

1.0 MARINE BIOLOGICAL RESOURCES DIVISION**1.1 OBJECTIVES**

- 1.1.1 To assess the presently utilized living marine resources in the waters around Sri Lanka in order to estimate the maximum sustainable yield and the present level of exploitation.
- 1.1.2 To explore the possibility of increasing the level of exploitation of the underutilized resources and to estimate the maximum sustainable yield.
- 1.1.3 To investigate the availability of other living marine resources, the extent of their distribution and their potential for a rational utilization.

1.2 PERSONNEL**Research Officers**

Dr. Mrs. F.H.P.J. Deyarathne

B.Sc. Zoology (Hons)
M.Sc. Fisheries Biology
Ph. D. Fisheries Biology

Mr. D.S. Jayakody

B.Sc. Zoology (Hons)
M.Sc. Fisheries Biology

Mrs. G. Amarasinghe

B.Sc. Botany (Special)

Mrs. W.F.N. Kumara

B.Sc. General (Second Class)

Mrs. G. Jayasekera

B.Sc. General (Second Class)

Mrs. R. Maldeniya

B.Sc. Botany (Special)

Mr. H.M. Molydeen

B.Sc. (General)

Research Assistants (06)

Laboratory Attendants (02)

Typist (01)

Data Entry Operator (01)

During the period under review the division functioned with a staff of 07 Research Officers, 05 Research Assistants, 02 Lab Attendants, and a Typist. The latter was confirmed in her position on September 01.

A Research Officer was assigned to the division on a part time basis to monitor the NARA /IPTP, joint Tuna Sampling Programme. A Data Entry Operator and a Research Assistant were also appointed on contractual basis.

1.3 WORK PROGRAMME & PROGRESS**1.3.1 NARA FUNDED PROJECTS****1.3.1.1 Study of the small Pelagic Fisheries**

The area from Kalpitiya in the North West to Hambantota in the South was covered. Three main fisheries namely, the small mesh gillnet fishery, beach seine fishery and the purse seine fishery were studied under this sub-project. The catch and effort data of the gillnet fishery were collected from five major fish landing sites along the coast by the Data Collectors recruited by the IPTP/NARA. In addition, the gillnet fishery in Chilaw was also covered. Length frequency data of *Amblygaster sirm*(*Hurulia*), *Sardinella gibbosa* (Salaya), *S. albellia* (Sunday), *Stolephorus heterolobus* (Haimessa), *Rastrelliger kanagurta* (Indian wackerel) from the gillnet fishery were collected for stock assessment purposes. The collection of data in south and to some extent in the south west were interrupted in the latter part of the year due to lack of public transport and the prevailing adverse atmosphere during the period.

The catch and effort data of the Beach Seine were collected from Negombo and between Moratuwa and Beruwala. The catch rates in 1988 remain unchanged. Purse seine fishery was studied in Hikkaduwa/Ambalangoda areas. Catch rates for 1988 has shown a slight increase from that of 1987.

Two Research Officers were involved in this study.

1.3.1.2 Study of the large Pelagic Fisheries

In addition to the Tuna Sampling Programme carried out by NARA/IPTP the following research work was carried out:

- a) Biological studies on small tunas such as food and feeding habits and the estimate of the spawning season.
- b) Age and growth studies of seerfish and Kawakawa by using daily growth rings in otoliths.
- c) Stock assessment studies of skipjack, yellowfin and small tuna.

Two Research Officers were involved in this project work.

Results of some of these studies have been published in research papers.

1.3.1.3 Prawn Fishery

The area covered by this project is from Chilaw to Aluthgama. The main landing sites are Chilaw, Negombo and Beruwala. In Chilaw prawn trawling is carried out by mechanised 31/2 ton boats where as in Negombo prawn trawling is carried out by non-mechanised sail driven conoes. In the Kalutara area prawns are caught by gillnets and trammel nets operated by FRP boats.

Each landing site was visited twice a month and data on catch and effort were collected. In Kalutara area length, sex and maturity data were also collected.

The collection of data was interrupted to some extent due to the conditions prevailing in the country during the latter period. The catch rates in Negombo show a rise by 51% from 1986 to 1987 and by 38% from 1987 to 1988. In Chilaw also the catch rates have risen from 1986 to 1987 by 46% and from 1987 to 1988 by 43%. These results do not agree with the predicted models. It seems that sampling in these two areas seems to be insufficient.

Therefore the intensity of sampling should be increased before coming to a conclusion about the shrimp stocks in these areas.

1.3.1.4 Lobster Fishery

Several lobster landing sites were sampled from Galle to Krinda twice a month. Catch and effort statistics were collected upto August 1988. The work programme during this year was interrupted at times as the officers were unable to reach some landing sites due to security reasons. The catch rates at the beginning of the year were low compared to 1987.

The Research Officer who worked on this project left the Island for post graduate studies in September. This Project was therefore discontinued from September 1988.

1.3.2. FOREIGN FUNDED PROJECTS

1.3.2.1 IPTP/NARA fish sampling programme in Sri Lanka

Indo Pacific Tuna Programme (IPTP) and NARA jointly carry out a fish sampling programme for tuna and tuna like fish and small pelagic fish at five major landing sites in Kalpitiya, Negombo, Beruwela, Matara and Hambantota.

Ten data collectors were placed at these sites to collect catch and effort data and length measurement of all the important species. This work was continued in 1988 and the analysis of data is done by the NARA officers. IPTP has assisted NARA with computer programme and entry of tuna data to the computers for compilation.

1.3.2.2 FAO/NARA Exploratory Tuna Fishery in Sri Lanka (TCP/SRL/6653 (1))

This survey was continued in 1988. 36 fishing trips were conducted during the year with a total of 130 fishing days. An average catch rate of 235Kg/ trip was recorded. Biological studies on feeding habits and spawning season of yellowfin tuna and skipjack tuna was also carried out. Survey was terminated in December 1988.

2.0 INLAND AQUATIC RESOURCES DIVISION

2.1 OBJECTIVES

- 2.1.1 Short and medium term research and pilot operations to develop freshwater and brackish water aquaculture.
- 2.1.2 Improve the exploitation of perennial and seasonal tanks.
- 2.1.3 Extending consultancy services towards the development of aquaculture and monitoring the effects of aquaculture practice to the environment.

2.2 PERSONNEL

Research Officers :

Mr. J.M.P.K. Jayasinghe	B.Sc. (General) M.Phil.
Mrs. P.M.A. Jayasuriya	B.Sc. (Special) (2nd class lower)
Mr. P.P.G.S.H. Siriwardena	B.Sc. (SPECIAL) M.Sc.
Mr. U.S. Amarasinghe	B.Sc. (Special) (2nd Class lower) M.Sc.
Mrs. S.C. Jayamanne	B.Sc. (Special) (2nd class lower)
Mr. W.M. Indrasena	B.Sc. (Special) M.Sc.
Mrs. M.D. Amarasinghe	B.Sc. (Special) (2nd class lower)
Mr. T.B. Wanninayake	B.Sc. (General) M.Phil.

Mrs. M.M. Kuruppu	B.Sc. (Special) (2nd class upper)
Mr. J.A. de Silva	B.Sc. (Special) (2nd class upper)
Mr. Ramesh Perera	B.Sc. (Special) (2nd class lower)
Mrs. Susan Yee	B.Sc. (Special) (2nd class lower)
Mr. D.E.S. Jayamaha	B.Sc. (General) (2nd class upper)
Mrs. P.K.M. Wijegoonawardena	B.Sc. (General)
Mr. K.A.U.S. Kasthuriarachchi	B.Sc. (General)
Miss V. Pahalawattarachchi	B.Sc. (Agri.)
Mr. Brett Herbert (Australian Volunteer)	B.Sc. (special) M.Sc.

Research Assistants	(10)
Lab Attendants	(05)
Typist	(01)
Draughtsman	(01)

17 Research Officers, 06 Research Assistants and 5 Lab Assistants were attached to the division during the period under review. Four Research Assistants, a typist and a draughtsman were employed on contract basis. Research Officers Mrs. P. Wijegoonawardena and Mr. D.E.S., Jayamaha were confirmed in their posts, whilst Mr. J. Costa, Lab Attendant was appointed as a Store Keeper.

2.3 WORK PROGRAMME AND PROGRESS

NARA FUNDED PROJECTS

2.3.1 Mullet fry survey -- Negombo lagoon

Objectives

To assess the mullet fry population, its seasonal variation and locations with a view to utilize them for culture purposes.

Sampling commenced in August and is continuing satisfactorily. Weight and length measurements of fry were recorded. Physico/chemical characteristics at the collection points were also recorded.

2.3.2 Red Tilapia Project

Objectives

To breed and culture red tilapia and obtain 100% red type so as to increase the palatability of tilapia.

Project commenced in April. Brooders were obtained in late July. Tilapia juveniles were introduced into cement tanks at NARA and a few in brackish water ponds in Negombo. Physico/Chemical characteristics of the ponds and growth measurements of the fish are being recorded. Feeding is also being done in a systematic way. 4 large individuals which had got entangled in twigs were sold at the open market. The 4 individuals each weighing approximately 750 gms. were sold for Rs. 52/= indicating an encouraging market for the coloured variety of tilapia.

2.3.3 Elver Survey

Objectives

To determine the migratory pattern of Elvers into rivers and their availability for culture.

Surveys commenced in August. Different types of nets were tested at various sites in the Southern and Western coasts. Diurnal surveys were also carried out. Transport problems and the recent disturbances greatly affected the survey.

2.3.4 Evaluation of *Perionyx excavata* for use in Aquaculture was completed. Studies on the reproductive rates, culture conditions, nutritional value of fish were also studied.

2.3.5 Ecological survey of lake Gregory at Nuwara Eliya. This was to be a year long project, but had to be terminated towards the latter part of September due to the situation in the country.

2.3.6 Mangrove productivity and litter decomposition studies.

Objectives

To determine the component and total litter production of the major types of mangrove ecosystems in riverine and fringe, in Dutch Bay.

To measure the annual woody growth of mangrove trees in these ecosystems.

To determine the net primary productivity (NPP) of the mangrove ecosystems in Dutch Bay.

To investigate the leaf litter decomposition rates for the dominant mangrove species i.e. *Rhizophora mucronata* and *Sonneratia marina* in these mangals.

To estimate the annual contribution of organic matter (detritus) to the coastal water by these mangrove areas.

Out Put

Total litter production in the riverine mangals at Kala Oya estuary was estimated to be 6.0 t/ha/yr and leaf litter all accounted for 81% of the total litter fall (Leaf litter fall is the most important fraction of the total litter fall which contributes to the continuous production of detritus, the food base for most of the food webs in these mangrove water (estuary + lagoon).

Annual woody growth in the mangrove trees at Kala Oya is 6.20 t/ha/yr (6t/ha/yr) while that at Erumathivu is 2.9 t/ha/yr (3 t/ha/yr).

The annual above ground net primary productivity (NPP) of the riverine mangrove ecosystems was to be 12 t/ha/yr. (of organic matter in dry weight) and the NPP for the fringe mangals at Erumathivu was estimated to be 7 t/ha/yr.

The findings of this projects is completed into a thesis for a M.Phil degree to be submitted to University of Peradeniya.

2.3.7 Tropic relationship in mangrove ecosystems

Role of *Terebralia palustris* (gastropoda) in the degradation of mangrove leaf litter in the mangals at Erumathivu - Dutch bay. (on going project).

Objectives

To determine the distribution and population structure of the gastropods (Population dynamics)

To estimate on the in situ size-specific grazing ability of the snails (feeding ecology)

To estimate the contribution by *T. palustris* to mangrove leaf litter degradation, have the production of detritus.

Relationship between the shell length and total dry weight has been determine 2x5 transect lines across the mangal have been used to obtain population densities.

Experiments (both field and laboratory) on food preference and ate of intake of food are underway.

2.3.8 Mangrove feeding growth in hyposaline soils

Objectives

To determine the growth rates of *Rhizophora mucronata* and *Avicenia marina* seedings in soils of different salinities and conditions.

To determine the growth rate of the two species under the influence of waters with different sainity regimes.

2.3.9 NARESA funded project

2.3.9.1 Artemia project

The following were studied on the sri Lankan Artemia.

- a. Life cycle and reproductive
- b. Hatching percentage and efficiency of Artemia cysts under varying temperature and pH.
- c. Culture of marine algae *Dunaliella* in the lab.
- d. Construction of 4 experimental ponds at Palavi.

2.3.9.2 Ornamental fishery Unit

General overseeing of the unit at NARA. Conducts lectures to participants of the NARA sponsored Ornamental fishery. Assisting private Ornamental fish culturists in setting up of projects.

2.3.9.3 Mud Crab Fishery Project

The following aspects of te mud crab fishery has been studied during the period from Jan. 1988 - Dec. 1988.

Reproductive Biology - Female mud crabs collected from the Negombo lagoon, were dissected to find out their respective maturity stages, the data were analysed to find their frequency of mature. Ova diameters of the different maturity stages were measured microscopically to find the Ova diameter frequency for the maturity stages. Ova diameter frequency is typically dependent on the Ova diameter frequencies of the maturity stages immature, developing, mature, spawning and spent.

Feeding biology - Seasonal variations in the food and feeding habits of the mud crab was studied. Feeding habits of the crabs varied according to the size. Smaller crabs preferred crustaceans while the bigger crabs preferred bivalves.. Further, the feeding time of the *Scylla serrata* too was studied by conducting diurnal surveys.

Larval and Juvenile population

Larval and juvenile populations of mud crabs were studied, diurnally and seasonally,

Breeding of *Etroplus suratensis*

Live specimens of *Etroplus suratensis* were brought to NARA and were reared in concrete tanks. When pairing occurred they were seperated. The pairs were fed with *Hydrilla* sp. once a day. High moratalities were experienced in the tanks during the latter period due to disruption of caring.

2.3.10 CDB/NDB Site Survey Project - Phase 11

Phase 11 commenced in January 1988. The preliminary trip to the South were made mainly to obtain accommodation at Matara and identification of sites. Eleven sites were selected between Aluthgama and Matara. The survey was temporarily confined to Matara due to the situation of the country at the time.

The following characteristics in the Southern coastal belt of Sri Lanka were recorded commencing April 1988.

