

MARINE BIOLOGICAL RESOURCES DIVISION

ANNUAL REPORT 1989

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Seven Research Officers were engaged in the research programme undertaken by this division during the year 1989. Mr. D.S. Jayakody returned to Sri Lanka on the 23rd April 1989 after completing his initial studies under the spilt Ph.D. programme in University of Stirling/U.K. Mrs. C. Amarasiri returned on the 10th April 1989 after completing M.Sc. course at the University College of North Wales, Bangor/U.K. The research programme during certain months of this year were interrupted due to the civil disturbances and lack of public transport in certain areas. Monitoring of the NARA/IPTP sampling programme in the South was not continuous due to the same reasons as above.

Based on the requests made by the Ministry of Fisheries & Aquatic Resources, this division initiated two new research projects during this period. They are the study of the Demersals and the Trawl fishery study in the Puttalam lagoon/coastal area.

A brief description of the research activities are given below:-

1. Study of Large Pelagics

Three research officers were engaged in this study during 1989.

- 1.1. The NARA/IPTP sampling programme was continued in 1989 at the major landing sites from Kalpitiya in the north to Hambantota in the south and the catch/effort and length frequency data were collected by the samples placed at these selected sites. Monitoring activities were interrupted at times in west and throughout the period in south.

The data collected have been analysed for small tunas and seerfish and the scientific papers on status of these stocks, were prepared and presented at Workshops/Seminars etc. Papers on other species are in preparation to be presented for the next expert consultation on Stock Assessment of tunas in the Indian Ocean.

1.2. Exploratory fishing by NW 35.

A followup survey of the BOBP exploratory fishing was conducted jointly by the Engineering and Technology Division and the Marine Biology Division to gather information to improve the catch rates in North-West area by changing the fishing depth.

During this year 28 trips were conducted with 178 sea days and 104 effective fishing days. The average catch rate for gillnet fishery was 288.4 Kg/day and for longline 113.7 Kg/day. The most profitable depth is 2 meter for gillnets and 0.25 meter for longlines.

1.3 Biological Studies

1.3.1 Age and growth studies of Kawakawa and fregate tuna were initiated in April 1989. A research paper prepared on this subject will be presented at the expert consultation of Indian Ocean Tuna.

1.3.2 A study of the feeding and spawning biology of frigate tuna was continued in 1989. Two spawning periods were observed for frigate tuna. The length at maturity was estimated at 27.3 cm. Food of frigate are composed of 64.2% fish, 21.4% squids, 11.8% shrimps and 2.6% miscellaneous items. High rate of cannibalism among adult frigate tunas were observed.

2. Study of Small Pelagics

2.1. Two research officers were engaged in this study. As in large pelagics the area from Kalpitiya in the north to Hambantota in the south were covered and data for the gillnet fishery were collected by the samplers under the NARA/IPTP sampling programme. In addition, gillnet fishery in Chilaw, the beach seine fishery in Beruwala and the purse seine fishery at Hikkaduwa/Ambalangoda were surveyed by the NARA research personnel.

The gillnet fishery data have indicated that the production by this fishery has remained more or less

at the same level in the study area. The production and the catch rate of the purse seine fishery in Hikkaduwa/Ambalangoda during this year has shown a slight increase. The catch of small tunas (Kawakawa & frigate tuna) by the purse seine in this area has increased during this year. Status of the Sardine (*A. sirm*) stocks on the west coast were studied.

2.2. Biological studies

Age and growth studies of Stolephorus heterolobus (Halmassa) and Raitreliger Kanagurta (Kumbalawa) were carried out by using the daily growth rings in otolith. Two research papers based on the work of small pelagics studies were presented at the Second Asian Fisheries Forum in Tokyo, Japan.

3. Study of the Prawn Fishery

The areas covered by this project are Chilaw, Negombo and Kalutara. In Chilaw prawn trawling is carried out by mechanized 3½ ton boats where as in Negombo it is carried out by non-mechanized sail driven canoes. In the Kalutara area prawns are caught by trammel nets operated by FRP boats.

Each landing site was visited twice a month and data on catch by species of prawns and effort were collected. Total lengths of a sample of Penaeus indicus were measured and sex and maturity stages were recorded. Morphometry studies of the same species was started in February.

The catch rate of total prawns in Negombo is decreased by 20% from 1988 to 1989. In Chilaw also the catch rate has been decreased by 6% from 1988 to 1989. In the Kalutara area although the catch rates remain the same as 1988 it is still lower than the catch rate of 1987.

4. Study of the Lobster Fishery

The field work on the lobster were re-initiated after the returned of Mr. Jayakody in April 1989. However, no regular sampling was done during the month of June, July and August due to the unsettled situation in the country.

The lobster fishery in the Kalpitiya were however surveyed and regular samples were collected for morphometric studies of lobsters.

5. Demersal Fishery Survey

This survey was initiated in August 1989 in the Negombo and Chilaw areas. One officer is working on this project. During the five months in 1989 the commercially important species of demersal fish were identified and the handline fishery, which is the main fishery for demersal in Negombo was monitored and the catch/effort data, species composition and length composition of Lethrinus spp were collected for stock assessment purposes. The average catch rate for the hand line fishery is estimated at 14.3 Kg/boat with an average monthly production of 17.2 MT of demersal in Negombo.

6. Trawl Fishery Survey - (Puttalam Lagoon/coastal sea area)

This survey was initiated in February 1990 to study mainly the resources exploited by the trawler in the Kalpitiya area. Field visits were made fortnightly to collect the catch/effort and length frequencies. Some of the data were analysed and used to get information about the fishery which was needed to write a report for the trawler fishery dispute in this area.

7. Training/Workshop/Seminars

7.1 Mrs. R. Maldeniya and Mr. N.M. Moyiaden participated in a Stock Assessment training course from 22nd-26th January 1989 in Bangkok, Thailand.

7.2 Dr. P. Dayaratne and Mr. J.A. de Silva attended a workshop on tuna and scerfish in the North Arabian Sea region from 6th - 8th February, 1988 in Muscat, Oman - Two research papers were presented by Dr. Dayaratne.

7.3 Dr. P. Dayaratne participated in the Second Asian Fisheries Forum held in Tokyo, Japan from 17th - 27th April, 1989 and present two research papers.

7.4 Dr. P. Dayaratne participated in a Seminar on Fisheries Research Management from 11-12 September 1989 in Phuket, Thailand.

- 7.5 Mrs. C. Jayawickrama followed a I.O.I./IOMAC training programme on Marine Affairs from 15th October - 21st December 1989 in Cairo, Egypt.

8. List of Publications

8.1 Papers published.

Dayaratne N.M.P.J. (1989) An assessment of Amblygaster sirm (Walbaum) stocks in the south west coast of Sri Lanka.

Paper presented at the Second Asian Fisheries Forum Tokyo, Japan.

Dayaratne N.M.P.J. (1989). Age and growth estimates of Stolephorus heterolobus (Ruppell) by using the daily growth rings in the otoliths. Paper presented at the Second Asian Fisheries Forum, Tokyo, Japan.

Dayaratne, N.M.P.J. (1989) Age, growth and mortality estimates of Scomberomorus commerson from the west coast of Sri Lanka.

Report of the workshop on Tunas and Seerfish of the North Arabian Sea. Region, Muscat Sultanate of Oman.

Dayaratne, N.M.P.J. (1989). Primary growth rings in otoliths of some clupeids from Sri Lanka. Asian Fisheries Science, Vol. 2, p. 255-264.

Dayaratne, N.M.P.J. (1989). Fisheries for seer fish (Scomberomorus spp - in waters around Sri Lanka. Report of the workshop on Tunas and Seerfish of the North Arabian Sea. Region, Muscat Sultanate of Oman.

Jayakody, D.S.(1989). Size at the onset of sexual maturity and onset of spawning in female Panyllirus homorus (Crustacea: Decapoda: Palinuridae) in Sri Lanka. Marine Ecology Progress series Vol. 57:83-87.

Maldeniya, R.- Food and feeding habits of yellowfin tuna (Thunnus albacares). Submitted for publication in Asian Fisheries Science.

Maldeniya R. - Variation of catch composition in gillnet and longline fisheries conducted in the coastal and offshore ranges of the western and southern seas of Sri Lanka. Submitted for publication in NARA journal.

8.2 Papers read at the STAAS

Karunasinghe, W.P.N. and J. Wijeyaratne on the exploitation of Amblygaster sirm stocks in the coastal waters of Negombo, Sri Lanka (read at 45th annual session).

Maldeniya R. Determination of the most effective mesh size for the capture of Skipjack (Katsuwonus pelamis) and yellowfin tuna (Thunnus albacares) from selectivity studies and consideration of biological aspects. (read at 45th Annual Session).

9. Reports submitted to the Ministry of Fisheries & Aquatic Resources

9.1 Regarding fishing disputes.

Trawling in Puttalam lagoon - by S.L. Surawecera and S.J.C. Jayawickrama 1989, submitted to Ministry of Fisheries and Aquatic Resources.

The Prawn trawling at Chilaw - by S.J.C. Jayawickrama 1989, submitted to Ministry of Fisheries and Aquatic Resources.

Investigations of the Beach Seine Dispute at Totamuna, Matara - by S.L. Surawecera and W.P.N. Karunasinghe 1989, submitted to Ministry of Fisheries and Aquatic Resources.

Investigation on the New fishing Technique at Weligama - by J.A. de Silva 1989, submitted to Ministry of Fisheries and Aquatic Resources.

