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The Inception of the Aquaculture Department

7th Anniversary Background Report

The Aquaculture Department, one of three established under the Southeast Asian Fisheries Development Center (SEAFDEC) marks its 7th year of operation this July. On its sixth meeting held at Kuala Lumpur, Malaysia on July 3-7, 1973 the SEAFDEC Council approved the establishment of the Aquaculture Department in Iloilo Province, Philippines. Already established were the Marine Fisheries Research Department with Singapore as host government and the Marine Fisheries Training Department with Thailand as host. Two years earlier, on the fourth SEAFDEC Council meeting held in Manila in January 1971, the SEAFDEC member-country representatives had already agreed to set up an aquaculture department in the Philippines. To this effect, a proposal for such an organization was presented by the Philippine Government. It was based on the member-governments' common interest in improving existing fish culture techniques in the region by carrying out research, training and extension in aquaculture through mutual cooperation.

SEAFDEC

Signatories of the treaty agreement establishing SEAFDEC were the governments of Japan, Thailand, Malaysia, Singapore, the Philippines and the Republic of South Vietnam. The agreement was drafted in December 1967. Membership was open to all the Southeast Asian countries (which included Laos, Cambodia, Burma and Indonesia) until the inaugural meeting of the Council, which was subsequently held in July 1968.

SEAFDEC was established to contribute to the promotion of the fisheries development in Southeast Asia by mutual cooperation among member governments and through collaboration with international organizations and other govern-

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Japanese ambassador to the Philippines Mr. Hideo Tanaka (in bush jacket) is briefed by visiting expert to the SEAFDEC Aquaculture Department Mr. Kunio Katsutani on the progress of the Department's research programs on milkfish and prawn while Aquaculture Department chief R.O. Juliano (fifth from left) talks with ecology project leader Hiroshi Motoh. Others in photo are Dr. Chhorn Lim, head of the Department's Tigbauan Research Station and Japanese visiting researchers Shiro Hara, Masanori Suemitsu and Shigeru Kumagai. Behind the group are the canvas tanks where experimental milkfish breeders or sabalo are confined. Mr. Tanaka visited the Department on June 25-26. (Story on page 2).

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ments. It has five salient functions: (1) train fisheries technicians of Southeast Asian countries, (2) study fisheries techniques suited to Southeast Asia, (3) develop fishing grounds, investigate fisheries resources and conduct research in fisheries oceanography in Southeast Asia, and (5) provide members with results of studies by the Center, and other information.

Implementation

Mindanao State University was entrusted with the task of implementing the establishment of the Aquaculture Department. This was agreed on in a conference in September 1972 among officials of the Philippine Government headed by then Secretary of Agriculture and Natural Resources Arturo Tanco, Jr. and the Japanese Government headed by then Ambassador Toshio Urabe.

Location of the Department's main station was recommended by a team of Japanese experts and MSU engineers who undertook a feasibility study of the project site. The Japanese team first came in 1971 and followed this up in 1972. It was led by a fisheries expert, Dr. K. Kuronuma.

The Department was formally established with the appointment of Prof. D.K. Villaluz, then dean of the Mindanao State University college of fisheries and director of the university's institute of fisheries research and development, as Chief of the Department. This was in July 1973 during the sixth council meeting of SEAFDEC.

International Status

Three months later, on September 13, 1973, the Philippine Government formally recognized the international status of the Aquaculture Department. President Marcos issued Presidential Decree No. 292 which provided the Department with, among other things, tax exemptions, immigration privileges, and other immunities generally granted to international and treaty organizations based in the country.

Funding

In the Department's plan of operations and program of work, the Philippines as host government was to provide the project site, physical facilities for laboratories, hatcheries, training, administration, office equipment and furniture. The host government was also required to provide the services of a department chief, professional and service staffs and funds for operation. In the same provision, the government of Japan was to furnish research and training equipment and instruments, the services of a deputy chief, an appropriate number of professional staff, and fellowship grants for trainees from member-countries.