Physico - chemical characteristics

These included salinity, temperature, pH, DO, Nutrients. These were recorded in the lagoons and waterways along the coast. Salinities were low. Nutrient values were also low.

Benthos studies

Sampling commenced in April 1988. 6 sites were identified between Bentot and Matara.

These new sites were added on in July as it was felt that the ongoing site were inadequate to cover the entire area.

Studies indicate a less abundant population of Benthos in these lagoons when compared to the North Western coast. Some locations have shown no signs of any organisms at all. This could be attributed to the closed ~~seasons~~ months of most sites. Most of these lagoons are also being used for dumping grounds of coconut husks. This caused an increase in the hydrogen sulphide levels and general pollution of the area.

The study was temporarily suspended in September.

Physical and Chemical characteristics of soil

This exercise was to analyse the physical and chemical characteristics of soil for the construction of ponds for prawn culture.

Sampling was carried out at potential areas around Bolgoda lake, Kaluganga Bentotal ganga and Kosgoda lake. Parameters studied were soil pH, soil mechanical analysis.

pH in almost all the sites were low, the maximum being 2.6 and the minimum 5.65. The soil in the Bolgoda area was clayey, Kaluganga sandy clayey and Bentota and Kosgoda lake was sandy.

Mangrove survey

The following aspects were studied

Distribution pattern

Abundance and species composition of mangroves and mangrove associated species at Bolgoda lake. Few mangrove species were found at selected sites. These include *Rhizophora apiculata* and *Bruguiera*. There was an abundant distribution of mangrove associated species at Wadduwa.

The survey had to be temporarily suspended in September 1988 due to unavoidable circumstances.

2.4 FOREIGN FUNDED PROJECTS

2.4.1 Disease related limitations of Sri Lanka's prawn hatcheries IFS (Sweden)

Objectives of first phase

To determine the microbiological contribution to hatchery mortalities with a view to developing curative measures.

Output: continued collection of samples of hatchery water from Andriez Mariculture hatchery in Chilaw. Microbiology of samples studied to determine the bacterial types and numbers present. Sampling so far on a bio-monthly basis. Bacterial types have been isolated as pure cultures and their numbers in hatchery water partly estimated.

1. *Gafrarium tumidum* (cockles)
2. *Marcia opima* (Clam)
3. *Marcia hiantina* (Flat clam)

Three bamboo cages were constructed for the following research purpose on these cockles and clams.

1. for study of growth
2. for study of condition factor
3. for study of density
4. for study of predators

Investigated socio-economics and market survey of these three species of clams and cockles in Puttalan area.

2.4.3 Sea Weed Culture project

Funding Agency - Bay of Bengal Programme (BOBP)

Objectives:

- a. To establish and operate a pilot scale seaweed farm in Puttalam lagoon.
- b. To carry out research on quality and growth rates of cultured seaweeds.
- c. To transfer the culturing technology to the local people to enhance their income.

This project commenced in early 1988 with the assistance of Bay of Bengal Programme. Construction work of a spore setting shed with spore setting facilities at Etalal were completed in May 1988. Research work commenced in June. Several surveys were made by boat in Puttalam lagoon to find out the location, distribution and the available quantity of different species of *Gracilaria*. Only two species (*Gracilaria edulis* and *Gracilaria verrucosa*) were available in that area.

Ten spore setting experiments were conducted in August by using frames which were made of four different materials such as raffia, cleaned raffia, monofilament and coir rope. Development of spores were tested on the influence of light, fertilizers and the aeration.

The frames with seeded material were placed in the lagoon and the development of the spores was checked. During the first two months only a few plants were found on the frames. In October and November more plants started to grow and in early December the biggest plants were 10 cm. in length.

Since it might be possible that some of the plants growing on the frames are not from spore setting, but from natural seeding, frames with unseeded materials were placed in the lagoon.

Another experiment on vegetative propagation was started in September. The vegetative cutting inserted in coir rope were placed inside a small cage (10x15m) in the lagoon to protect from grazing by fish. The growth of the plant were studied by measuring the length once in fortnight. For three months they gained a average length of 20 cm.

2.4.4 Fish Genetic Project

Funded by IDRC

A research project to evaluate the extent of Hybridization of introduced Cichlids in Sri Lankan Reservoirs and its effects on the fishery has been started since April 1988. The objectives of the project are as follows:

Physico-chemical parameters, zooplankton, phytoplankton and wild oyster samples were collected for further study. Spat collectors such as Coconut Shells, Asbestors and Windowpane oyster shells were placed on rack for spats settlement.

Puttalam Lagoon

1. Kelpitiya (Dutch Bay)

Three bamboo rafts (2x5m) were installed for experimental culture of mussels and oysters

Mussels - Brown mussel - *Perna perna*
Green mussel - *Perna viridis*
Oyster - *Crassostrea madrasensis*

Following works were carried out for brown mussels during the year.

1. Growth study of mussels in fruit baskets, coconut shells and mesh tubing.
2. Density study of mussels in fruit baskets, coconut shells and mesh tubing.
3. Mortality study.
4. Predatory behaviour
5. Fouling organisms
6. Condition factor

Green mussels were transplanted at the same site in October 1988 - which were transported from Trincomalee.

Growth study, Predatory behaviour, and fouling organisms were recorded on green mussels.

Oyster spats were collected from Kala Oya estuary and transplanted for following research work.

1. Growth study
2. Predatory behaviour and fouling organisms.

Same research activities were carried out at Muththuwaram on these species.

Relevant physico-chemical parameters, zooplankton and phytoplankton samples were collected fortnightly.

Kala-Oya

Monitoring works were performed at three sites at Kala Oya on Oysters, *Crassostrea madrasensis*. Three racks were constructed for spat collections. Asbestos, lime and nonlime coated tiles, Windowpane oyster shells, Oyster shells, and coconut shells were placed in every fortnight on rafts for spat falling. Growth study on each collector of oyster spats were recorded. Wild oyster samples were collected monthly for determination of condition factor.

Physico-chemical parameters, zooplankton and phytoplankton samples were collected for further study.

Cockles and clams fishery:

A small but expanding fishery exists in the puttalam lagoon area for both cockles and clams.

The main species being fishes are:

1. Determination of the extend of hybridization of the Cichlid populations in selected reservoirs and to correlate the degree of hybridization to the the individual populations.
2. Based on the above information suggest manageri measures for the fishery.
3. Determination of the extent of purity of broodstock which view for the same.

2.5 WORK COMPLETED

1. A detailed project proposal has been submitted to the University of Ruhuna.
2. A literature survey has been done for submission to the university of Ruhuna.
3. A maximum of 9 reservoirs in North Central Province have been selected for their diversity of the fishery due to the following reason:
 - a. the multitude of perennial reservoirs are chiefly located in the Dry Zone of the country (De Silva, 1937).
4. Electrophoretic trials have been carried out for four enzyme loci (Liver, red muscle, white muscle and eye) to identify the hybrid strains.

Work in progress

1. Samples are being collected from the commercial fishery of the said reservoirs during dry, wet and intermediate seasons to determine whether the catchability of different population has any conection to seasonality. Sample size is being determined by judging the level of mixing by examining the Visual meristic characters.
2. All fish samples are being analysed for their morphological and morphometric characteristics. In addition the mean size at maturity of the individual population and fecundity will be assessed.
3. The degree of hybridization is being evaluated using gel electrophoresis of tissue extracts of liver, red muscle, white muscle and eye of fish from the commercial fishery. The major advantage in the use of electrophoretic makers is the ability to identify heterozygotes from homozygotes.

2.6 CONSULTANCE SERVICES, SUPPLIED BY NARA IN CONNECTION WITH THE ESTABLISHMENT OF PRAWN FARMS 1988

Date	Services rendered	Client
Jan. '88	Site inspection for Shrimp Culture Culture	Mr. Godwin Fernando Associates, 2/208, EMICH, Colombo - 07
29th Mar '88	Soil analysis	Mr. A.H.M. Wijenayake 28, Colombo Road, Negombo
11th Apr '88	Soil water analysis	Mr. A. Nanayakkara Temple Road, Negombo
25th Apr '88	Soil analysis	Marketing Consultancy & Services Ltd.
11th July '88	Assessment of site at Andimune Udappuwa for Prawn farming	R.M. Ramanathan Contrain Street Udappuwa.
	Suitable site for prawn culture , Chilaw	M.R. Detram Z. Fernando Chilaw
11th July '88	Selection of site for prawn	Dennes Perera

	farming, Vairankattuwa Assessment of Prawn culture site at Kumbutukuliya, Arachchikattuwa.	Patric Lawe
2nd Jun. '88	Site selection for prawn farming, at Vairankattuwa, Mathupanthi, Panchavillu, Nawadamkulama.	IRED
17th Aug. '88	Site selection for prawn farming. Rajakadalawa.	Leonard de Silva
21st Nov. '88	Site selection for prawn farming at Waikkala Assessment of site for prawn farming at Arachchikattuwa. Site selection for prawn farming, Madurankuliya.	Palagathura mills W.A. Fernando Lakshman de Alwis
15th Dec. '88	Assessment of project Site for prawn farming and artemia production. Assessment of project Site for prawn farming at Vairankattuwa, Arachchikattuwa.	Dr. Lawrie Fernando W. Nimal Lawe
3rd Oct. '88	Assessment of site for Prawn farming at Suruwila, Arachchikattuwa. Assessment of site for prawn at Palliwasthurai Kalpitiya.	Joseph Fonseka Ali Khan

3.0 INSTITUTE OF POST HARVEST TECHNOLOGY

3.1 OBJECTIVES:

- 3.1.1 Improving the quality of fish by better handling and storage practices on board, at landing sites and during distribution and thereby minimizing post harvest losses.
- 3.1.2 Improving the processing techniques of traditional fishery products (dried fish, maldivian fish etc.) and thereby improve on quality
- 3.1.3 Improving the quality standards of marine exports (shrimps and lobsters)
- 3.1.4 Developing new products for human consumption using modern processing techniques
- 3.1.5 Formulation of animal and fish feeds.

The Institute is carrying out experiments in these fields and the knowledge gained has been extended to fishermen and others engaged in processing fish and fishery products through seminars and workshops.

3.2 PERSONNEL

Research Officers

Dr. S. Subasinghe	Ph.D.
Mr. T.S.G. Fonseka	B.Sc. M.Sc.
Miss H.N. Chinivasagam	B.Sc. (Hons) M.Phil.
Miss. Mala Perera	B.Sc. (Hons) M.Phil.
Mrs. V. Jayaweera	B.Sc. (Hons)
Mr. Sisira De Silva	B.Sc. (Hons)
Mrs. C. Vendakoon	B.Sc. (Hons)

To carry out the functions, the Institute headed by its Director have a staff of 07 Research Officers, 04 Research Assistants, 04 Laboratory Attendants, a typist and 08 Labourers.

Two scientific officers who left the island for Post Graduate studies abroad in 1966 and 1967 respectively were away during 1968 as well. Another officer left for her post graduate studies in the United Kingdom in October 1968.

Mr. M.T. Warnakulasuriya, a casual scientific officer left the institute in April whilst Miss. K.G. Sriyalatha a labourer was promoted to attendant post. A field assistant was recruited on casual basis.

3.3 WORK PROGRAMME & PROGRESS

3.3.1 Storage life of Farm reared shrimp at different temperature

This project was an extension of earlier studies of microflora farm shrimps. During this year the storage life of shrimp was studied at 0-Ciced condition and at ambient temperature. The pattern at variation of microflora with spoilage and incidence of some important pathogens such as Salmonella, Vibrio Parahaemolyticus and Esch. coli were also investigated. This study is concluded and a paper is being prepared the shelf life of prawns in ambient temperature was found to be around 12-15 hours, where as that of iced prawns it was about 2 weeks.

3.3.2 Frozen storage of Commercially important varieties of fish

Under this project the storage life of balaya was carried out. Effect of Antioxidants and Binding Agents were investigated. Part of this study to cover the effect of glazing could not be started as pre-planned due to unsettled situation prevailing. However the effect of Antioxidant and Binding Agents have just been concluded and results are being analysed for a report.

3.3.3 Maldive Fish

Completed a study on the pattern of insect infestation in maldive fish under laboratory conditions in order to evaluate the type and nature of attack that would occur in a store where the insects are prevalent. Two species, Lascoedesma Sirricorne and Democerus spp. were introduced individually and together into maldive fish, dry fish and a combination of both.

The study was concluded at the end of the year and a report is being prepared.

The effect of varying drying patterns (which could occur during rainy season - the peak season for Balaya) on the final organoleptic quality of maldive fish was studied. This was carried out as slow initial drying rendered products of low low organoleptic quality.

The various types of fungal spp, and the type and nature of bacterial growth were found to be responsible for off flavour. Some of the spp. isolated are types responsible for aflatoxins. Report is being prepared.

Preliminary work on the Pest Status of Lassoderma Senicorne a lesser known pest on tropical stored products was carried out. This sp. though not very common on fish products was found to attack maldive fish. This pest was found in Warehouses and retail shops in stored dried food products and thus attack maldive fish.

A preliminary survey indicated that it is absent in the imported product. Further studies on the extent of loss is being carried out. Report is being prepared.

3.3.4 Survey of the incidence of pathogenic bacterial in clam

This study which has started in March 1968 and is being continued. Survey for the pathogens such as Salmonella, Vibrio Cholerae and V. parahaemolyticus were studied. The general microflora pattern are also being studied. The quality of the water too was studied. This study would aid in preparing suitable standards for clams and should be carried out every year to evaluate

the present status of pathogens in clams.

3.4 TEST SERVICES

Over 200 samples of frozen seafood items such as prawn, lobsters, cuttle fish, etc. were tested on requests made by Sri Lanka Standards Institution and other clients. Number of samples were also investigated for quality. Number of samples were also investigated for contamination of formalin on request made by CFC. Other products such as fish meal and shrimp feeds were also tested.

3.5 PROJECTS UNDERTAKEN WITH OTHER AGENCIES:

1. Survey of seaweed industry in Sri Lanka. Project activities commenced in mid November. Collection of background information, literature survey and compilation of literature and compilation of the bibliography is being completed. information is collected using a questionnaire. Report should be ready by February 1989.
2. This Project activity commenced in November 1988. Extensive field surveys were carried out in the Western Coast of the island. Their activities will be extended to cover North Western and Southern coast soon.

