

## BANGOS NURSERY OPERATION IN THE PHILIPPINES

by

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### Abstract

The high mortality in raising bangos fry to fingerlings is one of the major drawbacks in chanos culture. Improvements made on the traditional method of bangos nursery operation considering the management by fishpond operators in the Philippines is presented in this paper.

### Introduction

The Philippines is recognized as one of the critical regions in the protein-starved world. It has about 50 grams of protein a day per capita, an intake much lower than the recommended 70 grams a day.

One of the sources of protein is fish. Production in 1974 from different fisheries sectors is as follows:

<u>Capture fisheries</u>	<u>In metric tons</u>
Marine - commercial	445,675
Marine - municipal	581,840
Inland (rivers, lakes, dams, etc.)	102,658
<u>Aquaculture</u>	<u>113,195</u>
TOTAL	1,243,368

The actual available supply of fish for food in the Philippines in 1974 is 1,304,000 metric tons which includes supplementary imports. On a per capita consumption, therefore, a Filipino eats 31.2 kg of fish per year, a figure much lower than the expected requirement.

To increase fish production, emphasis should be given to bangos culture which are environmentally suited either in the 176,000 hectares

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of fishponds or in the 6,000 hectares of fishpens now existing and developed. Since production of fingerlings is short of requirements, cost of production tends to increase which adds to the pressure in utilizing those land resources.

An assessment of fingerling production in the Philippines is necessary for the pursuance of further improvements in the traditional methods of nursery operation.

### Review of Literature

Raising bangos fry in the nursery pond is an intensive fish culture activity where a very high rate of production and/or mortality per unit area (or per unit volume of water) is encountered. Lin (Taiwan, 1968) believes that better care of fry, leading to higher survival rate, is the most important measure for the improvement of the milkfish industry. One way of reducing mortality is proper filtering of the water entering the fry ponds.

In the Philippines, Rabanal, et. al. (1950) noted four distinct phases in the development of the bangos fishpond industry and are as follows:

1. Bangos fry industry. This is the catching, sorting, collecting and transporting of bangos fry from the fishing grounds to the nursery areas.
2. Management of bangos nurseries. It involves the raising of bangos fry to fingerlings in the nursery ponds.
3. Management of bangos rearing ponds. This refers to the growing of bangos fingerlings to marketable size in the rearing ponds by supplying adequate amount of algal food and control of water supply for the whole pond system. The latter consists of elaborate and neatly constructed shallow pond units (500 to 5,000 sq. m.) managed separately as a business enterprise.
4. Commercial handling of marketable bangos. As soon as the bangos are harvested, these are properly iced and packed in containers suitable for shipment to wholesale market centers. In Hulo, Malabon, the "consignitario" takes charge of the sale to the "degaton" or consignor who gets 3-5% of the gross sales.

### Selection of Site, Layout and Construction

A. As part of a bangos fishpond system, nursery pond sites are selected on the basis of the following:

(1) adequate source of unpolluted tidal water; (2) clay, clay-loam or sandy-clay soil with rich organic matter, (3) complete drainage of nursery pond compartment, (4) clear area or with few vegetation, (5) level bottom or tidal flat, and (6) accessibility to the rearing pond compartments. Nursery ponds are relatively small shallow areas and are about 1% of the entire area of the bangos fishpond system. These small-sized shallow ponds are well kept and tended for growing the young bangos. A much smaller "kulungan" or catching pond is situated at the lowest part of the pond compartment for impounding or catching the fingerlings.

B. As a commercial bangos nursery, a series of more or less equal small-sized ponds are laid in such a way that each compartment will have a separate gate that leads to the canal system. Previously, this consists of a canal system, small-sized catching ponds and shallow nursery pond compartments; however, at present, newly established nursery pond systems do not have catching ponds. Instead, the water supply system is utilized as a source of water, catching pond, and/or reservoir. Usually, the commercial bangos nursery pond system is located in an area accessible to land and water transportation for better transport of fry and fingerlings, as well as supplies and materials. It has to be situated within the vicinity of extensive and large fishpond areas for growing bangos to marketable size. This type of pond system for exclusive growing of fry to fingerlings consists of the following:

1) "Semillahan" with gate and its accessories. Sometimes it is called "pabiayan", the growing area for the bangos fry. This area is used for growing bangos fry to fingerlings supplied with natural algal food.

