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**INTERNATIONAL  
FOUNDATION  
FOR SCIENCE**

**IFS WORK 1974-1983**

**AQUACULTURE**

The International Foundation for Science, a non-governmental, non-profit organization, is established to promote and support in developing regions of the world meritorious research in the fields of the natural and social sciences and in technology.

The Foundation will provide young scientists and technologists of outstanding merit from developing countries with financial and other support in their work.

A condition is that the research activity shall take place in the territory of a developing country.



INTERNATIONAL  
FOUNDATION  
FOR SCIENCE

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SWEDEN

## **FOREWORD**

By 1972, the year the International Foundation for Science was founded, scientists, academics, and policy makers interested in development aid had long recognized the difficult situation faced by young scientists from developing countries. Research opportunities did not exist in their countries, or if they did, they were reserved for senior and well-established researchers.

The need for an organization that could enable young scientists to pursue a career of research in their homelands was clear, and in 1972 Sweden and Canada provided the initial funds to establish such an organization, the IFS. Since then France, the Federal Republic of Germany, the Netherlands, Belgium, Norway, Switzerland, Nigeria, the United States, Australia and UNESCO have joined as donors of the Foundation. Member Organizations--scientific academies, research councils, and royal societies--from 65 countries advise the IFS on policy and promote its activities.

In the past ten years the IFS has awarded grants to nearly 800 scientists in 78 developing countries for research within a granting programme that includes Aquaculture, Animal Production, Food Crops, Afforestation and Mycorrhiza, Fermentation and Applied Microbiology, Natural Products, and Rural Technology. The grantees were selected based on the recommendations of the IFS Scientific Advisers, specialists in the IFS scientific areas who serve the IFS voluntarily and in a personal capacity.

The grants are modest (normally not more than USD 10 000) and can be awarded up to four times per grantee. Since the institute of the grantee provides a salary and facilities, IFS grants are devoted to purchasing the basic tools of research--equipment, expendable supplies, literature. Because grantees often face isolated and difficult conditions, because they are young and inexperienced, the IFS provides more than financial support.

Workshops are arranged on behalf of the grantees and are attended by IFS Scientific Advisers. These advisers provide guidance to grantees on such occasions, as well as by mail and visits to research sites.

The IFS was founded because there was no other organization providing this kind of support to developing countries. Today, ten years later, the IFS is still unique among organizations. This was the conclusion reached by a 1981-82 evaluation of the

**FOREWORD**

IFS commissioned by the IFS Sponsors and conducted by an external panel headed by Dr Francisco Sagasti of Peru and Prof Geoffrey Oldham of the United Kingdom. The panel also concluded that the IFS had succeeded in reaching the intended target group of young and well-educated scientists and had provided them with research opportunities in their own countries that would not otherwise have been available. The panel was satisfied with the selection of grantees and the quality and relevance of the research done by these scientists.

The panel made a number of recommendations for future activities. The proportion of grants given to scientists in Latin America and Africa should be increased in order to balance the geographic distribution between these continents and Asia. Because of the importance of the IFS Scientific Advisers to the success of the IFS activities, their number should be increased. The Foundation has implemented both of these recommendations.

The most important recommendation was that the IFS increase the scope of its activities. The need for such an increase is reflected by the number of applications received by the Foundation. Today the IFS is able to provide support for only one out of every three applicants. The IFS is making concerted efforts to seek additional funds that such a recommendation, and such a need, imply.

Gordon Butler  
President

## **GUIDE TO IFS WORK**

### **AQUACULTURE**

This report is a chapter of the IFS WORK, which includes chapters of all the scientific areas of the IFS granting programme: A, Aquaculture; B, Animal Production; C, Food Crops; D, Afforestation and Mycorrhiza; E, Fermentation and Applied Microbiology; F, Natural Products; G, Rural Technology. These other chapters have also been printed individually and are available from the IFS Secretariat.

The chapter AQUACULTURE presents in numerical order the names and institutions of grantees who have received grants in this scientific area during the years 1974 - 1983. The title, a short summary, and subject descriptors (taken from the OECD MACROTHESAURUS; those not found in the OECD publication are preceded by asterisks \*\*\*) are included as well as the amount of funding provided by the IFS. These amounts are given in SEK, Swedish Crowns. The funding dates coincide with the year of the award. Completed projects are indicated by a date; when no such date appears, the project is active as of 1983.

A brief introduction of the scientific area was written by the IFS Scientific Secretary Ms Christina Arosenius. There are two indexes: one by subject descriptor, the other by country.

The summaries of the projects were written at the IFS Secretariat and submitted to the grantees for their approval.

The information contained in the IFS WORK is part of a database created for sharing project information, the International Development Research Information System (IDRIS). The system, in the pilot project stage, is being hosted by the International Development Research Centre (IDRC) of Canada. The database is stored in the Centre's minicomputer, which uses MINISIS software. MINISIS processors were used to extract the information for the printing of the IFS WORK.

Ms Judith Furberg, Information Secretary, was responsible for the compilation and editing of the IFS WORK 1974 - 1983.

## **AQUACULTURE**

The science of aquaculture deals with methods of growing and culturing aquatic organisms in controlled environments. Bodies of water have always provided food for people and feed for animals, but in many areas wild stocks are becoming scarce because of exploitation. Aquatic products--fish, shrimp, oysters, mussels, and algae--are much appreciated in most parts of the world and interest in their culture is steadily growing. Improved techniques could result in production equal to that now achieved by catches of natural populations.

Aquaculture has been known to man for centuries; in some areas fish have been cultured for more than 2 000 years. Already existing techniques need to be researched: control of reproduction, testing of new and inexpensive feed, control of environment and pollution, study of new species suitable for culture. Intensive culture in artificial environments requires knowledge about diseases, parasites and predators, how and if the different species can be bred, and nutritional requirements.

The IFS has at present around 120 grantees working on these aspects of aquaculture. About 50% are located in Asia, where aquaculture has a long tradition. Aquaculture research is gaining great popularity in Africa, where 25% of the IFS grantees are located; and also in Latin America, where the remaining grantees are located. The warm waters in these countries favour a high growth rate of aquatic organisms and the need for protein among the people is great.

The majority of grantees--all in all some 75--are conducting research on fresh-, salt- and brackish-water fish. The most important species studied are tilapia, mullet, carp, catfish, groupers, milkfish, and seaperch--all of which have been cultured in traditional aquaculture systems. Often they are not native but introduced to new environments. Research focuses on the specie's adaptability to conditions, spawning techniques, hybridization, and genetic selection, and feed production from local materials, including agricultural and industrial wastes and by-products. The effect of the introduction of a foreign species on the native fauna must also be carefully controlled and a steady supply of fish seed provided for producers.

Different types of floating cages have been designed by IFS grantees and introduced to local farmers. Polyculture and integrated farming systems are also studied by some grantees, mainly in combinations of fish, poultry, ducks, swine,

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## AQUACULTURE

vegetables, sericulture, earthworms, or frogs. These systems are usually designed for small-scale farms suitable for one family households in order to enable them to efficiently utilize all products and by-products on their farm.

Crustaceans, one of the two main shellfish groups, include the species shrimp, prawns, and crabs. The giant freshwater prawn Macrobrachium rosenbergii is a popular species, produced commercially according to well-developed hatchery technology. There is still much to be done on this species as well as others to increase production. IFS grantees are working with mass production of seedlings, physiological studies, and feeding trials. There are currently 18 grantees located in Asia working with research on crustaceans, 4 in Latin America, and 2 in Africa.

The other main shellfish group is molluscs, including oysters and mussels. Techniques for culturing molluscs are well established in the temperate zone of Latin America, where there are 10 grantees studying the environmental influence and ecology of mollusc culture. There are 5 grantees working with mollusc culture in Asia and 2 in Africa; the warm waters favour their culture in these areas.

Algae are a source of food, feed, crop manure and a raw material for chemical and pharmaceutical industries. They are also an integrated part of many forms of fish and shellfish cultures. There are currently 5 IFS grantees within the area of Aquaculture and some 10 others in the IFS granting programme conducting research on the production and use of algae.

Three of the four aquaculture workshops organized by the IFS resulted in Provisional Reports that were later published by Elsevier Scientific Publishing Company. The first, held in Penang, Malaysia, 1978, was published by them as a Special Issue of Aquaculture, Vol. 10., No. 3. The second workshop, in Abidjan, Ivory Coast, in 1979, as a Special Issue of Aquaculture, Vol. 17, No. 3. The third, a giant prawn workshop held in Bangkok, Thailand, 1980, was published in book form with the title "Giant Prawn Farming."

In the past, the IFS has given a great deal of its support within this area to scientists in Asia, where there are many capable scientists working within the framework of a long aquaculture tradition. A number of Asian grantees have done



## **AQUACULTURE**

outstanding work in this field and now serve the IFS as scientific advisers.

For these reasons, the IFS has been attempting to increase the amount of support given to Latin American and African scientists. To this end, a workshop on aquaculture was held in Monteria, Colombia, 1981. It was a bilingual workshop and resulted in two Provisional Reports--one in English and the other in Spanish.

The next workshop in aquaculture is planned to be held in Africa.

## AQUACULTURE

Grantee A001: Dr N'guessan Kouassi, Laboratoire de Zoologie,  
Faculté des Sciences, Université d'Abidjan,  
04 B P 322, ABIDJAN 04, Ivory Coast

"Studies on Alestes spp. in Ivory Coast"

IFS funding:	22500 SEK 1974	44650 SEK 1978
	26975 SEK 1980	56000 SEK 1981

Previous research showed that the population of Alestes spp. is increasing in Lake Kossou and represents at present about 60% of the total fish population. This potential is not efficiently exploited due to a lack of knowledge of the biology, physiology, and ecology of the different Alestes spp. Dr Kouassi will study the growth and diet of Alestes baremoze, the most prevalent variety, as well as the pattern of distribution and the reproduction of the three main species. One of the main objectives is to try out rational methods to optimize exploitation of Alestes spp. Dr Kouassi also intends to investigate the possibility of using Alestes spp. for intensive cage culture.

/fish culture/ /fish breeding/ /freshwater fish/

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Grantee A002: Dr Bernard Ezenwa, Nigerian Institute for  
Oceanography and Marine Research, P M B 12729,  
LAGOS, Nigeria

"Studies on Chrysichtys nigrodigitatus"

IFS funding:	36000 SEK 1974	22000 SEK 1975
	22000 SEK 1979	Completed 1982

Catfish (Chrysichtys sp.) is very popular and in high demand in Nigeria. It lives in both fresh and brackish water. Dr Ezenwa will study the distribution within Nigerian waters to enable collection of fingerlings for stocking in ponds. The possibility of hatchery production either by breeding adults in a confined environment or by artificial fertilization will be examined. Chrysichtys spp., which are limited to West Africa, have not been used for aquaculture before.

/fish culture/ /fish breeding/

\*\*\* /catfish/ /ponds/

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## AQUACULTURE

Grantee A003: Dr Moolail Sebastian, Faculty of Fisheries,  
Kerala Agricultural University, MANNUTHY, 680  
651, Trichur, India

"Induced spawning and larval rearing of grey mullet"

IFS funding:                    14400 SEK 1974                    26880 SEK 1977

The grey mullet (Mugil sp.) is of great importance in brackish-water fish culture in India. However, it does not normally breed in ponds. Experiments conducted by the grantee have shown that Mugil macrolepis can be induced to breed by the pituitary hormone and that their larvae can be reared in large numbers. Dr Sebastian will conduct induced spawning experiments with the other commercially important Mugil spp. as well as large-scale rearing of their larvae.

/fish culture/ /reproduction/

\*\*\* /mulletts/ /ponds/

Grantee A005: Dr N Sukumaran, Fisheries College, Tamil Nadu  
Agricultural University, TUTICORIN 628 003, India

"Growth parameters of the freshwater mullet, Rhinomugil corsula"

IFS funding:                    27000 SEK 1974                    30450 SEK 1976

Rhinomugil corsula is an important freshwater mullet, now well established in the two major river systems of South India, namely the Vaigai and the Cauvery river systems. There are good prospects for R. corsula to be used in aquaculture. The influence of temperature, salinity and dissolved oxygen on the survival, energy utilization, and growth of R. corsula will be investigated.

/fish culture/ /rivers/

\*\*\* /mulletts/

## AQUACULTURE

Grantee A018: Mr M Borhan, Kanatir Experimental Fish Farm,  
El-Kanatir, El-Khairia, QUALIOUBIA, Egypt

"Fry production and artificial feeding of Cyprinus carpio and  
Tilapia sp."

IFS funding:           25300 SEK 1974                   Completed 1979

In Egypt there are many natural draining ponds which might be changed into controlled fish farms if they were cleared from weeds now in great abundance. At Abbasa, in the eastern part of the Nile delta, 40 hectares have been successfully converted into a controlled fish farm, but as facilities for reproduction are lacking, fry and fingerlings have to be transported from distant stations. Improved techniques for artificial spawning and care of fry will be studied. Different mixtures of supplementary feed in relation to natural feed and feeding habits will be investigated.

/fish culture/ /reproduction/

\*\*\* /ponds/ /carp/ /tilapia/

Grantee A019: Mr Daniel Rodriguez G, Repelon Fish Culture  
Research Station, INDERENA, Apartado Aéreo 849,  
CARTAGENA, Colombia

"Captivity growth and induced spawning of nicuro (Pimelodus  
clarias)"

IFS funding:           26600 SEK 1974

Mr Rodriguez G is trying to find out whether it is economically feasible to spawn and grow nicuro in captivity. During the next years, the maximum density compatible with fast growth will be studied as well as the use of inexpensive, locally-produced feed.

