

# SEAFDEC Asian Aquaculture

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## Flores Inducted as New AQD Chief

Dr. Efren Ed. C. Flores was inducted as SEAFDEC/AQD Chief on 21 April 1992. Previously Dean of the University of the Philippines in the Visayas (UPV) College of Fisheries, Dr. Flores starts a two-year term. He took his oath of office before the Chairman of the SEAFDEC Council, Department of Agriculture Undersecretary for Attached Agencies Atty. Benito Bengzon.

Dr. Flores finished his BS Fisheries at the University of the Philippines in Diliman, Quezon City (1964), MS Fisheries at Nagasaki University (1972), and Doctor of Fisheries at Hokkaido University (1979), the last two degrees as a Monbusho scholar in Japan. He had been a Colombo Plan Fellow on coastal fisheries in Japan (1968), ACTIM Fellow on fishing industry organization and management in France (1980), and DAAD Fellow on research organization and management in the Federal Republic of Germany (1983).

He was also Director of the Philippine Fisheries Research Society (1981-1982), founding member of the Asian Fisheries Society (1985), and a regular member of the Japanese Society of Scientific Fisheries.

His plans, programs, and expectations for SEAFDEC/AQD are expressed in an interview on pages 8-10 of this issue. He also sets the tone of his management (he believes in participatory governance) in this interview.

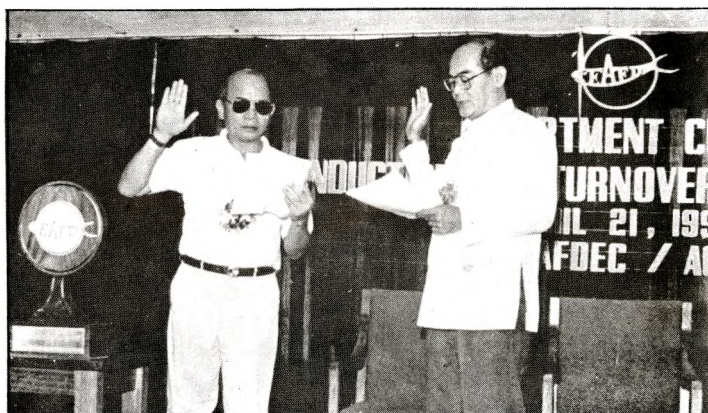
### Research Update

## Apparent digestibility of diets with various carbohydrate levels and the growth response of *Penaeus monodon*\*

Mae R. Catacutan, Associate Scientist, SEAFDEC/AQD

Digestibility is a measure of the nutritional quality of feed. Since the nutritional value of a feed depends on how

\*Source: *Aquaculture* 95:89-96 (1991).



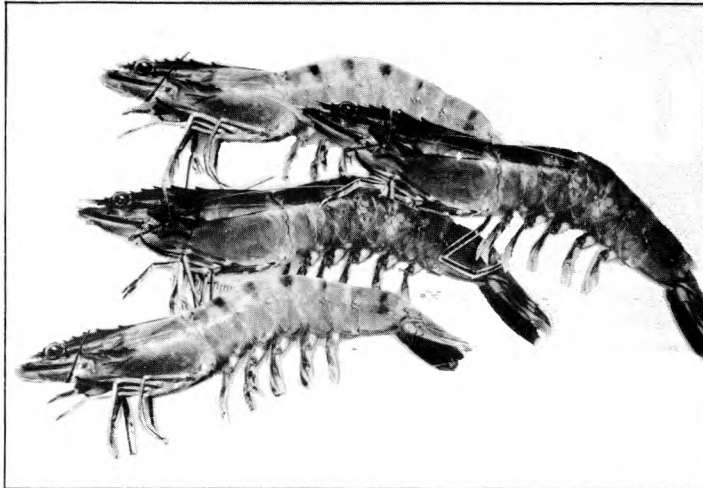
New SEAFDEC/AQD Chief Dr. Efren Ed. C. Flores (right) is inducted into office by Department of Agriculture Undersecretary Atty. Benito Bengzon.

### Inside

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it is absorbed and utilized by the animal, digestibility studies could provide valuable information for assessing

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A diet with more than 35% carbohydrate level might depress dietary efficiency as indicated by poor survival, specific growth rate, feed conversion ratio, and highest fecal protein content in shrimps fed 35% carbohydrate.

efficiency of diets with various feed components. This study was conducted to determine the apparent digestibility coefficients of whole diet and protein in isonitrogenous practical diets containing different carbohydrate levels and to determine the effect of these diets on growth and survival of *P. monodon*.

Four practical diets were formulated (Table 1) to contain the same amount of protein but vary in digestible carbohydrate content (5, 15, 25, and 35% breadflour). The diets were prepared by mixing all the dry ingredients except breadflour. Lecithin and cholesterol were mixed with cod liver oil before these were added to the dry mixture. The cooked breadflour was added last to the mix. The resulting dough was extruded through a 1-mm diameter die, steamed for 5 minutes, and dried in an oven for 2-3 h at 60°C. Dry diets were kept in plastic jars at 4°C until used.

The apparent digestibility of these diets were determined by the indirect method using chromic oxide as indicator. The diets were fed to *P. monodon* weighing 30-40 g which were individually stocked in 60-l fiberglass tanks. These were fed at 0900 and 1600 H daily. With a pair of tweezers, fecal pellets were collected at 1400 to 1500 H starting on the 7th day of feeding until the 21st day. The fecal pellets collected were immediately rinsed with distilled water to remove salts, were freeze-dried and pooled for analysis.

