



Asian Aquaculture

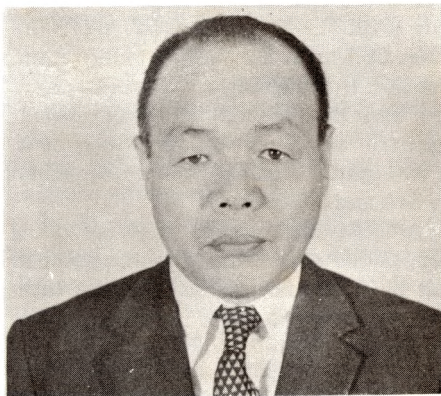
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Institute of Aquaculture Marks Year 2

Highlights of Accomplishments



HOSHINO

AQD Deputy Chief Retires

"The Department has grown in many ways and I hope it will continue to grow in research and become a great Asian aquaculture center. This is possible if Filipino power would only prove itself once again in achieving greater heights in research for the development of the aquaculture industry."

This was the sentiment expressed by Dr. Noboru Hoshino, outgoing Deputy Chief of the SEAFDEC Aquaculture Department, as he said his farewell to the Department personnel.

Dr. Hoshino, 66, has provided the necessary leadership for the cohesive work of the Japanese experts assigned to the Department as well as the pivotal point for the cooperative efforts among them and the Department's workers. He had been instrumental in the development of the SEAFDEC Aquaculture

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Organized only on May 23, 1978 with the appointment of its first director, the SEAFDEC Institute of Aquaculture (formerly Asian Institute of Aquaculture) has scored a fairly good record along three major spots in the aquaculture technology evolution and transfer link: planning, manpower training and technology dissemination.

Planning

1. Regional Workshop on *Aquaculture Development Strategies for Asia*, 6-13 August 1978. Eight developing Asian countries and Japan were represented by 68 experts on credit, training and extension, research, and planning. Agencies represented as well as cooperating insti-

(Continued on page 2)



SIA director J.C. Madamba awards plaque of appreciation to Iloilo fishfarm operator Atty. Cefarino delos Santos, vice president of the Federation of Fishpond Producers of the Philippines, for his contributions to the training and extension programs of the Aquaculture Department. Delos Santos and 83 others were recognized by the SIA, which implements the Department's technology transfer program, for their share in the planning, formulation and implementation of the program. Twenty-four from the private sector were cited, 4 from the Bureau of Fisheries and Aquatic Resources, 4 from the Development Bank of the Philippines, and several others come from such cooperating institutions as the University of the Philippines Brackishwater Aquaculture Center, Central Luzon State University Freshwater Aquaculture Center, Philippine Council for Agriculture and Resources Research, Fishery Industry Development Council and the Central Bank. The rest are researchers and administrative staff members of the Aquaculture Department who have been the main resource speakers in most of the training courses.

tutions included the ADB, FAO/UNDP, US AID, ICLARM, IDRC, SEARCA, SCSP and PCARR, BFAR, MNR, U.P., Fisheries Research Society of the Philippines, and the Technical Board for Agricultural Credit. The proceedings of the workshop contain the "Asian Plan for Action for Aquaculture and Small Fishfarmer Development," country papers of the Philippines, Indonesia, Thailand, Bangladesh, Singapore, India, Nepal, Sri Lanka, and proposed country and in-country projects on credit, research, data base, and training and extension. It also consolidates the identified problems of the aquaculture industry in the Asian region.

2. National Workshop on *Aquaculture Development Strategies for the Philippines*, 1-5 August 1978. A planning session that aimed to establish the country's aquaculture industry requirements regarding data base, training, extension, credit, and research. Co-sponsored with PCARR, TBAC, BFAR and MNR.