9.2 Other Reports

9.2.1 Development plan for the field station, Kapparatota, Kalpitiya and Trincomalee, by Dr. P. Dayaratne.

9.2.2 Marine Fish Resources on the west coast, by Dr. P. Dayaratne.

9.3 News Paper article and radio programmes

9.3.1 Radio talk on the conservation of marine resources - BOBP radio programme - 2nd April 1989 Dr. P. Dayaratne.

9.3.2 Lobster catches decline due to Disco nets - Viduwara Magazine (19th June 1989 - Sinhala- D.S. Jayakody).

Lobster in Peril-island (2nd July English- 1989).

To protect our lobster resources (16th July 1989) (Divayina-Sinhala).

The Scientist who loves lobster, Viduwara Magazine- 17th July 1989 - Sinhala.

Dr. P. Dayaratne,
Director, Marine Biological Division.

INLAND AQUATIC RESOURCES DIVISION

Annual Report - January to December 1989.

Objectives of the Division

1. Rational utilization of aquatic resources for the production of fin fish for domestic consumption and of brackish water shrimp for export.
2. Maximization of social benefits such as employment and income distribution for the Inland Fishery population.

Staff

Research Officers	-	11
Research Assistants	-	05
Lab Attendants	-	01
Typists	-	01
Draughtsman	-	01.

The following projects most of which were on-going projects were carried out at NARA.

Head Office, at various previously identified sites and at the Regional Centre at Kalpitiya.

Some of the projects had intermittent lapses during 1989 due to the situation prevailing at the time.

3. Priority areas identified

3.1 Studies to determine the most productive and suitable culture systems for shrimp/fin fish species.

3.2 Studies on production related constraints of aquaculture systems such as feed development, diseases and parasites and breeding methods of shrimps and fin fish with a view to improve the efficiency of hatchery methods.

3.3 Studies on the management of mangrove ecosystems.

3.4 Studies on the potentials of culturable species of fish/shrimp .

3.5. Identification of suitable areas for aquaculture.

3.6 Studies on reservoir fishery management.

3.7 . Studies on genetics of fish with a view to improve the management of reservoir fishery and quality of culturable exotic species.

3.8 Studies on Socio-economics with a view to maximize the social benefits of small scale aquaculturable farmers.

4. Research activities carried out for the year 1989.

4.1 Studies on the potentials of culturable species.

4.1.1 Mullet fry survey - J.L. de Silva

4.1.2 Grouper fry survey - Dr. A. de Alwis

4.1.3 Artemia project - M.M. Kuruppu

4.1.4 Lagoons crabs fishery - S.C. Jayamanne.

4.2 Studies on culture systems

- 4.2.1 Mollusc culture project - T.H. Wanninayake
- 4.2.2 Sea weed culture project - P.M.A. Jayasuriya
- 4.2.3 Red Tilapia project - D.E.S. Jayamaha
- 4.2.4 Reservoir Fisheries Project - U.S. Amarasinghe
- 4.2.5 Prawn/Fish Pathology project - R. Perera
- 4.2.6 Mangrove productivity studies - W.D. Amarasinghe

4.3 Details of projects

- 4.3.1 NDB/EDB project - J.M.P.K. Jayasinghe
(Project Leader).

During the year 1989 the following work was carried out.

- a) The phase 11 activities of the project - Mapping and investigation on potential areas for prawn culture between Panadura and Hambantota.
- b) Investigation on chemical and physical characteristics, land use patterns in brackish water bodies from Panadura to Matara.
- c) Basic Sociological investigations.
- d) Classification and mapping of Acid Sulphate potential in coastal swamps between Puttalam and Bentota.
- e) Detailed investigation on the soil chemistry in the above areas.
- f) Detailed investigations on water chemistry, sediment quality, survival and growth oceanrange brown gill prawns in commercial farms constructed in acid sulphate soil areas.
- g) Samples have been collected to study the accumulation of toxic metals during the culture of P. Monodon.
- h) Monitoring of farm effluents for nutrients and pollutants.

The split Ph.D programme of Mr. J.M.P.K. Jayasinghe is included in the above project work.

4.3.2 Mullet fry survey

Sampling of juvenile fry: The sampling of fry was carried out at selected sites on the fringes of the lagoon between May 88 and Sept. 89. Sampling was carried out using a variety of methods, the most important being cast netting and push netting.

One of the objectives of the project was to determine the availability of fry for the stocking of ponds from the Negombo lagoon. No quantitative data has been obtained on amounts available. Analysis of the commercial catch indicates that a significant portion of mullet brought from the brush piles fall into the ideal stocking size category. For the successful collection of fry (for commercial purposes), fry would have to be carried out by fishermen. As such the importance of being able to identify the different species of mullet by their respective sinhala names is a necessity. It is also believed that the commercial catch would given an reasonable estimation of the abundance and species variation for commercial purposes.

4.3.3 Grouper fry survey

Project commenced in 1989. Monthly field visits were carried out. Sites visited were Negombo, Chilaw, Kalpitiya and Karukapone. Fish collecting centres were visited to collect data on fry collection and fish markets were visited to collect data on adult catches.

The data collection showed a decline in catches of fry. However, the most common species collected was *E. tauyina*. In the adult catches too, this species was prominent. The decline in catches could be attributed to the problems prevailing in the country which hindered transportation of fry/fingerlings to collecting Centres and also difficulties encountered in air-freighting.

4.3.4 Armetia Project/Ornamental fishery

Conducted Temperature and salinity tolerance studies on the Sri Lankan Armetia from Palavi Salterns. Results indicate that this strain cannot adapt itself to low temperature.

2. Two inoculation experiments with Armetia were carried out in experimental ponds in Palavi. Both the experiments were successful and the armetia produced cysts in all four ponds. The cysts were analysed for their nutritional value in the school of Fisheries, University of Washington.

The results on the fatty acid and Amino acid profiles are being analysed.

3. Conducted four courses on Training in Ornamental Fishery"
Revenue Rs. 1,24,000.00

4. Consultancy services, exhibition on Ornamental Fishery. Fish sales Rs. 30,000.00

5. Survey of the unused clay pits in Wennappuwa Electorate for culture of Ornamental fish.

6. Took part in Janasaviya deliberation for fostering and job identification of Ornamental Fish Culture Projects.

4.3.5 Lagoon crabs fishery

A survey on the production, efforts and the present status of the fishery in the Negombo lagoon was investigated. Project was completed in December 1989. Thesis is being prepared from the results obtained for a M.Phil Degree.

4.3.6 Mollusc culture project

Oyster

Monitoring work was performed at three sites at Kala Oya on oysters *Crassostrea madrasensis*. Three racks were constructed at each site for monitoring of spat, strings of asbestos, windowpane oyster shells, coconut shells lime and non lime coated tiles were placed at fortnightly intervals on rafts for spat falling. Growth of oyster spat on each collectors were recorded monthly and also wild oyster samples were collected for determination of condition factor. Physico-chemical parameters, zooplankton and phytoplankton samples were collected for further study.

Two bamboo rafts were constructed in Puttalam lagoon and Mohoththuwaram for transplant of oyster spat.

Development of wild oyster beds:

Wild population of *Crassostrea madrasensis* is limited in Kala Oya estuary. Therefore unused tiles, coconut shells and concrete blocks were place in the area to develop the artificial reef for more spat settlement. These work programme is functioning regularly.

Clams and cockles Research:

A small but expanding fishery exists in the Puttalam lagoon area of both clams and cockles.

The main fish species being:

1. *Marcia opima* Clams
2. *Marcia hiantina*
3. *Gafrarium tumidum* - Cockles.

Two sites were selected in North part of Puttalam lagoon for carry out the following aspects.

1. For study abundance
2. For study of growth
3. For study of predatory behaviour
4. For study of condition index.

Transplanted Mussels in Puttalam Lagoon:

Three rafts (8 x 5m) were constructed in Puttalam lagoon for transplant of *Perna perna* (brown mussel) and *Perna viridis* (green mussel).

Following aspects were carried out during the year 1989:

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

Small number of green mussels spat were transported from Trincomalee and brown mussels were transported from Negombo.

Relevant physico-chemical parameters, zooplankton and phytoplankton were also collected during the study period.

4.3.7 Sea Weed culture project:

All the *Glacilaria edulis* (sea weeds) on the frames at Pitalai disappeared due to the high increase of salinity (50 ppt).

Since it was difficult to continue the experiments at Etalai with high salinity levels of water it was decided to transfer some for the experiments to Kalpitiya. Boat trips were made in Kalpitiya area to find some suitable sites with low salinity levels. Four places were selected namely Anwasal, Udawathottam, Periarichal and Sinnarichal. Vegetative propagation experiments were setup in all these sites. Spores setting experiments were also started at Kalpitiya area.

The results of these experiments show that the environmental condition at most of the sites at Kalpitiya area influence the growth of *Gracilaria edulis*.

Pond culture of *Gracilaria edulis*:

Pond culture trials were started in June 1989 in one of the ponds at Andriez prawn farm. Water parameters and the growth parameters were taken once in fortnight. It was revealed that lot of pests & algae have interfered the growth of the *Gracilaria* culture.

4.3.8 Red Tilapia project:

During the trials the brood stock of red tilapia produced red and black coloured offsprings. The observed survival was low as 40%. The fingerlings of red tilapia is being tried in mud ponds for culture.

It is felt that the present stocks are weak due to years of inbreeding and it is suggested that brood stock be important from either Thailand or Malaysia in order to improve the brood stocks.