/fish culture/ /reproduction/

\*\*\* /fish nutrition/ /catfish/

## AQUACULTURE

Grantee A020: Mr Jonathan Wilson, Institute of Marine Biology and Oceanography, Fourah Bay College, University of Sierra Leone, FREETOWN, Sierra Leone

"Productivity studies of mullets"

IFS funding:                    28300 SEK 1974                    37600 SEK 1978

Preliminary studies have been made in Sierra Leone to investigate the feasibility of the development of brackish-water fish culture. In that context, grey mullets are expected to play an important role. Mr Wilson will study the feeding biology and feed requirements of the grey mullet (Mugil sp.) in relation to productivity. He will also investigate whether various steroids, including sex hormones added to the feed, may increase the growth per unit feed intake.

/fish culture/ /reproduction/

\*\*\* /fish feeding/ /mulletts/

Grantee A021: Dr Chua Thia Eng, School of Biological Sciences, Universiti Sains Malaysia, MINDEN, Penang, Malaysia

"Rearing of groupers with floating cage culture"

IFS funding:                    26200 SEK 1974                    28990 SEK 1976  
    36000 SEK 1978                    Completed 1983

Dr Chua will study the growth of Epinephalus tauvina (groupers) in floating cages in the Penang straits. The experiments will include studies of feed and conversion rates, suitable cage sizes and stocking rates at different culture sites, as well as the standardization of reproduction techniques, e.g., the rearing of larvae. The fish species chosen for the experimental study are in great demand in Malaysia, Singapore, and Hong Kong.

/fish culture/ /reproduction/

**AQUACULTURE**

Grantee A022: Dr Abdel Dia, Centre de Recherches  
Océanographiques, B P V 18, ABIDJAN, Ivory Coast

"Studies on Chrystictvs spp. in relation to productivity"

IFS funding:           23600 SEK 1974                   31680 SEK 1975  
                          32900 SEK 1978

There are five species of Chrystictvs in Ivory Coast, mainly found in lagoons and river mouths. Slightly changed conditions seem to affect growth in some species. Dr Dia will study the growth and reproduction patterns of Chrystictvs spp. under different feeding conditions. Reproduction studies, including induced spawning experiments will also be carried out. The ultimate aim will be to improve aquaculture production.

/fish culture/ /reproduction/

\*\*\* /fish feeding/ /catfish/

Grantee A023: Dr Piamsak Menasveta, Department of Marine  
Science, Faculty of Science, Chulalongkorn  
University, Phya Thai Road, BANGKOK 5, Thailand

"Reproduction, nutrition and tolerance of giant freshwater  
prawns"

IFS funding:           28700 SEK 1974                   13200 SEK 1975  
                          7830 SEK 1976                   20900 SEK 1979

Dr Piamsak Menasveta is studying improved methods of breeding giant freshwater prawns (Macrobrachium rosenbergii) under laboratory conditions. The offspring will be reared with different diets, the growth rate and survival rate will be evaluated, and the tolerance of the prawn to various pollutants will be determined by bioassay methods.

/shellfish culture/

\*\*\* /prawns/ /ponds/

**AQUACULTURE**

Grantee A024: Dr Victoria Paredes S, Departamento de Piscicultura y Oceanología, Universidad Nacional Agraria, Apartado 456, La Molina, LIMA, Peru

"Parasitic diseases in sabalo and gamitana artificially raised in Iquitos"

IFS funding: 12200 SEK 1974 36550 SEK 1979

Dr Paredes S will carry out a systematic study on the parasitic diseases that affect sabalo (Brycon sp.) and gamitana (Collosoma nigricans). Identification of the pathogenic organisms and the parasitic incidence will be attempted. The results will be used to prevent or treat the different diseases, as well as for sanitary control measures.

/freshwater fish/ /parasitology/

Grantee A025: Mr Victor Venturi H, Departamento de Piscicultura y Oceanología, Universidad Nacional Agraria, Apartado 456, La Molina, LIMA, Peru

"Utilization of agricultural by-products for trout breeding"

IFS funding: 15200 SEK 1974 37840 SEK 1979  
75000 SEK 1982

Trout cultivation is being promoted in Peru through public and private enterprises. However, the lack of locally-produced feed is a hindrance. Mr Venturi H will investigate how agricultural by-products may be used for artificial feeding of fish, and in particular if this could be applied for the breeding of trout. In Peru the government is encouraging fish farming on an industrial scale as well as on a small scale. Local fish farming is particularly valuable for the peasants in the mountain regions where the conditions for the culture of trout are good.

/fish culture/ /agricultural wastes/

\*\*\* /fish feeding/ /trout/

## AQUACULTURE

Grantee A046: Dr Sena de Silva, Department of Zoology, Ruhuna University College, MATARA, Sri Lanka

"A feasibility study of culture and polyculture of the grey mullet (Mugil cephalus) in the coastal waters of Sri Lanka"

IFS funding:                   24885 SEK 1975   20240 SEK 1977  
   Completed 1979

Large areas along the coast of Sri Lanka are not suitable for anything but fish culture; however, knowledge and tradition are lacking. Dr de Silva will study the availability of mullets in the Negombo lagoon; evaluate the optimum stocking density, and measure physical and chemical changes in water quality as well as seasonal changes in the primary production when ponds are irrigated by lagoons.

/fish culture/

\*\*\* /ponds/ /mulletts/

Grantee A047: Mr P Sita Reddy, Centre of Advanced Study in Marine Biology, PORTO NOVO 608 502, Tamil Nadu, India

"Biosystematic analysis on mullets of Porto Novo"

IFS funding:                   15800 SEK 1975   11880 SEK 1977

Morphologically very similar mullets (Mugil spp.) can differ significantly in feeding and breeding habits, growth rate, and nutritive value. This creates problems in mullet fish farming. Mr Reddy will use modern taxonomical methods for a systematic analysis of different mullet species, abundant in the pollution-free Coleroon-Vellar estuarine complex at Porto Novo. Efforts will be made to relate the results to biological questions of importance in fish culture, e.g., feed and feeding, rearing of eggs and larvae, control of parasites and diseases, and stocking density versus growth.

/fish culture/

\*\*\* /taxonomy/ /mulletts/



## AQUACULTURE

Grantee A048: Mr Maher Shafik, Institute of Inland Water and Fish Culture, 10 Hassan Sabry Street, Zamalek, CAIRO, Egypt

"Induced spawning of mullets in Egyptian ponds"

IFS funding: 19750 SEK 1975

Mr Shafik will work on acclimatization and induced spawning of Mugil cephalus and M. capito in lakes and ponds. These mullets are of great economic importance in Egyptian fisheries and are also extensively used in fish farms. As they do not normally spawn in enclosed water, research on induced spawning is essential to satisfy the great demand for fry.

/fish culture/ /reproduction/ /lakes/

\*\*\* /ponds/ /mulletts/

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Grantee A049: Dr Inam Tareen, Institute of Hydrobiology, Department of Zoology, Fen (Science) Faculty, EGE University, BORNOVA IZMIR, Turkey

"Fry rearing of mullets"

IFS funding: 23700 SEK 1975 Completed 1977

Dr Tareen will study intensive culture of Mugil cephalus under controlled conditions including work on artificial and natural feeding and induced spawning. Fry collected from the coast will be reared on a large scale and fed artificially in ponds in the Aegean region, where many estuaries, lagoons and bays are well suited for mullet production. Induced spawning will also be practised in the experimental ponds. The aim of the project is to ensure better survival of fry and adults of grey mullets. Insecticides and other pollutants have severely affected the fisheries in the region and improved fish culture is desirable.

/fish culture/ /fish breeding/ /reproduction/

\*\*\* /mulletts/ /ponds/

## AQUACULTURE

Grantee A091: Dr Khoo Khay Huat, School of Biological Sciences,  
Universiti Sains Malaysia, MINDEN, Penang,  
Malaysia

"Reproductive physiology of Malaysian fish with special emphasis  
on ovarian maturation and artificial spawning"

IFS funding:           15480 SEK 1975                           16800 SEK 1977  
                          20750 SEK 1980

Dr Khoo will study the reproductive physiology and endocrinology of Malaysian fish, particularly freshwater species (Ixora tambroides), and two marine fishes (Polynemus indicus and Fleutheronema tetradactylum). Both natural and induced spawning will be investigated. The final aim is to regulate their reproduction in order to supply fish fry for commercial culture.

/fish culture/ /freshwater fish/ /salt water fish/  
/reproduction/

Grantee A092: Dr Fisseha Meskal, Central Laboratory and  
Research Institute, Ministry of Public Health,  
P. O Box 1242, ADDIS ABABA, Ethiopia

"Development of carp and tilapia hatcheries and identification  
of suitable sites for introducing fish culture in Ethiopia"

IFS funding:           17160 SEK 1975                           Completed 1977

Fish production in man-made ponds is unknown in Ethiopia; pioneer work is required. Furthermore, fish fry must be produced and cheap feed made available. Sites suitable for fish ponds will be surveyed in different parts of Ethiopia, and in successive stages efforts will be made to stimulate fish culture throughout the country.

/fish production/

\*\*\* /carp/ /tilapia/ /ponds/

## AQUACULTURE

Grantee A093: Dr Sudip Banerjee, Department of Biochemistry,  
University College of Science, 35 Ballygunge  
Circular Road, CALCUTTA 700 019, India

"Nutritional studies and digestive physiology of air-breathing fish under different ecological conditions"

IFS funding:	11000 SEK 1975	14100 SEK 1978
	72000 SEK 1983	

In India there are 1 million hectares of ponds or tanks used for carp culture, but there are also 0.6 million hectares of swamps and derelict waters. As swamp reclamation is expensive, techniques of mixed culture of air-breathing fish species (Clarias, Heteropneustes, and Anabas) are being developed to utilize these swamps. Air-breathing catfish species are generally known to be carnivorous species, but they may also possess enzyme complexes indicating a capacity to digest carbohydrate material from plant origin.

/fish production/ /swamps/

\*\*\* /catfish/

Grantee A094: Dr Mala Perumal Sivalingam, School of Biological Sciences, Universiti Sains Malaysia, MINDEN, Penang, Malaysia

"Culture of local mollusc species in Malaysia"

IFS funding:	22880 SEK 1975	22000 SEK 1977
	25800 SEK 1979	Completed 1981

The major object of the project is to obtain a ready supply of seedlings of molluscs for cultivation on a larger scale. Initially, various kinds of molluscs which could be cultured on a commercial basis will be investigated. Spawning seasonality under natural conditions and possibilities of induced spawning will be studied. Different micro- and macro-plankton feed will be tested to reduce mortality and increase growth rate of the seedlings.

/molluscs/ /shellfish culture/

**AQUACULTURE**

**Grantee A095:** Mr Libardo Buchelli, Proyecto de Acuicultura,  
Universidad de Nariño, Apartado Aéreo 279, PASTO,  
Colombia

"Fish production in freshwater in Nariño, Colombia"

IFS funding:           28600 SEK 1975                   32900 SEK 1978  
                          36335 SEK 1979

Mr Buchelli will try to raise native fish with a high rate of feed conversion in cold freshwater ponds in the district of Nariño. Species of possible commercial value will be collected in the lakes and rivers of the high Andes. After identification, the biology of the selected fish and the conditions of their habitats will be studied in order to find out the best methods for future fish culture development in the area.

/fish culture/ /fish production/

\*\*\* /ponds/ /trout/

**Grantee A097:** Dr Rafael Guerrero III, Technology Research  
Center, Buendia, Makati, MANILA, Philippines

"Development of techniques for massive production of tilapia"

IFS funding:           30800 SEK 1975                   35200 SEK 1977  
                          26400 SEK 1979

Cage culture of tilapia is still in the experimental stage in the Philippines, and Dr Guerrero III will ultimately assess its commercial value. He will study feed formulations using locally-available ingredients and determine feeding parameters and economy of production. Promising results obtained will be demonstrated in the field (in reservoirs, lakes, and streams) with the cooperation of public and private agencies.

/fish culture/

\*\*\* /tilapia/ /fish nutrition/ /cages/

**AQUACULTURE**

Grantee A102: Mr Sergio Martinez, Sección de Investigaciones,  
Instituto de Fomento Nacional, Apartado 628,  
MANAGUA, Nicaragua

"Project scheme on fish culture"

IFS funding: 22000 SEK 1976 Completed 1980

Mr Martinez will carry out pond culture experiments with three species (Tilapia sp., Cichlasoma managuensis, Rhamdia sp.) in order to obtain information on growth rate, influence of different feed and on other parameters influencing the fish culture productivity. The project will also include investigations on artificial feeding and breeding in order to reduce the mortality of fry in the ponds.

/fish culture/ /freshwater fish/

\*\*\* /ponds/

Grantee A104: Dr Stephan Dadzie, Department of Zoology,  
University of Nairobi, P O Box 30197, NAIROBI,  
Kenya

"Pond culture of tilapia and other commercially important fish species"

IFS funding: 13640 SEK 1976 Completed 1980

Dr Dadzie will raise tilapia only (monoculture), as well as in combination with other fish species (polyculture), e.g., with carp (Cyprinus sp. and Labeo sp.). In the latter case it is hoped that each species will occupy a feeding niche different from the others. In this way competition for food will be reduced and maximum growth will be realized within the shortest possible time. Dr Dadzie will also try to establish monosex (males) culture techniques of tilapia. Fertilizers, e.g., lime and cobalt, will be added to promote growth.