3. *Technical Consultation on Available Aquaculture Technology in the Philippines*, 8-11 February 1979. Identified, collated current available technology on milkfish, prawns, tilapia, and mussels and oysters; determined production potentials of these available technology, and pointed out technology gaps in selected aquaculture systems. Proceedings contain updated technology on these four top commodities as well as proposed technology transfer schemes. Done in cooperation with PCARR, it was attended by 79 of the country's outstanding fishery and aquaculture researchers, technologists, educators, extensionists and policy makers. Fourteen institutions including fishfarmers' associations and federations were represented. Proceedings were edited, printed and disseminated by SIA.

4. *International Cage and Pen Culture Workshop*, 12 to 22 February. It generated sharing of experiences among participants, provided practical guidance on the art and techniques of cage and pen culture and stimulated projects on this field. Attended by 53 participants from 15 countries, the workshop was sponsored by the International Development Research Centre in Canada and the Department. SIA handled the secretariat work and edited, produced and published the proceedings.

5. *Agribusiness Systems for Integrated Crop-Livestock-Fish Farming*, 19-25 November 1979. This symposium, a sequel to the SEARCA-ICLARM sponsored one on the same area, aimed to develop production and management strategies for a tri-commodity integrated farming system that could be worked out for small Asian farmers. Participants came from Indonesia, Japan, Korea, Taiwan, Thailand, Malaysia and the Philippines. It was jointly sponsored by PCARR and the Taiwan-based Food and Fertilizer Technology Center. The Aquaculture Department through the SIA participated in the planning and organization of the workshop and in the proceedings.

Training

SIA implements the training program of the Department. Training courses were instituted in 1974 and since then the Department has trained some 1,968 in various short-term non-degree courses.

Of this number 660 were trained under the farmers' *in situ* mobile program which SIA and the Bureau of Fisheries and Aquatic Resources initiated in 1978. The mobile training course aims to bring to the small fish farmer's doorsteps the latest in milkfish and prawn culture technology. It has so far been held in West Visayas, East Visayas, Bicol, Central Luzon, Northeast Luzon, and in Southeast, Northeast and Southwest (Zamboanga) Mindanao. Holding of a program is usually made upon request by fishfarmers' associations in the regions. SIA trainers, Department researchers and BFAR personnel work as a team in conducting the course.

SIA co-initiated the move to open the short-term courses to participants from third world regions outside of Asia. This enabled 20 fishery officers of Cuba as well as a few from such countries as Nigeria, Sierra Leone, Egypt, Colombia, and Panama to participate in the various programs.

The regular courses are: for international participants -- aquaculture research methodology, aquaculture management for milkfish and for prawn, and prawn hatchery management and operation. The local programs include prawn culture, barangay (small-scale) prawn hatchery operation, mussel and oyster farming, the *in situ* program, and such special skills courses as feeds and nutrition, Parasites, pests and diseases, and fishpond engineering.

An innovation, the APDEM (Aquaculture Project Development and Management) course has recently been tried out with highly encouraging results. While the *in situ* program is designed to bring the technology and management expertise to small farmers, the APDEM is meant to reach out to the more progressive ones as well as to key workers in private and government agencies involved in evaluating, developing and managing aquaculture projects. APDEM fulfills the long standing need by private aquaculturists to have technological advancements incorporated in management and economic recommendations. Held in February this year, APDEM attracted 54 people who made reservations, 35 of whom were able to participate. It included four foreign participants among its initial graduates. Resource persons were drawn from the private industry sector, Southeast Asian Regional Center for Research and Graduate Study in Agriculture (SEARCA), University of the Philippines College of Business Administration, the U.P. Brackishwater Aquaculture Center, and the research and management staff of the Aquaculture Department. It was jointly organized and implemented by SIA and SEARCA.

APDEM also proved that individual high-caliber experts from various agencies **can be mustered into an effective team** and motivated to work for a worthwhile endeavour.

Technology Dissemination

In no other area has SIA made a more powerful contribution to the Department's program to transfer aquaculture technology than in information dissemination.

SIA organized the Communications/Publications unit to back up the training and extension programs and in specific areas, to provide the lead role in the outreach services.