Functions

Three development functions were spelled out for the Department: research, training and extension. It was charged to (1) promote, undertake and coordinate research necessary for the development of the region's aquaculture industry, (2) train experts in aquaculture at various levels, from the researcher to the technician level, and (3) arrange for the exchange and dissemination of knowledge and information in the field of aquaculture and related activities to meet the needs of member countries.

The work plan specified, under research, the production of quality seedlings, improved pond construction, management and maintenance, improvement of natural fishfood, artificial feeds and feeding, biological manipulation of stocks, and control of diseases, predators and pollution. While shrimp culture was given priority under the plan, the Department would also undertake studies on the culture of other coastal and brackishwater fish and shellfish and, later, freshwater fish.

Organization

Five divisions were to be organized in the proposed organizational set up, namely, general affairs, seed production, pond culture, food and water quality and engineering. However, what was subsequently organised were a research division under which were the commodity oriented research programs, a development and administrative services division, and a training and extension division. Another division, the External Affairs, was later established in Metro Manila to provide the local and international liaison work and to handle business matters for the Department in the capital city.

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Japanese Ambassador Expresses Interest in Aquaculture programs

Japan's Ambassador to RP Mr. Hideo Tanaka, visited the SEAFDEC Aquaculture Department main station in Iloilo on July 25-26 and expressed interest on three points: (1) progress of the prawn and milkfish studies (2) usefulness and usage of Japanese-donated equipment and instruments and (3) progress of work and well-being of the Japanese aquaculture experts at the Department.

Ambassador Tanaka showed keen interest in the studies on prawn and milkfish, even as he asked whether AQD is conducting research on seaweeds. According to Mr. Katsutani, the ambassador was informed that the preliminary objectives of the research and development work on milkfish have been successfully attained. Mr. Tanaka was also informed that the Department has been closely cooperating with the private aquaculture sector and that the technologies are being transferred to them as soon as these are developed.

This year, Japanese Government's assistance in the form of research equipment and supplies is some 34 million yen.

Mr. Katsutani, the officer in charge of the office of the deputy chief said he has requested a replacement for Mr. Nukiyama whose tour of duty in the Department ended last month. The replacement should be arriving in August, he said. At present there are 5 Japanese experts at the Department: Mr. Katsutani, Mr. Shigeru Kumagai, Mr. Hiroshi Motoh, Mr. Shiro Hara, all in Tigbauan, and Mr. Masanori Suemitsu who is assigned in Leganes.

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Research was largely conducted at the main station in the coastal town of Tigbauan where the hatcheries and laboratories were established and at Leganes where the brackishwater pond system was constructed. Other substations were set up for milkfish research, for prawn spawner and sabalo collection, for pilot studies on green mussel and oyster culture, and other support and outreach activities. The third station, the freshwater fisheries station, was established in July 1977 along the freshwater inland lake, Laguna de Bay. This completed the organizational phase of the Department. The next few years were spent in trying out and firming up the research and development and the training and outreach programs. The succeeding years saw some eye-opening

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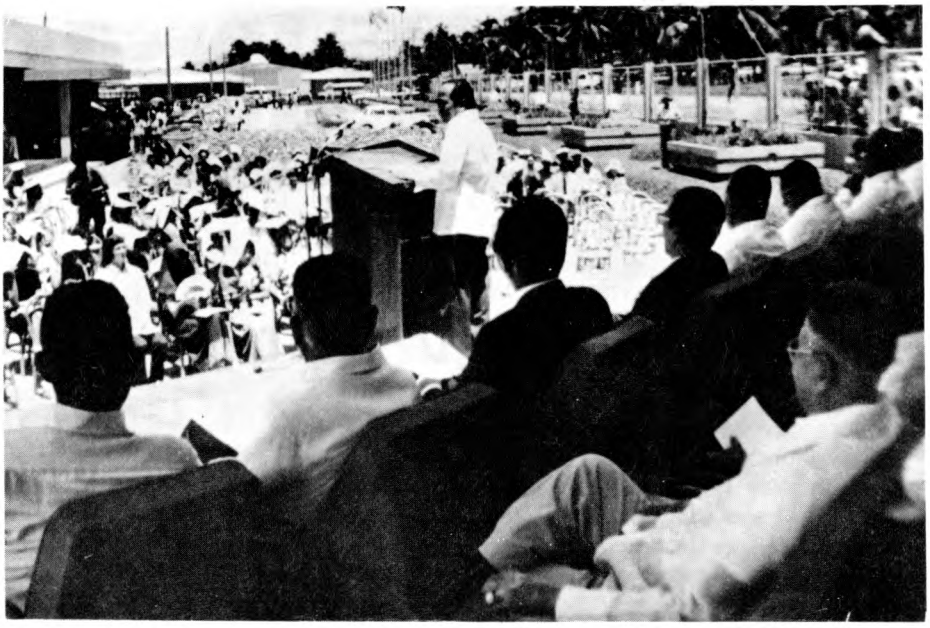