/fish production/

\*\*\* /polyculture/ /carp/ /tilapia/ /ponds/

**AQUACULTURE**

Grantee A105: Mr Alexandre Rabelahatra, Département de  
Recherches Forestières et Piscicoles, CENRADERU,  
BP 904, Ambatobe, ANTANANARIVO, Madagascar

"Improvement of artificial carp fry production in laboratory"

IFS funding:                    35200 SEK 1976                    36000 SEK  
1978

Mr Rabelahatra wants to improve laboratory techniques for artificial fry production in Madagascar. Maturity control will be made by pituitary injections. The eggs will be artificially spawned and containers will be used to hatch eggs and rear the fry. Feed for the fingerlings will be produced locally. Mr Rabelahatra aims to produce fingerlings in local laboratories to avoid long transportation to fish farms, as transport is critical for the fingerlings.

/fish culture/ /reproduction/

\*\*\* /carp/

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Grantee A106: Mr Purwanto Joko, Faculty of Fisheries, Institut  
Pertanian Bogor, (IPB), Jalan Raya Pajajaran,  
BOGOR, Indonesia

"A new trial of stocking of brackish-water ponds with Lates -  
Tilapia (predator - prey)"

Brackish-water ponds in Indonesia are exploited little and pond techniques and farming systems are underdeveloped. The rate of stocking is very low due to lack of fry of the traditionally farmed milkfish. Mr Joko aims at introducing Lates calcalifer in these ponds and at the same time Tilapia will be farmed, naturally fed with the plankton of the water, to produce fry to feed the Lates. Mr Joko will also investigate the possibilities of conditioning young Lates to feed on non-living feed in case the Tilapia fry is not enough to feed the Lates population.

/fish culture/

\*\*\* /ponds/ /lates/ /tilapia/

## AQUACULTURE

Grantee A107: Dr Thavamani Pandian, School of Biological Sciences, Madurai Kamaraj University, MADURAI 625 021, India

"Physiological studies on culture of chosen prawns (Macrobrachium spp.)"

IFS funding:	22000 SEK 1976	22500 SEK 1978
	21250 SEK 1979	13200 SEK 1980
	Completed 1982	

Dr Pandian will try to develop methods for artificial incubation of eggs to relieve females of this task in favour of further production. Synchronized hatching will be used to ensure greater survival rates. Rearing techniques of the larvae of Macrobrachium idae idella and M. nobilii up to seed stage will be investigated. Dr Pandian aims at establishing a model farm to enable mass production of seed for supply to local prawn farms.

/reproduction/ /shellfish culture/

\*\*\* /prawns/

Grantee A108: Dr Tarlochan Singh, Fisheries Development Authority Malaysia, 7th Floor, Wisma PKNS, Jalan Raja Laut, KUALA LUMPUR, Malaysia

"Physiology and culture of the giant freshwater prawn Macrobrachium rosenbergii"

IFS funding:	36960 SEK 1976	28200 SEK 1978
	Completed 1982	

Dr Singh will study the occurrence of osmotic and ionic stress of Macrobrachium rosenbergii juveniles: its migration from marine or brackish water into fresh water, and the development of their osmoregulatory ability. Digestive physiology studies will reveal the biochemical changes due to the migration. With this information, Dr Singh will attempt culture of larval-juvenile prawn culture in mangrove swamp areas which are often flooded by nutrient-rich water. The juvenile prawns should attain maturity in 6-8 months without any input of fertilizers or feed.

/swamps/ /shellfish culture/

\*\*\* /prawns/

## AQUACULTURE

Grantee A109: Dr Danai Limpadanai, Department of Marine Science, Chulalongkorn University, Phya Thai Road, BANGKOK 5, Thailand

"Culture of giant freshwater prawn (Macrobrachium rosenbergii)"

IFS funding:	33000 SEK 1976	12000 SEK 1977
	Completed 1979	

Dr Danai Limpadanai will investigate the possibilities of prawn culture in reservoirs, where conditions for growth to maturity should be possible. Spawning and hatching will take place in a nursing aquarium of regulated salinity. When reaching the post-larval stage, the prawns will be released into the reservoir. If good results from this study are obtained, prawn culture can be considerably increased by using the numerous reservoirs in Thailand for this purpose.

/reservoirs/ /shellfish culture/

\*\*\* /prawns/

Grantee A110: Mr Suchint Deetae, Department of Marine Science, Faculty of Fisheries, Kasetsart University, BANGKOK 9, Thailand

"Shrimp and prawn culture research, development and conservation"

IFS funding:	22000 SEK 1976	19800 SEK 1979
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This project aims at verifying the effect of tea seed cake used as a drug, harmless to shrimps, to control predator fish in shrimp ponds. Mr Suchint Deetae will study the effect of the drug on the predator fish and on the prawn. The lethal concentration of the drug will be determined. Affected sites and mechanisms will also be determined, as well as the adverse effect of the drug on tolerance of the experimental animals in relation to salinity and temperature. The possibility that the drug might inhibit sodium transport and consequently kill the animals will be investigated. The sodium concentration in body fluids in relation to salinity, temperature and concentration of the drug will be evaluated in order to be used as a basis for control of the predator.

/shellfish culture/

\*\*\* /prawns/ /ponds/ /predator control/



**AQUACULTURE**

Grantee A111: Dr Z Alamsyah, Faculty of Agriculture, Institut Pertanian Bogor, (IPB), Jalan Raya Pajajaran, BOGOR, Indonesia

The grantee is deceased

"The influence of different kinds of feed during the larval stadium of the giant gourami"

IFS funding:                    26400 SEK 1976                    Completed 1977

The giant gourami (Osphronemus) is a popular food in Indonesia. Its growth rate is very slow, and Dr Alamsyah will investigate whether this is due to its unusually short digestive tract. Feed with low digestibility given to the fry is expected to cause longer digestive tracts and thus increase the area of absorption. At a later stage, when fed ad libitum, this increased digestive capacity is expected to speed up the growth rate.

/fish culture/ /digestive system/

\*\*\* /fish nutrition/

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Grantee A112: Dr Bernabe Santelices, Laboratorio de Zoología, Instituto de Ciencias Biológicas, Universidad Católica de Chile, Casilla 114-D, SANTIAGO, Chile

"Production ecology of Chilean gelidiales (Rhodophyta spp.)"

IFS funding:                    28600 SEK 1976                    23520 SEK 1977  
    12900 SEK 1979                    57420 SEK 1982

The red algal genus Gelidium is represented in Chile by five species, three of which are of commercial value as agar producers. Scientific studies of these species are scarce. Dr Santelices will attempt to study the ecological factors limiting the growth, biomass production, and gel deposition both in the field and in the laboratory. Correlated field observations on the phenology, growth rates, and reproductive potentials and periodicities of these algae will support the formulation of a resource management programme for these economically important species. The experimental results in the laboratory will be used for their mass cultivation under controlled conditions.

/aquaculture/ /algae/

## AQUACULTURE

Grantee A137: Dr Flora Majid, BCSIR Laboratories, Dhanmondi,  
P O Box 5010, DACCA-5, Bangladesh

"Studies on growth, reproduction, nutrition and ecology of local algae of economic importance"

IFS funding:	31680 SEK 1976	7200 SEK 1977
	35200 SEK 1979	20000 SEK 1981

Algae grow abundantly in Bangladesh. Some are toxic but others are excellent sources of feed for fish, cattle, poultry and even human beings. The main objective will be to control harmful algae and to use the beneficial ones commercially. In order to achieve this goal, an extensive survey will be conducted of the common algal population of Bangladesh, and attempts will be made to control the toxic phytoplanktons. Physiological and ecological studies will be conducted with selected algae in the laboratory in order to ascertain growth factors and reproduction.

/aquaculture/ /feed production/ /algae/

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Grantee A177: Dr Ang Kok Jee, Faculty of Fisheries and Marine Science, Universiti Pertanian Malaysia, (UPM),  
SERDANG, Selangor, Malaysia

"Cage culture of Ikan jelawat (Leptobarbus hoevenii) and the giant gourami (Osphronemus goramy)"

IFS funding: 26100 SEK 1976

Dr Ang hopes to solve some of the basic problems for cultivation of Ikan jelawat and the giant gourami, such as optimum stocking rate in cages, food conversion, and its viability as a species for cage culture. Each cage measures 2 x 1.5 x 1 m and the fish will be stocked in cages at different stocking rates. The fish will be fed twice a day at 10% and 20% ration of its wet weight. The diet will consist either of trash fish or cockles. Measurement of weight and length of a least 25% of the population from each cage will be carried out bi-monthly. Water quality and other environmental properties (temperature, pH, oxygen content of the water) will be sampled regularly.

/fish production/

\*\*\* /fish nutrition/ /cages/

## AQUACULTURE

Grantee A178: Mr Cosmas Mumba, Fish Culture Division,  
Department of Fisheries, P O Box 100, CHILANGA,  
Zambia

"Large scale cultivation techniques of Tilapia andersonii, I. rendalli, and I. macrochir"

IFS funding: 30450 SEK 1976

Zambia is a landlocked country, and freshwater fish are in high demand. This project will be carried out in existing government fish ponds and will involve production of three Tilapia spp. Various amounts and types of fertilizers will be tested together with different fish feeds to determine the most productive and economic combination. Methods for extraction and incubation of eggs will also be established. The results of this project will be extended to local fish farmers by the publication of fish farming manuals.

/fish culture/ /reproduction/ /fertilization/

\*\*\* /ponds/ /tilapia/

Grantee A183: Dr Veerappan Muthukkaruppan, Department of  
Immunology, School of Biological Sciences,  
Madurai Kamaraj University, MADURAI 625 021,  
India

"An integrated approach to frog culture - developmental,  
immunological and ecophysiological studies in Rana tigrina"

IFS funding:	13050 SEK 1976	15400 SEK 1979
	16600 SEK 1980	20000 SEK 1981

Frogs have been extensively used for food as well as for biomedical research and teaching, and so the natural frog population is threatened. Dr Muthukkaruppan will carry out work on the Indian bull frog, Rana tigrina. This frog has a low fertility level and feeds only on live insects and worms. A schedule of hormone administration to induce spawning will be developed to ensure a maximum rate of fertilization. Suitable vaccines against common diseases will be sought. An ecological survey of the feeding and breeding habits will be made, and the nutritional and environmental requirements will be investigated.

/reproduction/ /animal nutrition/ /vaccines/

\*\*\* /frogs/

**AQUACULTURE**

Grantee A189: Dr Rabindranath Sen Gupta, National Institute of Oceanography, DONA PAULA 403 004, Goa, India

"Aquaculture of bivalves, crustaceans, and fish using treated sewage"

IFS funding:                    30800 SEK 1977                    22000 SEK 1979

It is intended to establish proper use of waste materials for feed for bivalves, crustaceans and fish. Standardized methods will be established to obtain optimum growth of primary producers (phytoplankton) using pretreated sewage and ammonium effluents. Phytoplankton will be fed to cultivated bivalves, and conversion efficiency and relative growth will be studied. Detritus will be used to feed crustaceans and detritus-feeding polychaetes will be used to feed fish. Residual water will be used for the cultivation of algae. The monitoring of bacterial flora in the sewage, elimination of toxic substance, and maintenance of nutrients will also be taken into consideration.

/aquaculture/ /feed production/ /wastes/ /pollution control/

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Grantee A190: Mr Sjamsudin Adang Rifai, Faculty of Agriculture, Padjadjaran University, P O Box 418, BANDUNG, Indonesia

"Control of reproduction of tilapia cage culture"

IFS funding:                    22000 SEK 1977                    18700 SEK 1979  
   40880 SEK 1981

Tilapia reproduce quickly and it is, in fact, necessary to control excessive reproduction. It has been reported that Tilapia aurea do not reproduce in cages because of alteration of the reproductive behaviour. It is expected that reproduction of I. nilotica can be controlled when raised in cages, and considering its ability to grow rapidly, I. nilotica may have good prospects for cage culture in Indonesia. Dr Adang Rifai will use cages sized 0,7 m<sup>3</sup> suspended in ponds. Cages will be stocked with 7, 14, 21, 28, 35, and 42 fish each. One control pond with a stocking density of one fish/m<sup>2</sup> will be maintained. Growth rate will be observed once a month by sampling from the populations.

/fish culture/ /reproduction/

\*\*\* /tilapia/ /cages/

**AQUACULTURE**

Grantee A191: Dr Eddy Tan, School of Biological Sciences,  
Universiti Sains Malaysia, MINDEN, Penang,  
Malaysia

"Controlled breeding of the catfish Clarias macrocephalus and  
some river cyprinids"

IFS funding:           24640 SEK 1977                   32250 SEK 1979  
                          56000 SEK 1981

Dr Tan will study Clarias macrocephalus, Leptobarbus hoeveni and Puntius gonionotus by using routine histological techniques to evaluate the natural cycle of gonadal maturation. The role of gonadal steroids and purified gonadotrophins in inducing spawning will be studied, and the minimum doses required will be determined. Radio-immunoassay techniques will be developed to measure circulating gonadotrophin levels in the fish. Culture techniques to rear the fry to fingerling size will be developed. Suitable composition will be determined as well as optimum maintenance conditions for rapid growth.

/fish culture/ /reproduction/

\*\*\* /catfish/

Grantee A192: Dr Ahmad Sheri, Department of Zoology, University  
of Agriculture, FAISALABAD, Pakistan

"Fertilization of fish ponds and artificial feeding of  
cultivated fish"

IFS funding:           37400 SEK 1977                   35200 SEK 1979

The freshwater habitats in Punjab are already overfished and the establishment of a scientific and effective system for fish culture may form a viable basis for production of animal protein. Dr Sheri will concentrate on three fish species, Catla catla, Labeo rohita and Cirrhina mrigala. Tests will be carried out on experimental farms and in aquariums. Growth rate will be compared with different variables, such as stocking rates, feed rations and feed composition. Inorganic fertilizers will be added to the water and the increased productivity will be determined as well as its effect on the growth of the fish.

