BANGOS REARING EXPERIENCES AT THE BFAR NETWORK

by

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INTRODUCTION

The Bureau of Fisheries and Aquatic Resources is the government agency charged with the responsibility of overseeing research, development and conservation of fishery resources of the country. These activities were started in 1907 when the Bureau of Fisheries and Aquatic Resources was then a Fisheries Section under the Bureau of Science. It gradually metamorphosed into a Fisheries Division under the Department of Agriculture and Commerce in 1932, and became the Bureau of Fisheries in 1947. In 1963, it was named the Philippine Fisheries Commission with more diversified fishery activities to later become what it is now, the Bureau of Fisheries and Aquatic Resources. Itr organizational growth brought with it expansion of fishery facilities in different parts of the country.

One area of fishery activity that has received great attention is the inland fishery sector. Starting with one brackishwater fish farm, the Dagat-dagatan Experimental Fish Farm in Longos, Malabon, Rizal, established in 1937, there are now 13 brackishwater demonstration fish farms and nurseries dealing on bangos production operated by the Bureau of Fisheries and Aquatic Resources (Table I). The stations which have made substantial contribution to fishery research and technology are the Dagat-dagatan Experimental Fish Farm and the Western Visayas Demonstration Fish Farm in Molo, Iloilo City. Activities in these stations are limited to bangos fingerling production and dispersal, with cultivation of bangos to marketable size as a secondary undertaking.

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Table 1. Brackishwater fish farms operated by BFAR which deal on bangos production.

	Fish Farms	Established	Area Developed (Ha.)	Area Undeveloped (Ha.)
1.	Nalvo Lake Fry Bank and Fish Nursery Pasuquin, Ilocos Norte	1968	4.1	0.5
2.	Malued Demonstration Fish Farm Malued, Dagupan City	May 1963	8.5	0
3.	Mamay Demonstration Fish Farm Mamay, Luna, La Union	Feb. 1973	8.0	0
4.	Northern Luzon Demonstration Fish Farm Pata, Claveria, Cagayan	1951	5.5	0
5.	Dagat-dagatan Experimental Fish Farm Longos, Malabon, Rizal	1937	10.5	0
6.	Naujan Sabalo Hatchery Naujan, Oriental Mindoro	1963	6.83	0
7.	Sorsogon Demonstration Fish Farm Cabid-an, Sorsogon	1957	5.0	3.0
8.	Virac Demons. Fish Farm and Nursery Virac, Catanduanes	April 1969	14.7	8.3

	Established	Area Developed (Ha)	Area Undeveloped (Ha)
9. Bohol Demonstration Fish Farm Bentig, Calape, Bohol	1959	10.0	0
10. Leyte Fish Nursery Leyte, Leyte	Jan. 1957	10.0	1.3
11. Western Visayas Demonstration Fish Farm Molo, Iloilo City	1954	7.5	0
12. Serafin Gatuslao Memorial Experimental Station Caradio-an, Himamaylan Negros Occidental	Sept. 1971	7.0	0.5
13. Northern Mindanao Demonstration Fish Farm Lala, Lanao del Norte	1952	12.0	20.0

Some Researches and Studies Undertaken by BFAR Personnel

Because of their great interest to help the bangos industry prosper some technical personnel of the Bureau of Fisheries and Aquatic Resources have undertaken researches which have provided basic information on bangos culture. The following are some of these studies:

A. Pond Fertilization

1) Sulit, Esguerra, and Rabanal (1932) conducted experiments using complete chemical inorganic fertilizers in the nursery ponds at Dagat-dagatan Experimental Fish Farms in 1957. Results showed that complete chemical fertilizer 8-18-4 (N-P-K) produced abundant fish food resulting in the increase of stocking rate from 20-30 fry to 50 fry/m^3 pond water. They also claimed that it reduced the usual mortality rate from 60% to zero. Rate of application was 30 kg/ha from the second to the fifth week. The final weights of the fish after two months ranged 2.56 to 6.15 gms in two separate ponds with a stocking rate of 50 fry/m.