In April 1975 the main station complex was inaugurated. Delegates from SEAFDEC member countries, ranking officials from the agriculture and natural resources ministries and other government offices, and hopeful private aquaculturists were on hand for this occasion. Here the governor of Iloilo Province keynotes the inauguration proceedings.

The 42-hectare main station complex as it looked in 1975. The research laboratories and hatcheries (background) had been set up by then but the administration building, the apartment for trainees and staff, and the staff houses were yet to be built.

Staffing of Aquaculture Business Projects*

Aquaculture projects may be classified as follows: by the species cultured — monoculture and polyculture; culture facilities used — earthen ponds, concrete tanks, and raceways; stocking density — intensive and extensive; feeding system — natural foods and artificial feeds; and by its integration in a farming system — fish *cum* pig, fish *cum* poultry, fish *cum* ducks, fish *cum* many other land animals, fish *cum* mollusc, etc.

Staff requirement of an aquaculture project depends on many factors. A high-prized species is demanding in its biological needs and will need highly trained technicians whose expertise should cover the fields of biology, engineering, ecology, pathology, nutrition, economics, processing and marketing.

Cultured species

The number of species of commercially valuable finfishes and crustaceans have increased.

In a monoculture system, only one species of fish or crustacean is considered. The problems related to the culture of a species are less complicated than in a polyculture system, especially with fish, shrimps and crabs. The optimum parameters for growth of a species can be identified and the culture system that would best suit its requirements can be designed. Problems multiply as the number of cultured species increase; the design of the culture system correspondingly becomes complicated.

Culture systems

Culture systems come in different shapes, sizes and materials. Culture systems are location specific due to variations in water salinity, available local materials and their costs of construction, feeding system, climatic conditions, tidal amplitude, production scheduling, availability of fish seeds, access to market, and demand and price elasticity. Their designs and magnitude will therefore depend on entrepreneurial decisions. The project can be low-cost, medium-cost, or high-cost.

Marketing systems

Depending on the target market and its distance and access to transportation, production of an aquaculture project may be scheduled as to time, volume and size of fish product to be sold. Elasticity of price and demand will dictate this phase of activity.

Factors that have major effects or influence on price are quantity of fish of the same species available in the target market, velocity of money (paydays, bonuses, gratuities, holidays), demand, quality of product, size of the produce (for instance, smaller size milkfish ranging from 200-250 g in weight are more in demand than larger ones), and calamities in other production areas. An economic survey of these factors and continuous monitoring of price movements should be done.

Magnitude of the enterprise

As production facilities increase in size and the production system becomes more highly technical, as in the culture of exotic species, the need for more trained and experienced technicians becomes more pronounced. Exotic species need a more sophisticated production system. Operators should be more skillful as risks increase. A P40-100 million enterprise necessarily calls for the best in the trade as compared to one of only a few thousand pesos investment.

Personnel needs

Top level

As numerous factors come into play in running an aquaculture project, the top man should be prepared to assume

* by Ceferino delos Santos, Jr., fishfarm operator, Iloilo Province, Phil. This article was excerpted from the lecture, "Staffing of Aquaculture Business Projects," given at the first Aquaculture Business Project Development and Management Course, March 3-16, SEAFDEC Aquaculture Department, Tigbauan, Iloilo, Philippines.