4.3.9 Reservoir Fishery Management project:

Studies on reproductive biology of *Oreochromis mossambicus*, *Oniloticus* and the bybirds between these two species were carried out in Kaudulla, Minneriya Pimburettawa and Maduru Oya reservoirs.

4.3.10 Prawn Pathology project

In view of the growth of the prawn culture industry in Sri Lanka and the relatively recent problems of disease and mortality both at hatchery and grow out level, work in this area to firstly identify the cause of mortality/reduced growth and

to develop means by which the health status of animals may be further development of the industry.

- a) Determination of bacterial numbers in normal and disease affected water/animals.
- b) Identification of microbial types and species composition.
- c) Development of tissue library or normal tiger prawn tissue.
- d) Determination of histopathology of infections at nursery and grow-out levels.
- e) Reinfection trials with infected cultured shrimp hemelymph on wild specimens.

Data collected on the bacterial loads of normal hatchery water (activity 1) with identification of species types down to genus level. Bacterial levels of hemelymph of diseased and wild animals compared (activity 1) and identification of types down to family level.

Histological library normal hepato-pancreatic and mid-gut tissue built up (activity 3) as well as with some tissue sections showing pathology of grow out shrimp (activity 4).

5. Development of services to the aquatic sector:

1. Report on the status of Rekawa lagoon.
2. Report on the suitability of the given sites at Arachchikattuwa, Chilaw and Nattandiya UGA divisions for prawn farming for the proposed Asian Development Bank Loan Scheme.
3. Report on the suitability of the site at Kapparatota for prawn farming. Report submitted to the Ministry of Fisheries and Aquatic Resources to be submitted to the Parliamentary sub Committee on Fisheries.
4. Report on the prospects of Mundal lagoon for Aquaculture. Report on the prospects of Mundal lagoon for aquaculture. Report submitted to the Ministry of Fisheries NW provincial Council.
5. Reports on the suitable areas for prawn farming along the North Western coast of Sri Lanka with special reference to species

of prawns. Report submitted to the Ministry of Fisheries, NW Provincial Council.

6. Report on the suitable areas for prawn farming along the North Western coast of Sri Lanka with special reference to species of prawns.

7. Report on the progress evaluation of approved shrimp culture projects in the NW province.

8. An integrated Development plan for Kadolkellewatta in Negombo to set up a Regional Research Centre for NARA.

9. Report on the survey to evaluate the feasibility of fish and prawn farming in a marshy area, mahawela, Welyaya in Kahawa.

10. Report on the "shrimp culture projects with special reference to identified areas in South, development plan for cluster system and identified problems.

11. Report on the proposed work on prawn feeds in Sri Lanka.

12. An integrated Development plan in aquaculture for Kapparatota Regional Research station.

13. Technical paper on training programmes for prawn farming in Sri Lanka.

14. Report on the prospects eel farming in Sri Lanka. Report submitted to the Co-ordinating Committee on Inland Fisheries and aquaculture.

15. Report of the Committee, appointed to study "Shrimp Culture Projects".

16. Report on the profiles of six lagoons in Sri Lanka.

Scholarships, Seminars, Study Tours - Abroad

1. One day work shop on the current problems of the shrimp farming industry in Sri Lanka.

2. Seminar on prawn culture organized by the DFCC.
3. Seminar on prawn culture organized by SLAAS.
4. Mrs. M.M. Kuruppu - India, U.S.A. (Artemia project).
5. Mrs. A. Jayasuriya - Thailand (Seaweed culture project).
6. Mr. T.B. Wanninayake - Japan (Asian Fisheries Forum).
7. Mrs. Amarasinghe - Japan.
8. Mr. J.M.P.K. Jayasinghe - Returned to Sri Lanka as part of Split Ph.D in U.K.

INSTITUTE OF POST HARVEST TECHNOLOGY

PROGRESS REPORT : JANUARY - DECEMBER 1989

Given below is an account of the progress of the activities undertaken by the Institute of Post Harvest Technology during the year 1989.

1. Study of the quality of Molluscs landed in Sri Lanka

Studies were carried out at Kalpitiya, Chilaw and Negombo. Samples were collected from the above sites bi-monthly and laboratory studies were carried out to assess the bacterial quality of the samples. A report prepared based on the on going studies and titled "Marketing of Molluscs in Sri Lanka" was submitted to a workshop held in France and as a result, Sri Lanka was admitted to a mollusc quality monitoring net work founded by the FAO. The work is progressing and a more detailed study which includes various socio-economic aspects is now being undertaken.

2. Survey of the Seaweed Industry

A comprehensive market study of the Seaweed Industry in Sri Lanka was carried out under a BOBP assisted programme. The report which covers examines the history of the industry, imports of seaweed based products, import substitution feasibility and the

economic feasibility of commercial, semi-commercial operations for agar and alginic acid extraction were examined. The report was submitted to the sponsors and a paper on seaweed marketing prepared based on the report was presented at a workshop held in Thailand in September. A pilot scale operation for the extraction of seaweed has been earmarked for 1990. The technical feasibility of setting up cottage scale agar extraction units too will be examined during 1990 under the BOBP programme.

3. Study on the improved utilization of shrimp waste

The study examines the possibility of improved utilization of shrimp waste. Annually around 1000-1500 MT of shrimp waste is discarded. The field survey part of the study has already been completed. Additional information on imports of shrimp feed has to be collected. Limited progress was made on the laboratory studies due to the unavailability of certain major pieces of equipment for laboratory work scheduled under the project. This project funded by the BOBP will be concluded in 1990.

4. Quality of Aquaculture Prawns

The project was meant to identify the actual bacterial quality of aquaculture prawns as against marine prawns in order to identify the processing requirements and realistic quality requirements of the former. The work was completed in August 1989 and a report was submitted.

5. Studies on Fish Sauce

A study was carried out to study the technical feasibility of manufacturing fish sauce using varieties of small pelagic species found in Sri Lanka. Sardines were used as test material and the fish subjected to varying salt concentrations. A 20% salt concentration was shown to give the best results and showed feasibility of commercial production.

6. Heavy metal contamination of shrimp

A study was carried out to assess the degree of heavy metal contamination of shrimp from Chilaw and Kelaniya Estuary the latter serving as a sample from a location with heavy

industrial pollution. The samples were analysed for Mercury a metal the concentration of which is used as a quality indicator for both shell fish species and Tuna by a number of importer countries. The Sri Lankan produce was found to contain levels very much below the maximum permitted levels. The studies if extended would provide us with information and data by which we could justify exemption of Sri Lankan exports from such stringent tests.

7. Test Services and other services to the industry

- a) Nearly seventy samples of sea food were analysed during the year for chemical and microbiological parameters. These included Prawns, Lobster, Fish Meal, Tuna, Canned fish etc.
- b) Consultancy services were provided to the private sector and the Ceylon Fisheries Corporation.
- c) Officers of the institute took part in prawn factory inspection scheme.
- d) Officers of the institute functioned in the National Agricultural Food Products Standards Committee.
- e) Officers of the institute took part in various Ministry programmes and the mobile ministry programme.
- f) Several information leaflets and pamphlets were prepared by the staff for distribution.

Publications and Reports.

1. Report on the Seaweed Industry in Sri Lanka - submitted to BOBP.
2. Paper on "Seaweed Marketing in Sri Lanka" presented at a workshop held in Thailand.
3. Paper on "Marketing of Molluscs in Sri Lanka" presented at a workshop held in France.
4. "Some Biochemical characteristics of fish sauce manufactured from sardines" paper submitted to IFS for publication.

Training & Study Tours

Mr. T.S.G. Fonseka went to UK for post graduate studies.

Miss N. Chinnivasagam attended workshop on mollusc sanitation held in France.

Miss Mala Perera attended fish quality workshop held in India.

Dr. Subasinghe attended workshop on Seaweed held in Thailand.

Dr. Subasinghe attended workshop on Fisheries Management held in Phuket, Thailand.

Staff

Dr. S. Subasinghe	Director
Miss Chinnivasagam N.	RO
Miss Perera Mala	RO
Dr. Y. Namaratne	RO
Lab Assistants	04
Lab Attendants	02
Labourers	08.

ANNUAL REPORT OF THE NATIONAL HYDROGRAPHIC OFFICE - 1989

1. Objectives

The National Hydrographic Office has the primary responsibility for hydrographic surveying and charting in Sri Lanka and is the focal point for all hydrographic data gathered in Sri Lanka. The NHO was established on 13th March 1984 under the auspices of NARA jointly with the Sri Lanka Navy and the Survey Department and is manned by personnel of the constituent parties.

The main objectives of the NHO are to carry out detailed hydrographic surveys of inland water bodies and inshore, nearshore and offshore national ocean space up to the outer limit of the Exclusive Economic Zone of Sri Lanka and the production of navigation charts and other documents embodying the results of these surveys.

The main activities of the NHO are to produce the following:

- a) Navigation charts of Sri Lanka waters from the territorial baseline to the outer limit of the Exclusive Economic Zone.
- b) Tide tables of national waters.
- c) Co-tidal charts of national waters.
- d) Preparation and issue of list of lights.
- e) Preparation and issue of notices to mariners.
- f) Continuous updating of the above documents.

