floating feeds are acceptable to most surface-water feeders as well as catfish. Floating feeds are more expensive than hard pellets because they require extra energy in extrusion process and increased drying time. Soft pellets have water content between 8-20% and are preferred by fish which strike for their food.

Type III – Semi-moist have water content in the range of 37-40% and are prepared from frozen or fresh, wet ingredients. They are the most expensive feeds available hence fish farmers are not interested in using them.

Feeding systems or techniques

A feeding programme is successful when the required amount of nutritionally adequate feed is consumed. The feeding plan and techniques are affected by fish species and size, time of

the year and the type of production system. The best guide for the fish farmer is to place the feed where it can be obtained by the fish, offer it so that the fish will receive their share/rations. Floating feeds can be broadcast mechanically from specially designed feeding troughs or from mechanical feeders. For small ponds, the feed can be distributed by hand (self feeder). Feeding of fry and small fingerling poses different challenges. The experienced fingerling producer knows where the young fish are located in the pond. He may use containers or shelters to attract or hold the newly-stocked fry in an area. Note that feed placed in wrong location will not be eaten and will reduce overall water quality.

Mechanical feeders include the demand type which is activated by the fish and the automatic type which is activated by a time clock. Both have serious limitations, one of which is the tendency to less frequent observation of the culture system. The demand feeder is useful in extensive systems where fish do not have to be observed closely e.g. in lakes, reservoirs. The automatic feeder is designed to offer a measured amount of feed at predetermined time of the day.

Relationships between feeding and production will be discussed in class.

Test-cropping and Grading

Before harvesting, there is the need for test cropping and/or grading for at least once a month after stocking of the fish into the production ponds. A farmer needs to make direct assessment of the status of his fish stocks over the growth period because there are some species especially the carnivorous species e.g. *Clarias* which exhibit hierarchical dominance in its feeding behavior. As a result, the more aggressive will be at an advantage to receive more food than others bringing about marked differences in sizes of individual fish. Not only

this, test cropping allows to monitor the health status and adjustments in the feeding rates to account for growth especially if artificial feeding is practised.

The test cropping involves capturing a few number of fish using cast net or seine net early in the morning of a cool day and a bowl/bucket of water is kept nearby to keep or hold the fish during examination. The fish is held in a wet cloth or foam and any surface with which the live fish makes contact during the examination must be thoroughly moistened / wetted. If large variations in size among individual fish are observed, the stock should be graded into appropriate size groups and probably restocked into different ponds if not ready for harvesting.

Grading can be carried out by eye or where large numbers of fish are to be sorted out for harvesting, a box with a bottom that consists of a series of bars or slots appropriately spaced to segregate the specific size range of fish can be used.

Grading also functions to produce equal-sized fish for the market at the time of harvesting. However, it should be noted that test cropping and/or grading during production period should not be more than once a month because it is stressful to the fish and they tend to go off their food for a few days.

References or relevant textbooks would be recommended during the introductory lecture. Inter-net lectures are incomplete for your excellent performance in my examination. Therefore, attend my classes punctually and regularly for your own good.