The effect of various sali density manipulation me milkfish fry *(Chanos ch* storage*

Gerald F.

ABSTRACT

The survival and growth of milkfish fry stored in plastic basins at different salinity levels and stocking density manipulation methods without aeration and fed with hard-boiled chicken egg yolk over a period of 14 days were determined. Results of this study reveal that survival rate and increase in body weight did not differ significantly ($P > .05$) at different salinity levels nor at different stocking density manipulation methods. Moreover, a significant interaction between salinity and stocking density manipulation method could not be statistically demonstrated.

The highest survival rate was 97.8% at stocking density manipulation I with 8 ppt while the lowest was 95.5% also

all responsibilities and therefore should know not only the technology required but the art as well. Aquaculture today is still more of an art than a science.

An extensive monoculture system of 10-20 ha for milkfish would only require a manager who has experience and perhaps a high school graduate. With this size, the pond owner is the manager. In an intensive monoculture or polyculture system of the same area of ponds, the manager should be at least a college graduate with a 3-yr diploma or a B.S. in fisheries, plus a few years experience in actual pond management. The manager of an integrated system

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nity levels and stocking hods on the survival of *ıanos Forsskal)* during

Quinitio

at stocking density manipulation I with 32 ppt. Increase in length, however, differed significantly ($P < .05$) at different salinity levels; in addition, a significant interaction ($P < 0.05$) between salinity and stocking density manipulation could be statistically demonstrated. Increase in length was fastest at: a) stocking density manipulation I at 16 ppt; b) stocking density manipulation II at 8, 16, or 32 ppt; and c) stocking density manipulation III at 8 or 16 ppt.

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* Submitted by G.F. Quinitio, SEAFDEC Aquaculture Department, to the faculty of the University of the Philippines in partial fulfillment of the requirements for the degree of Master of Science in Fisheries, major in Aquaculture, April 1980. The author was a scholar under the UP-SEAFDEC Graduate Program.

Edible Crustaceans in the Philippines*

20. MATUTA LUNARIS (FORSSKAL)

English name: Armed crab

Philippine name: *Parag-Parag* (Cebuano)

The body reaches about 4 cm in carapace length. With a long projection on each side the carapace is shining and robust. There is a prominent spine at the outer proximal portion of the pincer. Four pairs of walking legs are adapted for swimming as well as for burrowing in the sand.

The ground color of the entire body is pale yellow. The carapace is uniformly colored with small reddish brown spots forming irregular lines.

This species inhabits the shallow sand beach down to a depth of 20 m.

There is no existing fishery for this crab but people usually capture them by hand or by beach seine. It is widely distributed in the Indo-Pacific area including Japan, China, Philippines, Red Sea, South Africa and Australia.

Rural people dwelling near the shoreline catch this crab for food.

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* by H. Motoh; 20th in a series

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like a hatchery, nursery and grow-out pond complex for shrimps should have more capability considering the higher capital investment and the complexity of the project. A post graduate degree holder with experience would be an ideal manager, but this type of person is hard to come by.

Supervisory level

The number of supervisors under a manager will vary with the magnitude of the project. The different jobs involve maintenance of the culture system, culture of natural foods or manufacture of artificial feeds, water management, stocking and stock manipulation including harvest, packaging and transport, and marketing. If a hatchery is included in the system, then the scope of work would embrace the biological studies of the cultured species, culture of broodstock, larviculture, and water quality control. If the project is small, say 10-20 ha of extensive monoculture of milkfish, the scope of work may be reduced and a supervisor may carry a number of jobs. As the project increases in area and engages in the culture of exotic species, each scope of work should be better assigned to one specialist.

A good supervisor must have at least a high school education to be able to read and record from instruments used in the business and to understand better and follow procedures laid down by the manager. For an integrated system, specialized skills will be required of the supervisor, who must have at least a college degree in his specialty.