2) Padlan and Hosillos (1954) conducted a preliminary study on the effect of 12-12-12 (N-P-K) inorganic fertilizer on algae at the Western Visayan Demonstration Fish Farm in 1954. Results

of the experiment indicated that fertilization hastens algal growth and maturity; that growth of algae in pond fertilized at the rate of 50 gms 12-12-12 (N-P-K) fertilizer/m^3 is maximum during the first two weeks after application; nitrate-nitrogen appears to be the most important limiting factor in algal production and that pond fertilization retains and replenishes nutrients in the pond soil and water needed for algal growth.

3) Padlan (1956) further conducted studies on application of chemical fertilizer 12-12-12 (N-P-K) from Dec. 1955 to Jan. 1956, using a rate of 50 gms fertilizer/m^3 pond water. Initial weight of algae (Chaetomorpha, sp. and Claplophora sp.) was 310.2 gms/m^3 which increased to 886.5 gms/m^3 after two weeks.

This result increased fish production to 1,300 kg/ha/yr. With filamentous algae as basic fish food and applying 5 to 6 bags of 12-12-12/growing season of 3 to 4 months, fish production during the crop year 1958 and 1959 at the Western Visayas Demonstration Fish Farm was maintained at 1,300 kg/ha/yr.

B. Bangos Fish Food

1) Adams, Montalban and Martin (1932) recognized that the first three to four days of the fry's life in the nursery pond constitute the most critical period. They reported a 10 to 40% mortality of fry during the first 4 to 5 weeks in nursery ponds.

2) Rabanal, et al (1950) found that the natural food of fry and fingerlings under cultivation is the brownish, greenish or yellowish crust of microbenthic fauna and flora of the pond floor. The plant components include various forms of bacteria, unicellular and filamentous blue-green algae, especially those belonging to the family Oscillatoriacea, numerous diatoms and fragments of filamentous green algae. The animal components consist of different forms of protozoa, copepods, ostracods, free-living flat worms, round worms and larval forms of molluscs and larger crustaceans.

3) Acosta (1948), in cooperation with Carbine, made some successful experiments on the use of dry feeds for bangos fry. They found that a combination of egg-powder, powdered milk and rice bran, in addition to "lab-lab", produced the best growth rate and, at the same time, reduced mortality of the fry.

4) Ronquillo and Villameter (1957) made trials and observations on artificial feeding of bangos fry in concrete tanks using a stocking rate of 500 fry/m^3. They found that feeding bangos

fry with a mixture of 2 parts dry skim milk and 6 parts fine corn meal for 2 to 3 weeks before releasing them in nursery ponds reduced the mortality from 50 to 70% using ordinary nursery pond practice, to only 10 to 15%.

5) Padlan and Montalban (1955) found that corn meal was better than rice bran as artificial food for bangos fingerling.

6) Hosillos (1954) made a preliminary survey on the use of antibiotics and growth-promoting substances with supplementary feeds in milkfish fishponds. Findings indicated that fish growth did not increase significantly with application of terramycin TM-5 in combination with vigofac, a growth promoting substance, however, fish mortality reduced to as low as 20%. Mortality rates common at that time in the nursery ponds ranged from 50 to 80%.

C. Relative Growth of Bangos in Nursery Ponds

1) Rabanal, et al (1952) examined the growth of bangos fry at different stocking rates in the nursery pond and the results are shown in Table II. From the table, the effects of stocking rate is evident.

Table II

The Effect of Stocking Rate on Growth of Bangos Fry

Age Weeks	10 fry/ sq m	20 fry/ sq m	30 fry/ sq m	40 fry/ sq m	98 fry/ sq m	100 fry/ sq m
			Total Length in mm			
Original Stock	13.05	13.45	13.05	13.05	13.05	12.16
One week	26.21	18.86	25.38	26.19	23.64	16.32
Two weeks	38.38	29.82	34.63	34.52	29.67	24.84
Three weeks	56.78	40.97	46.14	45.38	40.35	28.28
Four weeks	70.47	50.17	47.71	46.82	42.30	33.78
Five weeks	79.02	52.35	51.76	49.67	44.66	36.86
Six weeks	76.24	55.01	53.34	51.15	45.36	36.59
Seven weeks	-	60.96	-	-	-	37.07
Eight weeks	82.50	62.11	54.70	55.91	48.25	41.86

D. Preliminary Study on the Possibility of Induced Spawning of Sabalo (Chanos chanos)

The Naujan Sabalo Hatchery Experimental Station Naujan, Oriental Mindoro had undertaken a series of studies on the occurrence and behavior of mature chanos along the Naujan coast. From 1967 to 1969, 76 mature chanos were caught. Fifty-eight of these were examined, thirty-seven of which were males and twenty-one females; however, three females and one male were found to possess spent gonads.