/fish culture/ /fertilization/

\*\*\* /ponds/ /carp/

## AQUACULTURE

Grantee A193: Mr Luis Alvarez-Lajonchere G, Empresa Nacional de Acuicultura, Carretera Central km 20 1/2, Cotorra, HABANA, Cuba

"Induced spawning and larval rearing of mullet (Mugilidae spp.)"

IFS funding:	35200 SEK 1977	36000 SEK 1978
	50000 SEK 1981	

The uncertain supply of mullet fry for rearing in Cuba has stressed the need to control the reproduction cycle. Mr Alvarez-Lajonchere G will carry out experiments on Mugil liza and M. curema to establish an adequate stock in captivity. Techniques and methods for capture and transportation will be developed and the adult mullets will be maintained for selective breeding and genetic work. A suitable in vivo method will be established to study ovarian development. Spawning will be induced by using hormone injections and stable techniques will be developed for the incubation of eggs and larval rearing for mass production.

/fish culture/ /fish breeding/ /reproduction/

\*\*\* /mullet/

Grantee A194: Mr El Nouman Babikor, Fisheries Research Centre, Agricultural Research Corporation, P. O Box 1489, KHARTOUM, Sudan

"Development of proper nursery management techniques for fry of Tilapia nilotica and Cyprinus carpio"

IFS funding: 35200 SEK 1977

Poor availability of fish seed and lack of proper nursery techniques have been a drawback for aquaculture in Sudan. Mr Babikor will initiate this scheme by breeding Tilapia nilotica and Cyprinus carpio according to procedures developed in other countries, e.g., Egypt. When the supply of fish seed and fry have been ensured, different techniques and feed regimes will be tried to select a breeding method adequate for Sudanese conditions. Techniques for proper pond management will also be developed.

/fish culture/ /fish breeding/ /feed/

\*\*\* /ponds/ /tilapia/ /carp/

## AQUACULTURE

Grantee A232: Prof Kandiah Arudpragasam, Department of Zoology,  
University of Sri Lanka, Colombo Campus, P O Box  
1490, COLOMBO 3, Sri Lanka

"Investigations on the cage culture of fish and the availability  
of fry in Sri Lankan waters"

IFS funding:                    24720 SEK 1977                    56000 SEK 1981

Various fish species will be tested for cage culture, and the most promising ones will be selected. Subsequent studies will determine the best cages, stocking density, feed and feeding rates, cage construction and location. The availability of fry will be surveyed at selected sites along the coast of Sri Lanka. Local fisherman will cooperate in the scheme by providing trash fish for feed and by servicing the cages.

/fish culture/

\*\*\* /cages/ /fish nutrition/

Grantee A234: Mr Aquiles Gonzalez S, Centro de Investigaciones  
y Fomento Piscícola Continental Tropical,  
(CINPIC), Universidad de Córdoba, Apartado Aéreo  
354, MONTERIA, Colombia

"Systems of polyculture of fishes in the warm inland waters of  
Colombia"

IFS funding:                    48000 SEK 1977                    50400 SEK 1981

Mr Gonzales S will start polyculture experiments in natural and artificial water reservoirs with the fish species Prochilodus reticulatus (bocachico), Brycon moore sinuensis (dorada) and Petenia umbrifera (mojarra negra). Fingerlings will be captured in their natural environment and transported to the water reservoirs where experiments will be made to determine the optimal stocking density and suitable proportions of the species in polyculture. Physical and chemical properties of the water will be regularly measured; and the occurrence of fungi, parasites, etc., will be investigated. Weight and growth increase will be controlled monthly. Monoculture of the same species will also be practised to compare the efficiency in both systems.

/fish culture/ /freshwater fish/ /reservoirs/

\*\*\* /polyculture/

## AQUACULTURE

Grantee A235: Dr Henry Costa, Department of Zoology, University of Kelaniya, KELANIYA, Sri Lanka

"Studies on breeding and seeding techniques suitable for culture and propagation of the giant prawn (Macrobrachium rosenbergii)"

IFS funding: 26400 SEK 1977

Giant prawn larvae will be bred in tanks using Artemia spp. as feed. Different types of locally-available diets of nauplii, cladocerans and copepods will then be related to growth and survival rates. When large numbers of juveniles can be produced, seeding experiments will be started in selected waters; and growth and survival rates will be studied along with physical and chemical parameters, organic matter, detritus and other impediments, e.g., predator fish. Also, the migration of the wild population of juveniles from a selected brackish-water body will be studied and an evaluation of this potential source of seeding material will be made.

/reproduction/ /shellfish culture/

\*\*\* /prawns/

Grantee A236: Dr Emmanuel Cruz, Freshwater Aquaculture Center, Central Luzon State University, Munoz, NUEVA ECIJA 2320, Philippines

"Use of sericulture waste- and by-products in aquaculture"

IFS funding: 26400 SEK 1977 22202 SEK 1980

To prevent erosion and sedimentation in the Pantabangan resettlement area, mulberry trees are being planted. Silkworm rearing will be established as a cottage industry. The waste- and by-products of sericulture will be utilized as feed in local fish farms. Dr Cruz will investigate their nutritive value and determine the deterioration of the nutrient composition during storage. Trials will be carried out with Tilapia nilotica, I. aurea, common carp (Cyprinus carpio), milkfish (Chanos chanos) and hito (Clarias macrocephalus). Silkworm wastes will also be compared with other animal waste as organic fertilizer in fish ponds.

/fish culture/ /freshwater fish/ /silkworms/ /agricultural wastes/

\*\*\* /ponds/



**AQUACULTURE**

Grantee A238: Mr Alexander Rantetondok, Department of Fisheries, Faculty of Animal Husbandry, Universitas Hasanuddin, UJUNG PANDANG, Indonesia

"Inventory and infestation of ectoparasites in milkfish (Chanos chanos) at Pandkajene (South Sulawesi)"

IFS funding:                    24000 SEK 1977                    Completed 1980

Milkfish farms in South Sulawesi have suffered from epidemics with severe losses in brackish-water ponds. The cause of the epidemics have been attributed to ectoparasites. To compare the relationship between fish deaths and parasites, Dr Rantetondok will survey the genera of parasites and the extent of infection. Random fish samples will be taken from brackish-water ponds four times a week at fish farms in Pangkep. The length and weight of the fish will be recorded, and the percentage of infected fish and the average number of parasites determined.

/fish production/ /parasitology/

\*\*\* /ponds/ /milkfish/

Grantee A262: Mr Mas'ud Sikong, Graduate School, Institut Pertanian Bogor, (IPB), Jalan Raya Pajajaran, BOGOR, Indonesia

"The effect of dietary protein and energy on growth of the tiger prawn, (Penaeus monodon)"

IFS funding:                    24000 SEK 197700

Feed is normally the largest single cost in prawn farming. Since penaeid prawns require diets with high protein contents, Mr Sikong will study whether protein requirements could be lowered by providing non-protein feed as sources of energy. Five crude protein levels and three energy levels at each protein level will be tried.

/feed/ /shellfish culture/

\*\*\* /prawns/

## AQUACULTURE

Grantee A263: Dr Philip Bwathondi, Tanzania Fisheries Research Institute, P O Box 9750, DAR ES SALAAM, United Republic of Tanzania

"Investigation into coastal fish culture in Tanzania"

IFS funding:            37600 SEK 1978                            29050 SEK 1980  
                              56000 SEK 1981

Dr Bwathondi will investigate the potential for marine fish production (not yet tried in the United Republic of Tanzania) and develop cultivation practices adapted to local conditions. The work will concentrate on rabbitfish. Site investigations will be carried out to assess water quality and abundance and seasonal distribution of fry. Studies on growth rates and feed requirement will be made and culture techniques with rafts and submerged cages developed.

/fish culture/ /fish breeding/ /salt water fish/

\*\*\* /cages/ /fish nutrition/

Grantee A264: Dr Thomas George, Fisheries Research Centre, Agricultural Research Corporation, P O Box 1489, KHARTOUM, Sudan

"The Chinese grass carp as a control agent for weeds infesting Gezira Agricultural Scheme, and as a food fish"

IFS funding:            37600 SEK 1978

The irrigation canal system of the Gezira Agricultural Scheme is often infested with aquatic weeds which provide breeding and nursery habitat for malaria carrying mosquitos and for schistosomiasis vector snails. The Chinese grass carp (Ctenopharyngodon idella) has already been introduced in the Sudan. When successful experiments on artificial breeding have been carried out, the carp will be released in the minor canals to control aquatic weeds and to some extent also mosquitos and vector snails. It is expected that the total production of fish for consumption will be increased by using the grass carp in polyculture systems in ponds, pens, and cages, where it would fill an unoccupied ecological niche.

/fish culture/ /fish breeding/ /irrigation systems/ /weed control/

\*\*\* /carp/

## AQUACULTURE

Grantee A285: Ms Luvriminda Guerrero, Philippine Council for  
Agriculture and Resources Research, LOS BANOS,  
Laguna, Philippines

"Studies on the biology and culture of molluscs and prawns"

IFS funding: 30150 SEK 1978 Completed 1982

The Central Luzon region is the main rice producing area in the Philippines. Fish, shrimps, and molluscs are cultivated in the paddies and are an important source food. However, the population of edible molluscs and shrimps has decreased because of the application of pesticides. To develop culture techniques, Ms Guerrero will study the biology of a few selected species to determine life cycle, growth, and reproduction in paddies, and optimum conditions. Monoculture and polyculture will be tried with and without rice. Attention will be given to the effect of pesticides on the cultured organisms by bio-assay and residue analyses by gas chromatography of tissues from cultured invertebrates.

/aquaculture/ /molluscs/ /crustacea/ /mixed farming/ /rice/  
/pesticide residues/

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Grantee A286: Dr José Carreon, College of Fisheries, University  
of the Philippines, (UP), Diliman, QUEZON CITY  
3004, Philippines

"Studies on the development of new technology for rearing Chanos  
chanos fry to stocking size"

IFS funding: 31500 SEK 1978 19350 SEK 1979  
35000 SEK 1981 Completed 1983

Milkfish (Chanos chanos) is increasingly important for fish production in the Philippines, but the supply of fingerlings does not meet the demand. Production is dependent upon the catch of wild fry, out of which only about 50% survive. Dr Carreon will design suitable culture containers to investigate the physical requirements for the milkfish fry under controlled conditions. Plankton and finely ground rice straw and chicken manure will be used in feeding experiments. The survival and growth of the fry, data on bacterial growth and water properties in the containers will be recorded.

/fish culture/ /fish breeding/

\*\*\* /fish feeding/ /milkfish/

**AQUACULTURE**

Grantee A287: Ms Elvira Alfonso, Centro de Investigaciones Marinas, Facultad de Biología, Universidad de la Habana, Av 1a No 2808, Miramar, HABANA, Cuba

"Massive culture of live feed for larvae of marine organisms"

IFS funding:	45000 SEK 1978	40000 SEK 1981
	97500 SEK 1983	

To ensure a supply of feed for larvae of commercial marine organisms during both winter and summer, simple methods to produce phytoplankton, rotifers, and copepods will be developed. To determine the best conditions for these organisms, different levels of salinity, fertilizers, and light will be tried. Other factors, such as pH, oxygen concentration, temperature, and variation of salinity due to evaporation and rainfall will also be investigated. Bio-assay techniques will then be used to determine the optimal feeding for survival, development and growth of commercially-cultured organisms: prawns (Penaeus spp.), stone crabs (Menippe mercenaria), mullets and oysters.

/aquaculture/ /shellfish/ /freshwater fish/

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Grantee A288: Dr Felicitas Piedad-Pascual, Aquaculture Department, Southeast Asian Fisheries Development Center, P O Box 256, ILOILO CITY, Philippines

"The energy-protein requirement of the Chanos chanos fingerling"

IFS funding:	38250 SEK 1978	23650 SEK 1979
	18300 SEK 1981	Completed 1983

Milkfish (Chanos chanos) is much appreciated in Southeast Asia. To increase the traditional milkfish production, supplementary feeding is necessary. Dr Piedad-Pascual will investigate the protein, carbohydrate and fat needs of the milkfish to formulate recommendations for suitable feeding. Fingerlings will be reared for 12 weeks under laboratory conditions. Randomized populations of fingerlings will be bred in aquariums where temperature and salinity are kept constant. Semi-purified diets with varied proportions of fat, carbohydrate, and protein will be tried to determine the optimum ratio between calories and protein to bring the fish to marketable size in the shortest time.

/fish culture/

\*\*\* /fish nutrition/ /milkfish/

**AQUACULTURE**

Grantee A326: Mr Sukumara Subramaniam, Institute of Marine Sciences, University of Dar es Salaam, P O Box 668, ZANZIBAR, United Republic of Tanzania

"Eye-stalk extirpation and its effect on moulting, growth rate, maturity and spawning in the penaeid prawns of Tanzania"

IFS funding: 26400 SEK 1979

In crustaceans, the moulting and gonadal development are controlled by hormonal secretions of the sinus and other glands located in the eye and eye-stalk. Previous investigations have shown that gonadal maturity can be hastened through eye-stalk extirpation. Juveniles and sub-adults of penaeid prawns will be collected. After length and weight measurement of the specimens, the distal half of the eye-stalk will be extirpated and the prawns will be reared in tanks by ad libitum feeding. Observations will be made on their moulting rate and rate of growth, as well as on the development of the gonads.