The effect of these diets on growth was determined by feeding it to *P. monodon* juveniles ( $139 \pm 11$  mg) twice daily at 0900 and 1600 H for 8 weeks. Three 60-l fiberglass tanks stocked with 20 shrimps were used for each diet. These were aerated and water flow rate was 5 l/h. Salinity and water temperature ranged from 32 to 33 ppt and 27 to 29°C,

Table 1. Composition of the experimental diets

Ingredient	Diet (g/100 g dry diet)			
	1	2	3	4
Fish meal	9.0	9.0	9.0	9.0
<i>Acetes</i> sp.	26.5	26.5	26.5	26.5
Soybean meal	34.0	31.0	26.0	22.0
Breadflour	5.0	15.0	25.0	35.0
Cod liver oil	3.0	3.0	3.0	3.0
Lecithin	0.5	0.5	0.5	0.5
Cholesterol	0.5	0.5	0.5	0.5
Vitamin mix <sup>a</sup>	1.5	1.5	1.5	1.5
Mineral mix <sup>b</sup>	1.0	1.0	1.0	1.0
Cr <sub>2</sub> O <sub>3</sub>	1.0	1.0	1.0	1.0
Celufil	18.0	11.0	6.0	0
Nutrient content (dry matter basis)				
Crude protein	39.98	40.51	39.68	38.67
Crude fat	11.92	11.23	10.32	9.45
Crude fiber	16.11	9.82	7.03	3.24
Nitrogen free extract	22.31	28.68	33.45	39.31
Ash	9.68	9.76	9.25	9.33

<sup>a</sup> Vitamin mix (mg/100 g dry diet): Para-aminobenzoic acid, 5.55; biotin, 0.22; inositol, 222.06; nicotinic acid, 22.21; Ca-pantothenate, 33.31; pyridoxine-HCl, 6.66; riboflavin, 4.44; thiamine-HCl, 2.22; menadione, 2.22; beta-carotene, 5.55; tocopherol, 11.10; calciferol, 6.66; cyanocobalamine, 0.555; folic acid, 4.44; choline chloride, 66.6; Na-ascorbate, 1110.3.

<sup>b</sup> Mineral mix (g/kg dry diet): K<sub>2</sub>HPO<sub>4</sub>, 1.0008; Na<sub>2</sub>HPO<sub>4</sub>·7H<sub>2</sub>O, 2.167; Ca(H<sub>2</sub>PO<sub>4</sub>)<sub>2</sub>·H<sub>2</sub>O, 2.671; CaCO<sub>3</sub>, 0.978; Ca-lactate, 1.663; KCl, 0.282; MgSO<sub>4</sub>·7H<sub>2</sub>O, 1.008; Fe-citrate, 0.121; AlCl<sub>3</sub>·6H<sub>2</sub>O, 0.0024; ZnSO<sub>4</sub>·7H<sub>2</sub>O, 0.048; MnSO<sub>4</sub>·4-6H<sub>2</sub>O, 0.0108; CoCl<sub>2</sub>, 0.0015; KI, 0.0023; CuCl<sub>2</sub>·6H<sub>2</sub>O, 0.0141; Celufil, 0.0216.

respectively. Shrimps were weighed every 2 weeks from the start of the experiment to determine feed allowance and growth.

Levels of crude protein in ground feed and fecal samples were determined by micro-Kjeldahl method and crude fat by Soxhlet extraction. The chromic oxide levels were determined colorimetrically at 440 nm after dry washing with perchloric acid. All analyses were done in triplicates and reported on a dry weight basis.

Weight gain, specific growth rate (SGR), feed conversion ratio (FCR) and survival rate were not different among all treatments, although weight gain tended to decrease in shrimps fed a diet with the highest (35%) carbohydrate content (Table 2). The apparent protein digestibility, which ranged from 92.8% to 94.3%, were not significantly different among treatments. Apparent dry matter digestibility increased from 75.7% to 86.9% as dietary carbohydrate increased. Carcass protein were the same in all treatments (Table 2) but fecal protein significantly increased as the carbohydrate level in the diet increased.

The results of this experiment indicated that increas-

Table 2. Digestibility coefficients for crude protein and whole diet and weight gain, specific growth rate (SGR), feed conversion ratio (FCR), and survival rate of *P. monodon* juveniles after 8 weeks of feeding four practical diets of varying carbohydrate levels

Dietary carbohydrate level (%)	Digestibility Coeff (%)		Weight Gain (%)	SGR (% wt. gain /day)	FCR*	Survival (%)	Crude protein (%)	
	Crude protein	Whole diet					Carcass	Feces
5	93.0±1.4 <sup>a</sup>	75.7±2.1 <sup>c</sup>	520±63 <sup>a</sup>	3.25±0.2 <sup>a</sup>	4.29±0.3 <sup>a</sup>	85.0±5.0 <sup>a</sup>	69.7±0.2 <sup>a</sup>	10.9±0.0 <sup>a</sup>
15	94.3±2.0 <sup>a</sup>	82.0±0.9 <sup>b</sup>	469±12 <sup>a</sup>	3.08±0.4 <sup>a</sup>	4.78±0.6 <sup>a</sup>	83.3±2.9 <sup>a</sup>	70.9±0.1 <sup>a</sup>	13.0±0.2 <sup>b</sup>
25	92.8±0.8 <sup>a</sup>	82.7±1.3 <sup>b</sup>	523±52 <sup>a</sup>	3.26±0.1 <sup>a</sup>	4.48±0.4 <sup>a</sup>	73.3±10.4 <sup>a</sup>	70.1±0.0 <sup>a</sup>	15.9±0.1 <sup>c</sup>
35	92.8±1.1 <sup>a</sup>	86.9±0.8 <sup>a</sup>	362±89 <sup>a</sup>	2.71±0.4 <sup>a</sup>	5.31±0.6 <sup>a</sup>	75.0±8.7 <sup>a</sup>	71.9±0.5 <sup>a</sup>	20.8±0.1 <sup>d</sup>

\*Column means with the same superscript were not significantly different (P>0.05).