Five mature sabalo have been successfully stocked in the station's fishpond for observation. After a year of observation on their adaptation and behavior under controlled conditions, none of the sabalo exhibited gonadal development.

Dr. Howard Clemens, Dr. Herminio Rabanal, Dr. Yun-An Tang and Mrs. Medina Delmendo, with the assistance of the station's personnel, made preliminary attempts to induce the spawning of sabalo in captivity in 1967. Sabalo breeders were injected with APL (human chorionic gonadotropin) but failed to respond as their eggs were still immature.

E. Freshwater Fish Culture

1) Rabanal, Felix and Martinez (1967), demonstrated at the Mario Santos freshwater fish culture ponds in Sibul Springs, San Miguel, Bulacan that bangos can be grown with other species of Asiatic carps obtaining a total fish production of 3,000 kg/ha/yr.

Of the 3,000 bangos fingerlings stocked on July 4, 1966, and after a year of cultivation, 1,469 bangos were harvested with a total weight of 1,332 kgs. The average weight of the marketable bangos ranged from 0.7 to 1.2 kg/fish.

Stock manipulation technique in freshwater fishpond with bangos as one kind of fish stock have been proven successful realizing a net profit for a year's operation approaching 60%.

Felix (1975) has made a thorough study of the fishpen industry in Laguna de Bay and has come out with a feasibility study on the prospect of fishpen operations in Laguna de Bay. The study resulted in regulations of fishpen operations (FAO 114) and the designation of a fishpen belt.

F. Pond Fertilization, Pest Control, Supplemental Feeding and Stock Manipulation

1) Acosta, Lopez and Chavez, (1969) demonstrated at the Dagat-dagatan Experimental Fish Farm that bangos production in brackishwater fishponds can be increased from an average annual production of 500 kgs (traditional method) to 3,000 kgs or more per hectare per year. Three areas were examined, namely, a) the growing of the desirable algae thru pond fertilization, b) protection and replenishment of the growth of desirable fish food thru pest control and supplemental feedings and c) proper manipulation of bangos stock thru proper planting and cropping.

The experiment consisted of four trials conducted in a 2.5 ha/pond. The results are shown in Table III.

G. Bangos Culture Experiences and Observations Undertaken by Some BFAR Personnel (Unpublished)

In spite of their present work assignment, some BFAR technical personnel have managed to make observations and trials on some aspects of bangos cultivation in private fish farms. These observations and experiences were never published, among which are:

	Culture Period (days)	Cost of Input ₱	Initial Wt of Stocks (Kg)	Wt of Harvested Stock (Kg)	Increments Kg/ha/day	Cost of Production ₱/Kg
1st	200	2,933.20	392.00	3,977.20	7.17	0.818
2nd	113	3,369.65	417.94	4,005.30	12.70	0.939
3rd	150	1,510.00	118.95	1,593.05	4.25	0.948
4th	126	2,159.05	233.62	4,762.00	14.90	0.453

1) Sergio S. Felix and Augusto O. Manga separately raised bangos fry in hapa in Laguna de Bay. Fingerling recovery were claimed to be 70% and 85%, respectively. Feed given were "lab-lab" and fine rice bran.

2) Vitaliano Encina and Arcadio R. Gatus, while examining the feasibility of mechanized catching of bangos fry, observed that bangos fry do not stay at the water surface but are caught by the mechanized trawl net 1 to 4 feet below the water surface near the shore. Fishermen from Balayan Bay observed that bangos fry in the sea form big schools, staying close to fish shelters provided for catching round scad and tuna. They are attracted by light and adhere to the side of the net during hauling of their ring nets.

3) Arcadio R. Gatus conducted some experiments and noted the following:

(a) Comparison between chicken manure and combination chicken manure/carabao manure as organic fertilizer in bangos fishpond. Preliminary results indicate that fish food develops faster in pond applied with combination chicken manure and carabao manure.