2. Personnel

The staff of the NHO in 1989 was as follows:

- a) Acting Head of NHO - Mr. W.S. Wickramaratne
- b) Charge Surveyors - Mr. S.S. Jayasinghe, B.Sc.
Mr. S. Withana, B.Sc.
Mr. M.A. Ariyawansa, B.Sc.
(Post Graduate Dipl. in Statistics)
- c) Hydrographic Surveyors - Mr. B.H.B. Nihal Silva
(Diploma in Surveying & Levelling).
- d) Land Surveyors - Mr. L.J. Goonasekera
Diploma in surveying & levelling
(on secondment from Survey Dept.)
Mr. K.A. Perera
Diploma in surveying & levelling
(on secondment from Survey Dept.
from 1.8.89)
Mr. M.V.R.C.G. Ariyaratne
Diploma in surveying & levelling.
(on secondment from Survey Dept.)
on 30.3.89.
- e) Survey Recorders - Mr. D.S.R.W. Mendis
Mr. A.P. Tillakaratne
(on secondment from Sri Lanka
Navy).

- f) Draughtsmen - Mr. P.B. Ratnapala
Mr. W.A. Wilfred
(Surveyor General's Licence for
Authorized Draughtsmen).
- g) Stehographer/
Typists - Mrs. Jayanthi Rodrigo.
- h) Consultant - Mr. Walter Gunaratne
Cartographer (Diploma in Cartography - City &
Guids of London).
- i) Consultant - Mr. Michael Gruber, M.S.
Hydrographer Dipl. Ing. (Geodesy), Hydrographer.
- j) Expert Hydrographer - Miss J. Bielke
Dipl. Ing. Geodesy & Hydrography
Hamburg Port Consulting Gmbh.
Under the Project for Strengthening of
the NHO.

3. Change of personnel, including promotions, confirmations etc.
and training courses followed:

- a) Miss U. Bielke arrived on 30th September 1989 on an 8 months
assignment as Expert Hydrographer for the Project for
Strengthening of the NHO.
- b) Messrs. S.W.S. Weerasinghe, S. Withana, M.A. Ariyawansa,
B.H.B. Nihal Silva and D.T. Mendis followed a course in
Basic Hydrography at the Institute of Applied Sciences in
Hamburg, F.R. Germany, from 4th June '89 to 1st September '89.
- c) Messrs. S. Withana, S.W.S. Weerasinghe and M.A. Ariyawansa
followed a course of training in advanced survey techniques
at the Institute of surveying and Mapping, Diyatalawa from
1st February '89 to 25th March '89.

REPORT OF WORK DONE IN 1989

4. Hydrographic and Land Surveys.

- a) Coral Reef Survey at Unawatuna and surrounding area to

determine the extent of the reef area for the coral survey and Mammals Programme (12.01.89 to 27.01.89).

- b) Land survey at Kadolkele for acquisition of an area to NARA and production of a plan to be submitted to GCFC (08.01.89 to 13.01.89).
- c) Hydrographic survey of the Mundel Lake and surrounding area in connection with Chairman's directive to survey prawn culture sites off Puttalam.
- d) Hydrographic survey of Hamilton Canal from Puttalam lagoon to Dedaru Oya (31.01.89 to 08.02.89).
- e) Hydrographic surveys for rock blasting for removal of obstacles at fish landing centres for Ministry of Fisheries (01.03.89 to 08.06.89).
- f) Hydrographic survey of Negombo lagoon for oceanography division (17.03.89 to 08.06.89).
- g) Land survey at weligama for acquisition of a site for Ministry of Fisheries 5.06.89.
- h) Hydrographic survey, current measurements and depth soundings of Hamilton Canal (07.08.89 to 10.08.89).
- i) Engineering survey of part of Kadolkele on a directive from Chairman (12.08.89 to 16.08.89).
- j) Hydrographic survey at Tangalle for the Sri Lanka Navy (25.10.89 to 27.10.89).
- k) Preparation of plans for the proposed development of the Negombo Lagoon (04.12.89 to 05.12.89).

5. Project for strengthening of the NHO

During the period under review the following progress was made.

- a) Preliminary work regarding planning, procurement of equipment and vehicles.

- b) Basic training for hydrographic surveyors in position fixing and computer handling.
- c) Preliminary investigation for establishing tri-sponder stations from Negombo to Kalutara with assistance from Survey Dept. followed by field work by the Geodetic Branch of the Survey Dept. in establishing the stations.
- d) Training of 5 officers from NHO & Oceanography Division in Basic Hydrography at the Institute of Applied Sciences, Hamburg.
- e) Arrival of hydrographic survey equipment and computers from F.R. Germany.
- f) A hydrographic survey of the Colombo Port Approaches was commenced in December '89 and the survey is in progress.

6. Miscellaneous work:

- a) Navigation support for Oceanography Unit.

The Surveyors of the NHO were engaged in providing navigation support to the Oceanography Unit on its Cruises Nos. 24, 25, 26, 27, 28 and 29 aboard the "Samudra Maru".

- b) Production of plans on 1:10,000 scale of the Navigation channel from Kalpitiya to Kudremalai for the Sri Lanka Navy.
- c) Production of sea Floor Morphology Maps of the Coast of Sri Lanka for the Oceanography Division.
- d) Production of a grid chart for the Ministry of Fisheries and Aquatic Resources for use in rescue operations.
- e) Over and above the foregoing the assistance and support requested by NARA Units in the making of maps, sketches and pursuing of survey related inquiries with the Survey Department and other Corporations were undertaken during the period under review.

ENVIRONMENTAL STUDY UNIT

Annual Progress Report - 1989

1) Projects undertaken in collaboration with local agencies.

1.1.) G.C.E.C. Environmental Monitoring Programme

1.1.1) Monitoring of Industrial Effluents

a) Katunayake Export Processing Zone

Fourty inspection visits were made to KEPZ and total of two hundred & two samples were collected and tested for various physico-chemical parameters. Some of these samples failed to conform to specifications laied by GCEC for effluent discharged into public sewers. Reports indicating recommendations for necessary follow up action were send to the GCEC with a view to the control of environmental pollution.

b) Biyagama Export Processing Zone

Thirty six visits were made to BEPZ and total of eighty three samples were collected and analysed. Reports with necessary recommendations were submitted to the GCEC.

c) Monitoring of Factory Effluent located out side Export Processing Zones - Ekala, Jaala, Negombo & Kandana

Four factories were visited and inspected their effluents and treatment facilities in order to prevent any environmental deterioration due to the release of effluent.

1.1.2 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 and outlets. Total of hundred and twenty two samples from Katunayake Sewage Treatment Plant and ninety nine. Samples from BEPZ were analysed during the year. Analytical reports including comments and recommendations were sent to the GCEC for necessary action.

1.1.3) Monitoring of Inland Surface Waters near Effluent Discharges from Export Processing Zones

a) Kelani River

Samples were collected from number of selected sites and analytical results indicated that the chemical quality of river water is well within the WRO guidelines for abstraction of drinking water. The presence of coliform bacteria would require that the water be treated before use for domestic purposes.

b) Dandugama Oya

Survey is being conducted at selected sites along the Dandugama Oya in close proximity to the effluent discharge from the KEPZ in well as from further upstream. The existing quality of the water in the stream was determined with the view to control any water quality degradation.

1.1.4) Monitoring of Safety & Quality of Drinking Water KEPZ & BEPZ

Chemical & bacteriological analysis were done on the drinking water supplied by GCEC to the Export Processing Zones. Residual Chlorine levels in the distribution systems were also determined in situ. In addition to that the quality of water from the water treatment plant was monitored to see the efficiency of the treatment system.

1.2) Environmental Study Nawara Eliya Lake/(NARESA grant)

This study was continued during this year. Input levels of pollutants were determined and sampling were done from the incoming stream as well as from the lake. Laboratory analysis were carried out on water samples collected. Thirteen chemical & two bacteriological parameters were determined. The concentrations of Phosphates, Nitrates, Nitrites, Ammonical nitrogen which can indicate the extent of pollution due to the fertilizers were determined. The levels of organic pollution were assessed.

2) Study of the Belihul Oya Stream and the Environs

Collection of baseline data was carried out on the Belihul-Oya upper catchment. The human impacts on this natural water body was determined. The chemical & bacteriological quality of this stream conforms its suitability for growth and natural reproduction of sensitive fishes like trout.

3) Consultancy Service

3.1) Monitoring of Tannery Effluents

a) Tan Lanka Ltd.

Effluent discharged from this tannery was regularly monitored and analytical report indicating comments and recommendations were submitted to the Company and to the GCEC.

4) Emergency Studies

4.1) Study on the Environmental Problems Associated with Rubber Effluent - Deraniyagala

This study was conducted in collaboration with Aquaculture Division. Environmental parameters of water and pathological aspects of the diseased fish were carried out. The reason for this sudden fish mortality was the Epizootic Necrotic Syndrome which was commonly found in the other areas of the country during the 1st quarter of the year.

4.2) The Water Quality and Fish Disease Studies in Mahaweli Area

Kotmale, Victoria and Polgolla:

The above mentioned areas were inspected and preliminary studies were conducted. Analytical data ruled out the water pollution parameters were causative factors for fish disease.

4.3) Reported Fish Mortality Around the Sinharaja Man & Biosphere Reserve

This study was carried out in collaboration with aquaculture

division. The area was rich in rainfall and water quality of the sampled streams were found to be well within the tolerance limits for growth and breeding indeterminate fish.

4.4.) Sillia Lake - Beruwala

At the request of Hon. Minister of Fisheries & Aquatic Resources and the Minister of Fisheries for the Western Provincial Council a multi-disciplinary study was carried out to report on the condition of the Silliya lake at Beruwala. Remedial measures were also recommended to rehabilitate the productivity of the lake.