\*FCR = Dry matter food consumed (g)/shrimp wet wt. gain (g).

ing carbohydrate up to 35% in *P. monodon* diets did not affect the apparent protein digestibility when diets contained about 40% protein. This was supported by the growth study which showed similar response in all diets.

However, a diet with more than 35% carbohydrate level might depress dietary efficiency as indicated by poor survival, SGR, FCR, and highest fecal protein content in shrimps fed 35% carbohydrate.

## Zooplankton (*Brachionus plicatilis* and *Moina macrocopa*) as Food for Milkfish Fry\*

C.T. Villegas and G.L. Lumasag Scientist, SEAFDEC/AQD and Dean, School of Marine Fisheries and Technology Mindanao State University at Naawan, Misamis Oriental 9023

The rotifer (*Brachionus plicatilis*) and the freshwater cladoceran (*Moina macrocopa*) are well known as suitable food for rearing various marine and freshwater fish larvae. Their mass production is well documented and widely practiced throughout the world. However, live cultures occasionally fail. Thus, freezing of surplus zooplankton, thawing, and then feeding them to larvae may be a necessary alternative. In this study, live and frozen *B. plicatilis* and *M. macrocopa* were evaluated as feed for milkfish fry.

Wild milkfish fry (standard length, 13.88 mm; weight, 3.95 mg) collected in Tigbauan and Guimbal, Iloilo were randomly stocked in 10 l filtered seawater at 20 fry per liter. The fry were acclimated to 32 -ppt salinity for 3 days prior to the experiment.

To ensure continuous supply of feed, staggered cultures of the zooplankton were done in an open shed using

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Live and frozen *B. plicatilis* and *M. macrocopa* were used as feed to evaluate their effects on the growth and survival of milkfish fry.

\*Source: J. Appl. Ichthyol. 7:65-71(1991).

one-ton fiberglass tanks. The rotifers were cultured using baker's yeast and marine *Chlorella* while *Moina* was cultured using chicken manure extract (200 ppm) and *Scenedesmus* sp. (50 000 cells/ml). The zooplankton were harvested with a fine-mesh net (60 µm); population counts were estimated using a Sedgewick-Rafter cell. For frozen feeds, zooplankton at predetermined densities were placed in plastic bags (3 x 18 cm) and frozen at -50°C until needed, then thawed at room temperature prior to feeding. The required feeding density was estimated by ratio and proportion.

Fry were fed live and frozen *M. macrocopa* and live and frozen *B. plicatilis* at 10-20 ind/ml once a day between 0900-1000 H. The alga *Tetraselmis tetrahele* was maintained in the aquaria at 75 000-100 000 cells/ml. A completely randomized design was used with three replicates per treatment. Two trials were conducted each for 30 days. Individual lengths and weights of 60 fish were obtained at the start of the experiment, and from 50 fish in each aquarium at the end of the trials. The specific growth rate (G) was calculated as:

$$G = \frac{100 (\log N \text{ final weight} - \log N \text{ initial weight})}{\text{number of days}}$$

Mortality was recorded daily. Percent survival was transformed to arc sin. All data were subjected to two-way analysis of variance with trials as blocks. Differences among treatments were assessed by Duncan's multiple range test.

Ranges of temperature, salinity, pH, dissolved oxygen, and ammonia during trial 1 (dry season, May-June) and trial 2 (wet season, September and October) were all within the desirable levels for optimum growth of milkfish fry.

Growth of milkfish fry seemed to depend on the zooplankton species and form (Table 1). Fry fed live *M. macrocopa* showed significantly higher length and weight gains compared with fry in other treatment groups (P<0.05). Significantly lower gains were obtained with frozen *Moina* than live *Moina*. Length and weight gains on live and frozen *B. plicatilis* were not significantly different.

Highest yield and survival were also obtained with fry fed live *M. macrocopa*, with a very marked reduction with frozen *M. macrocopa* (Table 1). Fry fed live and frozen *B. plicatilis* gave significantly lower yields and survival (P<0.05) than those fed *M. macrocopa*.

Thus, feeding live *M. macrocopa* to milkfish fry gives significantly higher growth and survival rates compared with fry fed *B. plicatilis*. These higher growth rates are related to the observed differences in the nutritional values of the zooplankton species. Proximate and fatty acid analyses (Table 2) showed that *Moina* had higher levels of crude protein and highly unsaturated fatty acids (HUFA), particularly eicosapentaenoic acid (20: 5n-3) and docosahexaenoic acid (22:6n-3), than *Brachionus*. These

Table 1. Growth and survival of milkfish fry fed live and frozen *Moina macrocopa* and *Brachionus plicatilis* over 30 days

Treatment	Individual gain		Growth rate (mg/day)	Survival (%)
	Length (mm)	(Weight)		
Live <i>M. macrocopa</i>	6.92±1.40 <sup>a</sup>	61.2±8.8 <sup>a</sup>	2.04±0.71 <sup>a</sup>	60.9±7.2 <sup>a</sup>
Frozen <i>M. macrocopa</i>	4.77±1.52 <sup>b</sup>	39.3±18.7 <sup>b</sup>	0.45±0.70 <sup>b</sup>	32.7±7.5 <sup>c</sup>
Live <i>B. plicatilis</i>	5.72±0.77 <sup>b</sup>	40.4±5.3 <sup>b</sup>	1.34±0.25 <sup>b</sup>	53.2±5.6 <sup>b</sup>
Frozen <i>B. plicatilis</i>	5.27±0.69 <sup>b</sup>	41.2±12.6 <sup>b</sup>	1.38±0.46 <sup>b</sup>	49.5±11.3 <sup>b</sup>

Values are means + S.E.M.. Within columns, means with common superscripts do not differ significantly (P>0.05).