2) "Kulungan" or catching pond. It is a much smaller unit where fingerlings are impounded and caught.

3) "Impitan" or "bansutan", or transition pond. This compartment is much bigger than the "semillahan". It is utilized for stunting the growth of fingerlings, as water reservoir, or for growing fingerlings to "garongin" size.

4) "Sangka" or water supply canal. It is the lowest portion of the entire area leading to the main gate, and is the main source of tidal water supply for the different pond compartments. It also serves as a passageway for input materials i.e., fertilizers (organic and inorganic), food (rice bran, copra meal, etc.) and other supplies.

5) Gates. The main water control gate is strategically located along the main dike. It may be made of concrete, adobe stones plastered with cement, or concrete hollow blocks. New commercial nursery pond layouts have a series of secondary gates and compartments along the canal system which act as catching pond, water supply reservoir and/or holding pond. Gates are properly screened with fine meshed nylon cloth. Wooden slabs are used to control the entrance and exit of water.

6) Dikes. The perimeter dike is as big as, or even much bigger than, the rearing pond dike to protect the area from floods. The canal dikes are much lower than the main while the secondary or divisional dikes are the smallest and with steeper slopes.

### Preparation and Management of Bangos Fishpond Nursery

#### A. Chronological Procedures Prior to Stocking of Bangos Fry

1) Cleaning and leveling of nursery ponds. About two months prior to the arrival of the new supply of bangos fry, preferably at the start of the dry season, the nurseries are drained, leveled and allowed to dry. In the process of leveling, the pond bottom is stirred thus allowing the nutrients at the sub-surface level to be available for "lab-lab" blue-green algal growth. Pests and predators are also eradicated during the process.

2) Drying of ponds. After two or more series of draining and drying, the pond bottom is exposed to sunshine to get rid of predators, and completely dry the pond until the bottom cracks. The surface soil should contain about 16-20% moisture prior to application of fertilizer. It is a common practice among fish farmers to apply 1 to 3 tons of chicken manure per hectare over the dry pond surface to generate the initial growth of lab-lab. Soil samples are taken and analyzed prior to the application of fertilizer.

3) Growing of "lab-lab". Tidal water to a depth of about 5-10 cm is admitted into the "pablayan" or "semillahan" after applying the fertilizer. As soon as growth of "lab-lab" is noted, chemical fertilizer is periodically applied to enhance further growth of micro-benthic flora and fauna.

4) Repair of dikes. Leaks and seepage are checked. It is necessary to prevent water from entering the pond during the drying and fertilization periods. Bangos are negatively rheotropic and incoming water through the holes in the dikes will serve as passageway.

5) Care of gates. Slabs and screens are snap-fit, the latter with fine nylon cloth or screen. This prevents entrance of undesirable predators and pests, as well as competitors for food.

#### B. Factors to be Considered in the Growing of "Lab-lab"

The following were noted by Rabanal, et al. (1950) to be necessary for growing "lab-lab":

- 1) Fertile clay, clay loam or sandy clay soil.
- 2) Pond water depth of about 5 to 10 cm during the growing of "lab-lab" and later increased to 20-30 cm during the growing period (bangos fry to fingerlings).
- 3) Salinity ranges from 10-40 parts per million (ppm).
- 4) Avoiding stirring the pond and preventing water from becoming turbid while growing "lab-lab" and the fry.
- 5) Freshening the water to enhance further growth of "lab-lab".
- 6) Eradication of pests and predators that feed on the natural food and the fry and/or fingerlings.

#### C. Procedure for Growing "Lab-lab", the Natural Food of Bangos in the "pabiayan" or Nursery Pond System:

- 1) Drain pond.
- 2) Level pond bottom and make a slight inclination towards the pond gate.
- 3) Allow the pond bottom to crack to dryness. Surface soil of about 10 cm deep should have 16-20% moisture content.