There are essentially two activities engaged in by the communications unit of SIA: production of information materials and provision of back-up services to other Department units.

The information materials being produced and disseminated are the following:

a. Popular Publications

1. *Fish Farm News* -- a fortnightly news service to fishfarmers of the country containing ten stories per issue. Started in October 1978, it is subscribed to by

AQD Deputy . . .

(From page 1)

Department as a research institute and, with his efforts, support and cooperation, the department speedily developed its research and training capabilities.

With Dr. Hoshino's retirement in April 1980, Mr. Kunio Katsutani assumed office as Officer in Charge of the Office of the Deputy Chief. His appointment as Deputy Chief will be confirmed by the SEAFDEC Council.

Dean Juliano expressed optimism that Mr. Katsutani will continue to give the support and assistance which his colleague had given in the past and work for the growth of the department which Hoshino envisioned -- an Aquaculture Department which is great in every way most particularly in research for the benefit of the private sector aquaculture industry.

more than 700 individuals including two fishfarmers associations (Iloilo and Capiz) which subscribe for their members. It is designed for broadcast but is also regularly carried by the nation's agricultural magazines and community newspapers.

2. *Popular Aquaculture Report Series* -- a service for mass media the series consists of in-depth feature articles on aquaculture R & D results. Main targets are the agricultural magazines and agricultural or industrial sections of newspapers.

3. *Media Releases* -- brief, single story announcements of important and fast-breaking events in the Department or the industry.

4. *Aqua Dep't News* -- fortnightly internal news sheet of the Department

b. Semi-Technical Publications

1. *Asian Aquaculture* -- the Department's outreach newsletter which carries research and industry development information from various sources in the world. Published monthly, it reaches 1800 institutions and individuals in 84 countries.

2. *Extension manuals* -- package of technologies produced by the Department's researchers, manuals contain commodity production guidelines. Six manuals have been prepared so far: (1) Design, Operation and Economics of a Small Scale Prawn Hatchery, (2) Manual

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Dr. Hoshino first came to the Department in April 1974 as leader of the Japanese mission. As an expert he worked with the prawn hatchery project for a year before he joined the milkfish group. He assumed office as deputy chief of the Department in January 1978.

Before joining SEAFDEC, he worked as Director of the Okayama Ken Public Development Co. and also as Director of Okayama Ken Fishery Laboratory. During this time Mr. Katsutani worked with him on the seed production of prawn, octopus and finfishes as well as *Artemia*. In 1945, he was assistant director of Nagasaki Ken Fishery Laboratory, and in 1955-59 was director of Totori-Ken Fishery Laboratory.

Hoshino has written more than 40 scientific papers on the study of marine fishery grounds and a few on the seawater of coastal areas in Japan and the study of seed production of seaweeds, prawn and fish.



Mr. Kunio Katsutani, AQD's OIC, Office of the Deputy Chief, assumed office last April 1980.

Mr. Katsutani was Director of the Seafarming Center, Okayama Prefecture before he joined SEAFDEC. He has also been to Taiwan and the United States where he worked on prawn hatchery. ●

Aquaculture Credit Schemes*

(Second in a Series)

Alternative Strategies

Financing requirements will have to differ with the pattern and level of operations. Small-scale enterprises need credit supervision and extension services. Industrial-scale aquaculture in the private sector at present tends to be more for the high-valued species and in many cases for the export market. Because of the many incentives offered for export-oriented industries, it may be comparatively easy to obtain financing for them, whereas production for domestic consumption seldom gets any preferential treatment or even reasonable consideration.

As is always the case with new types of emerging enterprises, there is considerable reluctance from financial institutions to extend support before large-scale commercial development occurs. In many areas, therefore, the immediate need is to create a suitable investment climate and to produce the economic data base through pilot operations. Naturally, the government could not invest in this expensive field of endeavor. The only recourse is for the private sector to take the lead with the help of an international body like SEAFDEC to

*Contributed by Emmanuel N. Encarnacion, Economist, SEAFDEC Aquaculture Department.

reassure their R & D program.