Initial average length and weight were 13.88±0.84 mm and 3.95 ± 0.95 mg., respectively. Each aquarium was stocked with 200 fry.

HUFA elements were found to be essential for the proper growth, development, and survival of marine fish larvae.

The suitability of frozen zooplankton varied with the species used. Frozen *Moina*, when thawed, showed a reddish coloration of the water not observed with frozen rotifers. During freezing and thawing, *Moina* cells probably experienced extensive damage and leaching of soluble proteins. This may be the reason why frozen *Moina* resulted in a marked reduction in growth and survival of milkfish fry. No significant effects on growth or survival

Table 2. Proximate (dry weight basis) and some fatty acid composition (percent total lipids) of *Moina macrocopa* and *Brachionus plicatilis*

	<i>M. macrocopa</i>	<i>B. plicatilis</i>
Moisture (%)	5.26	7.88
Crude protein (%)	55.74	42.50
Crude fat (%)	6.06	8.32
Crude fiber (%)	10.87	6.34
Nitrogen free extract	18.64	17.34
Crude ash (%)	8.69	25.18
Fatty acid methyl ester (FAME)		
C14:0	2.8	2.3
16:0	5.8	11.7
16:n-7	18.9	6.9
11:0	5.0	4.7
18:1n-9	23.0	17.2
18:2n-6	5.9	19.1
18:2n-3	3.5	17.1
20:4n-6	3.7	4.2
20:4n-3	0.7	-
20:5n-3	7.8	0.6
22:6n-3	0.3	-
Total n-3 HUFA	8.1	0.6

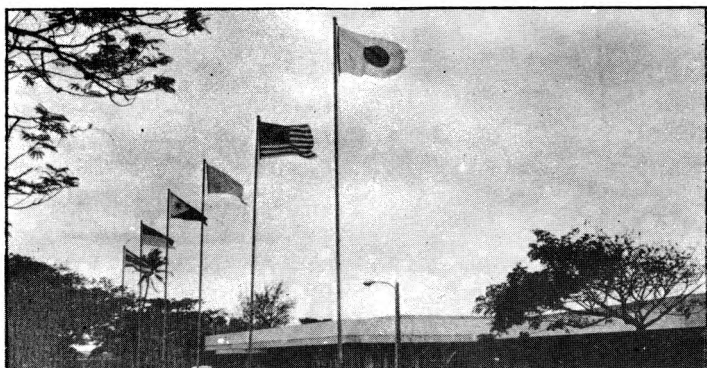
rates were observed in fry fed live or frozen rotifers.

Although milkfish fry can be grown using *B. plicatilis*, feeding live *Moina* to milkfish fry significantly improves fry growth and survival rate. Frozen *Moina* and

*Brachionus* proved to be unsuitable for rearing milkfish fry.

## Announcement from the SEAFDEC Secretariat in Bangkok, Thailand

# SEAFDEC to turn 25



Flags of SEAFDEC Member Countries in front of SEAFDEC/AQD in the Philippines.

The Southeast Asian Fisheries Development Center (SEAFDEC) will celebrate its 25th Anniversary on 8-11 December 1992 in Tokyo, Japan. Highlights of the celebration are the launching of the new training vessel MV SEAFDEC and the distribution of the 25th anniversary monograph on SEAFDEC's accomplishments from 1986 to 1992.

MV SEAFDEC will be launched by Their Imperial Highnesses the Prince and Princess Akishinomiya of Japan on 7 December 1992.

Twenty-five years ago, in late 1967, the "Agreement Establishing the Southeast Asian Fisheries Development Center (SEAFDEC)" was signed by the Minister of Foreign Affairs of Thailand, the Ambassadors of Singapore, Japan, Malaysia, the Republic of Vietnam, and the President of the Republic of the Philippines. To date, this agreement remains open to all other Southeast Asian nations such as Brunei, Burma, Kampuchea, Indonesia, Laos, and the Socialist Republic of Vietnam.

SEAFDEC has three Departments: the Training Department in Thailand (1968), the Marine Fisheries Department in Singapore (1969), and the Aquaculture Department in the Philippines (1973). The latest addition and the fourth Department is Marine Fishery Resources Development and Management in Malaysia.

For the past twenty-five years, SEAFDEC has continuously promoted fisheries development in Southeast Asia. It has provided training, conducted research on modern fishing technology, improved fish handling and post-har-

vest technology, and has brought technology directly to fishfarmers through extension and information dissemination.

### SEAFDEC/AQD Contributions

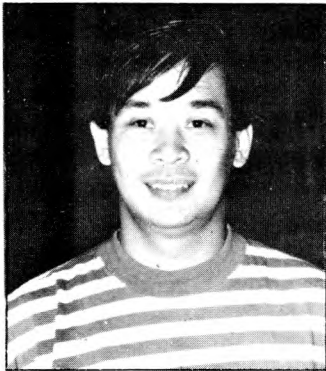
The most significant contribution of the Aquaculture Department (AQD) to the fishery industry in the region is the wealth of aquaculture techniques developed through continuous research. Such techniques which are suitable for fish farms in the region are ready for in-country adaptation. Some of these techniques have found their way into the aquaculture production systems of other countries through the training programs which AQD conducted.