5) Water Quality Study of Prawn Farms

This study was conducted in leading prawn farms situated along the coastal belt from Madampe to Battuluoya. The scope of this project is to see the co-relations between prawn disease and water quality.

6) Negombo Lagoon and Connected Water Ways

Study is being carried out to determine the sources of pollution and level of pollutants in the lagoon and connected water ways.

7) Activities related to Environmental Scoping Committees

7.1) Project proposal to set up a Tannery - Ekala

Environmental examinations were done with special reference to the quality of water to ascertain whether it was advisable to discharge the effluent to Attanagalla Oya.

Possibility of rapid deterioration of chemical and biological quality of water was brought to the notice of the GCEC, as well as to the Minister of Fisheries & Aquatic Resources.

7.2) Dr. Padmini de Alwis participated in the following Environmental Scoping Committees representing NARA and assisted in adopting necessary environmental mitigatory measures prior to the approval of projects.

- 7.2.1 Bangalawatta Development Project
- 7.2.2 Factory for manufacture of Dipped Rubber Gloves for Export
- 7.2.3 Agrochemicals Formulation & repacking industry at Ja-ela (Harrison & Crossfield)
- 7.2.4 Agrochemical repacking industry, Kandana (Finlay Chemicals Ltd.).
- 7.2.5 A water sports complex at Katunayake
- 7.2.6 Observation and comments were sent to the developer and to the GCEC regarding the Peliyagoda, Wedamulla & Mudun Ela integrated Drainage and Reclamation project.

8) Technical Committee of the Rehabilitation of Beira Lake

Dr. Padmini de Alwis is representing NARA at this committee which is presently taking necessary steps to implement most of the recommendations given in the report submitted by NARA to Presidential Secretariat in 1985.

A draft of a pilot project was submitted to this committee on the "Development of an appropriate Technology to reduce Phosphate input into Beira Lake".

9) Seminars & Workshops

9.1) Local

National Workshop on Major Research Instruments

Participated in two workshops organised by the Institute of Fundamental Studies in May '89 & June 1989 in order to get familiar with some equipment which are presently not available at NARA laboratories.

9.2) Abroad

9.2.1) 08th International Ocean Disposal Symposium

Dr. Padmini de Alwis participated in the above symposium organised by the (IMO) International Maritime

Organisation which was held in Yugoslavia in Oct. '89. The country paper was presented and contributions were made to prepare guidelines for future studies and assessments of oceanic disposal practices.

9.2.2) Advanced Training Course on MESOCOSM

Mr. N.H. Dassanayake got the opportunity to undergo the above mentioned training course held in China during Dec. '89. The country report was presented at this training course on the subject of Marine pollution.

10) Evaluation of Tenders - Equipment

Scheduling and the evaluation of tenders were done and awaiting for approval from the Development Secretaries in order to purchase a microbiological field test equipment.

11) Services Provided to Other Divisions

Six hundred & forty eight number of water samples (Negombo Lagoon) received from Oceanography Unit were analysed. All these samples were studied to determine Silica, Nitrate, Nitrite & Phosphates concentrations. Results were sent to Dr. Shanthi Wickramaratne.

12) Technical Papers

Paper titled "Water Quality Changes Associated with Human Interference (Belihul Oya - Sri Lanka)" was selected to be presented at the International Conference on Water Decade & Beyond". Due to the non-availability of financial assistance no participation was made to present the paper at the conference.

13) Extension Services

A number of requested chemical parameters were studied on water samples received from Inland Fisheries Dept. of the Ministry of Fisheries & Aquatic Resources. Results were sent to the Assistant Director Inland Fisheries Division.

14) Funding

14.1 GCEC Funds

Estimated cost for carrying out Environmental Monitoring Programme for the GCEC in the year 1989 was Rs. 6,19,000/-. Amount of Rs. 3,50,000/- was received from the GCEC and the balance is due shortly.

14.2 NARESA Funds

Rs. 17,092/- was received from the Natural Resources Energy & Science Authority in order to conduct N'Eliya lake environment study.

15) Staff

Staff consisted two Research Officers, four Research Assistants and a labourer during the year 1989.

16) Constrains

This following constrains invariably affected the activities of the ESU.

16.1 Lack of Equipment

16.1.1) G.L.C. for the analysis of pesticide residues

16.1.2) A.A.S. for the analysis of heavy metals etc.

16.1.3) Field microbiological test kit, for the determination of microbiological quality of water immediately.

16.2 Lack of Staff

No replacements were made in places of two Research Officers left - NARA in 1988. One Lab Attendant is also required to carryout divisional activities effectively.

(Dr. Padmini de Alwis)

26th January 1989.

ANNUAL PROGRESS REPORT

January-December 1989

DIVISION : INLAND AQUATIC RESOURCES
PROJECT : MOLLUSC CULTURE PROJECT (SRI LANKA)

Staff for the Project:

Mr. T.B. Wanninayake (Project Leader)
Mr. Palitha Kithsiri (Trainee Research Officer)
Mr. Udaya Fernando (Research Assistant)
Mr. W.G. Jayaratna (Laboratory Attendant)
Mr. P.A.H. Keerthiratna (Laboratory Attendant)

Research Progress

Puttalam lagoon

Species available

Oyster - Crassostrea madrasensis
Clams - Marcia Opima
M. Hiantina
Cockle - Gafarium tumidum
Mussels - (Transplanted)
Perna Perna
P. Viridis

Oyster

Monitoring work was performed at three sites at Kala Oya on oysters Crassostrea madrasensis. Three racks were constructed at each site for monitoring of spat. Strings of Asbestos, Windowpane oyster shells, oyster shells, coconut shells lime and non lime coated tiles were placed at fortnightly intervals on rafts for spat falling. Growth of oyster spat on each collectors were recorded monthly and also wild oyster samples were collected for determination of condition factor. Physico-chemical parameters, zooplankton and phytoplankton samples were collected for further study.

Two bamboo rafts were constructed in Puttalam lagoon and Mhoththuwaram for transplant of oyster spat.

Clams and Cockle Research

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

The main fish species being:

- | | | | |
|----|---------------------------|---|---------|
| 1. | <u>Marcia Optima</u> |) | Clams |
| 2. | <u>Marcia hiantina</u> |) | |
| 3. | <u>Gaffrarium tumidum</u> | - | Cockles |

Two sites were selected in North part of Puttalam lagoon for carrying out the following aspects.

1. For study of abundance
2. For study of growth
3. For study of predatory behaviour
4. For study of condition index.

Investigated socio-economics aspects of these three species in Puttalam and Kalpitiya area.

Started market survey programme on molluscan resources of tourist hotels in west coast of the country to evaluate the demand among the tourists.

Transplanted Mussels in Puttalam Lagoon

Three rafts (8 x 5 m) were constructed in Puttalam lagoon for transplant of Perna perna (brown mussel) and Perna viridis (green mussels).

Following aspects were carried out during the year 1989.

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

Small number of green mussels spat were transported from Trincomalee and brown mussels were transported from Negombo.

Relevant physico-chemical parameters, zooplankton and phytoplankton were also collected during the study period.

Extension work

North - Western provincial Council has allocated funds upto Rs. 10,4000 to initiate commercial level culture of brown mussels. Therefore five fishing families in Kalpitiya area have been chosen to be provided with technical guidance, culture materials etc. These culture systems will be used as the demonstration of mollusc culture farms.

ANNUAL PROGRESS REPORT
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DIVISION : INLAND AQUATIC RESOURCES
PROJECT : MOLLUSC CULTURE PROJECT (SRI LANKA)

Staff for the Project:

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TO : DIRECTOR GENERAL

FROM : MECHANICAL ENGINEER

SUBJECT : PROGRESS REPORT 1989

DATE : 26.01.90

General Functions

=====

(a) Maintenance

- Land and buildings
- Machinery and equipment
- Vehicles
- Research Vessels
- Furniture fittings
- Telephone and telex
- Water electricity supply and distributions

(b) Purchases and Supplies

- Furniture and fittings
- Spare parts
- Building materials
- Other machinery and equipment.

(c) Construction work

- Ponds and Tanks
- Improvements and Modifications to the existing buildings
- Laboratory and office room

(d) Fabrication work

- Field Aids
- Furniture and fittings
- Research Equipment and accessories.

(e) Management of Research Vessels

e.1 R/V "Samudra Maru":

Over all operation of this vessel is looked after by the Service and operation Division. The routine Services and Supplies such as supply of fuel, lub oil, running repairs and maintenance were carried out by this Division.

Annual Docking of this vessel was due in June-July 1989. Although the tender were finalized the award of the contract was delayed due to financial constraints.

However, the liferafts were serviced and quotations were called to purchase 02 Nos. new liferafts which were found to be replaced.

The vessel participated at the opening ceremony of NARA, Kapparahota R.R.C. by His Excellency the President of Sri Lanka.

e.2 R/V "Balaya 11"

This vessel was brought to the operational conditions. However, the vessel is idling as the vessel is not utilized for any project. Vessel is due for annual docking/sliping repairs. In 1989 above repairs were delayed due to financial problems. However, it is expected to carry out these repairs in 1990.

Proper crew for R/V "Balaya" 11 to be recruited if this vessel to be used for any project.

e.3 Other vessels

Other vessels which are based in Trincomalee are not operational at the moment.

2. Major Projects

2.1 Establishments of proper workshop facilities for NARA is near in completion. This work is being carried at by NARA staff along with other work. However this work is expected to complete by 1990.