If there is really too much diversity in aquaculture operations, the major development financing agencies should take this into account when considering support to aquaculture, particularly in its early stages of development. Banking policies and criteria for evaluation should be restructured to meet the considerations of a feasible project. This means that banks and financial intermediaries should show more flexibility in appraising project significance in so far as loan value criteria are concerned, such as (1) financial leverage or debt to equity ratio, (2) debt service cover, (3) analysis of cash flow turnover, (4) liquidity ratios, and (5) profit margin ratios.

On the other hand, the fishfarmer should have certain limits to his ambitions. As an entrepreneur, he is expected to utilize all his means and resources to raise additional funding for his business without the use of too much credit. He must learn to plan, organize and execute his alternative courses of action in harmonious cooperation with his colleagues. He must be able to marshal farm resources to its maximum utilization to avoid financial inconvenience.

Because aquaculture is not in a steady state technology, output is more volatile

(Continued on page 7)



Management of Fishponds with Acid Sulfate Soils*

7. Properties of Acid Sulfate Soils, BAC, Leganes, Iloilo

The profile analysis of some acid sulfate soils studied at BAC, Leganes, revealed that the pH of these soils ranged from 3.4 to 3.6 showing a highly acidic conditions (Table 2). Our past experiences show that this low range of pH is injurious to fish, where often milkfish mortalities were observed. The wet soil pH values showed an increasing trend with depth. Likewise total potential acidity was in the range of 70-95 me H/100 g soil. The analysis also resulted in high amounts of acetate soluble sulfates which ranged from 4310 to about 5586 ppm (Table 2). These sulfates upon chemical reactions result in sulfuric acid production and acid sulfate conditions. Available iron (extracted using 1 N ammonium acetate) ranged from 200-235 ppm. The soils showed a high concentration of exchangeable aluminum, which ranged from 105-180 ppm (Table 2).

There is not much information available on the toxic concentrations of these elements except the reports of Nikolsky (1963) who in general stated that the toxic concentrations of aluminum and iron for fishes are 0.5 ppm and 0.2 ppm, respectively. However, it is well known that these two elements when present in excess concentrations are capable of binding the phosphorus thus rendering it unavailable (Table 6).

The soils contained rather low amounts of available phosphorus, which ranged from 1.6 to 4.0 ppm (Table 2), this partly could be explained by the presence of high amounts of exchangeable aluminum and iron. Again, not much is known about the phosphorus

(Second in a Series)

Table 2. Chemical properties of acid sulfate soils, BAC, Leganes, Iloilo, 1979.

Profile Depth (cm)	Wet Soil pH	Dry Soil pH	Total Potential Acidity (meH/100g soil)	Acetate Soluble Sulfate (ppm)	Available Iron (ppm)	Exchangeable Aluminum (ppm)	Available Phosphorus (ppm)
0-15	3.60	3.40	70.0	4,310	200.0	105.0	3.6
15-30	4.40	3.60	61.0	4,320	250.0	81.0	4.4
30-45	4.40	3.40	87.0	5,062	216.0	112.0	2.8
45-60	5.70	3.50	93.0	5,014	318.0	168.0	1.6
60-55	6.30	3.50	95.0	5,586	327.0	180.0	4.0

content in soils for aquaculture. However, a minimum of 1 to 3 ppm of orthophosphate in pond water is reported to be necessary for good algae production (PCARR, 1976). Depending on the availability of phosphorus which varies from soil to soil, the soil should contain phosphorus several folds more than what is needed in the pond water.

Minerological studies by x-ray diffraction showed that the soil clay is mono-

mineralic (more than 90%) and the dominant mineral is smectite (montmorillonite) with some aluminum inter layering. The iron oxide present in the soil was amorphous in nature.

8. Chemical Properties of Some Pond Soils, BAC, Leganes, Iloilo:

The chemical properties of the pond soils which are under fish cultivation for

Table 3. Chemical properties of some pond soils^{1/}, BAC, Leganes, Iloilo.