One of the accomplishments with regional implication could be seen in the rapid development of the shrimp culture industry in the region. Shrimp production during 1986-1990, for example, increased from 1.6 times (31,000 - 54,000 tons) in the Philippines to 9.2 times (12,000 - 110,000 tons) in Thailand. In 1991, shrimp production from many countries in the region increased, except in the case of the Philippines where shrimp ponds were heavily damaged by the calamities that hit the country in late 1990. Export of shrimps has earned for the Philippines in 1986-1990 some US\$1,000 million.

AQD also contributed to the improved yield of milkfish from brackishwater fishponds, particularly in the Philippines, by improving upon the existing milkfish farming technology. AQD's continued research on milkfish, particularly the improvement of seed production techniques, hormonal induction, off-season sexual maturation, nutritional requirements, and improvement of grow-out control methods have addressed the major constraints of the industry which are: shortage of fry and lack of know-how on appropriate farming technology.

AQD continues to investigate, replicate, and refine techniques for broodstock development, breeding, and seed production of high-valued finfishes. Focus of research on sea bass is on improvement of induced spawning techniques and improvement of hatchery and nursery technologies; broodstock development for grouper, snapper, and mullet; and improvement of seed production techniques for rabbitfish.

## Coloso is New Research Division Head



Dr. Relicardo M. Coloso has been designated Head of Research Division (RD) on 8 June 1992 by the new Chief Dr. Efren Ed. C. Flores.

Dr. Coloso graduated from the Philippine Science High School as a national science scholar in 1970. He finished his Bachelor of Science in Chemistry, cum laude, in 1974 also as a scholar of the National Science Development

Board (now Department of Science and Technology) at the University of the Philippines (UP), Diliman, Quezon City. He took his Master of Science in Biochemistry at the UP College of Medicine under the SEAFDEC and Philippine Council for Agriculture Resources Research Staff Development Program in 1980. As a Fulbright-Hays scholar, he earned a Ph.D. in Nutritional Sciences (major in Nutritional Biochemistry) from Cornell University, New York,

U.S.A. in 1990.

In 1988, as a Ph.D. student at Cornell University, he won a Graduate Student Research Award in Abstract Competition sponsored by the American Institute of Nutrition (AIN). The competition was part of AIN's activities during its 1988 Annual meeting at the Las Vegas Convention Center, Nevada. His Ph.D. dissertation is on the metabolism of cysteine, a sulfur amino acid, in freshly isolated mammalian cells. He conducted his research in the laboratory of Dr. Martha H. Stipanuk, an expert in the field of sulfur amino acid metabolism. He is also co-author of the First Elvira O. Tan Memorial Award-winning paper, titled *Chronic Soft-shell Syndrome in the Tiger Prawn *Penaeus monodon* Fabricius, from Brackishwater Ponds*. The award is given to encourage and promote excellence in fisheries science among Filipinos.

His present research is on the essential amino acid requirement of finfishes such as milkfish and sea bass. His studies on milkfish are partially funded by International Development Research Centre while those on sea bass by the International Foundation of Science.

## New Chief Inaugurates Seawater Supply System

To augment the increasing seawater demand of the Research Division, a new seawater supply system for the Tigbauan Main Station was installed by incoming Chief Dr. Efren Ed. C. Flores on 7 April 1992. This is the first of four modules, planned to replace the old supply system.

The new system will increase filtered seawater supply from 1,800 to 3,600 tons per day. It has an offshore intake structure with a 20-HP vertically mounted pump, an automatic backwashing gravity sand filter, a 750 m<sup>3</sup> concrete reservoir, and a main distribution pipe header with interconnections to the existing seawater supply system. A 40-HP pressure booster pump will distribute the filtered seawater to various research end-users.

The long-overdue construction is based on the projected increased demand for seawater supply as the three-year SEAFDEC/AQD plan is fully implemented.



Dr. Efren Ed. C. Flores (second from left) inspects the reservoir during the inauguration of the new seawater supply system

## Statistics Training Course Conducted



Participants in the training course on "Statistical Analysis of Fishery Data Using SAS" pose for a souvenir photo.

The Research Division (RD), in coordination with the Division of Statistics and Statistical Laboratory, Institute of Mathematical Sciences and Physics (DSSL-IMSP), University of the Philippines Los Baños (UPLB), conducted a training on Statistical Analysis of Fishery Data Using SAS (Statistical Analysis System) on 14-21 May 1992. Venue was the Training and Information Division (TID) Conference Room.

The in-house staff development was aimed to provide an opportunity for RD staff to use SAS software for analysis of fishery data, and to train them in the interpretation of output from SAS. SAS is a statistical software widely used for data analysis and is available only under a master license agreement with SAS Institute Ltd. SEAFDEC/AQD is currently licensed to use SAS on an annual basis.

SEAFDEC/AQD Chief Dr. Efren Ed. C. Flores, who gave the welcome address in the opening program expressed gladness in having local resource persons. He said the lecturers, all faculty members of UPLB, would also benefit from the seminar-workshop, as this was the first time that they were being exposed to fishery data. Dr. Clarissa Marte introduced them: Dr. Ann Inez Gironella, Prof. Lina Catahan, Ms. Nydia Flores, and Ms. Mae Cabasay.