4.0 ENGINEERING TECHNOLOGY UNIT

4.1 OBJECTIVES

- 4.1.1 Conducting of fishing trials of NW35 Tuna Resources Survey Vessel under TGP/SRL/6653 Project.
- 4.1.2 Collecting data for inventorization of fishing gear and crafts in Sri Lanka.

4.2 PERSONNEL:

Research Officers

K.T. Weerasooriya

(in U.K. on a scholarship)
B.Sc. (Hon) Physics
Dip. in Fishing Technology
U.K. MBA (Sri Lanka)

S.L. Suraweera

M.Sc. (Hon) Mechanical Engineering, USSR
Certificate of competency in Deep sea navigat

Research Assistants

(02)

Lab Attendant

(01)

During the period under review, the unit was comprised of a five member staff, two Research Officers, Two Research Assistant and a Lab Attendant.

Mr. S.L. Suraweera, Research Officer, was transferred to Services & Operations Division and promoted to Grade 111, and have been entrusted with the responsibility of co-ordinating the Division activities, , until the return of Mr. K.T. Weerasooriya, who is away in United Kingdom on a scholarship.

Mr. W.G. Sirisena Lab Attendant was promoted to Grade 1.

4.3 WORK PROGRAMME AND PROGRESS

4.3.1 NARA Funded Projects

4.3.1.1 Fishing Gear and craft inventorization.

In this particular project sufficient work couldn't be carried out in 1988 due to the limited staff availability and full time involments TCP Tuna Resources Survey Project. However up to date we have covered from Kalpitiya to Negombo all landing sites.

4.3.2 Foreign Funded Projects

4.3.2.1 Tuna Resources Survey Project TCP/SRL/6653

Exploratory Tuna fishery project was funded by BODP and executed by NARA with the technical support from BODP frp, Kanuary 1987 and this project has ended in December 1988.

During the last two years operation of this vessel was successfully handled by this division and exploratory fishing trials have been completed amounting 74 cruises. Valuable information on tuna fishery was collected and this information is being analyzed at present to the final review meeting to be held in Maldives 3 February 1989.

During the project period one research assistant is full time engaged to co-ordinate the operation of the division and other R.A. and L.A. also assisted for the same when required. All members of the division took turns to go as observers on 5-6 day curises as per pre planned roster.

4.3.2.2 Self financing extension of tuna resources survey project

As mentioned above valuable informations on tuna resources were gather during 1987/1988 under TCP project TCP/SRL/6653. However still there are many gaps in our knowledge on offshore fisheries to develop it to satisfactory levels.

Therefore it was suggested that the same vessel NW35 can be engaged in carrying out research work in 1989 to fill some of these gaps which has been left essentially important to the fishermen, fishing companies, administrators etc.

The running cost and other expenditure of the project except subsistence overtime, travelling will be met by the catch sales accumulated to a sum of Rs. 900,000/= at the end of last year.

This projet has been approved by the ministry of Fisheries and NARA. Annual repairs were carried out to NW35 vessel at Negombo and the operations are sheduled to commence by 12th Jan, 1989:

4.5 SERVICES RENDERED

- a. Assisting the tender boards for the ministry of Fisheries
- b. Assisting the fishing trials of 65ft. combination vessels of the Ministry of Fisheries.

5.C. OCEANOGRAPHY DIVISION

5.1 OBJECTIVES

- 5.1.1 To systematically explore, harness and manage the vast ocean heritage which comes under the jurisdiction of Sri Lanka for the benefit of the nation.
- 5.1.2 To study the geological processes occurring on the continental margin and the nature of the seabed and basement of the continental margin to increase our knowledge of marine geology and to obtain a better understanding of the formation of the continental margin of Sri Lanka.

The main research activities are as follows:

- a. Studies on the marine geology of the continental margin including its morphology and physical characteristics, mineralogy and chemical aspects of the seabed sediments.

The research is concerned with systematic mapping and sampling of the seafloor and the analysis of sediments for their chemical and mineralogical composition. The results obtained are used to prepare maps of submarine morphology, charts depicting the nature of the seafloor useful to fishermen and sediment distribution maps.

- b. Studies of continental shelf and slope structure by single channel seismic profiling.

A high resolution seismic sparker and boomers is used to map the subsurface of the continental margin. Structures in the area, submarine canyons, buried river channels and sediment thickness are obtained by these studies.

- c. Sedimentation Processes:

Phenomena occurring on the sediment sea water interface are studied. Our main interests lie in investigations of coastal sediment drift and the mechanism of transportation of sediment from shallow shelf to the steep slopes and deep ocean.

- d. Investigation of the geological setting of marine mineral resources

In this research programme, emphasis is placed on the study of the geological setting and process of formation of marine mineral resources such as placer minerals, construction materials, carbonate sands on the shelf and phosphorites on the slope.

- e. Participation in international joint programmes of research

These research programmes involve our participation in co-operative research programmes such as the NARA - Scripps Institution of Oceanography joint survey of the Southern Continental margin of Sri Lanka and the Ocean Drilling Project (ODP).

5.2 Personal

Research Officers

Dr. Shanthi Wickremaratne	M.Sc. (Hons) Ph.D (Geology & Mineralogy)
Dr. Gamini Ranatunga	M.Sc. (Hons) Ph.D (Geology)
Mr. Dulip Jayawardane	B.Sc. (Hons) M.Sc.
Mr. N.P. Wijayananda	B.Sc.

Research Assistants	(02)
Lab Assistants	(01)
Sampler	(01)
Labourer	(01)

The staff of the division during the period under review was comprised of 4 Research Officers, 02 Research Assistants, a Lab Assistant, a Sampler and a Labourer.

One Research Officer was seconded for service at the IOMAC secretariat. Another officer who was away in the United Kingdom qualifying to register for a Ph.D returned in October,

Dr. SHanthi Wikremaratne, Research Officer was promoted to Grade 11 and officially appointed as Head of the division. Sampler Mr. Palitha Wickremasinghe was confirmed in his post.

5.3 WORK PROGRAMME & PROGRESS

During the year under review the following activities were undertaken.

5.3.1 The oceanography cruise programme for 1988 envisaged 55 days at sea including 40 for geological and 15 days biological oceanography. The geological oceanography programme progressed as planned with the completion of six oceanographic cruises and two test cruises for testing of new equipment (37 ship days). One cruise to study slope stability was not carried out due to the delay in the commencement of the UNDP 2nd Phase project and the delay in the purchase of specified equipment.

5.3.2 The project on the preparation of fisheries charts progressed with the completion of the 2nd fisheries chart for the Wennappuwa area. Data on bottom sediments and morphology were supplemented with data obtained on weather, currents and tides and depicted on the charts. A technical problem on the usage of these charts by fishermen, was overcome by obtaining the visual landmarks used by fishermen and incorporating them on the map. In collaboration with the Engineering & Technology Division of NARA the type of gear suitable for different areas are all depicted on the chart thereby enabling fishermen to fish in correct places with no fear of damaging their valuable nets.

5.3.3 The project on sediment and their sources in major rivers of Sri Lanka covering the Kaluganga basin progressed steadily with the completion of the analysis of over 200 sediment samples for their grain size parameters.

5.3.4 On a request made by the Secretary, Ministry of Fisheries the survey was carried out to determine the quality of the construction of the Puranwella Breakwater and the materials used and a report submitted.

5.3.5 The project on corals and shell beds could not be carried even after the return of Mr. Wijayananda due to the troubled situation in the southern part of the island.

5.3.6 The study of shallow water carbonate facies and facies models in continental shelf sediment - west coast Sri Lanka progressed according to plan and the areas from Kalpitiya to Negombo were completed.

The results obtained on this study indicated the existence of four shallow-water carbonate facies in the areas. A noticeable feature is the relative high abundance of benthonic species and the low diversity of planktonic species. Studies also indicate that shelf marginal reef progradation and resedimentation processes play the major role in determining the facies sequences.

5.3.7 Mr. Wijayananda completed his first years post graduate research at the Imperial College, London and returned to Sri Lanka on October 15th 1988. Under this project he has chemically analysed over five hundred samples from the eastern Indian Ocean and prepared sediment distribution maps for eighteen elements.

During the last three months of the year Mr. Wijayananda collected seabed sediment samples from the continental shelf & slope of Sri Lanka for detailed geochemical studies which will be done at the Imperial College during 1989/90.

5.3.8 Data collected on previous cruises covering the area from Kappitiya to Galle have been grouped into single diagrams for the entire western continental shelf of Sri Lanka. The following composite diagrams were prepared.

- a. the distribution of mean grain size in sediments of the western continental shelf of Sri Lanka.
- b. the distribution of sorting in sediments of the western continental shelf of Sri Lanka.
- c. the distribution of skewness sediments of the western continental shelf of Sri Lanka.
- d. the distribution of bottom sediments in the western continental shelf of Sri Lanka.
- e. the distribution of heavy mineral in sediments of the western continental shelf of Sri Lanka.
- f. the distribution of carbonates in sediments of the western continental shelf of Sri Lanka.
- g. the distribution of organic matter in sediments of the western continental shelf of Sri Lanka.
- h. the distribution of Aragonite, low and high magnesium calcite in sediments of the western continental shelf of Sri Lanka.
- i. the distribution of trace elements in sediments of the western continental shelf of Sri Lanka.

5.3.9 Seismic profiles collected during R/V "Samudra Mru" cruises were studied and sediment thicknesses were calculated in order to determine tentative estimates of reserves in carbonate material and glauconite. Calculations have shown the existence of approximately 23 billion tons of carbonate material with over 75% calcium carbonate to a depth of 1 meter. The Glauconite reserves are estimated at 36,000 tons off Panadura.

5.3.10 Data on the bottom morphology collected during R/V "Samudra Maru" cruises and annexed in Samudra Maru Reports were re-interpreted into three sheets and are ready for publication.

5.4.1 Services Rendered

Dr. Wickremaratne served in the NARESA Working Committee on Natural Resources to which he has been elected for the period 1988/90.

Dr. Wickremaratne served as invited expert in Marine Geology to the First Preparatory Meeting of the IOC Regional Committee for the Central Indian Ocean held in Islamabad, Pakistan.

Dr. Wickremaratne and Mr. Dulip Jayawardena represented Sri Lanka at the First Meeting of the Experts on Offshore prospecting for Mineral Resources in the Indian Ocean held in Karachi, Pakistan.

Dr. Gamini Ranatunga, Dr. S. Wickremaratne and Mr. N.P. Wijayanda represented Sri Lanka as Advisers on non-living resources at the 3rd Standing Committee Meeting of the IOMAC held in Colombo, Sri Lanka, November 1988.

Dr. S. Wickremaratne served as a visiting lecturer at the IOMAC - 101 Training Programme on the Management of Marine Resources in Kuala Lumpur, Malaysia.

Dr. S. Wickremaratne served on the International Editorial Board for the journal Coastal Resources Development and Management published in China.

On a request by the Secretary, Ministry of Fisheries the Puranwella Fishery Harbour breakwater was investigated by the division and the NHO and two reports submitted.

On a request by the Ministry of Fisheries the Division provided a one week training programme for 6 Fisheries Radio Officers.

On a request by the Ministry of Fisheries the Division is providing technical consultation necessary for the development of air and sea rescue operations currently being undertaken by the Ministry.

The Research Assistant (under the NARESA Grant) and two University trainees were introduced to the method of X-ray diffractometer analysis.

The Frank Iso-dynamic separator which we obtained through UNDP aid was commissioned. The NARESA Research Assistant, two University trainees and R.A.'s and two LA's of the Division were trained in the use of the instrument.

6.0 NATIONAL HYDROGRAPHIC OFFICE

6.1 OBJECTIVES

The National Hydrographic Office has the primary responsibility for hydrographic surveying and charting in Sri Lanka. The main objectives of the office are to carry out detailed hydrographic surveys of inland water bodies and inshore, near shore and offshore national ocean space upto the outer limit of the Exclusive Economic Zone of Sri Lanka, and the production of fair charts, navigation charts and other documents embodying the results of these surveys.

6.1.1 The main activities of the office are to produce the following:

- a. Navigation Charts of Sri Lankan Waters from the territorial sea baseline to the outer limit of the Exclusive Economic Zone of Sri Lanka.
- b. Tide Tables of National Waters.
- c. Co-tidal Charts of National Waters.
- d. Preparation and issue of Notices to mariners.
- e. Preparation and issue of list of lights.
- f. Continuous updating of the above documents.

6.2 PERSONNEL

Advisor

Mr. Nimal Wijesinghe

Charge Surveyors

Mr. S.W.S. Weerasinghe	B.Sc.
Mr. S. Withana	B.Sc.
Mr. M.A. Ariyawansa	B.Sc. Diploma (Statistics)
Mr. W.D.K.J. Muniratne	B.Sc.

Hydrographic Surveyor	(01)
Land Surveyors	(02)
Draughtsman	(02)
Survey Recorders	(02)
Stenographer	(01)
Survey Assistants	(04)
Office Aide	(01)
Consultant Cartographer	(01)
Expert Hydrographer	(01)

During 1988, the staff of the National Hydrographic Office was comprised of an Advisor, consultant cartographer, Expert Hydrographer, four Charge Surveyors, a Hydrographic Surveyor, two Land Surveyors two Survey Recorders, four Survey Assistants, a stenographer and an office aide.

Mr. Nimal S. Wijesinghe, Advisor, went abroad after completion of his contract period at the end of July 1988.

Mr. Michael Gruber, Expert Hydrographer, Hamburg Port Consulting, GMBH, joined the office in September, initially on a two year assignment as Consultant for the Project for Strengthening of the National Hydrographic Office. This is a project of technical co-operation between Sri Lanka and the Federal Republic of Germany, through the participation of the German Agency for Technical Co-operation and the Hamburg Port Consulting GMBH.

Dr. Shanthi Wickremaratne was appointed acting head of the NHO in November.

Mr. Walter Gunaratne, Former Map Production Officer, of the Sri Lanka Survey Dept. was engaged as Consultant Cartographer from February. Messrs. S.W.S Weerasinghe, S. Withana and M.A. Ariyawansa Charge Surveyors completed their probationary period and were confirmed in their posts.

Miss M.D.C. Jayanthi, Typist and Mr. P.B. Ratnapala, Draughtsman were confirmed in their posts.