Profile Depth	Properties ^{2/}					
	pH	Total Potential Acidity (meH/100g.)	Available Iron (ppm)	Exchangeable Aluminum (ppm)	Available Phosphorus (ppm)	Acetate Soluble Sulfate (ppm)
0-15	6.3	14.3	145.0	3.5	19.0	2,366
15-30	5.6	18.7	144.0	7.2	12.8	2,925
30-45	5.4	31.4	156.4	18.5	12.0	2,996
45-60	5.3	39.9	165.4	24.5	11.3	3,310
60-75	4.9	38.7	173.7	28.6	9.1	3,301
Mean ^{3/}	5.5	28.6	156.8	16.5	12.8	2,985

^{1/} Ponds under fish cultivation since last 5 years

^{2/} Values for each profile depth are a mean of 25 samples

^{3/} Mean of 125 samples

*Contributed by Dr. V. P. Singh, soil and water management specialist at UP BAC.

the past 5 years and have received some reclamation treatments are presented in Table 3.

The pH of the soil showed a decreasing trend with an increase in depth ranging from 6.3 (the surface layer) to about 4.9 at about 60-75 cm depth. But, under wet conditions, due to soil reduction the pH of deeper profiles is always expected to be higher than the surface layer.

The analysis of potential soil acidity, available iron, exchangeable aluminum and sulfates showed an increasing trend with increase in depth and decrease in pH values (Table 3), which the reverse was the case for available phosphorus. With increasing depth the mean values ranged from 14.3 to 38.7 me/100 g soil for potential acidity, 145 to 173.7 ppm for available iron, 3.5 to 28.6 for exchangeable aluminum, 2366 to 3301 ppm for sulfates and 19 to 9.1 ppm for available phosphorus (Table 3).

The results indicate that at higher pH, the concentrations of aluminum and iron are considerably low, while the concentration of available phosphorus is markedly high. The results also reveal that though the deeper profiles of these soils show acidic pH and high concentrations of iron and aluminum, (indications of acid sulfate soils) the soils have improved considerably because they have received various reclamation treatments such as repeated flooding and flushing, repeated applications of lime, and fertilization (Singh and Camacho, 1980).

The analysis values of above-mentioned properties were then grouped in different pH ranges (Table 4) to show their inter-relationships. The results clearly indicate a definite trend of increasing aluminum and iron concentrations with decrease in pH, and a decrease in available phosphorus content with decrease in pH (Table 4). A three-unit decrease in pH increased exchangeable aluminum by about 60 folds

(Continued on page 6)

Edible Crustaceans in the Philippines*



18. *Thalassina anomala* (HERBST)

English name: *Mud lobster*.

Philippine name: *Palatak, Kolokoy or Kulukoy (Tagalog), Oson or Uson (Ilongo), Manla (Cebuano)*

This species may exceed 20 cm in body length and reaching a weight of 130 g. Resembling a scorpion, this peculiar animal belongs to Section Anomura like the coconut crab, *Birgus latro*. The sub-chelated pincers are asymmetrical in shape and size. Abdominal part consists of six fragile segments and a telson.

The entire body is brown or reddish brown in color.

It inhabits muddy burrows excavated along the dikes surrounding

fishponds and in mangrove swamps. In early morning, newly scavenged mud particles which form muddy mound can be observed in the areas mentioned above. Massive pincers carry out the wet mud from the bottom of the burrows. A slow-moving animal, the mud lobster is nocturnal and spends its time mostly in the burrow although it leaves the hole on rainy days.

There is no specific operation for catching the animal. They are captured only by chance i.e., by fishpond workers scavenging dikes or mangrove areas.

This species is distributed in the Indo-Pacific area, from Okinawa (southern Japan) through the Philippines to the Indian ocean.