Technician level

Technicians are only required in large and sophisticated culture systems. The technician should have expertise in water analysis, identification of pond fauna and flora, fish diseases and their prevention and cure, nutrition needs of the species, culture of natural food or manufacture of artificial feeds, maintenance of pumps, aerators, and filters and maintenance and repair of dikes, water gates, screens and other structures.

Fishery graduates specialized in the different fields should be hired and given in-service training by experts employed in the short term. This may require hiring foreign experts, if the expertise is not available locally. Care should be taken that the foreign expert has had ample experience in the culture of the species intended to be produced. Not anyone with an advanced degree in fisheries from another region or country would have the experience needed for the project.

Semi-skilled labor

Semi-skilled labor is needed to backstop supervisors and technicians. A high school education is the minimum educational qualification. This level of personnel could be trained and moved up later to fill the jobs of technicians and supervisors. This person is usually a young one who, if proficient and intelligent, could become an asset to the enterprise.

Casual labor

Any manual worker who has had experience in fishpond work may be hired to do odd jobs such as the application of fertilizers and chemicals, repair of dikes and water gates, harvesting, and transport of products.

Salaries and Benefits

The manager, of course, receives the highest salary and the most attractive fringe benefits for attaining production targets. From experience, a manager works best when given a percentage of the annual net profits. Fringe benefits may consist of travel grants to countries with similar aquaculture activities. If the project owner plans to expand his operations to include other species, the

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Dean D.K. Villaruz, former chief of the Aquaculture Dapartment, receives from agriculture minister Arturo Tanco a check representing proceeds from sale of Japanese-donated rice in the Philippines under the Kennedy Round. This was in late 1973. The money was used to underwrite part of the operational cost of the Department. Ranking Philippine Government officials and then Japanese ambassador to the Philippines Mr. Toshio Urabe (7th from left) witness the event.

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manager could profit well from tours and observations in countries known to be advanced in the technology. It will be twice rewarding as it will upgrade the manager's capabilities and provide him the opportunity to take a relaxing break from a very demanding job.

Due to lack of qualified persons in the industry, especially those with a Ph.D. or an M.S. degree in fisheries, marine biology, oceanography, aquaculture engineering or fisheries nutrition, the salary range will be from a minimum of P6,000 to a maximum of P30,000 per month. A bonus of 2-5 percent of the net income usually goes with a lower monthly basic salary.

For supervisors and technicians, the basic salary may range from P1,000 to P5,000 per month plus a percentage bonus on net income after hitting the set minimum production target which is fixed from year to year.

Caretakers, assistants to supervisors, and technicians are paid according to their qualifications and nature of work on a monthly basis. The range could be from P330 to P800 a month.

For casual laborers, their pay could be on a daily or piece-work basis. Most of the odd jobs in fishponds are done on piece-work basis. Among these are spreading of fertilizers and lime (paid per bag), application of chemicals (paid by the hectare), cleaning and tilling the pond bottom (by the hectare), repair of dikes and excavation of water supply and drainage canals (by lineal meter or by square meter), and harvesting and transport of fish products (per night's work depending on volume handled). Wages vary from place to place.

Model Staffing, Philippine Conditions

A. Monoculture of milkfish

1. Extensive

0.1 – 5 ha	Pond operator with a daily or monthly paid help. Casual labor when needed.
5.1 – 10 ha	Pond operator with 2 caretakers on monthly salary plus bonus. Casual labor when needed.
10.1 – 20 ha	Pond operator with 3 caretakers on monthly salary plus bonus. One of the caretakers will be the farm manager. Casual labor when needed.
20.1 – 50 ha	Pond manager, one caretaker for every 10 ha of pond area. All paid on monthly basis plus bonus. Casual labor when needed.

2. Intensive

0.1 – 5 ha	Pond operator and 2 helpers on daily or monthly salary basis plus bonus. Casual labor when needed.
5.1 – 10 ha	Pond operator, pond manager, and 2 caretakers on monthly salary plus bonus. Casual labor when needed.
10.1 – 20 ha	Pond manager, and 4 caretakers on monthly salary plus bonus. Casual labor when needed.
20.1 – 50 ha	Pond manager, 2 supervisors, and 8 caretakers (1 for every 5 ha) on monthly salary plus bonus. Casual labor when needed.