6.3 WORK PROGRAMME AND PROGRESS

During the year under review the following activities were undertaken.

6.3.1 Coral Reef Survey in Unawatuna Bay

On a request from the Coral Division of NARA to carry out a survey and prepare a plan showing reefs in Unawatuna Bay, two surveyors were engaged on the survey work for 10 days from 30th January 1988.

6.3.2 Survey of Hydro-Electric Reservoir Ponds in Laxapana, Canyon and Norton Bridge

This survey was undertaken on a request from the Ceylon Electricity Board who wished to ascertain the storage capacity with respect to water level for the regulating of ponds at Norton Bridge, Canyon and Laxapana Reservoirs. The survey was commenced in 1987 and continued in 1988.

The field work was done in two phases.

Phase 1 - Establishment of Control Points and survey of topographic features in all three ponds.

Phase II - Carrying out soundings of the ponds.

The plans were completed and handed over to the Ceylon Electricity Board on 14th October 1988.

6.3.3 Rock Blasting surveys for the ministry of Fisheries

The surveys were carried out at Unakuruwa Rottegewella, and Hammuttage Waraya starting from 15th March 1988. Two surveyors were engaged in this work and the plans prepared on schedule. A second survey was carried out at the same location -s of rock obstructions which had not become evident from the first survey. The report and plans of the second survey were submitted to the Ministry of Fisheries. Further survey work regarding the removal of obstructions remains to be done in these locations, in collaboration with the Ceylon Fishery Harbours Corporation.

6.3.4 Galle Buck - Land and Hydrographic Survey

A land and hydrographic survey was carried out on a request from the Chairman, NARA to prepare a chart showing shore features and bottom topography in the Galle Buck area in Colombo Fort. The work was carried out between 24th February and 6th April 1988 and the plan work completed thereafter.

6.3.5 Land Survey at Etalai - Kalpitiya

On a request from the Aquaculture Unit of NARA a land survey was carried out at Etalai-Kalpitiya on 1st March 1988. The site surveyed was to be taken over by NARA for a project to be implemented by the Aquaculture Unit.

6.3.6 Land and Hydrographic Survey - Lake Gregory, Nuwara-Eliya

Inspection maps and diagrams of the lake were prepared. The survey was started on 16th June 1988 and completed on 13th July 1988. The plans and maps were completed in November 1988.

6.3.7 Survey of the Puranawella Fishery Harbour

At the request of the Ministry of Fisheries a survey of the Puranawella Fishery Harbour, being constructed by Construction & Development Engineers Ltd. under the supervision of the Ceylon Fishery Harbours Corporation, was carried out from 12th May 1988 to 27th May 1988. A comprehensive report was prepared highlighting the present situation with regard to the position, shape and finished level of the breakwater.

6.3.8 Land and Hydrographic survey of the Naval Dockyard at Trincomalee.

On a request from the Sri Lanka Navy the National Hydrographic Office carried out a detailed land and hydrographic survey of the Naval Dockyard and Harbour area at Trincomalee, from 15th June 1988 to 22nd July 1988, in connection with the construction of the proposed quay at Trincomalee Harbour. Plan work was completed in August 1988 and a copy of the fair sheet of the survey was submitted to the Central Engineering Consultancy Bureau.

Subsequently, on a request from the Central Engineering Consultancy Bureau, the NHO carried out engineering surveys at two sites in the Naval Dockyard, in September 88 and a plan was completed and submitted to the CECD in October 1988.

6.3.9 Maps of the Negombo Lagoon

On a request from the Chairman a map of the Negombo Lagoon and surrounding area on the scale of 1:10,000 was prepared with appropriate colouring.

6.3.10 Land and Hydrographic Survey of Negombo Lagoon

On a request from the Ministry of Fisheries the NHO carried out a land and hydrographic survey of the Negombo Lagoon to determine the silted area and the pattern of currents. This was completed in November 1988.

6.3.11 Land Survey at Kadokele in Negombo Lagoon

On a request from the Directorate of Services and Operations, NARA, a land survey was carried out at Kadokele for the purpose of acquiring an area of land for NARA. The survey was executed and plans prepared in December 1988.

6.3.12 Navigation support for Oceanography Unit

- 1) The surveyors of the NHO were engaged in providing navigation support to the Oceanography Unit on its cruises Nos. SM-18, SM-19, SM-20, SM-21, SM-22 and SM-23 aboard the "Samudra Maru".
- 11) A surveyor from NHO carried out position fixing support for the Oceanography Unit for a sea bed sampling survey in the area between Kalpitiya and Udappuwa from 24th to 28th February 1988.
- 111) On a request from the Sri Lanka Navy the plans of the Puttalam Lagoon Survey of Channel, were re-drawn on the same scale on eight A1 size sheets.
- 1V) The following miscellaneous documents were prepared.

Diagram showing the numbering system for hydrographic charts of NHO

Map showing marine zones of Sri Lanka with their extents.

- V) Over and above the foregoing the assistance and support requested by NARA Units such as in the making of maps, sketches, lettering on charts, pursuing survey related inquiries with the Survey Department and Corporations were undertaken during the period under review.
- VI) During the period under review seven meetings of the Director's of NHO were held.

6.4 PROJECT FOR STRENGTHENING OF THE NATIONAL HYDROGRAPHIC OFFICE

This project aimed at providing the necessary technical expertise and instrumentation to strengthen the hydrographic service in Sri Lanka offered by the Federal Republic of Germany as a fulfilment of the efforts of the International Hydrographic Bureau, commenced with the arrival of the German expert in hydrography, Mr. Michel Gruber, in Sri Lanka in September.

In initial work of planning of the project started a few days later after Mr. Gruber made a study of the present set-up of the organization.

The preliminary work attended to during the months October, November and December 1988, included the visiting programme of the Expert to organizations in Colombo related to the hydrographic field, procurement of quotations for vehicles, frequency permits, programme of lectures on positioning and echo sounding and introduction in computer handling and operating.

7.0. ENVIRONMENTAL STUDY DIVISION

7.1 Objectives

- 7.1.1 To investigate, monitor & report on aquatic environments & factors affecting it.
- 7.1.2 To compile baseline data on existing aquatic ecosystems
- 7.1.3 To respond to and advise on aquatic environment problems & emergencies.
- 7.1.4 To provide extension services with respect to the aquatic environment such as
- a) Analytical Services
 - b) Advisory (Environmental Impact Assessment)
 - c) Consultancy services
 - d) Development of environmental awareness to both private & public sectors
- 7.1.5 To study quality of effluent releasing from factories in order to prevent contamination of aquatic environment.

7.2 PERSONNEL

Research Officers

Dr. (Miss) Padmini de Alwis

B.Sc. (2nd Class Hon)
Ph.D (Microbiology)

Mr. N.H. Dassanayake

B.Sc. (General)

During the year the division had a staff of 04 Research Officers, 02 Research Assistants, a typist, Laboratory Attendant and a Labourer. Research Officers, Dr. Ravi Pereira and Mr. H. Yatapana resigned from their posts in September & October '88 respectively.

7.3 WORK PROGRAMME AND PROGRESS

7.3.1 NARA & NARESA Funded Projects

7.3.1.1 Nuwara-Eliya Lake

The study identified eighteen feeder streams around the lake, many carry appreciable nutrient loads together with large bacterial loads in some instances. A multidisciplinary research approach was set up to assess the present status of the lake. A paper on preliminary findings was presented at the SLAAS Technical Sessions in Dec. 1988.

7.3.1.2 Belihul-Oya Stream

Samples were collected from sites along a tributary of the Belihul-Oya at monthly intervals from 5 sites to ascertain the present quality of the stream at Horton Plains. Results indicate the composition of water of the Belihul-Oya passing through Horton Plains is neutral in reaction with no excess of mineral or saline constituents.

7.3.2 GCEC Environmental Monitoring Programme

7.3.2.1 Monitoring of Industrial Effluents

7.3.2.1.1 Katunayake Export Processing Zone

Fifty two inspection visits were made to Katunayake Export Processing Zone and a total of two hundred & thirty eight samples were collected and analysed for fifteen parameters. Out of these samples 101 samples failed to conform to GCEC specifications for effluent discharged into public sewers. Reports indicating recommendations for necessary follow up action were sent to the GCEC with a view to the control of environmental pollution.

7.3.2.1.2 Biyagama Export Processing Zone

Forty six visits were made to the Biyagama Export Processing Zones - and a total of 122 samples were collected during the year. Thirty seven samples did not conform to the GCEC standards for effluent discharged into public sewers. Reports were sent to the GCEC with recommendations for necessary action where required.

7.3.2.1.3 Monitoring of Factory Effluent Located Outside Export Processing Zones - Ekala & Biyagama

Factories located in the Industrial Estate at Ekala were inspected at, once in two weeks intervals and samples were collected and analysed whenever necessary.

In - effectiveness of in-house treatment plants of M.K.C Industries Ltd. (Weligampitiya) & Pure Beverages Company Ltd. (Biyagama) was brought to the notice of the GCEC Authority for necessary action.

7.3.2.2 Monitoring of Common Sewage Treatment Plants in KEPZ & BEPZ

Two Common treatment plants located in two Export Processing Zones were inspected weekly and samples were collected from inlets as well as outlets. Thirty nine out of Eighty nine samples collected from Katunayake STP found to be unsatisfactory as they exceeded requisite BOD levels while twelve samples (out of 75) collected from Biyagama STP were found to have unsatisfactorily high BOD values.

7.3.2.3 Monitoring of Inland Surface Waters near Effluent Discharges from BEPZ

7.3.2.3.1 Kelani River

Samples were collected from a number of selected sites and analytical results indicated that the chemical quality of river water is well within the W.H.O. guidelines for abstraction of drinking water. The presence of faecal indicator organisms would require that the water be treated before use.

7.3.2.3,2 Dandugama Oya

Survey is being conducted at three selected sites on the Dandugama Oya in close proximity to the effluent outfall from the Katunayake Export Processing Zone. Samples were collected at once a week intervals and analysed for the determination of 20 chemical & 02 microbiological parameters.

7.3.2.4 Monitoring of Safety & quality to Drinking Water KEPZ & BEPZ

7.3.2.4.1 Treated Water

Laboratory bacteriological & chemical analysis were done on the drinking water supplied by GCEC to the Export Processing Zones. Residual chlorine levels in the distribution system were also determined in situ. Analysis were also done to see whether water confirms to the standards required for boiler feed waters.

7.3.2.4.2 Ground Water - KEPZ.

Samples were collected from the tube wells located in KEPZ. Five out of eight were found to be unsatisfactory according to the W.H.O. standards & reports were sent to the GCEC with recommendations.

7.3.2.5 Rearing of Fish in a Reservoir Located in BEPZ

Determination of quality of water from reservoir at BEPZ was carried out regularly to study the feasibility for rearing the fish in this reservoir. Necessary recommendation & information were reported to GCEC.

7.3.3 Special Projects

7.3.3.1 Disposal of Solid Wastes - Union Carbide Ceylon Ltd

Joint inspections were carried out with CEA, CISIR & GCEC and observations & comments were made and sent to the GCEC along with the precautionary measures that have to be taken by the Union Carbide Ltd in order to make the operations of solid waste disposal safe from an environmental point of view.

7.3.3.2 Industry for Manufacture of Mirrors

Inspections were made, water samples were collected and analysed for 20 chemical parameters. Subject to the adoption of some precautionary measures approval of this industry was recommended.

7.3.3.3 Project for the manufacture of Yeast

Inspections were done jointly with GCEC and observation and comments were sent to the GCEC regarding the site approval for the above project.

7.3.3.4 Pollution of Two Ponds within the Zoological Gardens - Dehiwela.

Preliminary investigations on two water filled quarries were conducted at the request made by Director, National Zoological Gardens - Dehiwela.

Chemical & biological analysis of the two ponds were carried out and the report together with observations were sent to the Director Zoological Gardens. Follow up work is required for a more permanent solution and will be undertaken after mutual agreement with the Dept. of National Zoological Gardens.

7.3.3.5 Muthurajawela Marsh Development

The ESU represented NARA at meetings held by the GCEC on the subject of the development of the Muthurajawela marsh. NARA and the CEA cautioned against any proposed development without an EIA or extensive consultation with all parties (especially NGO's) concerned. NARA is to institute a study of the intergrated development perspectives for Negombo and Muthurajawela.

7.3.3.6 Bottled Water Project - Avery Ltd

In response to the letter from Chairman NARA request, the site chosen by Avery (Devon Falls) was visited and deemed visually to be unsuitable for abstraction of drinking water due to its heavily polluted nature. The representative was advised to seek another source of a purer nature which could then be tested for purity.

7.3.3.7 Governors Pool Development

Chairman/NARA and several Officers from the Agency including Dr. Ravi Pereira & Mr. Nimal Wijesinghe of the NHO met with the architects involved in the above project on 23.02.88. Further discussions were to be held prior to any proposed construction activity.

7.3.4 Emergency Studies

7.3.4.1 Disease Outbreak at Katunayake Garments Ltd - KEPZ

A study was conducted to find out the relationship between a disease outbreak at this factory and water quality provided by the GCEC. Results indicated that the drinking water supplied to this factory was free from disease causing organisms.

7.3.4.2 Fish Mortality due to UFD in Dandugam Oya & Kelani River

Studies were carried out following reports on fish mortality in Dandugam Oya & Kelani river in collaboration with the Aquaculture Unit of NARA. chemical tests carried out ruled out the possibility that chemical pollution of the water was the primary cause for the mortality. Pathological examination of fish collected from the sites indicated that the fish showed Necrotic Ulcerations of body & gills together with secondary bacterial & fungal infections characteristic of ulcerative fish disease (UFD).

7.3.4.3 Investigation of Reported Water Pollution from Leaking Oil Pipe Line.

A preliminary study was conducted on ground water quality around Maguruwila & Gonavela. Report was forwarded to the Petroleum Corporation & Chairman/NARA together with chemical analysis of water samples.

7.4 EXTENSION SERVICES

7.4.1 Testing of Water Quality in Ceylon Fisheries Corporation Premises

Tests were conducted to study the quality of water supplied to Ceylon Fisheries Corporation by the NWS & DB.