It is occasionally sold in fish markets at a retail price of some P3/kg.

by H. Notoh; 18th in a series

ERRATUM: *Thenus orientalis*, no. 16 in the series, spells *orientalis*.

Management of Fishponds . . .

(From page 5)

Table 4. Chemical properties of some soils from brackishwater fishponds^{1/}, BAC, Leganes, Iloilo.

Range	pH Mean	Total Potential Acidity (meH/100g)	Exchangeable Aluminum (ppm)	Available Iron (ppm)	Available Phosphorus (ppm)	Acetate Soluble Sulfate (ppm)
3.5 or low	3.5	61.0	168.2	154.2	6.6	4,310
3.5 - 4.0	3.8	79.0	96.9	253.7	8.1	4,538
4.0 - 4.5	4.4	55.0	55.5	240.1	8.5	3,707
4.5 - 5.0	4.7	45.3	32.4	197.0	8.6	3,349
5.0 - 5.5	5.2	27.6	12.8	134.1	10.1	2,981
5.5 - 6.0	5.7	22.2	3.2	115.7	11.9	2,562
6.0 - 6.5	6.4	20.6	1.1	121.0	16.9	2,761
6.5 - 7.0	6.8	11.6	0.1	155.8	18.6	2,374
7.0 - 7.5	7.4	5.7	0.1	115.0	25.3	1,925

^{1/} Ponds have been under cultivation since the last five years.

Table 5. Total fish (milkfish plus wild species) harvest (kg/ha) under different fertilizer and water management regimes; i.e., lablab and plankton (after Camacho, 1977).

Treatment ^{1/}	Lab-lab	Plankton
N	623.0	475.5
CN	514.0	826.7
CNP	424.0	721.3
CP	878.3	341.4
NP	339.5	451.7
C	468.0	312.3
U	346.5	190.8
P	382.5	172.5
Mean	497.0	437.3

Table 6. Kinetics of pH in acid sulfate soils upon drying and submergence.

Treatment	pH ^{1/}			
	Initial Soil	Leachate	Overlying Water	Final Soil
1. Continuous drying for six weeks	3.3			3.3
2. Two weeks drying followed by four weeks submergence	3.3	4.5	3.3	4.2
3. Three weeks drying followed by three weeks submergence	3.3	4.7	3.6	4.2
4. Four weeks drying followed by two weeks submergence	3.3	4.1	3.4	4.0
5. Continuous submergence for six weeks	3.3	4.8	3.2	4.5

and consequently decreased the available phosphorus by 2 folds. Similarly, a decrease in pH by about 4 units increased aluminum by 1680 folds and decreased available phosphorus by 4 folds (Table 2). These results are in agreement with the findings of other workers and earlier findings of Ponnampereuma (1977).

There is an indication that in soils with low pH, as in the case of most acid sulfate soils, phosphorus is very likely to be deficient. Furthermore, negligible response to phosphorus fertilization is expected because of the binding effect of excess exchangeable aluminum (Table 5). In other words, if the pH of these soils could be increased to neutrality, the aluminum toxicity could be eliminated, and the cost of phosphorus fertilizer application could be reduced because of the increase in availability of phosphorus at neutral pH.

9. The Kinetics of pH in Acid Sulfate Soils upon Drying and Submergence:

The results indicate an increase in pH by about more than 2 units (Table 6) as a result of 3 weeks submergence and considerable decrease in aluminum concentrations. However, the pH of the surface soil and overlying water generally did not exceed 4.5 but at a depth of 10 cm and below it was always above 5.25 (Table 6 & 7). The low pH was probably due to a very low activity of micro-organisms under highly acidic conditions and high rate of oxidation. This also indicates that flooding alone perhaps cannot raise the pH of these soils to a neutral reaction.

Table 7. Kinetics of pH in an acid sulfate soil upon submergence for 4 weeks, BAC, Leganes, Iloilo.