/reproduction/ /shellfish culture/

\*\*\* /prawns/

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Grantee A327: Dr Samson Oduleye, Department of Biological Sciences, University of Ilorin, P M B 1515, ILORIN, Nigeria

"The effect of exogenous pharmacological agents on the reproductive physiology of Tilapia nilotica"

IFS funding: 26400 SEK 1979

Tilapia are prolific, producing high population densities which result in slow growth and small individuals. Previous studies have indicated that wide-ranging effects on the reproduction and growth of tilapia can be achieved by exogenous therapy. Dr Oduleye will try to slow down the rate of reproduction of tilapia by using a dithiocarbamoyl hydrazine derivative, methallibure, as a therapeutic agent. Samples from the treated population will be taken regularly. The gonadosomatic ratio will be recorded and histological observations will be carried out continuously. Blood samples will be taken for laboratory hormone assays to evaluate the effect of the drugs on the reproductive cycle.

/fish culture/ /reproduction/

\*\*\* /tilapia/

**AQUACULTURE**

Grantee A328: Dr Joseph Royan, National Institute of Oceanography, DONA PAULA 403 004, Goa, India

"Culture of brine shrimp, Artemia salina"

IFS funding:           17600 SEK 1979                           20000 SEK 1981  
                          Completed 1983

The increasing demand for brine shrimp cysts in mariculture exceeds the present supply. In India, Artemia salina is obtained only in a few places from wild populations which are not stable, due to environmental changes. Dr Royan will make a survey of the distribution and ecology of the existing populations in India. Cysts will be collected and inoculation of local and foreign strains of A. salina will be made in selected salt pans. Laboratory studies will be carried out to identify suitable strains for different environmental conditions.

/feed production/ /shellfish culture/

\*\*\* /prawns/

Grantee A361: Dr Reungchai Tansakul, Department of Biology, Faculty of Science, Prince of Songkla University, HAAD YAI, Thailand

"Rearing giant prawn (Macrobrachium rosenbergii) larvae in brine"

IFS funding:           12900 SEK 1979                           56000 SEK 1981

The giant prawn (Macrobrachium rosenbergii) has been successfully cultivated in Thailand during recent years. The critical problems for large-scale rearing is the production of larvae, and raising them to the post-larval stage. Dr Reungchai Tansakul will try to develop a method of rearing prawn larvae in brine. Preliminary successful results have already been obtained, but the method needs improving. Larvae will be reared in artificial brine of different concentrations, and the efficiency and economics of this method will be evaluated and compared to methods using sea water. Successfully developed, the technique could help farmers in remote areas to produce their own larvae.

/shellfish culture/

\*\*\* /prawns/

## AQUACULTURE

Grantee A362: Mr Frederico Villamayor Junior, Philippine Root Crop Research and Training Center, Visayas State College of Agriculture, (VisCA), BAYBAY, Leyte 7127, Philippines

"Mixed farming of Tilapia nilotica and Colocasia esculenta"

IFS funding: 19350 SEK 1979

Fish is the main source of protein in the Philippines, but the supply of fish does not meet the demand. Mr Villamayor Junior will try to adapt the system of fish culture in connection with rice cultivation to mixed farming with gabi (Colocasia esculenta) and tilapia (Tilapia nilotica). Different stocking rates of male tilapia will be tried to determine the optimum rate. In addition, various levels of ground, dried leaves and unmarketable roots of cassava and sweet potato will be given to the fish to determine their potential as feed. Different levels of dried ipil-ipil leaves (Leucaena leucocephala) will be fed to mixed sexes of tilapia to determine its effect on the sexual maturity and spawning habits of the fish and its potential as fish feed.

/fish culture/ /fish breeding/ /mixed farming/ /food crops/

\*\*\* /tilapia/

Grantee A363: Mr Hugo Nava, Departamento de Piscicultura y Oceanologia, Universidad Nacional Agraria, Apartado 456, La Molina, LIMA, Peru

"Techniques of rearing larvae of the freshwater prawn (Cryphiops caementarius)"

IFS funding: 32250 SEK 1979 60000 SEK 1982

The freshwater prawn (Cryphiops caementarius) is much appreciated in Peru. The prawn population is declining due to overfishing and pollution of the waters. Initial trials to rear the prawn larvae have been promising, but the technique needs improving. Mr Nava will establish the correct composition of brackish water for the different larval stages, and determine the most adequate and economical larval feed. An overall economic evaluation of cultivation of Cryphiops caementarius will also be made.

/feed/ /shellfish culture/

\*\*\* /prawns/

## AQUACULTURE

Grantee A364: Mr Celso Beltran G, Corporación Regional de  
Desarrollo de Urabá, (COURPOURADO), Apartado  
Aéreo 51928, MEDELLIN, Colombia

"Methods and possibilities for the development of the culture of  
mangrove oysters on the Urabá gulf in Colombia"

IFS funding:                    34400 SEK 1979                    50000 SEK 1981

The natural population of the mangrove oyster (Crassostrea rhizophorae) has been much exploited and its culture at an industrial level would guarantee its preservation. Mr. Beltran G will determine appropriate culture sites in terms of depth, salinity, oxygen and plankton availability. Oyster spawn will be set in various parts of the estuary at different times of the year to determine the sites and the time to obtain the highest growth rates. Growth and mortality under natural and artificial conditions will also be compared.

/oyster culture/

Grantee A365: Mr Pedro Morales S, Universidad Nacional del  
Altiplano, Apartado 291, PUNO, Peru

"Cage culture of trout (Salmo gairdnerii) in the Titicaca Lake"

IFS funding:                    43000 SEK 1979

Lake Titicaca is situated at an altitude of more than 3 000 m, and with its rather low water temperature the prerequisites for trout culture should be promising. Mr Morales S will rear trout fry in the lake in net cages of different sizes and forms. Different stocking rates will be tried and adequate feed rations for maximum conversion developed. Successful methods will be further tried and economically evaluated.

/freshwater fish/ /fish production/ /lakes/

\*\*\* /cages/ /fish feeding/ /trout/



**AQUACULTURE**

Grantee A366: Ms Nephersonia Jumalon, Aquaculture Department,  
Southeast Asian Fisheries Development Center, P O  
Box 256, ILOILO CITY, Philippines

"Integration of Artemia spp. production with salt production and  
milkfish/prawn culture in earthen salt ponds"

IFS funding:	30100 SEK 1979	30000 SEK 1981
	60000 SEK 1982	76000 SEK 1983

The development of aquaculture in the Philippines is hampered by lack of feed to rear fish fry. Artemia spp. cysts, the feed commonly used, is imported and quite expensive. Ms Jumalon will investigate the feasibility of Artemia spp. cyst production in earthen salt ponds and adapt existing technologies to Philippines conditions. Trials will be made to establish the correct salinity, water management and fertilization requirement to allow Artemia spp. production without negative effects on the salt production.

/feed production/

\*\*\* /polyculture/ /milkfish/ /prawns/ /ponds/

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Grantee A367: Dr Uday Raj, Institute of Marine Resources,  
University of the South Pacific, (USP), P O Box  
1168, SUVA, Fiji

"Increasing the distribution of the edible freshwater clam,  
Batissa violacea"

IFS funding: 38700 SEK 1979

The freshwater clam (Batissa violacea) is popular in the Fiji Islands. It inhabits the tidal flats of all major rivers; this distribution seems to be governed by the inability of the larvae to colonize the river upstream, the limit occurring where the spring tide nullifies the current. Dr Raj will study the biological and environmental conditions in rivers with freshwater clam populations and confirm that their colonization of rivers beyond the limit of tidal influence is possible. Parent stock and larvae will be introduced into the upper parts of the rivers. The colonizing ability of the clams will be evaluated and comparative studies related to larval development and growth rate will be made on colonies from both natural and new habitats.

/molluscs/ /rivers/ /shellfish culture/

## AQUACULTURE

Grantee A368: Mr Francisco Seixas das Neves, Departamento de Oceanografia e Limnologia, Universidade Federal do Rio Grande do Norte, NATAL RN-59000, Brazil

"A survey of freshwater systems for the culture of prawns and other commercially important indigenous species"

IFS funding:                    21500 SEK 1979                    35000 SEK 1981

The northeastern region of Brazil is not very industrialized, and its economy relies mostly on agriculture and fisheries. There are many freshwater systems which should be suitable for aquaculture but which are not exploited. Mr Seixas das Neves will make a taxonomic survey of prawns within the region and identify the species of commercial value. Laboratory experiments will be carried out to obtain a successful parent population, and the larval development, feeding habits, and growth will be studied. Suitable culture techniques will then be developed.

/crustacea/ /animal feeding/ /shellfish culture/

Grantee A405: Ms Leoneza Herculano Soares, Departamento de Oceanografia e Limnologia, Universidade Federal do Rio Grande do Norte, NATAL RN-59000, Brazil

"An investigation into the biology and culture of the indigenous fish Mylossoma bidens and Colossoma bidens"

IFS funding:                    20750 SEK 1980

Aquaculture is little developed in the northeastern region of Brazil where it has good potential in view of the available natural and artificial freshwater systems. Ms Herculano Soares will make field studies to determine the distribution of the species. Data on growth rate and feeding habits will be collected and compared with corresponding data obtained under artificial conditions. Better knowledge of the biology of the species will be the basis for subsequent culture experiments.

/fish culture/ /freshwater fish/

\*\*\* /fish feeding/

## AQUACULTURE

Grantee A406: Dr Alassane N'Diaye, Faculté des Sciences,  
Université d'Abidjan, 04 B P 322, ABIDJAN 04,  
Ivory Coast

"Study of the reproduction physiology in some Ivorian fish species"

IFS funding: 20750 SEK 1980

This project is closely connected to Dr Kouassi's (IFS grantee A001). The development throughout the year of the endocrine glands affecting the reproduction in three fish species, Chrysichtys, Pomadasys and Alestes, will be studied under natural conditions. Corresponding studies will be carried out on the same species kept in ponds. To investigate their potential for aquaculture, experiments to induce spawning by means of hormonal treatment will be carried out.

/freshwater fish/ /reproduction/

\*\*\* /ponds/

Grantee A407: Mr Naib Iscandari, Fisheries Division, Ministry  
of Natural Resources, Private Mail Bag 435,  
FREETOWN, Sierra Leone

"Fish culture project (Tilapia nilotica)"

IFS funding: 41500 SEK 1980

A fish farming programme has been started at Makali in Sierra Leone. The ponds have been stocked with Tilapia nilotica, which will supply juveniles to fish farmers. Mr Iscandari will develop standard procedures for production of T. nilotica fry. Basic data on water quality requirements, growth rate, culture type (mono- or polysex culture) and stocking density will be collected. Feed made of locally-available material will be tested and evaluated from both the nutritional and economic points of view. The methods of pond culture and management can then be improved and adapted to local conditions.

/fish culture/ /fish production/

\*\*\* /fish feeding/ /tilapia/ /ponds/

## AQUACULTURE

Grantee A408: Dr Sam Prah, Institute of Aquatic Biology, P O  
Box 38, ACHIMOTA, Ghana

"Cultivation of the freshwater prawn, Macrobrachium vollehoveni  
in ponds in Ghana"

IFS funding: 41500 SEK 1980

A small hatchery will be established to produce a reliable supply of post-larval prawns of the West African species Macrobrachium vollehoveni. The post-larval prawns will be stocked in earthen ponds. Experiments on water quality, stocking densities, growth rate and pond management will be carried out. Artificial feeding and natural feeding, enhanced by fertilization, will be tested. The results of these studies will indicate critical stress conditions and the best period for harvesting and restocking. Economical evaluations of the programme will also be made.

/fertilization/ /animal breeding/ /shellfish culture/

\*\*\* /ponds/ /prawns/

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Grantee A409: Mr Abderrahmen Bou Ain, Département de Biologie,  
Faculté des Sciences et Techniques de Sfax, SFAX,  
Tunisia

"Controlled reproduction and breeding of two species of seaperch  
(Dicentrarchus labrax and D. punctatus)"

IFS funding: 41500 SEK 1980

The supply of marine fish in Tunisia varies considerably partly due to uncontrolled fishing. Mr Bou Ain will try to improve the supply of two highly appreciated species of seaperch (Dicentrarchus labrax and D. punctatus) by restocking lagoons. Induced spawning and artificial fertilization of the eggs will be used to ensure larvae production. Feeding experiments will be carried out to rear the larvae to stocking size. When successful results have been obtained for the two species, hybridization experiments will be made to combine their desirable characteristics.

/fish culture/ /fish breeding/

\*\*\* /seaperch/

## AQUACULTURE

Grantee A410: Mr Muchtar Ahmad, Faculty of Fisheries,  
Universitas Islam Riau, PEKANBARU, Riau,  
Indonesia

"An integrated aquaculture technology for small-scale farming"

IFS funding: 41500 SEK 1980

Economic and technical analyses of the present agricultural practices in the Riau province will be made, with emphasis on the production of sweet potato and chickens and the culture of the fish species Tilapia nilotica, I. mossambica and Helostoma temminckii. Mr Ahmad will then establish integration methods by determining suitable planting and stocking densities of land and ponds. Chicken manure will be used to fertilize the fish ponds, from which mud will be taken to fertilize land for sweet potato cultivation. Economic and technical analyses will be made and further trials carried out to improve the methods.

/fish culture/ /mixed farming/ /sweet potatoes/ /poultry/  
/manures/

\*\*\* /tilapia/

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Grantee A411: Dr Rita Adiyodi, Vatsyayana Centre of  
Invertebrate Reproduction, Department of Zoology,  
Calicut University, KERALA 673 635, India

"Edible crabs and prawns; studies on induced breeding and the culture of juveniles"

IFS funding: 41295 SEK 1980 54600 SEK 1981

Prawns and shrimps are among the most important marine products in India. Losses during hatching and juvenile stages are very high due to predation and other factors. Dr Adiyodi will try to increase the productivity of crabs (Paratelphusa sp.) and prawns, (Macrobrachium and Penaeus spp.) by investigating factors which affect maturation, egg production and spawning, such as hormone production, feeding, temperature, and salinity of the water. Methods to produce fertilized eggs with stored semen will be established, as well as special hatcheries relieving the female from parental duties. The optimum conditions for survival and fattening of the juveniles will then be studied.