7.4.2 Testing of Water Quality in CFHC Premises

Tests were conducted to study quality of water supplied to Ceylon Fishery Harbours Corporation by the NWS & DB. Bacteriological quality & pH that did not meet Sri Lanka Standards were brought to the notice of G.M. of CFHC, with necessary recommendations.

8.0 ECO -SYSTEM STUDY DIVISION

8.1 OBJECTIVES

8.1.1 To undertake policy and purpose oriented research in relation to NARA's Coral Reef Programme.

8.1.2 To Establish a Multiple-use Marine Reserve at Unawatuna, Galle, one of the last remaining coral reefs in Sri Lanka.

8.1.3 To map Corals/Sand stone reefs in the country.

8.1.4 To assess the reefs and resource potential and the effects of both natural and human induced activities on the resources of the area concerned.

8.1.5 To establish human use limits.

3.2 PERSONNEL

Research Officers

Dr. Ajantha de Alwis

Ph.D (Fisheries Biology)

Mr. Arjan Rajasuriya

G.C.E. (O/L)

Divers

(02)

During the year the division functioned with a staff of four officers comprising of a Research Officer, Diving Officer, Diver/Technician and a Casual Diver.

Diver Technician Mr. Luxman Ginige was confirmed in his post in September. Mr. A. Meedeniya, an undergraduate from the University College of Wales, worked in the programme from January to June on a voluntary basis.

3.3 WORK PROGRAMME & PROGRESS

All projects under Coral Reef Programmes are NARA funded. Regular visits (once a month) were done during (January - July) non-monsoonal period and investigations were carried out within and out side the bay of Unawatuna (by snorkel diving and SCUBA diving, surface towing with a diver on a tow rope). Observations and recording of fish corals and other dominant organisms were made. Information on tourism fisheries and other related activities in the Unawatuna Bay area were obtained by direct observations and interviewing officials of the Ministry of Fisheries, Fishermen, Hoteliers, Villagers etc. In addition to these, a land survey and a sea survey was carried out with the NHO of NARA to determine the reserve boundaries.

In view of mapping of the coral/sand stone reefs of the country, the Colombo area was covered by the team. Assessments were done by snorkel and SCUBA divers. Records on the percentage live and dead coral cover, species composition of corals fish and other organisms were recorded. New records of corals were added to the coral reference collection of NARA.

Coral Reef surveys generally are confined only to six months of a year due to natural reasons (during monsoons, work cannot be done at sea). Therefore it is necessary to make maximum use of the time and the division must be geared with more divers and also with more diving equipment. This was very badly felt as Unawatuna surveys had to be carried-out quickly. A vehicle which can accommodate all diving equipment (including a compressor) and personnel, is a vital requirement.

9.0 NATIONAL MARINE MAMMALS PROGRAMME

9.1 OBJECTIVES

9.1.1 To carry out studies on population dynamics of small Cetaceans.

9.1.2 Study the stock size of dolphins by mortality studies, direct observation and tagging method.

9.1.3 To carry out large whale surveys to study their migration and stock sizes.

9.2 PERSONNEL

Research Officers

Dr. Ajantha de Alwis

Ph.D. (Fisheries Biology)

Miss. Anouk Ilangakoon

B.A. (General)

Research Assistants

(02)

Miss. Anouk Ilangakoone, Miss. Kanthi Subasinghe and Mr. W.P. Mahendra were confirmed in their posts as Research Officer and Research Assistants respectively in September.

9.3 WORK PROGRAMME AND PROGRESS

Monitoring of fish landing sites along the coast from Negombo-Kottegoda for assessment of dolphin mortality was continued upto the 3rd quarter 1986. The prevailed situation in the country during the 4th quarter (October - December) prevented the team from collecting data. Morphometric data on the species were recorded. Other information such as the distance from which the dolphins were caught were recorded by interviewing the fishermen.

Lack of boat facilities have prevented in carrying out a tagging programme, and also observation tours. Since 1986 mortality studies have been confined to west and south coast of Sri Lanka. It was possible to carry out any studies on large whales during the year.

In view of the above constraints it has been decided to extend the programme to 1989 to obtain sufficient information to establish the population size of dolphins.

10.0 INFORMATION DIVISION

10.1 OBJECTIVES

- 10.1.1 To collect published and unpublished products of analysed and recorded data in documentary, audio-visual or electronic form.
- 10.1.2 To store, repackage and disseminate information useful for the development of aquatic resources and marine affairs in Sri Lanka.
- 10.1.3 To establish a Marine Affairs and Aquatic Resources Information Service and to progressively broaden its activities from National to Regional and International Levels.

The objectives to be realised by the following:

The establishment of an automated national repository & research library in marine affairs.

Create a computerised data base of national marine & aquatic resources literature, which could provide search and bibliographic output services with back up document delivery services.

Establishment of a Documentation Unit which could process, repackage & publish the information gathered, at national, regional & international level. Reports, abstracting journals, Directories, leaflets & Information packages are outputs of this division.

Establishment of an Extension Services Unit to provide currency awareness and outreach services to the user community.

10.2 PERSONNEL

Information Officers

Lalitha D. Bandaranayake

B.Sc.
A.S.L.A.

Gayathri Padmaperuma

B.Sc.
M.Sc. (Agri)

Lloyd Wijesuriya

B.Sc

Michele Berenger (Extension Officer)	D.A. (Special)
Yasasiri Janaka Kumara (Publications Officer)	G.C.E. (A/L)
Librarians	(02)
Data Entry Operator	(01)
Liaison Officer	(01)
Typist	(01)
Labourer	(01)

During the year, the staff position of the division was strengthened with the recruitment of new staff.

Miss. Michele Berenger, the Extension Officer was confirmed in her post in January.

10.3 WORK PROGRAMME AND PROGRESS

10.3.1 Library

Library expansion in terms of space and holdings commenced with the commencement of the IDRC funded MAARIS Project, in Jan, 1988. The Laboratory to the left of the Library was cleared and organized to house the computer facility, the publishing facility and the staff cubicles.

10.3.1.1 Acquisitions

As Rs. 78,000.00 was available for purchase of books from the MAARIS project, it was possible to increase the subscriptions of periodical titles from the 14 of the previous year to 24 titles.

In order to strengthen the collection of monographs in areas such as, oceanography, hydrography & marine geology, requests were sent out to international organizations & publishing houses of repute for books, giving list of books necessary with all relevant details.

10.3.1.2 Services

The inclusion of subjects on marine aquatic resources in the school curricula, brought in an influx of school children. A demand was also made by the parents for publications, that could be purchased, which could provide the necessary information for the children in simpler form. Two information leaflets were planned to be printed in 1989 for this purpose, with MAARIS funds.

The use made of the inter-library loan facility showed a marked increase in 1988, both in terms of requests from outside libraries as well as requests from our officers. The Accession List, with all accessions to the Library was circulated quarterly among the NARA staff.

A new Editorial Board for the Journal of the National Aquatic Resources Agency was set up in Aug. 1988 as follows:

- Dr. Hiran W. Jayewardene (Chairman)
- Dr. G.C.N. Jayasuriya
- Prof. H.H. Costa
- Prof. Sena de Silva
- Prof. G.E. Dissanayake
- Prof. P.A.J. Perera
- Dr. S. Subasinghe
- Dr. Ravi Perera
- Prof. R.J. Roberts
- Mrs. Lalitha Bandaranayake (Secretary)

But till the end of the year it was not possible for them to meet. The Vol. 32 of the Journal went into press in the fourth quarter of the year and was not possible to get it printed before the year was out due to the work being disrupted in commercial establishments.

10.3.2 MAARIS (Marine Affairs & Aquatic Resources Information System)

The MAARIS Project commenced in Jan, 1988, with 50,000 CDB available to NARA from IDRC of Canada for the first year. This was to strengthen the library & set up the Documentation unit. Further sum of 50,000 CDS was made available to NARA in April 1988, under the MAARIS Project from ICOD of Canada to strengthen the Extension Unit.

10.3.2.1 Computer Facility

A fully operational desk-top publishing system with all relevant hardware & software in addition to the computer requirements for the national data-base, was purchased with the same amount of money made available in the project for the latter only. Since we also had the good fortune to recruit an experienced systems analyst as one of the information officers, we have in a very short space of time being able to not only proceed rapidly towards the setting up of the data-base but also offer from MAARIS a service for which no provision was made in the project. That is a system capable of providing 'layout' of documents by use of "Ventura" desk-top publishing software with a camera ready copy of the document printed by use of the LaserBeam Printer, to be used as art-works for printing. MAARIS Data Basesystems were designed with assistance also from Mr. Gaffoor of MARGA Institute, the consultant to the MAARIS Project.

The inputs to the data-base were done, each with its own abstract, and by the end of 1988, 83 publications were included and work was progressing towards the generation of an abstracting journal, from this data base.

10.2.2.2 Printing Facility

Though it was not planned at the beginning as a result of the lay-out facilities available from the computer unit, by the end of 1988, we were able to offer NARA a complete documentation service, from lay-out to printing, using the heavy duty photocopy machine available.

Though no provisions of staff were made for this purpose, this service is now possible due to the enthusiasm and willingness of all staff in the division to work as a team often in non working hours.

By the use of this facility it is hoped to do the lay-out & all text and art works for all future issues of the NARA Journal by ourselves, saving a considerable amount of money now spent on type-setting when printing is entrusted to commercial printing houses. It is also hoped to provide editing, lay-out, printing & publication services to all NARA publications in 1989, from a fully equipped printing facility with an offset-printer, plate maker, and laminator partly funded by UNDO & IDRC.

10.3.2.3 Extension Services facility

In addition to the appointment of the Extension Officer and Liaison Officer the services of the two photo technicians of NARA are made available to the unit. The development of NARAPHOTO Archives as a resource base was undertaken in 1988. The NARA collection of several thousands of photographs and negatives, accumulated since the inception, was sorted, numbered and filed under subject headings. The file collection now stands over 50.

For the video archives all past news items, documentaries and features containing NARA telecast over Rupavahini were traced with a view to purchasing. All past radio programs recorded by NARA personnel and broadcast over SLBC going far back as 1983 were traced and recorded.

With establishment of the unit in Jan. 1988, it plunged headlong into the controversy resulting from the announcement of the proposed Coal power plant in Trincomalle. NARA was required to provide information on the possible and potential environmental damage from coal-fired electricity generation especially its effect on marine life.

The Extension unit initiated and provided background material for newspapers, radio and TV coverage for this controversial topic. It also embarked on production of a 45mt. documentary entitled "Price for Power: two sides to the question on Trincomalle coal power saturation". Complete editing of this production was not possible due to lack of in-house equipment. Video footage have also been made on the following.

- activities of NHO
- NARA /FAO Sea-weed project
- mussel culture project
- R.V. Conrad
- R.V. Samudra Maru

Media coverage was also given to conservation of sea-turtles and mangroves. Contributions were also made to the press on the Ocean Drilling Program (ODP) of the sophisticated deep-sea drillship "JOIDES RESOLUTION" on its survey in the Indian Ocean.

0.3.5 IOMAARIS (Indian Ocean Marine Affairs & Aquatic Resources Information System)

This regional information system would create three Marine Affairs & Aquatic Resources Information & Data Processing Facilities in the three IOMAC countries, One such facility now being developed with the IOMAC Secretariat in Colombo, has identified the MAARIS library as its reference library as it is housed at NARA which is the IOMAC Focal Point for Sri Lanka. The "documentation & publishing unit" of MAARIS now services the IOMAC Secretariat with regard to its documentation & printing requirements, and will continue to be the repackaging unit of the IOMAARIS Node in Sri Lanka, in this net-work.

This computerized Data Centre for IOMAARIS, which will set up the in-house data files is also to be intergrated within NARA making use of already existing computer facilities. MAARIS already has capabilities in terms of equipment, personnel and expertise in programming/system design, to receive data in electronic media & disseminate it to the region. The Bibliographical Data Base of MAARIS uses internationally accepted software (UNESCO/CDS/ISIS) which has facilities for processing numerical data and net-working facilities. In the design of the MAARIS data-base at NARA begining from the input sheet, provision has been made for access and dissemination of information regionally.

MAARIS, node of this net-work at NARA, operating directly in conjunction with the IOMAC Secretariat, would when fully operational, act as a switch board service for exchange of information, for referral purposes. Though not designed as a repository, its in-house regional bibliographical data file, would contain references to publications from all IOMAC countries. A few more data-files would be set up, including a register of experts, now being processed at NARA.

By this NARA and Sri Lanka stands to gain directly in terms of information access to publication & data from the region & indirectly in the upgrading & strengthening of the present library and information facility in quality and dimension.

ANNEX 1

SEMINARS, STUDY TOURS AND TRAINING PROGRAMMES

1.0. Marine Biological Resources Division

All officers of this division participated in FAO/DANIDA/NARA, training course on Fish Stock Assessment held from 15th Jan. to 11th Feb. 1988 at NARA.

Dr. P. Dayaratne, Mrs. R. Maldeniya & Mr. J.A. de Silva participated in a review meeting of the Exploratory fishing for Tuna in Sri Lanka and Maldives TCP/SRL/6653 held at NARA from 9th - 11th May 1988.

Dr. P. Dayaratne participated in the 12th Advisory Committee Meeting of Bay of Bengal held in Orissa, India from 11th Jan. to 15th Jan. 1988. This was followed by a study tour to visit the Fisheries Research Institutes in India.

Dr. P. Dayaratne & Mr. J.A. De Silva participated in the Expert Consultation on Stock Assessment of Tuna in the Indian Ocean and the 10th session of the IOFC meeting in Mauritius from 22nd June - 1st July 1988.

Mr. D.S. Jayakody left for Post Graduate Studies in the United Kingdom in Sept. 1988.

Dr. P. Dayaratne & Mr. J.A. de Silva participated in the 3rd Standing Committee Meeting of the IOMAC held in Colombo from 21st Nov. to 23rd Nov. 1988.

2.0 Inland Aquatic Resources Division

Mr. P.P.G.S.N. Siriwardena, attended the Working Party Meeting for Survey on Aquaculture, Tokyo, 26-30 Sept. 1988.

Mrs. M.M. Kuruppu, participated in the 3rd International Nutrition Workshop, Bangkok, June 1988.

Mr. J.M.P.K. Jayasinghe, completed 9 months of study at Stirling University, U.K. for his Ph.D from June 1988 Feb. 1989.