Profile Depth	pH ^{1/}	
	Initial	Final
0- 5	3.1	4.6
5-10	3.3	4.7
10-15	3.4	5.2
15-20	3.4	5.3

End of Part II

Next issue: Management recommendations

ASIAN AQUACULTURE

Aquaculture . . .

(From page 3)

compared to its counterparts in agriculture. The fishfarmer, therefore, is obliged to seek alternative activities to raise capital internally without broadening his sphere of constraints. For example, during the construction and development stage, project phasing and PERT programming could restrain the farmer from overexpanding. If he has a broader scope of operation, the farm could attain self reliance through integration of operation or diversification in culture species. This would result in increasing output and output capacity since the farm could very well sell additional by-products.

If self-reliance is not feasible, another alternative calls for greater cooperation within a contiguous farm area. Emphasizing inter-lending of farm tools, implements and equipment could restrain the purchase of cost-push resources for operation and achieve greater efficiency through economies of scale. With excess "material" in rural areas, one farm could always help another in terms of labor, capital or entrepreneurial skills.

Credit is a much abused form of financing among developing enterprises. The purpose of credit availment is to attain certain financial leverage for the firm by investing additional capital in business that pays a higher return than bank cost of capital. *Credit should never be utilized to rehabilitate losing fishfarm ventures, least of all high risk aquaculture propositions.*

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NOTES FROM READERS

I have had the pleasure of being introduced to your fine publication, the Asian Aquaculture. I shall be most grateful to you if you could put me on your mailing list and if you could forward to me the past issues of your publication, particularly the September and October 1979 issues which carry the article, "Some general guides and cost estimates for a small-scale prawn culture project."

V. Selvarajah
Fisheries Research Institute
Penang, Malaysia

Please place the Iowa Cooperative Fishery Research Unit, Iowa State University on the mailing list to receive Asian Aquaculture and other publications you may have available. We will be happy to place you on our mailing list to receive our reports and publications if you request us to do so.

John Nickum
Unit Leader

The Marine Products Export Development Authority has set up a special cell for extension work in prawn farming. Asian Aquaculture is very useful in our extension work. I would appreciate very much if you could enrol us on your mailing list for all the free and priced publications published by you.

M. Sakthivel
Joint Director
MPEDA, Government of India

In a recent issue of Aquaculture Digest, I read there is available for subscription Asian Aquaculture. I would appreciate very much being put on your mailing list. I am sure it will be of great interest to me.

Mike Donnel
Charter Resources Co., Florida

I came across a copy of Asian Aquaculture and am greatly impressed by its coverage and content. Our faculty members have been informed of the publication and we wish to subscribe to it.

Jesus Bonilla
Sudlon Agricultural School
Cebu

From perusal of aquaculture magazines in Australia I believe your department has done research on the aquaculture potentials of many species in your region. I have read two publications issued from your Department, namely, Aquaculture Extension Manual No. 1 (Design, operation and economics of a small-scale hatchery for the larval rearing of Penaeus monodon) and Asian Aquaculture. I would appreciate copies of these publications.

M. Blackburne
Queensland, Australia

Would you be kind enough to mail a copy of your journal direct to the Director, Inland Fisheries, Ministry of Fisheries, Colombo. He has undertaken to circulate this journal to aquaculturists in various parts of the country.

Brian Forbes
Credit Manager (Agriculture)
Bank of Ceylon

I am grateful for the copies of Asian Aquaculture you have been sending me and I wish to be a regular recipient. May I request you to send me the other issues that I have not received.

Sani D. Macabalang
Bureau of Fisheries and
Aquatic Resources
Cotabato City

Acknowledgement

The author wishes to recognize the assistance of the SEAFDEC Makati Office staff in providing data for the article. ●

Institute of Aquaculture . . .

(From page 3)

on Prawn Culture, (3) Milkfish Culture in Brackishwater Ponds, (4) Nutrition and Feeding of Sugpo (*Penaeus monodon*), (5) Manual of Operations: Sugpo Pond Culture, and (6) Manual on Mussel Farming. The manual on pond operations for prawn culture was translated into the dialect of the Panay-Negros region, printed into a manual form and distributed free to fishfarmers and fishfarm associations in the region. Extension manuals also form part of trainees' kits.