- 4) Take soil sample for analysis.
- 5) Apply fertilizer, the amount depending on soil analysis and requirements.
  - (a) Organic: chicken manure, 1,000 - 3,000 kg or rice bran, 500 - 1,000 kg, or copra meal, 200 - 500 kg.
  - (b) Chemical: 16-20-0, 2 - 5 bags, 18-46-0, 1 - 2 bags.
- 6) Expose the pond bottom to sunlight for 5 days.
- 7) Admit new tidal water to a depth of about 5-10 cm and seal gate completely with soil blocks. Eradicate undesirable fish with KCN, and snails with tobacco dust or aquatin.
- 8) Apply some fertilizer (organic or chemical) to areas with thin layer or less growth of "lab-lab".
- 9) Admit new tidal water into the pond 5-10 cm deep.
- 10) After a week, when "lab-lab" shall have been noted to grow luxuriantly, flush the pond with water 2 to 3 times prior to stocking of fry to get rid of the highly saline water and other toxic materials.

#### D. Stocking of Nursery Ponds

As soon as the fry arrive at the nursery pond site, larvae of other species of fish that go with the catch must be removed or sorted out. Most of the predatory species found with the bangos fry are "bidbid" (Elopidae), "bagaong" (Theraponidae), "bia" (Gobidae), "buan-buan" (Megalopidae), and other miscellaneous larval fishes.

Usually, stocking of the fry is undertaken during the coolest part of the day, i.e., early morning or evening. The fry must be properly acclimatized prior to release in the nursery pond.

Stocking rates range from 30 to 50 fry/sq. m. However, in commercial bangos nursery ponds, stocking rates of 50 to 100 fry/sq. m. could be attained with intensive management. The fingerlings could be kept in the compartment for a year with minimal growth through supplementary feeding with fine

rice bran ("cono") and with minimum mortality. The nursery pond could be a source of stock for the rearing pond all the year round. Through proper care and management of the stock, there will be less mortality.

The most prevalent causes of mortality are (a) pollution, (b) fungal infection, (c) parasites, (d) predators, (e) carelessness of caretaker (f) sudden changes in temperature, salinity and other physico-chemical factors.

Artificial feeding is resorted to when depletion of natural food is noted. The most common practice among fishpond operators is to feed fine rice bran ("cono") at a rate of 5-12 kg per 300,000 fingerlings per day.

The following are the steps in stocking the nurseries with bangos fry:

(a) Sorting. Previously, bangos fry from catching grounds are transported in porous unglazed earthen jars ("palayok") or five-gallon cans, each containing around 3,300 fry. The earthen jars break easily and cause heavy losses while in transit. At present, oxygenated plastic bags are used as transport containers. Upon delivery to fishpond operators, the contents of each container are poured into a white basin for scrutiny and examination. The fry are again counted, the dead ones removed, and the fry of predators/fishes such as "bid-bid" (Elops), "buan-buan" (Megalops), and many other species of fish are eliminated.

(b) Technique of stocking. Usually, to stock the fry in the nurseries, they are placed in a jar which is set in the water, slowly turned over and the fry allowed to acclimatize prior to release. Stocking is done during the colder part of the day, that is, early morning or late evening. It is advisable that the temperature and salinity of the pond water approximate that of the water in the jar or plastic bag at the time of stocking. Sunny days are preferred for stocking because the first three or four days after stocking are the most delicate and critical period in their whole pond life. At this time, they are very weak due to catching and transport, and are susceptible to sudden changes in temperature and salinity caused by heavy rains. Before stocking the fry in the nurseries, highly saline water caused by excessive evaporation should be changed with new

brackishwater from the reservoir, head pond, canal, or river. The floating debris in the nurseries caused by rain or water run-off from the dikes or watershed can easily suffocate the bangos fry.

(c) Care of bangos fingerlings. Adams, et. al. (1931) described the different methods of handling and care of bangos fingerlings in the nursery. "Hatirin" are young bangos of the fingerling size, that is, about 5-10 cm in length. There is no definite time for catching the "hatirin". Demands regulate catching and delivery of fingerlings. They are collected in the "kulungan" or water supply canal and kept there for one day without food before delivery. This explains why "lumut" is not allowed to grow in the "kulungan".

(d) Rate of growth of bangos from fry to fingerlings. The bangos fry is about 10-15 mm long and weighs 0.0002-0.008 g. In about 4-6 weeks, it grows to 5-10 cm long weighing about 1.2-5.0 g.

The fingerlings could be kept in the nursery pond as source of stocking material for one year. Through proper management techniques, the growth of fingerlings could be stunted without impairing their health and with negligible mortality.