Mrs. M.M. Kuruppu, Mrs. S.C. Jayamanne, Mr. U. Amarasinghe & Mr. J.A. de Silva participated in the FAO/DANIDA/NARA, Training Programme on Fish Stock Assessment, Colombo, 15 Jan. - 11 Feb. 1988

Represented NARA at the committee appointed to make recommendations on innovative approaches for the development of Inland Fisheries in Sri Lanka.

3.0 Institute of Post Harvest Technology

Dr. S. Subasinghe, Mrs. V. Jayaweera and Miss. Nalini Chinivasagam participated in the Indo-Pacific Fishery Commission Working Party on Fish Technology and Marketing held in Bangkok, Thailand from 19-22 April, 1988.

4.0 Engineering and Technology Division

Mr. S.L. Suraweera World Symposium on Fishing Gear and Fishing Vessel Design in New Foundland, 21 - 24 Nov. 1988.

5.0. Oceanography Division

Mr. Dulip Jayawardena attended a 4 week Training Programme on Deep Sea Bed Mining at Cartehena, Colombia and at the U.N. Law of the Sea Office.

Dr. G. Ranatunge attended a 3 weeks training course on remote sensing held in Dakha, Bangladesh in June 1988.

Dr. S. Wickremaratne represented Sri Lanka at the First Meeting of Experts on Offshore Prospecting for Mineral Resources in the Indian Ocean held in Karachi, Pakistan in July 1988 (1 week).

Dr. S. Wickaremaratne was invited by the IOC as expert in Marine Geology to the first preparatory meeting of the IOC regional Committee for the Central Indian Ocean held in Islamabad, Pakistan in June 1988 (3days).

Mr. N.P. Wijayananda was in Imperial College, London completing his 1st year post graduate research from 15th October 1987 to 15th October 1988.

6.0 National Hydrographic Office

Mr. S.W.S Weerasinghe, was away in Japan for a period of three and half months following a course in Nautical Charting at the Hydrographic Dept. Tokyo, sponsored by Japan International Co-operation Agency.

Mr. S.W.S. Weerasinghe, attended a workshop in Remote Sensing in the Survey Dept. under the auspicious of the Arthur C. Clerk Center.

Mr. S. Withana participated in a seminar on Tropical Cyclones conducted by the Meteorological Department.

Mr. P.B. Ratnapala, participated in a two weeks training course in Desk Top Publishing System at Messrs. DATEXT (PVT) Ltd, Colombo.

7.0 Environmental Study Division

Dr. Ravi Pereira attended a seminar on Environmental Education conducted by UNESCO & CEA from Feb. 9 - 13, 1988.

Dr. P. de Alwis attended a seminar on "Evaluation of Research & Development Effort" at NAFESA on 19th Feb. 1988.

Dr. Padmini de Alwis participated in ICHAC - ICI Training Programme on Marine Affairs, held in Kuala Lumpur, Malaysia from 10th Oct. to 16th Dec. 1988.

Dr. P. de Alwis was interviewed in a panel discussion on Radio in March in the subject of River Pollution and the outbreak of Ulcerative Fish Disease (UFD). The panel also consisted of Dr. Upali Denanayake, Dr. R. Mathes & Miss . Y. Perera from CISIR.

Dr. Ravi Pereira was interviewed along with Mr. Lalanath de Silva of Environmental Foundation Ltd. in March in the subject of the coal fired power plant proposed for Trincomalee.

8.0 Eco-System Study Division

Mr. A. Rajasuriya attended IOMAC-101 training course in Marine Affairs from 10th October to 18th December 1988 held in Kuala Lumpur, Malaysia.

10.0 Information Division

Mrs. L. Bandaranayake underwent training in the use of CDS/ISIS software package gifted by UNESCO for the MAARIS Data Base, at a workshop held by the Sri Lanka Library Association, 4 - 7 March 1988.

Mrs. L. Bandaranayake attended a Regional Consultation on Fishery Information to identify ways & means of strengthening co-operative programmes for exchange of information, data & experience in support of small scale fisheries organized by BOEO in Madras from 5 - 7 Oct. 1988.

Miss. M. Berenger, attended the IOI Training Programme on Management of Marine Resources in the Exclusive Economic Zone, in Halifax from 9 June to 10 Aug. 1988.

Miss. M. Berenger, attended the 'Pacem in Maribus' conference, Halifax 22 Aug - 26 July 1988.

Miss. M. Berenger, undertook a study tour in New York, U.K. Geneva, and Singapore from 31 Aug. - 16 Sept. 1988.

Mr. Lloyd Wijesuriya underwent training in the use of CDS/ISIS software package for library data bases organized by the Sri Lanka Library Association from 11 - 15 July 1988.

Miss. Gayathri Padmaperuma attended the INFOFISH(KL)Export Development Board Seminar on "Marketing & Technical issues in the export of fishery products" 5-6 July 1988.

Mr. Yasasiri Janaka Kumara & Mr. Lloyd Wijesuriya attended a one day seminar on Information Technology organized by the Sri Lanka Library Association on 9 Sept. 1988.

ANNEX 11

PUBLICATIONS, REPORTS, PAPER PRESENTED & SERVICES RENDERED
ETC.

1.0 Marine Biological Resources Division

Dayaratne, P. 1988 - Exploitation of small pelagic fish resources by purse seiners on the south west coast of Sri Lanka. Proceeding of the symposium on Tropical Marine Living Resources 12 - 16 Jan. 1988, Cochin, India.

Dayaratne, P. & Maldeniya, R. 1988 - The status of tuna fisheries in Sri Lanka. Proceedings of the Expert Consultation on Stock Assessment of Tunas in the Indian Ocean Mauritis 22 - 27 June 1988.

Dayaratne, P. (in press) - Primary growth rings in otoliths of some clupeids from Sri Lanka Asian Fisheries Research Journal.

Dayaratne, P. (in press) - Age and growth of milkfish (*Chanos chanos*) by using daily growth rings in otolith. Journal of Inland Fisheries Ministry of Fisheries Sri Lanka.

Dayaratne, P. - An assessment of *Amblygaster sirm* (Walbaum) stock in the south west coast of Sri Lanka. Accepted for presentation at the Second Asian Fisheries Forum 17 - 22 April, 1989, Tokyo Japan.

Dayaratne, P. - Age and Growth estimated of *Stolephorus heterolobus* (Ruppell) by using the daily growth rings in the otoliths, Accepted for presentation at 2nd Asian Fisheries Forum 17 - 22 April, 1989.

Jayawickrema, S.J.C and D.S Jayakody (1988) - Population dynamics of *Penaeus indicus* (H. Milne Edwards) in the west-coast of Sri Lanka. Proceedings of the symposium held by the Marine Biological Association of India.

Jayawickrema, S.J.C (1988) - Fishery and some aspects of the population of *Panulirus homarus* (Linnaeus) from Mutwal, Sri Lanka. Presented at the 44th annual session of SLAAS. Sent to Asian Fisheries Science to consider for publication.

Jayawickrema, S.J.C and D.S Jayakody (1988) - Status of the prawn fishery in Negombo and Chilaw. Sent to the Secretary, Ministry of Fisheries through Chairman, NARA.

Karunasinghe, W.P.N. - The status of the Beach Seine fishery in the south west coast of Sri Lanka. Processing of the symposium on Tropical Marine Living Resources 12 - 16 Jan. 1988, Cochin, India.

2.0 Inland Aquatic Resources Division

Amarasinghe, U.S. 1988. Growth-over fishery: a potential danger in the Sri Lankan reservoir fishery, In: Reservoir Fishery Management and Development in Asia (S.S. de Silva ed) pp. 105 - 112, IDRC Publication, Ottawa, Canada.

Amarasinghe, U.S. 1988. The role of fishermen in implementing management strategies in the reservoirs of Sri Lanka. In: Reservoir Fishery Management and Development in Asia (S.S de Silva ed.) pp. 153-163. IDRC Publication, Ottawa, Canada.

Amarasinghe, U.S 1988. Empirical determination of a desirable mesh size for the gill net fishery of *Oreochromis mossambicus* (Peters) in a man made lake in Sri Lanka. Asian Fisheries Science 2:000-000.

Anarasinghe, U.S. and J.L. Samarakoon, 1988. Some factors affecting contribution of the cichlid species *Ectopoma suratensis* and *Tilapia rendalli* to gill net catches in a man made lake in Sri Lanka. Asian Fisheries Science, 2: 60-66.

Infection of *Cherax quadricarinatus* (Decapoda: Parastacidae) by the microsporidium *Theλονamia* sp. (Microsporida: Rosematidae). Journal of Fish Diseases 11. 301-303. Brett Herbert.

II. Anarasinghe. Socio-economic status of the human communities of selected mangrove areas on the west coast of Sri Lanka Mangrove Ecosystem. Occ. paper No. 3 UNDP/UNESCO Regional Mangrove Project.

W.M.T.B. Wanninayake and A.A.D.S. Kumara. Experimental studies on raft culture of brown mussel *Perna perna* (Linnaeus) in Sri Lanka. Proc. of 2nd Asian Fish. Forum. Tokyo, Japan.

S. Siriwardena, P.P.G.S.N. Siriwardana and Tissa R.P.K. Seasonal and diurnal changes in some hydrobiological conditions of Bolgoda lake. (accepted to be published in Journal of Inland Fisheries IV).

Siriwardena, P.P.G.S.N. Milk fish farming in pens in Sri Lanka "Some economic aspects and recommendations". (acceptable to be presented at the 2nd Asian Fisheries Forum in April 1989).

Reports:

Perionyx excavata assessment for use in aquaculture submitted 23rd June 1988.

Quarterly progress report for 3rd quarter.

9 monthly reports were compiled and given to Chairman, Director General, U.I.C./I.A.R.D. and Professor H.H. Costa.

Yearly reports of activities submitted to Director General 26th December

Annual report on Mollusc culture (Sri Lanka) report submitted to IDRC-Canada.

Trincomalee Thermal Power Project - Phase III. Reports on Biological Aspects.

Report on grouper culture in Puttalam lagoon.

Report on the assessment of the suitability of an abandoned clay pit in Kaduwela for breeding and rearing of ornamental fish and breeding of freshwater prawn.

Preparation of quarantine committee report.

Preparation of quarantine committee report.

Preparation of lecture on disease problems in ornamental fish culture cause.

Advisory service to ornamental fish prawn culturists with regards to fish/prawn health.

Reports on U.F.D. occurrence in Sri Lanka.

Report on mosquito control in the Jattaramulla area.

Mullet fry-survey - Negombo lagoon.

Study of Benthos.

Monitoring of the IPHT/NARA Tuna sampling programme.

Red tilapia project.

To establish and operate a pilot scale sea weed fauna in Puttalam lagoon.

Suitable locations for trout fishing.

EDB/NDB Phase I.

Report of the Reservoir Fisheries Management Project I. Parakrama Samudra. March 1988.

Recommendations for the management of reservoir fishery in Sri Lanka. March 1988.

Report on the fishery in Maduru Oya reservoir, December 1988.

Report on the suitability survey of clay pits in Wennappuwa A.D.A. Division for fish culture in the special reference to Ornamental fishery.

Report on Advisory/testing services for Lever Aquaproducts Ltd.

Evaluation of the feasibility of crab culture fattening project in the Kalpitiya lagoon.

3.0. Post Harvest Technology Division

Following papers were presented at the Indo-Pacific Fisheries Commission Working Party on fish technology and marketing held in Bangkok, Thailand. April 1988.

V. Jayaweera and S. Subasinghe. Some chemical and microbiological changes during chilled storage of prawns (*Penaeus indicus*).

V. Jayaweera and S. Subasinghe. Microbiological changes in prawns (*Penaeus* sp.) during processing in Sri Lanka.

H.N. Chinivasagam, S. Subasinghe and G.C. Widanapathirana.
The storage of Vacuum packed Heat Sterilized Trenched sardines (*Amblygaster sirm*) at Ambient temperature.

S. Subasinghe, and M.K.W. Perera. Recovery of Flesh from *Oreochromis niloticus* by three different methods: Manual Separation, Filleting and Mechanical Deboning.

T.S.G. Fonseka and G.S. Widanapathirana. A study of Aerobic Microflora of Shrimp (*Penaeus indicus*) caught in the Sea off Negombo.

T.S.G. Fonseka. Microbial Flora of Pond Cultured Prawn (*Penaeus monodon*).

5.0 Oceanography Division

W.S. Wickremaratne. Offshore Minerals Deposits of Sri Lanka in Journal 'Kamnantha' Vol. 15 No. 1 1988.

W.S. Wickremaratne. Oceanography In Sri Lanka Past present and future. Journal of the Geol. Society of Sri Lanka. Vol. 1 No. 2 1988.

W.S. Wickremaratne. Minerals from around Sri Lanka. Journal of the Institutes of Chemistry Vol.1 1988.

W.S. Wickremaratne. Bottom sediments from the western continental margin of Sri Lanka. Abss. first International Conference of Asian Marine Geology, Shanghai, China.

W.S. Wickremaratne. Offshore prospecting for mineral resources in Sri Lanka. Proceeding of the IOMAC Vol. 2 1988.

W.S. Wickremaratne. Physiographic features on the western continental shelf of Sri Lanka. Proc. SLAAS 44th Annual Sessions, 1988.

W.S. Wickremaratne. Continental shelf sediments of western Sri Lanka. Proc. SLAAS 44th Annual Sessions, 1988.

Dhanmaratne, W.S. Wickremaratne. Shallow water carbonate facies on the continental shelf between Kalpitiya and Udappuwa. (Coauthored) Proc. SLAAS 44th Annual Sessions, 1988.

N.C. Ranatunga, W.S. Wickremaratne. A case study on Hydrography and Oceanography parameters of these selected estuaries of the eastern coast of Sri Lanka (Coauthored) Proc. SLAAS 44th Annual Sessions; 1988.

W.S. Wickremaratne. Offshore area National Atlas of Sri Lanka, 1988.

W.S. Wickremaratne. The first meeting of the IOMAC technical group on offshore prospecting for mineral resources. Geological Society of Sri Lanka Newsletter Vol. 5 No. 5 Dec. 1988.

H.P. Wijayananda (Coauthor). Himalayan uplift history observed on the Equator-Geotime 1988 January.