Course topics included Introduction to SAS and its Environment, Data Processing, Preliminary Data Analysis, Parametric Tests, Non-Parametric Tests, Analysis of Relationships, and Analysis of Categorical Data. The training course consisted of morning lectures and afternoon workshops. While the morning lectures were open to RD staff and interested SEAFDEC/AQD employees, the afternoon workshops were limited to 13 participants due to

limited computer facilities. The 13 participants selected to attend the afternoon workshops were: Breeding - Rosemarie Caballero, Grace Garcia; Nursery - Fe Dolores Estepa, Demetrio Estenor; Farming Systems - Anicia Hurtado-Ponce, Jocelyn Ladja, Jurgenne Primavera, Neila Sumagaysay; Feed Development - Ilda Borlongan, Nelson Golez; Fish Health - Gilda Lio-Po; and Binangonan Freshwater Station - Angelito Gonzal. A lone participant from University of the Philippines in the Visayas, Merlina Andalecio, was also invited to attend the training.

The participants were given a Certificate of Attendance during the closing program. Administration Division Head Rufil Cuevas distributed the certificates. Likewise, the lecturers were presented a Certificate of Appreciation for their invaluable contribution as resource persons.

In a brief message to the participants, Dr. Gironella said they enjoyed conducting the course. She said knowledge of basic statistical analysis is a must for researchers and that consultation with a statistician before the start of an experiment should be done to avoid problems.

## Shrimp Hatchery Training Course Ends



Shrimp hatchery training course participants pose during their graduation. Seated left to right: Ricardo Atayde, Suttinee Limthamaisorn, Lydia Noblefranca, Melita Consulta, Loverney Bandong. Standing left to right: Jong Sze Kiat, Thongchai Permgarm, Emeric Lorenz Valdegamo, Abdul Rahim Hashim, Theerapong Krainara, Jose Urbano, and Enock Wakwabi.

### Erratum

In our March 1992 issue, source of the Research Update article titled "Shrimp Production in Brackishwater Ponds Applied Varying Fertilizer Combinations" is *Aquaculture*, 94:39-48 (1991), and not as printed.

## INTERVIEW: Dr. Efren Ed. C. Flores

*Dr. Efren Ed. C. Flores started his term as Chief of SEAFDEC/AQD on 8 April 1992. He was Dean of the College of Fisheries, University of the Philippines in the Visayas for six years before he was drafted as Chief.*

*He is a Likas Yaman awardee of the Philippines' Department of Natural Resources (1984) for developing the capture fisheries sector of the fisheries industry.*

*In this interview, he outlines his plans and priorities for SEAFDEC/AQD and shares with us his ideas on aquaculture and research management.*

**The previous Chief said that his legacy to SEAFDEC/AQD was training the researchers into first-rate scientists comparable with researchers of research institutions in developed countries, based on scientific papers published. Are you going to support this thrust by continuing the incentive allowance, or do you think the training is over and should shift to the next phase? What phase should this be?**

The training of researchers is a continuing activity, specially in developing countries where most researchers aim for the "greener pasture." A number of our researchers have opted to go into private practice and we see a number of them active in the aquaculture industry here and abroad. For those who are still with us, the administration will assure them of professional growth and economic stability. The previous administration created an atmosphere conducive to research work. This will be maintained, and at the same time the Department will also improve on areas where improvements may be necessary.

The administration believes that scientists developed by the Department will have more dedication and commitment compared with those trained elsewhere. To this end, the Department



“  
As long as  
the output  
reflects AQD's  
work objectives,  
banners need  
not be waved.  
”

should develop its own set of reputable scientists rather than hire ready-made ones, and make sure that only young researchers with growth potential shall be taken in.

**The previous Chief also mentioned about the need to review SEAFDEC/AQD's mandate vis-a-vis the socioeconomic and environmental realities that are unfolding in the region. What do you think of that?**

The present administration fully agrees with the thinking of the previous administration on the need for the Department to look into the users of the technology and the effect of such technology on the environment. The Chief will actively involve himself with the Malalison Project which is community-based and where environmentally-sound aquaculture practices are introduced to provide more opportunities for the fisherfolk.

**What are your plans for research in SEAFDEC/AQD at least for the next two years?**

Research work plan for the Department is not dictated by the administration but is arrived at through a series of consultations involving people from the government, academe, and the aquaculture industry. The concerns of the administration would be that research is conducted efficiently, minimizing loss and excessive use of energy. Furthermore, as stated previously, the researcher should consider the effect of the developed technology on the end user and the environment.

**Seemingly, the operative word, particularly in the fisher-**



ies sector is collaboration. What is your idea of close collaboration between SEAFDEC offices in Thailand, Singapore, Philippines, Malaysia, and other research institutions in Southeast Asia. Similarly, how would you effect close collaboration with Philippine government agencies such as DA-BFAR, BAR, PCMARD, UPV-Fisheries, UP-MSI, DOST, LLDA, Silliman University, UPLB? Particularly with the Fisheries Sector Program Project going on, how does this dovetail with SEAFDEC/AQD?

Collaboration with other institutions reduces overhead costs. Through the Office of the SEAFDEC Secretary-General, the present administration will work for closer collaboration with other aquaculture R & D institutions in the region. When institutional linkages are made, the researchers can then start direct communication with their counterparts on collaborative work in areas of mutual interest.

There will also be closer collaboration between the Department and the Philippine Government line agencies, the academe, and the aquaculture industry. With the Department being a member of the National Fisheries Research Network, more collaborative activities can be expected in the near future with the member institutions of the network.