(e) Enemies of bangos fingerlings. High mortality of young bangos is caused by animal predators that get into the "kulungan". They include several species of fish, crustaceans, birds, snakes and parasites. Among the food competitors are "langaray" (Ambassis sp.), "kabasi", sardine, "sap-sap" and others. Crustaceans likewise enter the nursery and the rearing ponds and compete with bangos for food. Some of them also bore holes through the dikes, such as the "alimango" (Scylla serrata) and "koloykoy" (Thalassinus sp.). The common frog (Rana vittigera) together with their tadpoles, water snakes, called "kalabukab" (Distiera ornata) and "malabasahan" (Laneneis), prey on the young bangos. Birds also prey on the young bangos especially when they appear in big flocks, the most common among which are the "tagak" (heron) and kingfisher.

(f) Methods of catching fingerlings. Catching of fingerlings may be done using the "pasubang" method or allowing them to go with the current. These are



caught in the catching area ("kulungan" or canal) with a "panagap" or fingerling seine. Prior to catching of the fingerlings, reserve clear water has to be impounded for "stand-by" use during the operation.

(g) Technique of counting fingerlings. Counting of fingerlings is done by placing them in a "bitinan" or suspension net. A long pole is placed horizontally at the mid-portion of the rectangular "bitinan" allowing the fingerlings to stay at one end. This whole batch is divided into two with another pole and so on until a well proportioned batch could be easily counted. This method is used to minimize handling of the fingerlings and speed up the counting.

#### Methods of Transport of Bangos Fingerlings

##### A. Transfer of Fingerlings within the Pond System

In a complete bangos fishpond system, bangos fingerlings placed in a "bitinan" are dragged slowly towards the rearing pond through the canal system and ultimately through the secondary gate. Sometimes, the fingerlings are allowed to go against a water current artificially created in the canal system and ultimately ends at the rearing pond. To assure swimming of the fingerlings into the rearing pond, a "pangaboy" or drive-in net is used to drive them into the rearing pond.

##### B. Transport of Fingerlings with "Pamandawan"

Bangos fingerlings are distributed from the nursery pond centers to the various rearing areas by means of liveboats or "pamandawan". This boat may be a wooden dugout with flat bottom, measuring from 10 to 20 m long and propelled by an inboard or outboard motor. The bottom of this boat is provided with two well-screened holes for the free entrance of water. It may also be a flat bottom barge-like boat, which is usually towed by another motor vessel. The fingerlings can be transported even under very crowded condition in these live-boats, however, this must coincide with high tide and clear water.

With the use of "pamandawan", precautionary measures should be taken particularly on the water supply to be used in the transport. Non-polluted brackishwater must be used. It is also essential that water circulation and aeration are maintained. This is done as soon as the fingerlings are placed in the boat by opening the water holes. These boats are prevented from sinking by bailing out water from them. The fingerlings should not be transported during inclement weather,

such as typhoons and floods. Turbid waters and shallow areas where the boats may run aground should be avoided. High tide is the best time for transporting and should preferably be undertaken during early morning or through the night to early morning. Upon arrival in the rearing pond area, fingerlings are again scooped by means of pails and transferred to the transition pond or "impitan" which has been previously prepared. This pond can be stocked with from 1 to 15 fingerlings/sq. m. depending on the abundance of filamentous algae, in which case, the caretaker should make pathways for swimming and grazing areas of the fingerlings.

### C. Transport of Bangos in Plastic Bags with Oxygen

Properly tempered clear brackishwater must be placed in plastic bags prior to stocking with bangos fingerlings, and oxygen tightly secured. Bags are placed in either cardboard boxes, styrofoam containers, or "pandan" bags. Transport of fingerlings should be made during the coolest part of the day. In the event fingerlings are to be transported to a far place, acclimatization is resorted to.

### Cost Benefit Factors in Bangos Nursery Operation

Raising bangos fry to fingerlings is a big business. Typical data on commercial fish nursery operation were gathered by Mr. Nathaniel Vicencio, BFAR Senior Fishery Biologist, in 1969 (Blanco, 1970). The 2.7 hectare nursery pond system is located in Dampalit, Malabon, Rizal. Water supply is obtained from Panghulo River, one of the tributaries affected by polluted water. Clear water is available during high tides, at which time it is allowed to enter the pond.