H.P. Wijayananda. Abstract of presentation developing country participation with ocean drilling programme in Geosciences in development conference on the application of Geology in developing countries. University of Nottingham, England. 1988 September.

H.P. Wijayananda. Regional Geochemistry of the surface sediments from the Eastern Indian Ocean upgrading report submitted to the Imperial College, London. 1988 December.

D. Jayawardena. Minerals from the Marine Environment. Proceeding of the IOMAC Vol. 2, 1988.

Reports:

R/V "Samudra Maru" cruise SII 14-18 reports.

Reports on the visit of Olie Linden, Consultant, Marine Pollution.

Report on workshop and engineering support facilities at SLFTI.

Reports on the suitability of the Korean combination vessel for NARA's offshore activities.

Report on the visit of Dr. Osmond Shinashin of the National Science Foundation (NSF), U.S.A.

Report on the Integration of the SLFTI with NARA including the training courses that should be organised with details of curriculum.

UNDP Phase II project proposal - All sections relating to Oceanography (more than 2/3 of the document).

Proposal for SAREC funding - all section relating to Oceanography.

Preliminary inspection report on the Puranwella fishery harbour breakwater.

Report on the quality of the construction of the Puranwella breakwater and the material used.

Project proposal from Sri Lanka for geological survey of the continental shelf in the Central Indian Ocean, submitted to the First Preparatory Meeting of the IOC regional committee for the Central Indian Ocean.

Project proposal from Sri Lanka for the studies of coastal water dynamics in the Central Indian Ocean as a region, submitted to the First Preparatory Meeting of the IOC regional committee for the Central Indian Ocean.

Progress report of NAKESA project on the study of shallow water carbonate facies and facies models in continental shelf sediment - West Coast Sri Lanka. Part 1.

Progress report of NAKESA project on the study of shallow water carbonate facies and facies models in continental shelf sediment West Coast Sri Lanka. Part 2.

Cabinet memorandum on the acquisition of a new research vessel submitted in June 1988.

Cabinet memorandum on detail Exploration of the monazite deposit by the Ull Revolving fund submitted in November 1988.

Project proposal for "Sediment budgets of major rivers - western coast Sri Lanka submitted to the Netherlands for funding. October 1988.

Project proposal for the study of Quaternary Geology of coastal plains of Sri Lanka submitted to the Netherlands Institute of Geology. October 1988.

Project proposal for introducing marine geology to the Universities of Sri Lanka. Submitted to the Netherlands for funding. October 1988.

Report on the critical assessment of the feasibility study report on the filling of Mutthurajawela submitted by a Dutch Company. December 1988.

Project proposal for the holding of a training workshop on offshore prospecting for mineral resources to be held in January 1989 which included lectures, training on board R/V Samudra Maru and laboratory work.

Papers read/presentation

Oceanography in Sri Lanka - past, present and future - Inaugural Presidential Address delivered at the Annual Sessions of the Geological Society of Sri Lanka in January 1988 (W.S. Wickremaratne).

Mineralogy and Geochemistry of bottom sediments on the western continental margin of Sri Lanka. Paper delivered at the Annual Sessions of the Institute of Chemistry (W.S. Wickremaratne).

Movements in offshore sediments. paper delivered at Seminar on Thermoluminescence applications delivered at the Institute of Fundamental Studies. (W.S. Wickremaratne).

Offshore prospecting for mineral resources in Sri Lanka. Paper delivered at the First Meeting of Experts on Offshore Prospecting for Mineral Resources in the Indian Ocean, Karachi, Pakistan. (W.S. Wickremaratne).

Recent advances in Oceanographic Research. Paper delivered as invited lecturer at the Annual Prize Distribution Ceremony of the Geological Association of Sri Lanka (W.S. Wickremaratne).

Minerals from the Marine Environment. Paper delivered at the First Meeting of Experts on offshore prospecting for Mineral Resources in the Indian Ocean, Karachi, Pakistan. (D. Jayawardena).

Lecture on the Geology of Land based mineral resources and mineral resources of the oceans in the Indian Ocean Region delivered to the participants as invited lecturer of the IONAC-IOI Training Course on Management of Resources held in Kuala Lumpur, Malaysia. (W.S. Wickremaratne).

Lecture on Petroleum Geology of the Indian Ocean delivered to the participants as invited lecturer of the IONAC-IOI Training Course on management of Resources held in Kuala Lumpur, Malaysia. (W.S. Wickremaratne).

Five papers were read at the 44th SLAAS Annual Sessions. Names of papers were given in section on papers read above.

5.0 NATIONAL HYDROGRAPHIC OFFICE

Papers

Paper titled "Degree Course in Survey Sciences" by Mr. M.S. Wijesinghe, read at the Proceedings of the 44th Annual Sessions, 1988, SLAAS.

7.0 ENVIRONMENTAL STUDY DIVISION

Dassanayake, N.H., de Alwis, Padmini and Pereira, Ravi (1988). Nuwara Eliya preliminary results of an environmental survey. Presented at 44th Annual Sessions of the SLAAS

Dassanayake, N.H., Pereira, Ravi and de Alwis Padmini (1988). Water quality of the Salinul Oya at Horton Plains presented at 44th Annual Sessions of the SLAAS.

Rajasuriya, A. and de Alwis, D.P. (1988). Coastal & Marine Resources of Sri Lanka - Emergency Issues & problems regarding their exploration exploitation and conservation. Presented at IOI-IONAC training course held in Malaysia 1988.

8.0 ECO-SYSTEM STUDY DIVISION

Dr. A. de Alwis, Mrs. S.C. Jayamanne and Mr. Asoka Perera. October 1988. Preparation of a guide to brackishwater prawn culture (in Sinhala).

Dr. A. de Alwis, Mr. A. Rajasuriya, Mr. P. Weerakkody and Mr. L. Sinige. Preparation of a coral manual (final draft is now ready).

Mr. P. Weerakkody. Preparation of lay-out for a brochure on coral reefs.

Mr. A. Rajasuriya and Dr. A. de Alwis. Preparation of a guide to Inland Coral Identifications.

Dr. A. de Alwis, Mr. U.S. Kasturiarachchi, Mr. A. Rajasuriya and Mr. P. Weerakkody. Report on the population explosion of grouper in Negombo and Chilaw Lagoons.

Dr. A. de Alwis, Mr. A. Rajasuriya, Mr. P. Weerakkody, Mr. L. Sinige and Mr. A.C. Heedeniya. Preparation of a management plan for Unawatuna multiple use marine reserve (Final draft is ready).

Mr. A. Rajasuriya, et.al. Investigation of upcountry streams for the re-introduction of trout for sport fishing and preparation of a report on the above.

Dr. A. de Alwis, Mr. U. de Silva and Mr. T.S. Manninayake. Site selection survey for grouper culture.

Dr. A. de Alwis. Preparation of SAARC Project proposal.

Dr. A. de Alwis. Delivered a lecture at a seminar on 'Man and Ecology' sponsored by Carl Duisberg Association of Sri Lanka.

9.0 NATIONAL MARINE MAMMALS PROGRAMME

Miss Kanthi Subasinghe. Whales for ever day May 5th 1983. An article for the Sinhala Science paper Vidurava on the Marine Mammals (May 11th issue). Two photos with the article.

An article for the Island on the (May 13th Wednesday 1983).

Radio interview programme Vasantha Sandella on Saturday 21st May 1983.

10.0 INFORMATION DIVISION

Papers:

Mrs. L. Bandaranayake, "Current status of fisheries information in Sri Lanka: country status report" presented at the BOBP Regional Consultation in Fisheries Information, Madras, 5 - 7 Oct. 1983.

Mrs. L. Bandaranayake. "Library applications of CD-ROM Technology" presented at the Sri Lanka Library Association Seminar on Information Technology, Colombo, 5 Sept. 1983.

Mrs. M. Berenger. "Transfer of Marine Technology to developing world", Pacific Fisheries Conference, Halifax, 22-25 Aug. 1983.

Mrs. L. Bandaranayake, "Co-operation & Data Exchange" Islands, Vol. 2, Dec. 1983

m. Berenger. "India's Deep Sea Mine Site in the Central I.O." IO News, Vol. 2, Dec. 1988.

Other Services Rendered:

Mrs. L. Bandaranayake prepared the following report for the Agency.

"Plans & programmes for human resources development in Sri Lanka in Aquatic Resources."

Mrs. L. Bandaranayake served as the consulting editor to 'IO News' - newsletter

Mrs. L. Bandaranayake prepared the document (IOMAC-1/SC-3/5) entitled "Indian Ocean Marine Affairs & Aquatic Resources Information System (IOMAA.RIS)" for the IOMAC Secretariat which was presented at the 3rd Standing Committee meeting, 21 - 23 Nov. 1988.

The lay-out & printing of all documentation for the following meetings of the IOMAC were done by the staff of IMAARIS.

a. First Meeting of IOMAC Technical Group on Offshore Prospecting for Mineral Resources in the Indian Ocean, Karachi, Pakistan, 11-14 July 1988.

b. IOMAC Standing Committee, Third Meeting, Colombo 22-24 Nov. 1988.

The Chairman,
National Aquatic Resources
Research & Development Agency.

Report of the Auditor General on the Accounts of the
National Aquatic Resources & Development Agency
for the year ended December 31, 1988 in terms of
Section 14 (2) (c) of the Finance Act No. 38 of 1971

The audit of the accounts of the National Aquatic Resources Research & Development Agency for the year ended December 31, 1988 was carried out under my direction in pursuance of provisions in Article 154(1) of the Constitution of the Democratic Socialist Republic of Sri Lanka read in conjunction with Section 13(1) of the Finance Act No.38 of 1971. My observations which I consider should be published with the annual report of the Agency in terms of Section 14(2)(c) of the Finance Act appear in this report. A detailed report in terms of Section 13(7)(a) of the Finance Act was forwarded to the Chairman on November 17, 1989.

1:2. Scope of Audit

Audit opinion, comments and findings in this report are based on a review of the financial statements presented to audit and substantive tests of samples of transactions. The scope and extent of such review and tests were such as to enable as wide an audit coverage as possible within the limitations of staff, resources and time available to me. Sub Sections (3) and (4) of Section 13 of the Finance Act give discretionary powers to the Auditor General to determine the scope and extent of the audit.

2. Accounts

2:1. Opinion

In view of the comments appearing in this report, I am unable to express an opinion on the accounts presented. Major observations in this regard are referred to below.

<u>Deficiencies</u>	<u>Reference to paragraph in this report</u>
i. Accounting policies	2:5:1
ii. Omissions in the accounts	2:5:2
iii. Classification errors	2:5:3
iv. Inappropriate disclosures	2:5:4
v. Evidence for audit	2:5:5
vi. Non-compliance with Laws, Rules, Regulations and Management decisions	2:5:6
vii. Money Claims	2:5:7
viii. Slow moving, idle and under-utilised assets and labour	2:5:8

2:2. Financial Results

According to the accounts the working of the Agency for the year ended December 31, 1988 had resulted in an excess of expenditure over income of Rs.3,355,457 as compared with a corresponding deficit of Rs.3,858,055 in the previous year. The following statement gives a summary of the financial results for the year under review and the previous year.

Year ended December 31,

	<u>1987</u>		<u>1988</u>	
	Rs.	Rs.	Rs.	Rs.
<u>Income</u>				
Government Contribution	11,130,000		10,000,000	
Sundry income	<u>142,435</u>	11,322,435	<u>77,446</u>	10,077,446
<u>Less: Recurrent expenditure</u>		<u>17,557,892</u>		<u>13,935,511</u>
Excess of Expenditure over income		(5,335,457)		(3,858,055)
Prior year Adjustments		(37,952)		(8,323,588)
		<u>(5,373,419)</u>		<u>(12,184,603)</u>
<u>Income and Expenditure Accounts</u>				
Balance brought forward		<u>(14,174,801)</u>		<u>(1,998,136)</u>
Balance carried forward		<u>(20,548,220)</u>		<u>(14,174,301)</u>
		=====		=====

2:3. Financial Structure

The financial structure of the Agency as at December 31, 1988 as compared with that as at December 31, 1987 is given below.

	<u>As at December 31,</u>	
	<u>1988</u>	<u>1987</u>
	Rs.	Rs.
<u>Resources</u>		
Government Contribution	30,770,030	27,270,080
Foreign Aid	11,086,598	8,552,561
Other Contribution	350,000	317,114
	<u>42,206,778</u>	<u>35,149,755</u>
Income and Expenditure Account balance	(20,548,220)	(14,174,301)
	<u>21,658,558</u>	<u>21,974,954</u>
	=====	=====
<u>Utilization</u>		
Fixed assets at written down value	21,370,394	21,150,698
Net current assets	(211,836)	824,256
	<u>21,558,558</u>	<u>21,974,954</u>
	=====	=====

2:4. Source and application of funds

The following statement shows the source and application of funds of the Agency during the year under review.

<u>Source of funds</u>	Rs.	Rs.	Rs.
Government Contribution for Capital	-	3,500,000	
Foreign Aid	-	2,524,137	
Other Contributions	-	<u>32,386</u>	5,057,023
<u>Application of Funds</u>			
Deficit	5,355,457		
Add- Prior year Adjustments	<u>37,952</u>		
	5,373,419		
Less: Items not involving movement of funds			
Depreciation for the year	<u>2,559,500</u>	3,218,910	
Additions to Fixed Assets		<u>3,279,196</u>	<u>7,093,115</u>
Decrease in Working Capital as analysed below			(1,035,092)
			=====

Effect on Working Capital

		<u>Increase</u>	<u>Decrease</u>	
		Rs.	Rs.	
Stocks	48.	484,547	-	
Debtors		317,724	-	
Deposits receivable		62,500	-	
Advances		502,113	-	
Loans receivable from Employees		104,933	-	
Cash and Bank balance		-		
Creditors and Accrued expenses		-	399,369	
Deposits payable		-----	390,179	
		<u>1,572,222</u>	<u>2,608,314</u>	<u>(1,036,092)</u>

2:5. Comments on Accounts

2:5.1. Accounting Policies

The Agency had not disclosed its accounting policies in the annual financial statements.