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research breakthroughs like the artificial and induced spawning of the giant prawn *Penaeus monodon*, the taming of the wild adult milkfish spawner and the subsequent rearing of milkfish fry, and other discoveries. But the Department's contributions to the aquaculture industry are not measured solely by these sensational discoveries. Of greater long term and collective impact are the bits and pieces of laboratory findings and inventions which little by little started filling the knowledge gaps. The small-scale hatchery technology for prawn, the nursery and pond rearing techniques of prawn fry, polyculture studies of milkfish and prawn, oyster and mussel culture techniques showing improved methods and materials, cage culture of tilapia and pen culture of milkfish, disease and pollution control measures, feeds and feeding, and other findings -- these were to pile up and are still piling up inexorably into a body of useful aquaculture knowledge that should lead and indeed have led to some significant industry developments and production increases. To complement the research efforts, the Department immediately instituted a training and extension -- the so called "outreach" -- program to package laboratory and other findings into meaningful production guides and to institutionalize the transfer of technology even as it is steadily being built up.

This group of fishery officers of the Philippines bureau of fisheries was one of the first recipients of the prawn culture training program started by the Department.

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Note: If water pumps and aerators are used, one of the supervisors should have training on engine repair and maintenance.

B. *Polyculture of milkfish and shrimps*

1. Extensive

0.1 – 5 ha	Pond operator, and 4 caretakers paid on monthly basis plus bonus. Casual labor when needed.
5.1 – 10 ha	Pond operator, pond manager and 8 caretakers paid on monthly basis plus bonus. Casual labor when needed.
10.1 – 20 ha	Pond manager, 4 supervisors and 8 caretakers paid on monthly basis plus bonus. Casual labor when needed.
20.1 – 50 ha	Pond manager, 4 supervisors, 2 technicians, and 16-20 caretakers (1 caretaker per 2-2.5 ha) paid monthly plus bonus. Casual labor when needed.

Note: Water pumps, filters and aerators will be used. Hence, two of the supervisors must have training on engine repair and maintenance. The technicians will take care of the feeding rates and application, as sampling will be done weekly.

End of Part I

Next issue: Staffing of an integrated prawn hatchery, nursery and grow-out pond project.

Anniversary Greetings to the SEAFDEC Aquaculture Department

Tough. It's all written on the faces of these participants to an aquaculture case writing workshop sponsored recently by the SEAFDEC Institute of Aquaculture. The group was composed of some of the country's leading private fishfarmers and research and development workers. Shown here pondering over a sample case on problem analysis are (l-r) Mr. Ramon Doromal who manages a fish brokerage and operates a large fishfarm concern in Southern Philippines, Atty. Ceferino delos Santos, a Western Visayas fishfarm leader and innovator and former president of the Philippine Federation of Fishfarm Producers, and Dr. Rafael D. Guerrero III, dean of Central Luzon State University's college of inland fisheries. The case studies drafted by the participants will be used in subsequent APDEM (Aquaculture Business Project Development and Management) courses which are sponsored by the SEAFDEC Aquaculture Department and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). Handled by Prof. Edward Tayengco of SEARCA, the workshop generated an initial 13 cases which were refined by faculty members of the University of the Philippines' college of business administration. The same faculty members serve as resource speakers in APDEM programs.

The other participants were private aquaculturists Atty. Carlos David, Mr. Antonio Ortiz, Mr. Julius Saria, Engr. Manuel del Rosario, president of the Iloilo Fishfarmers' association, Mr. Ruperto Angudong, president of the association of Negros Occidental fishfarm operators, SEAFDEC research and training staffers Mr. Fred Yap, Mr. Dan Baliao, Dr. Fred Santiago, Atty. Jose A. Agbayani, and Ms. Alice Lavina, and Dr. Virendra Pal Singh, a soil and water management specialist currently working with the U.P. brackishwater aquaculture center.

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