(b) Preliminary study on the effect of mud press (a sugar milling by-product) as organic fertilizer for bangos fishpond. Results indicate that three-month stored mud press applied at a rate of 3 tons/ha to a pond elevated 1 ft above MLLW supports good growth of benthic algae.

(c) Comparison between tilled and untilled bangos pond. Newly-constructed fishpond were used and tilling was done using a hand tractor. Both ponds received the same amount of organic fertilizer and lime, that is, 2 tons chicken manure and 2 tons of quick lime per hectare. Tilled ponds showed early, very even, and abundant fish food growth.

(d) Effect of pre-feeding on the survival rate of bangos fry. Pre-fed fry were given artificial feed for at least 3 to 7 days before stocking in the nursery pond. Results indicate that bangos fry stocked in 5 parts per thousand chemically treated brackishwater in plastic containers and fed with fine bread had a higher percentage of survival, compared with non-fed bangos fry.

(e) Comparison of the rate of survival of bangos fry stocked during the months of April-May and that stocked during the months of August-September in a fishpond in Bohol. Initial results indicate that bangos fry stocked during the months of April-May have higher percentage of survival.

Problems

A. Lack of a National Research Program on Fish Culture Based on Priority or Needs of the Industry

Researches, if ever carried out in government fish farms, are meager and incidental. No program of research is spelled out for any government fish farm.

B. Poor Facilities of Government Fish Farms for Research

Some farms are too small and not ideally located to be worthy of being called a demonstration fish farm.

C. Lack of Technically-trained Personnel to Undertake Research

Some fish farm managers need further training and experience to carry out their functions effectively. Some personnel are misplaced.

D. Lack of Fingerling Supply in Areas Where Demand is Great

This problem was greatly felt during the past three years when there was a phenomenal sprouting of fish pens in Laguna de Bay. Hence, some erected fish pens costing millions of pesos were not stocked with bangos fingerlings. Because of the unexpected diversion of bangos fingerlings to some fishpens, legitimate fishpond operators in the neighboring provinces were also unable to stock their fishponds.

E. Lack of Incentives for Researchers, Hence, Most Technical Personnel Prefer to be Extension Workers rather than Researchers

F. High Cost of Inorganic Fertilizers

G. High Cost of Bangos Fry

RECOMMENDATIONS

A. There is a need to evaluate existing government farms to determine which farms are capable of undertaking applied researches on brackishwater fish culture. They should be located in four strategic areas where the four Philippine climatic conditions are represented. Applied researches should be conducted in areas of the size of commercial ponds rather than in small-sized ponds which may be good only for purely basic researches. One of these research brackishwater fish farms is recommended to be close enough to serve the fingerling requirements of fishponds and fishpens in Central Luzon which are periodically flooded. This will also help stabilize the price of bangos fingerlings.

B. Fishery curriculum in Fishery Schools (Collegiate level) should give more emphasis on fishpond engineering. Present graduates have meager knowledge in this area, especially fishpond layout, plan-

ning, construction specification, etc. They find difficulty in submitting a program of work and preparing budget estimates which are a must for any technical personnel of BFAR. The greatest bulk of fishpond investment goes to fishpond construction and development. A good technical man in fishpond management cannot be effective if he does not know how to properly set up his fishpond and facilities.

C. Acclimatization of bangos fingerling for stocking fishpens in Laguna de Bay should immediately be studied and results disseminated to prevent further losses due to fingerling mortality, a problem which deprives fishpond operators in Central Luzon of the bangos fingerling supply needed for their farms.

D. A study should immediately be undertaken to determine whether or not fry concession would lower present cost of fry thereby giving the fry gatherers a fair return from their labor, or the possibility for the government to lower the price ceiling for this commodity. Among the factors that play a part in increased bangos fishpond production are the availability of bangos fry and the rationality of its cost.

E. Fertilizer cost should be subsidized by the government for fishpond purposes, like that for rice and corn products. It cannot be denied that fish is the principal diet of Filipinos.

F. Fishery technical personnel with inclination for research should be properly motivated to go into research. Incentives in the form of research allowance, promotions and annual awards for the best research paper may induce more people to go into fishery research.

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