/crustacea/ /reproduction/ /shellfish culture/

**AQUACULTURE**

Grantee A445: Dr Sena de Silva, Department of Zoology, Ruhuna University College, MATARA, Sri Lanka

"Investigations into the best production potential of Etroplus suratensis and the characteristics of suitable water bodies"

IFS funding: 29050 SEK 1980

There is a large number of freshwater reservoirs available for semi-intensive fish culture in Sri Lanka. Dr de Silva will investigate the aquaculture potential of an indigenous cichlid species, Etroplus suratensis. Their breeding grounds, water quality requirements, feeding habits and predators will be studied as well as spawning success and viability of eggs. Experiments on hatching, larval mortality and growth will be made and the approximate composition of different species in the reservoir determined.

/fish culture/ /fish breeding/ /reproduction/ /freshwater fish/  
/reservoirs/

Grantee A450: Mr Jorge Builes J, Corporación Regional de Desarrollo de Urabá, (CORPOURABA), Apartado Aéreo 51928, MEDELLIN, Colombia

"Fish culture development programme of the sabaleta (Brycon henni) in Urabá, Colombia"

IFS funding: 44000 SEK 1980

The sabaleta (Brycon henni) is a promising fish species in Urabá, and they could provide the inhabitants with a cheap source of protein. Mr Builes J will study the feasibility of culturing sabaletas in ponds and drainage canals. He will also study their population density, food conversion, induced spawning and hatchery methods.

/fish culture/ /fish breeding/ /reproduction/ /freshwater fish/

\*\* /ponds/

**AQUACULTURE**

Grantee A451: Dr Shivaji Srivastava, Department of Zoology,  
S M M Town Post-Graduate College, BALLIA 277 001,  
India

"Breeding and feeding behaviour of air-breathing fishes (Channa punctatus, Clarias batrachus and Heteropneustes fossilis)"

IFS funding: 44000 SEK 1980

In spite of their commercial importance and potential as a source of protein and phosphorus, air-breathing fishes are not systematically cultivated. Dr Srivastava will study the breeding and feeding habits of Channa punctatus, Clarias batrachus and Heteropneustes fossilis. This will also involve observations on the cyclic changes in the gonads and their fecundity. Attempts will be made to study the possibility of inducing spawning through corticosteroid treatment.

/fish culture/ /fish production/ /reproduction/

\*\*\* /catfish/

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Grantee A452: Dr Catalino de la Cruz, Freshwater Aquaculture  
Center, Central Luzon State University, Munoz,  
NUEVA ECIJA 2320, Philippines

"Feasibility of rice straw as fish feed"

IFS funding: 36255 SEK 1980

Rice straw is an abundant agricultural by-product in the Philippines. Although its value as feed is at present limited to ruminants, it could be used for feeding fish in fish ponds if its digestibility and protein content could be improved. Dr de la Cruz will try to improve the digestibility of rice straw by physical and chemical treatment. He will also induce microbial growth during the decomposition of straw, thus providing the protein component. Straw feed formulation and analysis will be carried out. Feeding tests will initially be made with Tilapia spp. Performance of the feed in fish production will also be tested in aquariums and in ponds.

/fish culture/ /feed production/ /agricultural wastes/

\*\*\* /ponds/ /tilapia/

## AQUACULTURE

Grantee A453: Dr Romeo Fortes, Brackishwater Aquaculture Center, College of Fisheries, University of the Philippines in the Visayas, P O Box 138, ILOILO CITY, Philippines

"Development of culture techniques for the seabass (Lates calcarifer)"

IFS funding: 35200 SEK 1980

Although fish species of commercial importance abound in the coastal and estuarine areas of the Philippines, only milkfish and prawns have so far been cultured in ponds. Culture techniques for tilapia have recently been developed, while those for mullets are still at the experimental stage. Recent reports on aquaculture published in the Philippines emphasized the need for new species in order to utilize more efficiently the existing ponds by using several species in polyculture. Dr Fortes will develop culture techniques and determine densities for seabass (Lates calcarifer) in ponds, pens and cages. Stocking ratios for polyculture with other species of fish will also be determined.

/fish culture/

\*\*\* /polyculture/ /ponds/

Grantee A454: Dr Lai Hoi Chaw, School of Biological Sciences, Universiti Sains Malaysia, MINDEN, Penang, Malaysia

"Induced spawning of estuary grouper (Epinephelus salmoides)"

IFS funding: 33000 SEK 1980

The development of aquaculture in Malaysia is hindered by an insufficient seed supply which is now subject to seasonal and meteorological influences. Dr Lai will induce the spawning of groupers by varying the environmental conditions such as temperature and photoperiod and/or by intra-peritoneal injection of various hormones.

/fish culture/ /fish production/ /reproduction/

\*\*\* /groupers/



## AQUACULTURE

Grantee A455: Ms Bessie Ong, School of Biological Sciences,  
Universiti Sains Malaysia, MINDEN, Penang,  
Malaysia

"Prevention of vibriosis in cultured marine fishes by  
vaccination"

IFS funding: 26400 SEK 1980

Fish diseases are a threat to profitable cage culture exploitations in Malaysia. Present records show that a single outbreak of disease in a farm can result in 90% fish mortality. A vaccine for vibriosis has been successfully prepared and marketed in the United States but cannot be used in Malaysia since the pathogen involved is a warm water species. Ms Ong will produce a vaccine from local strains of bacteria that is both effective and practical to use for the prevention of vibriosis in groupers, (Epinephelus salmoides) and other cultured fishes such as the snapper (Lutianus sp.), seabass, (Lates sp.), and pomfrets (Stromateoides sp.) and will test it under local environmental conditions.

/fish culture/ /freshwater fish/ /vaccines/

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Grantee A456: Mr Tran Mai Thien, Research Center of Inland Fish  
Culture, DINGH BANG, Ha Bac, Viet Nam

"Carp breeding in Viet Nam"

IFS funding: 44000 SEK 1980

The grantee will collect all varieties of domestic and introduced carps in Viet Nam and study the growth rate, food conversion, reproductive behaviour and consumer preferences in order to breed a domestic strain with optimum characteristics.

/fish culture/ /fish breeding/

\*\*\* /carp/

**AQUACULTURE**

Grantee A457: Ms Maria Saavedra, Instituto Nicaraguense de la Pesca, P O Box 2020, MANAGUA, Nicaragua

"Effect of organic and inorganic fertilization and formulated food in Tilapia aurea males using different stocking rates"

IFS funding: 44000 SEK 1980

Aquaculture has until now not been developed in South or Central America, in spite of its great potential in these areas.

Ms Saavedra will study different aspects of feeding, growth and management of Tilapia aurea. Different fertilizers will be used to obtain optimal productivity of the water, and different stocking rates will be tried. The effect of additional feeding will also be tested. Based on these experiments, guidelines for semi-intensive I. aurea culture in the region can be established.

/fish culture/ /fish production/

\*\*\* /fish feeding/ /tilapia/

Grantee A458: Mr Carlos Lacayo L, Instituto Nicaraguense de la Pesca, P O Box 2020, MANAGUA, Nicaragua

"Basic studies of oyster culture"

IFS funding: 44000 SEK 1980

Oyster culture has not yet been developed in Nicaragua and Mr Lacayo L will attempt to collect the necessary data and experience for successful commercial production. The growth rates, spawning season, and intensity of seed fixation will be studied under different local conditions.

/oyster culture/

## AQUACULTURE

Grantee A459: Mr Julio Moscoso C, Departamento de Piscicultura y Oceanología, Universidad Nacional Agraria, Apartado 456, La Molina, LIMA, Peru

"Use of cowshed manure in fish ponds of the Central Amazon region (Satipo)"

IFS funding:                    40040 SEK 1980                    60000 SEK 1983

Mr Moscoso C will study the use of cowshed manure in fish ponds and determine a cheap and simple technique to improve their natural feed. The experiments will be carried out in six fish ponds of 500 m<sup>2</sup> each with the following species: tilapia (Sarotherodon niloticus), common carp (Cyprinus carpio), and probably silver carp (Hypophthalmichthys molitrix).

/fish culture/ /feed supplements/ /manures/

\*\*\* /ponds/ /tilapia/ /carp/

Grantee A502: Mr Job Ochieng, Kenya Marine and Fisheries Research Institute, Kisumu Laboratory, P O Box 1881, KISUMU, Kenya

"Biological means of increasing fish production in ponds, dams and other smaller lakes in Kenya"

IFS funding:                    40000 SEK 1981

There are in Kenya about 8 000 acres of fish ponds, but their management has been left to farmers, who could benefit from improved aquaculture management techniques. Mr Ochieng will determine the best conditions for optimum production in ponds of five species in polyculture by manipulating various biological procedures, e.g., the use of fast-growing species, efficient species combination, stocking rates and pond fertilization rates. The species involved are Cyprinus carpio, Macropterus salmoides, Sarotherodon leucostictus, Sarotherodon niloticus and Tilapia zilli. The results will be used to set up eight pilot, regional state-owned dams to be used as demonstration centres and a possible prelude to restocking smaller, depleted lakes in Kenya.

/freshwater fish/

\*\*\* /polyculture/ /ponds/

**AQUACULTURE**

Grantee A503: Ms Lila Ruangpan, Department of Fisheries,  
Brackishwater Fisheries Division, Kasetsart  
University, BANGKOK 9, Thailand

"Development of vaccine for control of infectious diseases in  
prawns"

IFS funding:           42500 SEK 1981                   15000 SEK 1983

Preventive treatment and control are necessary in Thailand where aquaculture is now threatened by pests and diseases. Ms Ruangpan will develop and test a vaccine for vibriosis and other epizootic diseases in prawns. She will compare the efficiency of the vaccine using different methods of administration (oral and intraperitoneal injection). She will also study the efficiency of formalin-killed and heat-killed vaccines.

/vaccines/ /shellfish culture/

\*\*\* /prawns/

Grantee A504: Dr Lim Phaik Ee, School of Biological Sciences,  
Universiti Sains Malaysia, MINDEN, Penang,  
Malaysia

"Studies on the nutrition and the preparation of artificial  
feeds for some commercially important cultured fish in Penang"

IFS funding:           45000 SEK 1981

The estuary grouper has been successfully cultured in the coastal waters of Penang, but further studies are necessary to develop supplementary feed or artificial diets in order to promote proper nutrition and maximum growth. Dr Lim will identify the nutritional requirements of fish species selected for intensive culture (in particular, groupers) and formulate appropriate diets from locally-produced ingredients. She will determine the quantitative requirements of the essential amino-acids.

\*\*\* /fish nutrition/ /groupers/

**AQUACULTURE**

Grantee A505: Mr Leoncio Ruiz Rios, Departamento de Piscicultura y Oceanología, Universidad Nacional Agraria, Apartado 456, La Molina, LIMA, Peru

"Rearing of larvae of the Amazon fish Brycon sp. and Collossoma sp."

IFS funding: 40000 SEK 1981

The lack of an adequate supply of fingerlings of Amazon fish hinders the development of aquaculture in Peru. Mr Ruiz Rios will study larval rearing and survival rates using different feeds and different stocking densities. At a later stage, induced reproduction by hormone treatment will be tested.

/fish culture/ /fish breeding/ /reproduction/

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Grantee A506: Dr Enrico de Oliviera, Instituto de Biociências, Universidade de São Paulo, Caixa Postal 11461, SAO PAULO, Brazil

"Cultivation of agar producing algae"

IFS funding: 40000 SEK 1981

Agar utilization in Brazil relies mostly on imports, as the natural populations of Gracilaria spp. have been over-harvested. Dr de Oliviera intends to develop a programme for the cultivation of Gracilaria spp., a red algae processed for agar production. He will also develop a suitable methodology for farming seaweeds in the tropics and selection of productive strains.

/aquaculture/ /algae/

## AQUACULTURE

Grantee A507: Mr Li Sifa, Shanghai Fisheries College, 334  
Jun-Gong Road, SHANGHAI, China

"A comparative study of strains, and selective breeding of  
Chinese farm fish"

IFS funding: 40000 SEK 1981

Chinese farm fish, such as silver carp (Hypophthalmichthys molitrix), big head (Aristichthys nobilis), grass carp (Ctenopharyngodon idellus), black carp (Myopharyngodon piceus) and Wuchan fish (Megalobrama amblycephala), occupy a very important place in freshwater fishery in China and their production has been increased by expanding culture areas and improving rearing techniques. Mr Li intends to improve their production further by selective breeding and genetic improvement. He will evaluate the characteristics (growth, survival) of various strains of Chinese carp, in particular wild strains from Yangtze, Pearl rivers, and local domestic strains. He will also determine the strains with the best potential for increasing fish productivity in different waters (ponds, lakes, reservoirs). The above studies will be done with a view to producing and evaluating the hybrids' offspring.

/fish culture/ /fish breeding/

\*\*\* /carp/

Grantee A508: Mr Orton Msiska, Fisheries Department, P O Box  
44, DOMASI, Malawi

"A study of mpasa (Opsaridium microlepis) and (Labeo mesops) as  
subjects for aquaculture in Malawi"

IFS funding: 25000 SEK 1981

Mr Msiska will study the cultural prospects of the mentioned species as subjects for intensive aquaculture in Malawi. He will initially study induced spawning and survival and growth of fry. Later, growth rates of fingerlings in ponds will be determined using different feeds, and optimum stocking densities will be investigated. Different cultivation techniques will be compared.