Furthermore, collaboration with the aquaculture practitioners in the industry should be encouraged. The present practice of working together with the private hatchery operators for bangus (milkfish) hatchery is a move toward that direction. The private practitioner who has devoted time and money in his work is

a rich source of knowledge gained through experience. This source of information has not been fully utilized by the researcher. This collaborative activity allows the researcher access to such indigenous knowledge, which when used to develop or refine technology can result in its ready adoption or easy acceptance by the end users.

**With the diminished IDRC funding for basic research in the biological sciences, how would you realign AQD's research priorities?**

The shift in research priorities of the IDRC is in response to the needs of the 90's and that is "Empowerment through knowledge." In the last two decades, vast amounts of knowledge have been accumulated in research institutions, both in developed and developing countries. But this knowledge is unknown to people in the rural areas, or even to those in the urban, except for the big companies who have the technical manpower to absorb the knowledge produced by research institutions. But what about our fisherfolk? Will we let them forever "miss the boat"? The present administration agrees with IDRC that we should provide knowledge that is understandable and usable to the fisherfolk. As stated earlier, the development of technology should always be in consultation with the end user.

The Department by its name is oriented to a specific industry and as such its activities should respond to the needs of the industry. Therefore, research which is undertaken for the sake of science is not within the province of the Department.

**What are your plans for training, techno-transfer (extension) and information dissemination in terms of goals, personnel build-up, incen-**

**tives, etc.? How do these differ from that of the previous administration?**

For training, the Department will undertake this year an assessment of aquaculture training needs of the country. A team from the Department will conduct a nationwide survey of the requirements of the end users of aquaculture technologies. Next year, a similar activity will be conducted among SEAFDEC member countries and Indonesia. This assessment of training needs will result in an updated training program responsive to the needs of the region.

Parallel to the above activities, the Training and Information Division (TID) of the Department is required to review its organizational structure and delivery of services. With the updated training and information services of the TID, there is a need to upgrade and expand logistic support such as infrastructure and equipment requirements. To this end, documents are being prepared to support the negotiation process with the funding agencies.

This administration adheres to the policy of participatory governance. Plans and programs of each Division must be initiated by the Division concerned. When necessary, the Chief suggests options for development and growth, and with the Division concerned, decisions are made for directions to be taken. This policy allows the Divisions to be creative, and not just wait for "orders from the Chief."

**One area worth looking into is the assignment of Japan International Cooperation Agency (JICA) experts to AQD. What sort of relationship or collaboration**

**would you like to happen between JICA specialists and AQD researchers?**

The assignment of JICA experts to AQD is based on the request of the Department. The JICA experts assigned to AQD are here to complement the Department's staff on areas of specialization which need further strengthening. As such, they are assigned to the Department's Research Division where they are given the title "Visiting Scientists." Their specific area of research would naturally be in their area of specialization which is the basis for their assignment to a specific section in the Research Division. It is within this section of assignment that the JICA experts are expected to closely associate with the research staff on their respective research activities.

**Prior to your being nominated Chief of SEAFDEC/AQD, what major fisheries or aquaculture projects were you involved in?**

Prior to my appointment as Chief of SEAFDEC/AQD, I was Dean of the College of Fisheries, University of the Philippines in the Visayas. I was mostly involved in the development of fisheries projects with the Department of Agriculture Fisheries Sector Program for research projects like the "Resource and Ecological Assessment of Ormoc Bay"; with the Hokkaido University for instructional projects like the "Collaborative Doctorate Program in Fisheries"; and with the Sarmiento Research and Development corporation, for extension projects like the 11-month "Aquaculture and Capture Fisheries Training Program for Secondary School Teachers from Indonesia."

As a researcher, I was involved in a research project on indigenous fishing crafts and gears in the Western Pacific with researchers from Japan, Indonesia and Malaysia (1985 to 1989). Presently, I am working with a group of researchers from Tsukuba Univer-

sity, the University of the Philippines, and other local institutions on studies in Maritime Anthropology in the Visayas, Philippines (1991-1995). I am now making the necessary negotiations for the inclusion of the SEAFDEC/AQD Malalison Island Project as one of its project sites. With this link-up, the Malalison project would be complete with components on aquaculture, resource management, socioeconomics, and maritime anthropology.

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**You have a Likas Yaman award from the Philippines' Department of Natural Resources. What particular work is honored by this award?**

The Likas Yaman Award given to me back in 1984 was for my work in developing the capture fisheries sector of the fisheries industry.

**When you spoke before the AQD employees during the symposium for the selection of Chief in November 1991, I got the impression that you would like a very close collaboration between AQD and UPV - to complement AQD's research by UPV's teaching, and vice**

**versa. Is this correct? Do you see a very close relationship between the two institutions?**

The establishment and development of both institutions were made through the support of the Philippine government with the intention of 1) providing the much needed well-trained technical manpower to support the needs of the country and the region, 2) providing the technologies responsive to the present and future needs of the aquaculture industry, and 3) disseminating such technologies to the end users. With these common objectives, the UPV and the AQD should combine their resources in order to hasten their respective delivery services at the least cost to the funding agencies.

With the two institutions located near each other, it would be a waste of effort and resources to duplicate facilities and activities. For example, SEAFDEC/AQD has developed capabilities in milkfish breeding, and hatchery facilities. On the other hand, UPV has established nursery and growout ponds in Miagao and Leganes, Iloilo. With these existing facilities, both institutions can now work on the various problems of the milkfish industry. The stage has been set for the workers of both institutions to work as one cohesive body for a more efficient service delivery system.