2.2 Considerable improvements to NARA Ground Floor of the main building was carried out. Arranging of the Musium, installation of 3½ ton, fishing vessel in the Musium, Terrazo flooring, completing of the granite counter were among the major improvements.

2.3 Renovation work to the Kapparatota R.r.C. was carried out by NARA.

Service and operation staff in a very short period, enabling. The opening of the same in time by His Excellency the President of Sri Lanka. This work was appreciated the State Minister of the Ministry of Fisheries and Aquatic Resources who closely supervised the work.

S.L. Suraweera
(Mechanical Engineer).

ANNUAL REPORT OF THE
OCEANOGRAPHY DIVISION
1989

1. STAFF

During the period under review the staff of the division consisted of the following:

Research Officers	-	09 (1 in UK for Ph.D, 1 acting S/GB, 1 on NARESA project, 2 trainees)
Research Assistants	-	03 (1 casual)
Lab Assistants	-	01
Sampler	-	01
Labourer	-	01
Typists	-	01 (casual)
Diver/Artist	-	01 (casual).

2. Research Work

During the period under review the following research activities were under taken:

2.1 The long term programme to survey the Continental Margin of Sri Lanka was continued and the R/V Samudra Maru was out at sea on 7 cruises for a total of 41 ship days as planned. The following cruises were carried out:

a) Cruise No. SM - 24 was carried out to collect sediment samples from Colombo to Weligama for a special Geochemical study of the Continental Margin of Sri Lanka. This cruise which took place from the 10 to the 16th of January collected 45 dredge samples from the continental margin. During this survey a team from the Marine Mammal Unit also participated making observations on cetaceans.

b) Cruise No. SM - 25 was carried out to collect sediment samples from Colombo to Mannar for a special Geochemical study of the Continental Margin of Sri Lanka. This cruise which took place from the 25th to 28th of January collected 40 dredge samples from the continental margin. During this survey a team from the Marine Mammal Unit also participated making observations on cetaceans.

- c) Cruise No. SM - 26 was carried out to collect sediment samples from Colombo to Batticaloa for a special Geochemical study of the continental margin of Sri Lanka. This cruise which took place from the 2nd to the 8th of February collected 30 dredge samples from the continental margin. During this survey a team from the Marine Mammal Unit also participated making observations on cetaceans.
- d) Cruise No. SM - 27 was carried out on the regular programme to systematically survey the continental margin of Sri Lanka from Kalpitiya to Mannar. This cruise which took place from the 21st to the 25th February completed 650 line K.m. of soundings and collected 16 grab and dredge samples. A geologist from Iran was given a training course in Geological, Geophysical and sampling methods in offshore exploration.
- e) Cruise No. SM - 28 was carried out on the regular programme to systematically survey the continental margin of Sri Lanka from Hambantota to Little Basses. This cruise which took place from March 30th to April 5th completed 950 line K.m. of soundings and collected 36 dredge samples. During this survey a team from the Marine Mammal Unit also participated making observations on cetaceans.
- f) Cruise No. SM - 29 was carried out to collect sediment samples from Batticaloa to Mullativu from a special Geochemical study of the Continental Margin of Sri Lanka. This cruise which took place from the 5th to the 12th of April collected 51 dredge samples. During this survey a team from the Marine Mammal Unit also participated making observations on cetaceans.
- g) Cruise No. SM - 30 was carried out to study ocean circulation including temperature/salinity gradients and sediment dynamics on the continental shelf between Panadura-Maha Oya. This cruise which took place from the 1st to 4th August was a joint oceanographic cruise with the Augsburg University - FRG. During this survey a specially constructed current meter with attached sensors for salinity, temperature and dissolved oxygen was used to measure the parameters in 18 oceanographic stations. In addition areas of upwelling was determined using a special portable echo sounder.

2.2 A preliminary investigation of the Mundel Lale and the water way connecting the lake to the Puttalam Lagoon was undertaken from the 30th of January to the 8th February. During this survey the Geology, Hydrology and Bathymetry of the Mundel Lake was studied and the hydrography of the water way connecting the two lagoons was investigated by taking spot heights and by the establishment of tide poles. A report was prepared jointly with the Inland Aquatic Resources Division of NARA.

A comprehensive multidisciplinary oceanographic study of the Negombo lagoon was undertaken. This survey which was initiated in March is planned to be completed in one year. The spatial variation, seasonal and diurnal oscillation in oceanographic parameters will be determined. Sampling stations were established along six diagonal lines across the lagoon. A total of the 20 stations were selected giving a homogenous coverage of the lagoon. Tidal fluctuations were monitored regularly during each survey by establishing a tide pole at the mouth of the lagoon, each sampling station was visited by a four member team twice a week on every Tuesday and Friday. The survey has completed 79 field trips for 1989.

The following parameters were measured at each sampling station: Temperature, Light penetration, Transparency, Currents, Turbidity, Salinity, PH, suspended Matter Nutrients, Benthos, Plankton and siltation rates.

To date a total of 22160 parameters have been measured in-situ. 800 suspended matter samples, 800 Nutrient samples, 400 each benthos and plankton samples, 200 silt trap samples and 40 bottom sediment samples have been collected.

The nutrients were analysed at the ESU lab with the kind consent of Dr. Padmini Alwis. The Benthos is been analysed by Mr. Janaka de Silva of the Aquaculture Unit. Dr. Pauline Dayaratne has undertaken to analyse the plankton samples. In addition the following Heavy metals Fe, Cu, Zn, Ni, Co, Mn, Hg, Pb, in water samples once a month and silt from traps have been analysed at the Peradeniya University by our researchers.

The hydrographic survey of the Negombo lagoon was conducted by the N.H.O.. The results of the study has provided a vast amount of new data and previously unknown facts about

pollution, siltation rates, the ebb and flood tides, water velocities etc.

- 2.4 A preliminary investigation of the Hamilton Canal from Chilaw to the Mundal Lake was completed from 17th to the 22nd of July.

The canal was surveyed by taking soundings using a portable echo sounder on 35 diagonal lines across the channel. A further 250 spot heights were also collected and sounding lines were run along the axis of the canal. Current measurements were taken in 35 stations. The fluctuations of the water level in the canal were measured by the establishment of two tide poles at either end of the canal.

A survey of land use in the catchment areas of the streams debouching into the canal were also calculated using available maps. Additional data on the discharge and intake of water into the prawn farms in the vicinity were also collected. A computer programme was developed to calculate the carrying capacity of the canal. Results indicate that due to siltation the carrying capacity of the canal almost equals the intake and discharge volume of the canal.

- 2.5 A survey of beach rocks on the west coast of Sri Lanka from Weligama to Chilaw was carried out on the 22nd and 23rd of April. This survey was continued upto Kalpitiya. The genesis, petrography and mineralogy of beach rocks in Sri Lanka were investigated.

- 2.6 The origin of the heavy mineral deposit found on the banks of the Mundal lake was surveyed from the 13th to the 14th of May. Results have shown that this deposit is composed of predominantly the mineral Magnetite. A full paper on the results of the survey is under preparation.

- 2.7 A survey of a small body of water called the Silliya lake in Beruwala was undertaken in November jointly with the ESU and Aquaculture division. Pollution of the lake was studied including depth measurements. A report on the study was presented to the NOP.

- 2.8 A survey of a reported occurrence of beach minerals in the Hambantota district was investigated in December. The mineralogy of the deposit and extent was determined. The serpentinite body found at Ussangoda was also visited and samples collected to investigate the possibility of using the weathered top cover of the body as a source of iron ore.

3. OTHER FIELD TRIPS

Officers of this division were involved in preparing a report to be presented to the parliamentary consultative committee meeting regarding a dispute on the introduction of a new fishing method that was affecting a small scale fishery at Jeligama. 3 one day field trips were undertaken.

4. OTHER ACTIVITIES

- 4.1 Officers of this unit were involved in training a Geologist from Iran in offshore exploration for mineral deposits. The Geologist was given both theoretical and practical training. He was also given the opportunity of participating on two field trips to the Negombo Lagoon and one cruise on board the R/V Samudra Maru.
- 4.2 Officers of this unit participated in discussion with a representative from ICOD who was here to make arrangements for a forthcoming course on non fuel mineral resources to be held in Sri Lanka in 1990. These course discussions included arrangements for hosting the course/ material, lectures and field excursions.
- 4.3 Dr. Wickramaratne was involved in upgrading 3 projects proposals to be handed over for funding to the Netherlands Government.
- 4.4 Dr. Kanatunga attended a workshop of Marine Space Information Systems in Karachi from the 2nd to the 8th of July.
- 4.5 Officers of this unit participated in the forth standing committee meeting of the IOMAC from 17th to the 21st July.

5. LABORATORY WORK

- 5.1 The bottom of Topography maps of cruises SM 17, 18, and 19, were completed. Work is in progress to compile 3 sheets covering the areas from Kalpitiya to Hambantota.
- 5.2 Heavy mineral separations of 55 samples collected from the Kelani-ganga were completed. Each samples was first seived into six fractions and each fraction was separated into about six individual minerals. The minerals in the fraction that could not be separated using the iso-dynamic separator was counted under the binocular microscope.
- 5.3 176 samples collected on cruises SM 20, 21, 22, 23 were seived into six fractions each and analysed for organic matter and carbonate content.
- 5.4 675 sediment samples were prepared and packed for special Geochemical study of same.
- 5.5 All samples stations occupied during Samudra Maru cruises were plotted on 1:500000 scale.
- 5.6 Soundings on cruises SM 19, 21, 22, 27 and 28 have been transferred from the echo roles to be a record book.
- 5.7 The methodology to analyse silt and clay size reactions was developed-
- 5.8 176 grain size analyse of sediment samples were plotted on probability paper and statistical parameters calculated.
- 5.9 The Geology of the Kelani Ganga river basin was plotted on a inch to one mile scale and statistical parameters plotted..