/fish culture/ /fish breeding/

\*\*\* /ponds/

**AQUACULTURE**

Grantee A509: Dr Gulroo Sufi, Department of Zoology, University of Dacca, DACCA-2, Bangladesh

"The effects of hormones on the maturity of Shinghi fish (Heteroneutes fossilis) and carp (Hypophthalmichthys molotrix)"

IFS funding: 40000 SEK 1981

There is a great demand for carp and Shinghi fish in Bangladesh, yet no physiological studies related to maturation have been carried out. In order to ensure a constant supply of fish fry throughout the year, Dr Sufi will study the rearing of these fish in artificially constructed tanks or ponds and induce maturation of the gonads by hormonal treatment. He will also attempt to induce off-season maturation of the gonads.

/fish production/ /reproduction/

\*\*\* /carp/ /ponds/

Grantee A541: Mr Francis Oduro-Boateng, Technology Consultancy Centre, University of Science and Technology, KUMASI, Ghana

"Cage feeding to study digestibility and conversion rate of some formulated feeds for Tilapia discolor in Lake Busumtwi"

IFS funding: 54040 SEK 1981

Mr Oduro-Boateng will design and fabricate inexpensive cages for fish culture, using locally-available materials. He will then investigate the best feed rations for cage culture of Tilapia discolor in Lake Busumtwi. Information about the cage culture system thus devised will be disseminated to local fishermen around Lake Busumtwi.

/fish culture/ /lakes/

\*\*\* /fish nutrition/ /tilapia/ /cages/

## AQUACULTURE

Grantee A542: Mr Kumar Sumantadinata, Faculty of Fisheries,  
Institut Pertanian Bogor, (IPB), Jalan Raya  
Pajajaran, BOGOR, Indonesia

"Genetic improvement of common carp (Cyprinus carpio) in  
Indonesia"

IFS funding:                    56000 SEK 1981                    64000 SEK 1983

Common carp is an important fish of freshwater ponds in Indonesia. Improvement of culture techniques have increased the production, which is, however, far below its potential. To attain a higher yield, genetic improvement is a necessity. During the first period of research, Mr Sumantadinata will make an inventory of the status and problems of carp culture and determine the genetic differences between races using morphological and electrophoretic markers. Growth rate differences between races will then be determined. Finally, a breeding programme will be established to improve growth and feed conversion rates.

/fish culture/ /fish breeding/

\*\*\* /ponds/ /carp/

Grantee A543: Dr Nataraja Murugan, Department of Zoology,  
Madura College, MADURAI 625 011, India

"Studies in mass culture of fish using daphnids as feed"

IFS funding:                    28000 SEK 1981                    25200 SEK 1983

The economic value of daphnids, an important group of micro-crustaceans, has already been proven. Recently, larvae of prawns, mullets and a number of marine fish larvae have been reared using suitable types of cultured plankton for feed. Dr Murugan will attempt to culture Daphnia carinata king and Ceriodaphnia cornuta on a large scale as feed for larvae of fish rich in energy. Larvae of three main freshwater fish species will be used for experiments: Catla catla, Cirrhinus mrigla and Cyprinus carpio.

/aquaculture/ /crustacea/ /freshwater fish/ /salt water fish/



**AQUACULTURE**

Grantee A544: Dr Thanumalaya Subramoniam, Department of  
Zoology, University of Madras Chepauk, Triplicane  
P O, MADRAS 600 055, India

"Reproductive physiology of the edible crab (Scylla serrata)"

IFS funding:                   40320 SEK 1981                   39200 SEK 1983

Dr Subramoniam will study the reproductive physiology of Scylla serrata in its natural environment, Pulicat Lake. His experiments will include the study of environmental as well as endocrinological factors governing the breeding biology of this species. The results obtained are expected to be useful for the cultivation of these crabs and ultimately for increasing their propagation.

/reproduction/ /lakes/ /shellfish culture/

\*\*\* /crabs/

Grantee A545: Dr Jayampathy Samarakoon, Department of Zoology,  
University of Kelaniya, KELANIYA, Sri Lanka

"Experimental raft culture of the green mussel Mytilus viridis  
in Sri Lanka "

IFS funding:                   42000 SEK 1981                   63750 SEK 1983

There is a strong local demand for mussels. Green mussel spat collected from natural beds will be suspended from a raft using four different methods. Growth will be regularly measured. Seasonal changes in spat availability will be assessed from natural beds as well as from spat collectors attached to the raft. Dr Samarakoon intends thus to determine: (1.) if spat of green mussel grows to a marketable size in eight months, and (2.) the seasonal changes in abundance and availability of spat.

/shellfish culture/

\*\*\* /mussels/

## AQUACULTURE

Grantee A546: Mr Richard Pretto M, Dirección Nacional de Acuicultura, Ministerio de Desarrollo Agropecuario, Santiago de Veraguas, PANAMA 5, Panamá

"The effect of organic fertilization on the economics of penaeid culture in Panamá"

IFS funding: 33600 SEK 1981 80000 SEK 1983

In order to decrease the cost of prawn feed, thereby promoting the expansion of their culture in Panamá, Dr Pretto M will evaluate the nutritional value of agricultural by-products (chicken and hog manure) as potential organic fertilizers in earthen ponds. Different water quality parameters will be monitored in order to determine the maximum dosage of organic fertilizer that can be employed. Feeding experiments will also be carried out.

/shellfish culture/ /manures/

\*\*\* /prawns/

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Grantee A547: Mr Guilherme de Medeiros, Departamento de Oceanografia e Limnologia, Universidade Federal do Rio Grande do Norte, NATAL RN-59000, Brazil

"Survey of edible bivalves (Mollusca bivalvia) of the coast of Rio Grande do Norde, and their viability for aquaculture"

IFS funding: 28000 SEK 1981

During the initial phase of the project, a survey of the coastal region of the State of Rio Grande do Norde will be carried out to get an overall idea of the bivalve fauna. The study is also expected to give an idea of the general ecology of the region, with particular reference to the bivalve fauna. Attempts will also be made to designate regions which are suitable for aquaculture of appropriate bivalve species.

/ecosystems/ /shellfish culture/

## AQUACULTURE

Grantee A548: Mr Suppachi Summawuthi, Department of Fisheries,  
Brackishwater Fisheries Division, Kasetsart  
University, BANGKOK 9, Thailand

"Spawning and larval rearing of oysters (Crassostrea lugubris)"

IFS funding: 39200 SEK 1981

Oyster cultivation in Thailand is still highly dependent on the collection of seeds from natural sources. The availability of such seeds is unreliable due to seasonal changes, pollution and predators. In order to use the vast areas suitable for oyster cultivation in Thailand, the grantee will use spat from hatcheries and develop an efficient method for spawning, larval rearing, and spat collection of Crassostrea lugubris.

/reproduction/ /shellfish culture/

\*\*\* /oysters/

Grantee A549: Mr Clementino Camara Neto, Departamento de  
Oceanografia e Limnologia, Universidade Federal  
do Rio Grande do Norte, NATAL RN-59000, Brazil

"Experimental culture of Hypnea musciformis and Gracilaria spp."

IFS funding: 22400 SEK 1981

Mr Camara Neto will experiment with the culture of Hypnea musciformis and Gracilaria spp. on rafts placed in protected coastal regions. Rectangular frames suspended about 60 cm below the surface will carry sisal ropes of about 2 cm diameter. Pieces of algae will be fastened to these ropes at 3 cm intervals. He will also determine the depth at which maximum growth takes place by suspending a sisal rope from an anchored buoy. Laboratory studies will involve the utilization of effluents from culture experiments and the germination of carpospore of Gracilaria under laboratory conditions.

/algae/

## AQUACULTURE

Grantee A550: Mr José Solano M, Centro de Investigaciones y Fomento Piscícola Continental Tropical, (CINPIC), Universidad Nacional de Córdoba, Apartado Aéreo 354, MONTERIA, Colombia

"Mass production of larvae and fingerlings of dorada (Brycon moorei sinuensis)"

IFS funding: 50400 SEK 1981

Reproduction in captivity of the dorada has already been partly solved at CINPIC. Mr Solano M will now study the mass production of fingerlings of this species which is one of the most promising for intensive aquaculture in Colombia. The ultimate aim of this project is to satisfy the demand for dorada fingerlings in Colombia.

/fish culture/ /fish breeding/ /freshwater fish/

Grantee A584: Mr Dhaneshwar Goorah, Ministry of Agriculture, Fisheries and Natural Resources, 3rd Level, Registrar General's Building, PORT LOUIS, Mauritius

"Integrated fish and duck cultivation in the context of village development"

IFS funding: 40600 SEK 1982

Mauritius is heavily dependent on imports for food, having concentrated all its production on sugar products. The only agricultural by-product which is available in quantity is therefore molasses. Mr Goorah will develop a duck feed which is based on molasses and cereals. He will also try to develop efficient practices for rearing ducks. The droppings of the ducks will then be used as feed/fertilizer in ponds to raise Chinese and Indian carps, as well as giant freshwater prawns. The integrated system of fish and duck breeding will be designed and evaluated according to its economic benefits.

/mixed farming/ /feed production/ /fertilizers/ /fish/  
/shellfish/

\*\*\* /ducks/

**AQUACULTURE**

Grantee A585: Prof Francisco Geraldés S, Estacion Experimental de Pesquerias y Acuicultura, Centro de Investigaciones de Biología Marina, Universidad Autónoma, SANTO DOMINGO, Dominican Republic

"Production studies on Tilapia nilotica in the Dominican Republic"

IFS funding: 34800 SEK 1982

This project aims at obtaining basic information on biology, water quality, diet, and production parameters in order to prepare a cost analysis and financial budget to be used on a commercial scale and at the national level. Different production methods will also be compared (extensive, semi-intensive, and intensive) to select the best one at the lowest cost.

/fish culture/

\*\*\* /tilapia/

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Grantee A586: Mr Alamousa Traore, Direction de la Pêche et de la Pisciculture, B P 7044 OUAGADOUGOU, Upper Volta

"Utilization of rice bran and cotton oil-cake to feed Tilapia nilotica in aquaculture systems"

IFS funding: 58000 SEK 1982 57600 SEK 1983

Mr Traore will try to develop rural aquaculture in Upper Volta using locally-available agricultural wastes. Experiments will be carried out in ponds with Tilapia nilotica using rice bran and cotton oil-cake. The aim is to find optimal conditions to obtain the best possible food conversion. An economic study will also be carried out.

/fish culture/ /agricultural wastes/

\*\*\* /fish feeding/ /tilapia/ /ponds/

**AQUACULTURE**

Grantee A587: Mr Alexander Rantetondok, Department of Fisheries, Faculty of Animal Husbandry, Universitas Hasanuddin, UJUNG PANDANG, Indonesia

"Rearing of milkfish fry and fingerling (Chanos chanos) using net enclosures in brackish-water ponds"

IFS funding: 46400 SEK 1982

In Indonesia, particularly in South Sulawesi, efforts to cultivate milkfish are intensifying. One of the problems encountered is the lack of fry for stocking the ponds. Traditional methods of fry collection and attempts to rear them to fingerling size in nursery ponds are accompanied by high mortality rates. Mr Rantetondok will rear milkfish in net enclosures, using different stocking rates and feeds with a view to finding the best system of rearing fry to fingerling size. Mr Andarias (IFS grantee No A588) is working in collaboration.

/fish culture/ /fish breeding/

\*\*\* /milkfish/

Grantee A588: Mr Ishak Andarias, Fakultas Pasca Sarjana, Institut Pertanian Bogor, (IPB), Jalan Raya Pajajaran, BOGOR, Indonesia

"Studies on the rearing of milkfish (Chanos chanos) in freshwater tanks"

IFS funding: 46400 SEK 1982

In Indonesia, particularly in South Sulawesi, efforts to cultivate milkfish are intensifying. One of the problems encountered is the lack of fry for stocking the ponds. Traditional methods of fry collection and attempts to rear them to fingerling size in nursery ponds are accompanied by high mortality rates. Mr Andarias will rear milkfish in freshwater tanks, using different stocking rates and feeds with a view to finding the best system of rearing fry to fingerling size. Mr Rantetondok (IFS grantee No A587) is working in collaboration

/fish culture/

\*\*\* /milkfish/ /ponds/

## AQUACULTURE

Grantee A621: Dr Jorge Toro, Centro de Investigaciones Marinas,  
Facultad de Ciencias; Universidad Austral de  
Chile, Casilla 567, VALDIVIA, Chile

"Accumulation of toxins in the blue mussel Mytilus chilensis"

IFS funding: 71250 SEK 1982

In recent years, several deaths caused by consumption of mussels which had accumulated red-tide toxins have occurred in Chile, resulting in a prolonged prohibition of their sale. Dr Toro will aim at identifying toxic and non-toxic dinoflagellates in order to decide in which cases a prohibition of the sale of mussels is really justified. Furthermore, laboratory experiments with mussels and pure cultures of the dominant toxic algal species will be carried out to quantify the degree of toxicity and the elimination rate of the toxins in relation to various algal concentrations and to different periods of exposure.

/algae/ /toxicity/ /shellfish culture/

\*\*\* /mussels/

Grantee A622: Mr Jorge Reartes, San Roque Fish Culture Station,  
Casilla de Correa 36, 5152 V CARLOS PAZ,  
Argentina

"Evaluation of the pejerrey as a pond-reared food fish"

IFS funding: 52500 SEK 1982 52000 SEK 1983

The pejerrey (Basilichthys bonariensis) is an atherinidae fish of great importance for sport and commercial freshwater fisheries in Argentina. At present their culture is extensive and methods for mass fry production in hatcheries and pond management need to be developed. Fry rearing experiments will be carried out in glass aquariums and in outside manured ponds using live feed such as Artemia spp. and rotifers and non-living feed. Fish up to adult size will be reared in manured ponds without supplementary feed as well as in non-manured ponds with supplementary diets. The effect of different kinds of animal manure and artificial feed on the growth and survival rates of the pejerrey will also be studied. Environmental parameters such as temperature, pH, dissolved oxygen will be recorded regularly.