The Department is working further to expand its service delivery system by involving other institutions whose work objectives are geared towards the utilization of our renewable fisheries resources at sustainable levels. When such a system is expanded to involve many institutions along the way, there is a tendency for the names and titles of the participants to be relegated to the footnotes. This does not in any way bother the present AQD administration. As long as the output reflects AQD's work objectives, banners need not be waved.

## Institute of Human Rights Focuses on Marginal Fishermen



On 5 June 1992, a Roundtable Discussion on Marginal Fishermen was held at the Bocobo Hall, University of the Philippines (UP) Law Center, Diliman, Quezon City. The discussion was the 24th in the series of symposia sponsored by the Institute of Human Rights, UP Law Center.

Invited guests were fishermen from Cavite, academicians, bureaucrats, researchers, and students. The speakers were: Mr. Ronald B. Roldan, Division Chief, Coastal Resources Management Division, Fisheries Sector Program (FSP), Department of Agriculture (DA); Mr. Manuel Garcia, Jr., Research Information Utilization Division, Philippine Council for Agriculture Resources Research Development, UP at Los Baños; and Dr. Flor Lacanilao, former SEAFDEC/AQD Chief and now a professor at the Marine Science Institute, College of Science, UP Diliman.

Mr. Roldan discussed the small-scale fishermen, their situation, problems and the underlying causes, and proposed solutions. He cited three: 1) that fishermen have to be less de-

pendent on fishing, 2) a massive resource conservation and rehabilitation campaign must be waged in key areas nationwide; 3) appropriate and responsive fisheries legislation must be passed. He also discussed the FSP Project financed by the Asian Development Bank. It was followed by a lively question and answer portion particularly from the invited fishermen from Cavite.

Mr. Garcia discussed the role of research information utilization as exemplified by an R & D organization.

Former SEAFDEC/AQD Chief Dr. Flor Lacanilao discussed policy issues for fisheries management. He stated that small-scale fishers have been increasingly marginalized by production oriented activities such as development of mangrove swamps into fishponds, introduction of pen and cage culture in lakes, and the use of effective but destructive fishing gears such as the trawl.

Dr. Lacanilao strongly recommends that economic objectives reflect environmental costs and wider social benefits. Environmental damage caused by some aquaculture and fishing practices needs long-term and expensive rehabilitation programs. In coastal wa-

ters, fishing should be limited to low-technology passive gears such as hook and line, traps, and gill nets. He recommends ecological approaches that will ensure continued social benefits and sustainable production without degrading the resource base.

Dr. Lacanilao finally touched on law enforcement in fisheries. He stated thus:

"The prevailing open access over municipal waters is the basic cause of competition among users and the subsequent resource depletion. Law enforcement has failed to settle user conflicts, and these have led to unfair competition in favor of large-scale enterprises and accelerated resource destruction."

"It is high time we institute an alternative system of effective access regulation and control. Giving territorial use rights in fisheries to associations (not individuals) of municipal resource users could be the best strategy for law enforcement, as the users themselves will then have the right and responsibility to guard their occupational area against violators."

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## Meetings & Conferences

### **Second Mollusc Culture Network Meeting and Workshop on Participatory Research Methods for Coastal Resource Development SEAFDEC/AQD, Iloilo, Philippines 13-23 October 1992**

The Second Mollusc Culture Network Meeting will be held in the Philippines on October 13-23, 1992 in cooperation with the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD). The meeting will provide an opportunity for a number of project scientists to discuss current research and future plans. This meeting comes at a time when IDRC is reorganizing its programs and it will be important for network participants to discuss the future of the Network.

A workshop on Participatory Research Methods for Coastal Resource Development will be held. The objective of the workshop is to introduce to scientists the methods of participatory research that are useful in coastal resource development. The workshop will be led by scientists from several institutions and agencies in the Philippines using methods such as rapid rural appraisal, agroecosystem analysis, gender sensitive analysis of resource utilization, and user involvement in technology development. In the short time available most of the topics will be addressed only on a discussion basis but field work will be carried out to demonstrate some of the methods.

Most of the projects in the Network, and from which

other participants will come, have had a biotechnical focus. This workshop is a first step (for some) to explore ways of transforming a technical project into a rural development project. Some participants have had experience with the social science issues and it is hoped that this workshop will help integrate the social and biological sciences to form the basis for future collaboration in coastal community work.

Meeting participation will not be restricted to currently funded IDRC projects. Several participants are from institutions that have a common interest in these issues.

The topic of the workshop has been stated as "participatory research" because of the need to discuss appropriate research methodology to be used in coastal resource development. The level achieved will vary with each situation. Thus, the workshop emphasis will be on developing the rationale for user involvement and working on a few methodologies that will at least help the scientist understand the users' socio-cultural and bio-physical environment.

The workshop will be integrated with the Second Mollusc Culture Network Meeting. There will be time devoted to discussion of biotechnical problems of mollusc culture, and culture and management options for other species.

For more information, write or call: Dr. Gary F. Newkirk, Biology Department, Dalhousie University, Halifax, Nova Scotia, B3H 4J1 Canada, FAX: 902-494-6899, Tel.: 902-494-2284, 902-494-3610 or Mr. Wenresti G. Gallardo, Chairman, SEAFDEC Organizing Committee, Tigbauan, Iloilo, Philippines 5021; Tel.: 8-12-61, 7-45-35, 7-05-05; Cable: SEAFDEC ILOILO; FAX: 63-33-81340.

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