TO : DIRECTOR GENERAL

FROM : HEAD OF THE DIVISION
ENGINEERING AND TECHNOLOGY DIVISION

SUBJECT : PROGRESS REPORT, 1989

DATE : 26.10.90

As per programme of Scientific Research for 1989 our research work was restricted to mainly extension of the Tuna Resources Survey project and to other services to the Ministry of Fisheries and Aquatic Resources.

1. Present Staff

At present 05 employees (all permanent) are attached to this division.

Research Officer:

- K.T. Weerasooriya (in UK on a scholarship)
B.Sc.(Hon) in Physics Diploma in fishing
Technology NARA (Sri Lanka).
- S.L. Suraweera
M.Sc.(Hon) in Mechanical Engineering specialized
in Industrial fishing (USSR) certificate
Competency in deep sea Navigation (USSR), MIE, C, Eng(S.L)
MRIN (UK).

Research Assistants

- S.S.C. Peiris - G.C.E. (A/L)
- P.S. Fernando - do -
- W.G. Sirisena - do -
- S. Fernando - do -

2. Activities in 1989

The followup self financing project of TCP/SRL/6653 was carried out through out the year 1989.

During the above period total of 28 fishing trails were carried out. Total of Rs. 531,784.95 was generated against the expenditure of Rs. 705,089.44. Reasons for the losses of fishing operation are the low fishing days (the vessel was not operational for about 3 months due to brake down), as experimental fishing was also carried out along with the commercial operations.

During this year a proposal to modify this vessel was prepared in participation with the fishermen and submitted to the Hon. Minister of Fisheries and Aquatic Resources. It is decided that this vessel will be modified as suggested and to put on to trials during 1990.

3. Services rendered and reports submitted to the Ministry of Fisheries and Aquatic Resources.

3.1. Reports on Fishing Disputes.

- a) Small scale fishermen vessels beach seine fishermen at Thotamuna, Matara.
- b) Trolling line and small scale fishermen vr. purse seine fishermen at Weligama.
- c) Small scale fishermen vs. trawling fishermen at Kalpitiya.

3.2. Project proposals:

- a) Identification of new demersal fishing grounds for shrimp and fish around portugul bay area of Sri Lanka.
- b) Deployment of low cost fish aggregation devices in the Western and Southern provinces of Sri Lanka.
- c) Inventorization of fishing gear and crafts in Sri Lanka.

3.3. Reports:

- a) Improvements to NW coast fisheries development project vessels.

- b) Report on gear Technology in reservoir fisheries.
- c) Off-shore multiday fishing boat.

4. Constraints Faced by the Division:

At present Mr. Suraweera is conducting the research work as the head of the division in addition to the full time work as a Mechanical Engineer NARA. Therefore it is strongly recommended that one research officer to be recruited for this division.

Fund allocation is also insufficient to carry out productive research work in the field of fishing gear and vessels as such studies need more funds and a proper research vessel.

S.L. Suraweera.

ANNUAL REPORT 1989 - EXTENSION UNIT

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In the year under review Extension Unit improvised an 'Editing Studio' by linking up the professional audio mixer, special effects generator, monitors, the portable Umatic recording machine and high band camera gifted under foreign aid and the VHS camera/recorder and loaned audio cassette recorders, and using an old VHS deck as a 'destination' began recording programmes essentially for in-house use. These are in VHS format pending the acquisition of professional editing machines to match with the other equipment. Studio wiring and improvised furniture layout was designed by unit personnel, as was a spray proof housing for the VHS camera. Graphics and artwork production were also initiated to supply the need for illustrations in video filming, and production of leaflets, brochures and posters for educational public awareness work. An artist/diver was loaned from the Oceanography Division for the purpose.

Despite the limitation placed on reporting of government agency activities caused by the disturbances in the country and the upheaval in media institutions, some of NARA's activities were given publicity through Extension Unit productions for national TV. The following were telecast on the national network - Rupavahini:

* "The Skies The Limit" - 15 mt documentary on advances in remote sensing for Indian Ocean Usage.

* "Dinapothan/Dateline" - Export of Ornamental Fish - 20 mt documentary on fish exports telecast in Sinhala & English.

* News Items on : * NARA's participation in Karachi IOMAC Space Conference.

* NARA helps with self employment ideas for coastal fisherwomen in fish processing and ornamental fish breeding.

* National Marine Mammal Programme personnel retrieve first complete specimen of a Sperm whale to be put on display in Sri Lanka.

The following was telecast on international television networks:

visnews item - * Capture of ornamental fish and damage to reefs.

The film "The Skies The Limit" was also screened during the sessions for IOMAC Conference delegates discussing remote sensing at the third standing committee meeting of IOMAC, held in Colombo.

Recording in VHS format, Extension Unit also put out a special 15 mt documentary production entitled "Tuna Fishing in Troubled Waters" to illustrate the issue in a fishing conflict which had arisen in coastal Meligama. This film was screened in Parliament before a Parliamentary Consultative Committee to bear out the case put forward by NARA for introduction of management practices. Two further filmlets 'Lobsters in Peril' and the 'Seaweeds Story' were produced and screened before an audience of parliamentarians who visited NARA.

A collage of visuals on ornamental fish was used in a training course for aquarium owners and hobbyists organised at NARA.

Production of a one hour documentary on NARA in Sinhala was undertaken and is nearing completion and a collage of visuals on wetlands was compiled and screened before the Ambassador of the Netherlands visiting NARA.

Despite restriction on travel due to the prevailing situation at the time, a number of video recordings and accompanying photo coverages were made during the year, for use in future productions. These included:

Field Recordings

1. Tourist potential of boating on the Dandugama Oya
2. Attempted rescue of wounded dolphin at Puttalam
3. Bird life in the wetlands of Palavi
4. NARA seaweed culture project at Italai
5. NARA production of brine shrimp at Palavi
6. Lobster catch at Mutwal
7. Flooding of Colombo North
8. Stranded whale at Negombo: pickling of whale flesh
9. Opening of regional station at Kapparahotta
10. Recovery of whale skeleton and specimen from Thoduwawa
11. Open water sport fishing in the vicinity of Colombo harbour
12. Coral mining and kilns at Akurala
13. Culture of pearl oysters and marine habitat at Galle
14. Capture of marine ornamental fish from Wellawatta reef.

In-house Recordings

16. Ornamental fish unit and fish tanks
17. Mrs. Kuruppu and Mr. Grero lecture demonstrations on rearing methods and fish feed

18. Lemosh describing fish diseases
19. Mr. Wijeyananda's post-cruise presentation on Deep Sea Trenches and plate tectonics
20. Visit of Kalutara women group
21. Demonstration of pickling fish
22. Demonstration of solar drying of fish
23. Interview with Mr. Jasenthuliyana on space applications for Indian Ocean usage
24. Mahaweli Plume satellite pictures
25. Interview with Kumar Chitty on Law of the Sea in relation to Sri Lanka
26. Interview with Seabell experts on marine contingency planning
27. Visit of Fisheries Minister Joseph Michael Perera to NARA
28. Visit of State Minister P.S.L. Galappata to NARA
29. Interview on problems of the Prawn Farmer with visiting expert Dr. S. Olson
30. Interview with Arjen Rajasuriya on status of ornamental fish export trade and reef conservation.

Several radio broadcasts on marine related subjects were also organised during the year. They were broadcast as follows:

<u>Programme</u>	<u>Subject</u>
'Headlines'	Interview with Mr. N. Jasenthuliyana, Director UN Outer Space Affairs Division on remote sensing for Indian Ocean usage.
'Options'	Interview with Capt. Devendra G. G. Jayatilaka on the inauguration of a Maritime Heritage Trust.
'Facests of Lanka'	Introduction to diving off Wellawatta.

- 'Facets of Lanka' Kalpitiya fisheries & Aquatic Resources
- 'Chords & Casual Conversation' Painting Fish in their marine habitat
- 'Chords & Casual conversation' Ornamental Fish Breeding Training Course at NARA.

Other audio recordings were made for future media use/as follows:-

- * Mr. Wijayananda on his split Phd studies in deep ocean sediments.
- * Mrs. Anesty Jayasuriya on her work in initiating seaweed culture.
- * Captain Ravi Jayaratne & C.P. Jayasinghe on marine pollution
- * Dr. Barry on Canadian oceanography.

In the field of print media the following were published through Extension Unit:

- * Brochure on Kapparatota Weligama Station of NARA
- * Feature on lobster research in Island newspaper
- * Article on Tuna 'Unchoked Fishery in Indian Ocean Can Damage Tuna Stock' in Ceylon Daily News.
- * Article on Ornamental Fish - in Vidusara science magazine
- * Press release on prawn farms 'Prawn Farms Hit by poaching' - Daily News
- * " " " " Sinhala version (update)
- * Press release - IOMAC-UN Space Applications Workshop in Karachi.
- * Interview Mr. Jayakody on endangered lobsters - Vidusara Science Mag.
- * " Mr. Anesty Jayasuriya on sea weed culture "
- * " Mr. Jayasinghe on aquaculture " " "
- * " Mr. Wanninayaka on mollusc culture " "
- * News Brief on Ornamental Fish Breeding Training Course
- * " " Seaweed Culture Project at Etalai
- * " " Split Phd study of Mr. Wijayananda.