3. *Aqua Guide Series* -- while manuals carry the entire range of production information for one commodity, Aqua Guide is designed to contain only one or two closely related aspects in the culture of a commodity i.e. diseases, broodstock production, feeds and feeding, etc. Two have been published: *P. monodon* Broodstock and General Information on Fish Cage and Pen Culture.

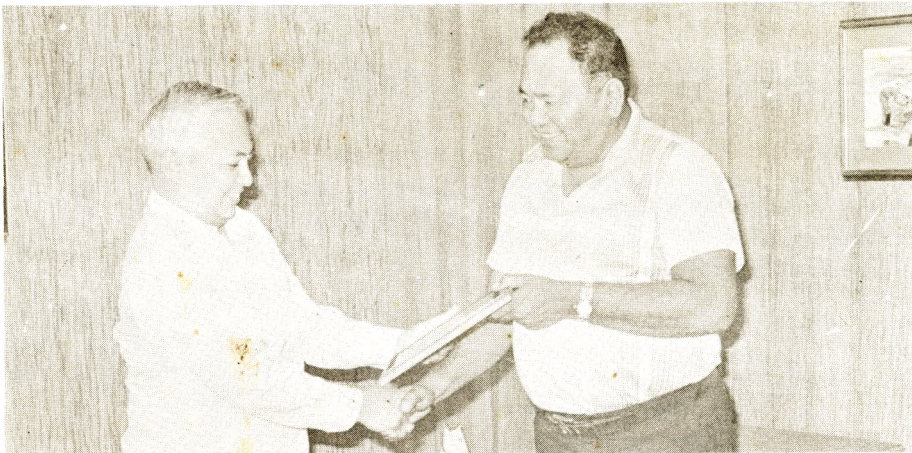
c. Technical Publications

1. *Quarterly Research Reports* -- contain extended abstracts of Department research findings.

2. *Technical Reports Series* -- one issue carries a full-length technical article on any topic relevant to aquaculture. It is non-periodic.

3. *Annual Report* -- the unit edits for publication the Department's annual report.

4. *Reports to the SEAFDEC Council* -- include the Department's Program of Activities and Progress Report. Produced and printed by the unit for the annual Council meeting.



Mr. Ruperto Angudong, president of the Negros Occidental Fishfarm Producers Federation receives appreciation plaque also for his contributions to the training and extension programs of the Aquaculture Department.

5. *Proceedings* -- edited proceedings of Department-sponsored or co-sponsored symposia, workshops and conferences. Four have been published since the unit was organized in June 1978: Aquaculture Development Strategies in Asia; Aquaculture Development Strategies for the Philippines; Technical Consultation on Available Aquaculture Technology in the Philippines; and International Workshop on Pen and Cage Culture of Fish (with IDRC). The proceedings are edited, organized and printed by the unit.

Scientific Information

Documentation and dissemination of scientific information on aquaculture and related subjects took a big stride with the initiation of the Aquadoc (aquaculture documentation) and the scientific literature service projects. IDRC sponsors Aquadoc while the SLS project is a Department-sustained service. On the global scale, SIA made the initiative to become a member and Asian input center

of the FAO-operated aquatic sciences and fisheries information system (ASFIS) but negotiations had not been fruitful.

Technology Verification

The institute also struck out into other areas notably the crucial technology transfer link of verification.

Verification serves the purpose of field testing laboratory results in farmers' fields under given agro-climatic, cropping, and socio-economic patterns. The end result of technology verification is a package of technological recommendations that has been shaped by the tests taking into consideration all the variables in the farmers' fields.

Projects have been formulated along this area. The Department's researchers and some private sector representatives were enlisted in the planning and would be involved in the implementation. The projects could be implemented more successfully under a cooperative scheme between the Department and other interested agencies. ●

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