/fish culture/

\*\*\* /ponds/ /fish nutrition/

**AQUACULTURE**

Grantee A623: Mr Wichien Sakaras, Brackishwater Fisheries Section, Rayong Fisheries Station, BAN PHE; Rayong Province, Thailand

"Optimum stocking density of seabass (Lates calcarifer) in cages"

IFS funding: 56250 SEK 1982

The seabass is a fish of great commercial value in most of Southeast Asia. Its induced breeding has been successfully achieved and seeds are now readily available. Mr Wichien Sakaras will conduct experiments to determine the optimum stocking density of different size groups.

/fish culture/

\*\*\* /seabass/

Grantee A624: Mr Eduardo Jaramillo L, Instituto de Zoología, Facultad de Ciencias, Universidad Austral de Chile, Casilla 567, VALDIVIA, Chile

"Environmental effects of estuarine mussel aquaculture in Southern Chile"

IFS funding: 71250 SEK 1982

Choromytilus chorus and Mytilus chilensis are bivalves living in the estuaries of Southern Chile. Recognition of their economic potential and protein value has resulted in recent years in increased efforts to culture them artificially with the use of rafts. However, nothing is known about the possible influence of their intensive culture on the benthic communities. Mr Jaramillo L will study and describe quantitatively the environmental effect of mussel culture on the sedimentation rate, the chemical-physical characteristics of the substrate and faunal abundance in the Queule River estuary.

/environmental effects/ /rivers/ /shellfish culture/

\*\*\* /mussels/



## AQUACULTURE

Grantee A625: Ms Ladda Wongrat, Department of Fishery Biology,  
Faculty of Fisheries, Kasetsart University,  
BANGKOK 10900, Thailand

"Improved production and use of Artemia spp. in Thailand"

IFS funding: 48750 SEK 1982

Although the integrated production of salt and Artemia spp. has been found to be possible in Thailand (salt production during the dry season and shrimp or fish during the rainy season), no detailed information is yet available on the subject. There is therefore a great need for specific research to improve Artemia spp. production, such as strain selection, better pond management to ensure optimal cyst quality, and use of Artemia spp. biomass in aquaculture hatcheries and nurseries. Ms Ladda Wongrat will also study the standardization of production, harvesting, and processing techniques as well as the organization of extension facilities for salt workers.

/feed production/ /salt/ /shellfish culture/

\*\*\* /ponds/

Grantee A626: Ms Virginia Manzano, College of Fisheries, Bicol University, TABACO, Albay, Philippines

"Polyculture system using groupers and tilapia in brackish-water ponds"

IFS funding: 52500 SEK 1982

Three stocking combinations of groupers (Epinephalus spp.) and Tilapia mossambica and monoculture of each species will be tried in 21 ponds which will be treated with tobacco dust, lime, chicken manure and inorganic fertilizers. After six months of culture, the survival, growth and total production of both species under different treatments will be determined. Based on the results obtained, Ms Manzano will determine the optimum grouper-tilapia ratio for maximum production.

/fish culture/ /agricultural wastes/

\*\*\* /fish feeding/ /groupers/ /tilapia/

## AQUACULTURE

Grantee A659: Mr Beato Pudadera, Aquaculture Department,  
Southeast Asian Fisheries Development Center, P O  
Box 256, ILOILO CITY, Philippines

"Polyculture of prawns (Penaeus indicus and P. monodon),  
milkfish (Chanos chanos) and tilapia (Tilapia nilotica)  
fertilized with manure"

IFS funding: 56250 SEK 1983

Mr Pudadera will determine the optimum stocking density and combination ratio of a polyculture system of shrimps, milkfish and tilapia that will result in maximum yields. The economic viability and effects of chicken manure on the plankton community and physico-chemical parameters of the pond will also be studied. Twelve, 1000 m2 earthen ponds with poultry houses constructed at the mid-portion of each pond will be utilized. Pilot testing of the viable results will be done.

/fish culture/ /manures/

\*\*\* /polyculture/ /ponds/

Grantee A660: Mr Harpasis Sanusi, Department of Hydrobiology,  
Faculty of Fishery, Institut Pertanian Bogor,  
(IPB), Jalan Raya Pajajaran, BOGOR, Indonesia

"Effects of salinity, antibiotics and food on the survival and development of larvae of mangrove crab (Scylla serrata)"

IFS funding: 60000 SEK 1983

The mangrove crab (Scylla serrata) is common in mangrove swamps, brackish-water and estuarine areas. It is the biggest and the most highly esteemed edible crab in most Asian countries. Very little information is, however, available on the biology of this crab. Mr Sanusi will study the larval survival and development at each metamorphosis under various treatments of salinity, antibiotics and feed. The main objective of this study is to develop a method of hatching the eggs in the laboratory and rearing the larvae. Large-scale culture will be investigated at a later stage.

/shellfish culture/

\*\*\* /crabs/

**AQUACULTURE**

Grantee A661: Mr Edirisinghe Udeni, Postgraduate Institute of Agriculture, University of Peradeniya, Old Galaha Road, PERADENIYA, Sri Lanka

"Livestock - fish integration"

IFS funding: 67500 SEK 1983

Though Sri Lanka has extensive potential to develop an inland fisheries industry, it lacks sufficient knowledge to make it economically viable. One of the possible ways of reducing the cost of production is livestock and fish integration. Mr Udeni will determine the optimum stocking density and combination ratio of a polyculture system composed of tilapia and grass carps, integrated with poultry, in brackish-water ponds. An attempt will be made to use duck litter only as supplementary food. Water quality parameters will be recorded regularly.

/fish culture/ /poultry/

\*\*\* /polyculture/

Grantee A662: Mr Remy Mangindaan, Department of Fisheries, Fakultas Perikanan, Universitas Sam Ratulangi, MANADO, Indonesia

"Tank experiment on the culture of catfish (Claria batrachus) using coconut oil cake and slaughter-house wastes"

IFS funding: 52500 SEK 1983

The white catfish was accidentally introduced into Tondano Lake, North Sulawesi, in around 1975. Mr Mangindaan intends to cultivate them in a series of 30 small tanks (1m x 0.75m x 0.50m), where initial body weight and feeding level are the variables. Each daily ration will be given in four portions during the night. Growth rates, production, feed utilization or feed conversion, and flesh quality will be measured and recorded to determine the best feeding regime for each size group.

/fish culture/ /agricultural wastes/

\*\*\* /catfish/ /fish nutrition/

## AQUACULTURE

Grantee A699: Mr Rafael Vasquez-Montoya, Centro de Ciencias del Mar y Limnologia, Universidad de Panamá, Ciudad Universitaria "Octavio Méndez Pereira", Estafeta Universitaria, PANAMA, Panamá

"Effects of poultry manure supplements in pelletized feed on growth of giant prawn (Macrobrachium rosenbergii)"

IFS funding: 64000 SEK 1983

Mr Vasquez-Montoya is going to study the rearing of one species of giant prawn. The prawns will be fed on pellets made from chicken wastes and feed supplements. Chemical analysis of the poultry waste will be done to determine the optimal amount to be used. The grantee will establish trial diets in three different ponds, and the performance and growth of the prawns will be recorded bi-weekly. The research is expected to determine the suitability of prawn farming under local conditions for commercial development.

/feed production/ /manures/

\*\*\* /prawns/

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Grantee A700: Mr Adou Cisse, Centre de Recherches Océanographique, 29 Rue des Pêcheurs, B. P. V 18, ABIDJAN, Ivory Coast

IFS funding: 68000 SEK 1983

"Studies on the feeding of tilapia"

The importance of aquaculture in the Ivory Coast is increasing. Mr Cisse is going to investigate the possibilities of using locally-available agro-industrial wastes as food for tilapia. He will also try to establish suitable feed, which has as little animal protein as possible and is adapted to local economic conditions. This feed can then be produced and used in other aquaculture systems in the country.

/feed production/ /agricultural wastes/

\*\*\* /tilapia/

## AQUACULTURE

Grantee A701: Mr Mauricio Giraldo R, Corporación Autónoma Regional de los Valles del Sinú y del San Jorge, (CVS), Apartado Aéreo 355, MONTERIA, Colombia

"Feeding ecology of laboratory-reared bocachico larvae (Prochilodus reticulatus maddalena)"

IFS funding: 48000 SEK 1983

Bocachico is a popular and widely consumed fish that is in danger of being eliminated because of dam construction in the rivers. There is not much known about the feeding habits of its larvae and their influence upon survival and growth. Mr Giraldo R will study the feeding habits of the fish and also other environmental factors (dissolved oxygen, salinity, turbulence and light) that influence survival and growth rates. Tests will be made to find out food preferences, food concentrations, and food size of bocachico larvae in little containers.

/fish culture/

\*\*\* /fish nutrition/

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Grantee A702: Dr Zoel Varela G, Instituto Nacional de Pesca, (INAPE), Constituyente 1497, P O Box 1612, MONTEVIDEO, Uruguay

"Development of methods for reproduction and rearing of catfish"

IFS funding: 74080 SEK 1983

Dr Varela G suggests that the two catfish species Steindacheridion scripta and Pseudoptatystoma spp, not previously farmed, are well suited for intensive farming. He intends to do research on their biology, reproduction and culture. The fish will be collected from inland rivers and studied in ponds. The aim of the project is to establish the species most suitable for intensive farming. Performance will be measured in terms of fertility, handling growth, feed conversion, taste and market acceptability.

/fish culture/ /reproduction/

\*\*\* /catfish/ /ponds/

**AQUACULTURE**

Grantee A703: Mr Carlos Bertran, Instituto de Zoología,  
Universidad Austral de Chile, VALDIVIA, Chile

"Environmental influence of mussel aquaculture in Southern Chile  
(Queule River estuary): biodeposition process by mytilids"

IFS funding: 64000 SEK 1983

In the south of Chile, aquaculture is based largely upon the culture of mussels in the estuarine environment. The number of cultivation sites is growing faster than the biological knowledge about their possible environmental effects. The main studies by Dr Beltran will be: (1.) the production of faecal pellets from Choromytilus chorus and Mytilus chilensis, (2.) the amount of organic matter deposited in the culture area, and (3.) the environmental effects of such deposits on the soft sea bottom.

/environmental effects/ /shellfish culture/

\*\*\* /mussels/

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Grantee A704: Ms Marcela Pascual, Instituto de Biología Marina  
y Pesquera "Almte. Storni", C C 104 - 8520 San  
Antonio Oeste, RIO NEGRO, Argentina

"Oyster culture in the San Matias Gulf"

IFS funding: 68000 SEK 1983

This project will evaluate the possibilities of oyster culture in Argentina, more specifically of Ostrea puelchana in the San Matias Gulf. Ms Pascual will focus on the reproductive ecology of the species, larval development and artificial rearing, artificial collection of spat in the natural environment, comparative analysis of growth and mortality rates in bottom and off-bottom culture and improvement of farming technology. The establishment of a new industry in this area of Argentina is very important, as land resources are poor.

/oyster culture/ /reproduction/

## AQUACULTURE

Grantee A705: Mr Juan Vera, Instituto de Bioquímica, Facultad de Ciencias, Universidad Austral de Chile, Casilla 567, VALDIVIA, Chile

"Studies of gametogenesis, fertilization and development of the mussel Choromytilus chorus"

IFS funding: 62800 SEK 1983

The family of mussels is potentially an important source of food and may also provide a basis for social development in certain regions of Chile. A major limitation for the farming of mussels in the collection of young larvae. The main purpose of Mr Vera's studies is to find out optimal conditions for fertilization and development of embryo and larvae in order to design methods to mass produce mussels. The gametogenesis will be studied by electron microscopy of samples collected year round to see the annual cycle of the mussel. A complete survey of methods to collect gametes will also be carried out.

/reproduction/ /shellfish culture/

\*\*\* /mussels/

Grantee A706: Dr Sinnakkaruppan Mathavan, Department of Animal Physiology, School of Biological Sciences, Madurai Kamaraj University, MADURAI 625 021, India

"Mass production of Macrobrachium seedlings"

IFS funding: 68000 SEK 1983

The prawn industry in India is important and there are plans to increase productivity by culturing prawns in coastal, estuarine and freshwater systems. The biggest problem is the lack of seedlings. This is due to several factors including low fecundity in the females and a high rate of egg loss and larvae mortality. Dr Mathavan's research will be directed to developing some techniques for mass rearing of larvae up to the seedling stage. He will try to increase egg production by relieving M. nobilii females from the task of incubation and with unilateral eyestalk ablation. He will also improve and enlarge a newly designed incubator for eggs.

/reproduction/ /shellfish culture/

\*\*\* /prawns/

**AQUACULTURE**

Grantee A707: Dr Meeransa Shafee, Section Halieutique, Institut Agronomique et Vétérinaire Hassan II, BP 6202, RABAT-INSTITUTS, Morocco

"Shellfish culture (aquaculture of oysters, mussels and clams)"

IFS funding: 64000 SEK 1983

The consumption of shellfish is steadily increasing in Morocco. The supply at the moment is not sufficient to meet the demand. The lagoons in Morocco are reported to be highly productive and thus suitable for cultivation of shellfish. Dr Shafee will study the environmental factors and the adaptation of oysters, mussels and clams in three lagoons of Morocco. Temperature, salinity, pH, dissolved oxygen content, organic matter, chlorophyl content and currents and tides will be recorded bimonthly. The bivalves will be studied from nutritional and physiological points of view to find the best way to produce marketable products.

/environmental effects/ /shellfish culture/



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