2:5.2. Omissions in the Accounts

- (a) The value of the vessel "Samudra Haru", handed over to the Agency by the Ministry of Fisheries in 1985 and used for research activities had not been brought to account.
- (b) The movable and immovable property now in the custody of the Agency which were formerly owned by the Ministry of Fisheries had not been vested in the Agency and valued and brought to account in terms of Section 35 of the National Aquatic Resources Research & Development Agency Act No.54 of 1981.
- (c) No adjustments had been made in the accounts in respect of the sum of Rs. 120,580 paid by the Agency on account of the electricity bills of the Fisheries Training Institute of Sri Lanka relating to the year under review.
- (d) The fish stock held by the Agency as at December 31, 1988 had not been valued and taken into the accounts.
- (e) Accrued liabilities had not been brought to account in terms of Payment of Gratuity Act No.12 of 1983.

2:5:3. Classification Errors

- (a) Expenditure of Rs.5,743 relating to 1987 had been inappropriately charged to Income and Expenditure Account of the year under review.
- (b) An expenditure of Rs.128,365 incurred on food items, consumables, repair expenses and stationary which was of a revenue nature had been capitalised.

2:5:4. Inappropriate disclosures

- (a) A sum of Rs.3,425 incurred in respect of the construction of the main pond had been shown under Buildings instead of being brought to account under Main Pond.
- (b) An expenditure of Rs.19,980 incurred in respect of fish bought for the Ministry of Youth Affairs had been shown under buildings without effecting recovery therefor from the Ministry concerned.
- (c) Security deposits amounting to Rs.8,735 obtained for the construction of buildings at Kalpitiya Research Centre and refunded had been shown under buildings without treating as refundable tender deposits.

2:5:5. Evidence for Audit

Fixed assets, Current assets and liabilities valued at Rs.33,497,003 could not be satisfactorily vouched or accepted in audit due to the absence of register of fixed assets, verification reports and documents in support of assets and liabilities.

2:5:6. Non-compliance with Laws, Rules, Regulations and management decisions

- (a) The National Aquatic Resources Management Council and Scientific and Technical Committee had not been appointed as required by Section 13 and 17 of the National Aquatic Resources Research and Development Agency Act No.54 of 1981.
- (b) The Accounts for the year ended December 31, 1988 which should have been rendered for audit on or before April 30, 1989 in terms of Section 13(5) of the Finance Act No.38 of 1971 had been furnished only on June 12, 1989.
- (c) Unpaid salaries which should have been banked within 4 days as per Manual of Procedure of the National Aquatic Resources, Agency, had been retained by the Cashier for more than 10 days.

- (d) As specified in paragraph 3 of the Public Administration Circular letter No.254 of 84.03.15 a procedure for the control of vehicles had not been formulated.
- (e) Vehicles owned by the Agency should be garaged within the premises of the Agency. However, it was disclosed that officers using vehicles had retained vehicles in their residences.
- (f) Although, according to Chapter 4 the Manual of Procedure cash receipts of the Agency should be banked daily, there were instances where such monies had been banked after a week.

2:5:7. Money Claims

- (a) Advances amounting to Rs.258,454 paid during 1985 and 1987 for supplies and services had remained unsettled even as at December 31, 1988.
- (b) Petty cash advances amounting to Rs.105,315 paid to officers of the Agency, were outstanding as at the end of 1988 for periods ranging from 6 months to 4 years.
- (c) Out of the advances and loans given to employees during the period 1983 to 1987, a sum of Rs.13,353 had remained irrecoverable due to employees leaving the services of the Agency.

2:5:8. Slow-moving, idle and under utilized assets and labour

Fish breeding tanks valued at Rs.25,000/= were lying idle for four years.

3. Financial and Operating Review

3:1. Financial Results

The operation of the Agency during the year under review had resulted in an operation deficit Rs.6,335,457 as compared with a corresponding deficit of Rs.3,558,000 in the previous year thus showing a decline in the operational results by Rs.477,392.

3:2 Transport

The Agency had a fleet of 25 vehicles during the year under review as compared with 25 vehicles including 2 vehicles borrowed from other institutions in the previous year. The cost of running, maintenance etc. of this fleet during the year under review amounted to Rs.1,594,175 as compared with a corresponding expenditure of Rs.957,210 in the previous year. Certain significant statistics relating to the usage of this fleet are given below.

Number of kilometres performed	370,812
Number of litres of fuel consumed	58,804
Overall average performance per litre	6.32 Km.
Total expenditure incurred on fuel	Rs. 610,351
Average expenditure on fuel per kilometer	Rs. 1.64
Total expenditure incurred on repairs	Rs. 383,828
Average expenditure on repairs per kilometre	Rs. 2.65

3:3. Budgetary Control

Major variations were observed between the budget and the actuals thus indicating that the budget does not appear to have been utilized as an effective instrument of control.

4. Systems and Controls

Deficiencies observed during the course of audit were brought to the notice of the Chairman of the Agency in my detailed report. Special attention is needed in respect of the following areas of control.

- (a) Cash
- (b) Petty cash payments and advances to staff
- (c) Purchases
- (d) Control over fixed assets
- (e) Budgetary Control
- (f) Book keeping

Sgd/- W. Gaminipapa,
Auditor General.

NATIONAL AQUATIC RESOURCES AGEN

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Trial Balance as at 31.12.1988

	Rs. Cts.	Rs. Cts.
(2) Buildings	12,137,818.28	
(04) Machinery	2,597,500.35	
(05) Furniture	545,934.15	
(06) Library Books & Journals	878,087.87	
(07) Equipment	8,926,502.04	
(08) Vehicles	2,411,321.33	
(10) Others	1,752,375.58	
(11 B) Mollusc culture project	128,323.65	
(12) Main Pond	352,826.90	
(14) Auditorium	513,801.44	
(15) Stock	142,152.01	
(17) Deposit	152,755.00	
(19) Purchase Advance	613,799.27	
(20) Service Advance	601,566.50	
(23 A) Salary Advance	8,213.10	
(25 B) Festival Advance		
(27 A) Travelling Advance	3,717.50	
(28) Special Salary Advance	9,900.00	
(31 A) Bank loan	3,170.00	
(33 A) Distress Loan	107,788.00	
(35 D) Petty Cash Others	106,35.51	
(39) Bank A/C No. 6600101712	1,193,429.67	
(41) Bank A/C No. 6600102585	10,574.94	
(42) Prepayment	64,558.05	
(43) Sundry Debtors	64,098.57	
(44) Bank A/C No. 660012824	50,000.00	
(45) Govt. contribution - Capital		25,474,954.01
(45) Govt. Contribution - Recurrent		11,130,000.00
(47) Foreign Aid		2,524,137.17
(48) Provision for Depreciation		8,203,655.44
(49) Accrued Expenses		1,629,253.40
(50) Other Income - Capital		32,885.10
(52) Sundry Creditors		75,174.22
(57 B) E.P.F. Control		465,767.37
(60 B) E.T.F. Control		44,738.76

(Cont's..2/.)

	<u>Rs.Cts</u>	<u>Rs.Cts.</u>
(63 B) Stamp Duty		1,457.00
(64) Sundry Receipts		110,555.50
(65) Puranawella Project	11,200.41	
(66) Rehabilitation Tax		
(69) Refundable Deposit		45,575.05
(70) Ministry of Foreign Affairs	4,940.00	
(71) Sundry Deposit 'Balaya'		83,774.05
(72) UNEP		254,905.55
(74) Navy Deposit	1,390.15	
(75) IPTP	3,212.51	
(76) Sundry Deposit 'Whales weep Not'		33,675.94
(77) UNDP	252,548.43	
(78) Pigeon Island Deposit		130,850.00
(79) Ratgama Project		7,710.00
(80 A) EDB/NDB		470,848.10
(82) GCEC		527,748.90
(83) Port authority		100,000.00
(84) Coral Reef Project		49,394.32
(85) UNDP (De Silva)		3,725.35
(86) Other Deposit		41,859.50
(87) IOMAC		1,029.59
(88) Ceylon Electricity Board	15,630.95	
(89) Ministry of Fisheries	22,612.40	
(91) Ministry of Youth Affairs		33,370.00
(92) ICOD		18,447.40
(93) Travelling Unclaimed		353.58
(94) Salaries Unclaimed		12,549.03
(95) Sea Weed Project	75,536.74	
(97) DANIDA		10,097.35
(98) Unclaimed Fees		8,965.50
(100) Sale of Fish		21,451.50
(102) Sundry Income		117,582.75
104) Interest		3,391.26
(109 C) Salaries	5,000,139.70	
(111) Overtime	394,338.72	
(112) Allowances	1,242,790.01	

(Cont'd..3/.)

	<u>Rs.Cts</u>	<u>Rs.Cts.</u>
(114) Fees	165,097.50	
(116 A) Travelling	545,861.92	
(118) Fuel	578,514.72	
(121) Stationery	575,719.54	
(124) Consumables	274,015.53	
(126 B) Maintenance of M/V	1,420,094.30	
(127) Postage	37,093.55	
(129) Telephone	197,341.50	
(130) Safety Equipment	2,040.00	
(131) Electricity	1,314,523.23	
(133) Gas	31,755.95	
(135) Advertisement	102,175.00	
(136) Entertainment	93,137.40	
(139) Security Service	453,999.33	
(140) Foreign Travelling	35,232.50	
(141) Welfare	41,944.54	
(144 B) EPF & ETF	1,067,511.53	
(145) Grants & Subsidies	49,327.50	
(148) Other Services	199,030.09	
(150) Adjustments	37,561.93	
(151) Bank Charges	1,312.06	
(152) Audit Fees	50,000.00	
(153) Depreciation	2,559,500.03	
	-----	-----
	51,875,413.02	51,875,413.02
	=====	=====

NATIONAL AQUATIC RESOURCES AND DEVELOPMENT AGENCY

Income and Expenditure Account for the year ended 31st December, 1988

1987

1988

10,000,000.00	Government contribution	11,180,000.00
77,415.52	Sundry income (Sche: 01)	142,435.52
-----		-----
10,077,415.52		11,322,435.52

Recurrent Expenditure
Administration Expenses

151,942.45	Salaries & Allowances (Sche:02)	7,242,979.71
12,320.00	Gratuity	49,327.50
371,664.84	Employees Provident Fund	1,067,611.53
324,698.28	Overtime	394,338.72
568,324.90	Travelling	545,861.92
386,815.00	Security Services	458,999.38
35,961.00	Fees	165,097.50
032,875.70	Fuel	978,544.72
94,220.00	Advertising	102,175.00
243,901.38	Stationery (Sche: 03)	555,190.08
30,559.45	Postage	37,093.65
99,794.03	Entertainment	98,187.40
18,347.60	Welfare	41,944.64
118,788.84	Telephone	197,341.90
42,575.95	Foreign Travelling	86,282.58
319,625.61	Sundries (Other Services)(Sche:4)	164,718.81
285,051.80	Maintenance of vehicles (sche: 05)	1,400,868.70
1,300.00	Uniforms	
50,000.00	Audit fees	50,000.00
10,815.10	Bad Debts Written off	1,812.06
	Bank charges	
	Consumables (Sche: 06)	111,631.29
-----		-----
11,199,581.93		13,749,972.09

686,698.88	1,314,623.23
16,567.43	31,756.95
	2,040.00
2,032,662.31	2,559,500.03
2,735,928.62	3,907,920.21
13,935,510.95	17,657,892.30
(3,858,065.93)	(6,335,456.79)
(8,326,593.43)	(37,361.93)
(12,184,663.46)	(6,373,418.72)

Establishment Expenses

Electricity
Gas
Safety equipment
Provision for Depreciation

Excess of expenditure Over Income
Adjustments for Previous Year

Dr. Hiran W. Jayawardene)
CHAIRMAN

25th April, 1989

(Dr. G.C.N. Jayasuriya)
DIRECTOR GENERAL

25th April, 1989

Balance sheet as at 31st December, 1983

Contribution Employed	
25,933,760.93 Balance BYF as per last year	21,974,954.
3,400,000.00 Grant for the year	3,500,000
4,503,742.64 Foreign aid for the year	2,524,137.
-----	-----
33,842,503.57	27,999,091.
317,113.90	32,886.10
-----	-----
34,159,617.47	28,031,977.
(12,184,663.46)	6,373,418
-----	-----
21,974,954.01	21,658,558
=====	=====

Employment of Contribution
Fixed Assets

Buildings	11,897,377.65	4,625,565.60	7,272,812.05
Machinery	2,597,500.35	675,312.12	1,922,188.23
Equipment	8,926,502.04	1,801,761.37	7,124,740.67
Furniture	615,934.15	197,086.53	418,347.62
Library books & journals	878,087.87	188,863.53	689,224.34
vehicles	2,411,321.33	665,555.39	1,749,765.94
Main-pond	352,926.90	31,711.39	321,115.51
Auditorium	513,801.44	18,800.51	491,000.93
Others (Sche: 08)	1,880,699.24	-	1,880,499.24
-----	-----	-----	-----
	30,074,050.97	8,203,636.44	21,870,394.53
			21,370,394.53

Current Assets

142,162.01	Stocks (Sche: 09)	627,108.92
199,053.62	Debtors (Sche: 10)	515,778.51
100,265.00	Deposits (Sche: 11)	162,765.00
613,252.12	Advances (Sche: 12)	1,215,365.77
225,506.15	Debtors Employees (Sche: 13)	330,444.21
4,752,102.09	Bank and cash (Sche: 14)	254,095.61

		4,105,557.82

Current Liabilities

950,013.24	Creditors & Accrued	
	Expenses (Sche: 15)	7,349,381.59
577,833.05	Deposits (Sche: 16)	1,968,012.20

		4,317,393.79

		(211,836.00)

		21,658,557.82
		=====

Dr. Hiran W. Jayewardene
CHAIRMAN

25TH April, 1989

Dr. G.C.N. Jayasuriya
DIRECTOR GENERAL

25th April, 1989.

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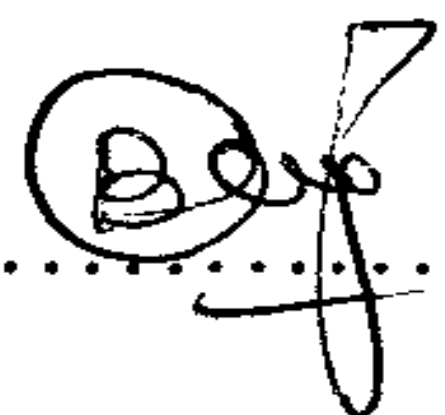
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