Extension Unit also supplied photographic services, prints and slides for the following:

- * NARA Handbook
- * Kapparithota brochure
- * Cover page of Mihikatha environmental magazine (wetlands)
- * Cover page of Vidusara Science Magazine (Whale)
- * Colour photo spread in Sunday Island (lobsters)
- * Cover page of Prawn Culture report
- * " " seaweeds "
- * " " Trincomalee "
- * " " Crocodile Slaughter report.
- * Illustration of Tuna article for Daily News
- * Illustration for Mr. Jayakody interview in Vidusara.

Artwork and Graphics supplied by the extension unit were as follows:

- * Design for Kapparithota Board
- * Artwork for Kapparithota Brochure Cover
- * Artwork for Kapparithota Poster for Ministry
- * Identification Guide on Open Water Fishes for Marine Resources Centre model fish display.
- * Artwork & text for folder cum poster for use in schools & coastal villages in lobster conservation and management effort.
- * Design & text for folder on 'introduction to the marine habitat' for use in school environment & awareness programme.
- * Three Tuna artworks for Tuna poster
- * Illustration of seaweeds for Mr. Jayasuriya's report on Seaweed Culture
- * Graphic on Pollution for Environmental Services Unit
- * Illustrations for environment I publication by Dr. Wickramaratne.

- * Set of Transparencies (illustrated) for Mr. Jayasuriya's lecture on seaweed in Bangkok.
- * Set of Transparencies (illustrated) for Extension Unit presentation.
- * Oceanography Division Logo
- * Fisheries Training Institute Logo
- * Assorted Artworks, Titles & Credit Titles for Video Productions.

Lifesize Displays & Models were also prepared by the Extension Unit for decorating the NARA premises.

Fibreglass Models

- * Marine Resource Centre under sea habitat display
- * 2 sets Eugong statutory (6 Nos.)
- * 2 sets Dolphin statutory (6 Nos.)
- * Sailfish, Black Marlin, Swordfish, Blue Marlin, Striped Marlin, Yellowfin Tuna, Shark, Kobra Paraw, skipjack Tuna (7 Nos), Seer fish (2 Nos), Grouper, Lates (3 Nos.)

Plaster of Paris & Rigifoam Models

- * Scale model of Kapparithota ground plan
- * " " " " seabed
- * " " " Kadolkele ground plan
- * NARA logo for Auditorium
- * NARA logo for Reception Area

In addition Unit personnel were engaged in framing a series of posters and photos for display in the NARA premises.

Extension Unit was also engaged in organising public relations events such as the following:

- * Co-ordination of guided tour of NARA and video and film presentation for the students of the Overseas Childrens School
- * Co-ordination of visit of womens group from Kalutara to learn self employment techniques in fish processing and ornamental fish breeding at NARA
- * Special screening of a film on Coast Erosion for the benefit of members of the Environmental Services Unit of NARA
- * Organisation of Photo Club at NARA, issue of cameras to members and display of best photographic exhibits.

During the year members of the Extension Unit were called upon to give presentations describing work in hand before the following distinguished visitors to NARA:

- * Representatives of USAID and NILOS
- * State Minister P.S.L. Galappati and Opposition MPs
- * USAID funding year.

During the year under review one member of the Extension Unit was sent abroad for training during August and September at the 10th Regional Training Course for Fisheries Extension Workers in Communication Media held at the SEAFDEC Training Centre in Bangkok, Thailand. While attending the course which included training in graphics, photography, print media, OHP, sound and slide and video production, she scripted, edited and directed the class video production. This was a 15 mt. documentary on the training activities of the class.

LIBRARY AND INFORMATION DIVISION
ANNUAL REPORT - 1989

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STAFF

The Library and Information Service Division is under the Director Information, assisted by the following staff:

- * Two Information Officers
- * Publication Officer
- * Two Librarians
- * Data Entry Operator
- * Typist
- * Peon.

The Director Information post is vacant since October 1989 and the Information Officer Miss. G.A. Padmaperuma and the Publication Officer Mr. Janaka Kumara left NARA on 30th June 1989. Since the registration of Director Information, Miss. V.N. Perera was assigned to carry out the duties of Director Information.

NEW ACCESSIONS

Books, Periodicals, Reprints, FAO publications and other publications have been received as usual on a free of charge basis.

The following publications were received by the Library during this period:

- * 56 Books
- * 168 Periodical Issues
- * 69 FAO Publications
- * 23 IOC Reports
- * 12 NARA Officers Reports
- * 3 Annual Reports
- * 3 Reprinters.

In addition the following periodicals are subscribed to the Library but 20 periodical titles which have been approved by the Director General were not paid for by the Accountant.

The following Periodicals are being subscribed:

- * Economic Review
- * Reader's Digest
- * Mihikatha
- * Loris
- * J. Marga
- * Kalpana.
- * Marine Pollution Bulletin
- * World Fishing
- * Fishing News International.

PUBLICATIONS

- * "Accession List" - lists of all accessions to the Library was circulated quarterly among the NARA staff.
- * "News from NARA" - A repackaged news bulletin of news paper articles, leading to the publication of NARA News letter No. 3 was completed in 1989 and it was distributed at the Negombo Mobile Ministry Service. It has been very useful in giving an overview of the activities of NARA to visitors to the Institution and also for general media work.
- * Armetia manual was completed using Library equipment during this period.

SERVICES

- * Reference and Lending - All books in the Library are lent only to the NARA staff and the staff of the Ministry of Fisheries. Periodicals, FAO Publications and other publications are only available for reference. During this year University students and trainees of various divisions including the Ornamental Fisheries Division used the reference library.
- * Document Procurement - A photocopying machine has been installed in the library. Copies of documents available

in the library have been provided free of charge to the officers of NARA and to outsiders within and outside the country at a nominal charge. All charges are deposited with the shroff and the original receipt given by him is handed over to the recipient.

The charges are:

- Rs. 2.50 per A4 size sheet
- Rs. 3.00 per A4 size sheet (copying on both sides)
- Rs. 4.00 per A3 size sheet
- Rs. 5.00 per A3 size sheet (copying on both sides)
- Rs. 2.00 per U3 size sheet
- Rs. 2.50 per U3 size sheet (copying on both sides)
- Rs. 3.00 per F4 size sheet
- Rs. 4.00 per F4 size sheet (copying on both sides).

STAFF TRAINING

Mr. L. Wijesuriya Information Officer left for a three months Computer Training Course at the Asian Institute of Technology, Bangkok, Thailand on September 1989.

VACANCIES

The following staff vacancies still exists in the Information Division:

- * Director Information
- * Publication Officer
- * Information Officer
- * Photocopy Operator
- * Labourer.

ANNUAL REPORT FOR 1989

NATIONAL MARINE MAMMAL PROGRAMME

Personnel:-

The project functioned with a staff of four members during the year 1989. This included the Co-ordinating Officer, one Research Officer and two Research Assistants, all attached to NARA on a permanent basis.

Work Programme:-

Marine mammal sighting surveys and stranding investigations were carried out during the course of this year. Sighting data was collected by members of the team participating on five cruises of the "R/V Samudra Maru" in the first and second quarter of the year. These cruises covered the areas off the north-west, west, south-west, south, south-east and east coasts of Sri Lanka. The large whale species recorded were Balaenoptera musculus (Blue whale), Balaenoptera edeni (Bryde's whale), and Physeter macrocephalus (Sperm whale). In addition to this the following 7 species of small Cetaceans were also observed - Stenella longirostris (Spinner dolphin), Stenella attenuata (Spotted dolphin), Stenella coeruleoalba (Striped dolphin), Tursiops truncatus (Bottle-nose dolphin), Grampus griseus (Risso's dolphin), Steno bredanensis (Rough Toothed dolphin) and Pseudorca crassidens (False Killer whale). Possibilities of carrying out field work in the third quarter were limited due to the security situation prevailing in the country.

Four whale strandings along the west and north west coasts occurred between August and December 1989 and were investigated by the marine mammal research team. The first stranding was at Karukkapone (north of Negombo) in August and was identified as a Sperm whale (physeter macrocephalus) after close study of a maxilla which was recovered. A second stranding which occurred at Kalpitiya in September was investigated but the remains were not sufficient for positive identification. A young Sperm whale (Physeter macrocephalus) brought into the Negombo fish landing site in October was also identified, measured and photographed. Based on this identification action was taken

in court against the people who brought it in. The fourth stranding occurred at Thoduwawa on 10th November. It was identified as a Sperm whale (Physeter macrocephalus) measured, photographed and the complete skeleton retrieved for display at NARA

Staff Training:-

Ms. A.D. Illangakoon, Research Officer of this programme attended a 10 week training programme on Marine Affairs, sponsored by IOMACIOI in Egypt from 15th October to 21st December 1989.

Participation of staff at Local/foreign seminars, symposia, work shops:-

Nil.

Publication, papers read, other Reports and Services:-

W.P. Mahendra - Article in Loris magazine - "Sperm whales of Sri Lanka"

A.D. Illangakoon - Text and design for educational brochure on Marine Mammals of Sri Lanka.

Equipment:-

Nil.

Constraints:-

It is difficult to carry out systematic marine mammal research due to the inavailability a suitable vessel for work out at sea. It is essential to have a fairly fast and easily manoevable boat for this purpose.

PROGRESS REPORT - OCTOBER TO DECEMBER 1989

CORAL REEF RESEARCH PROGRAMME

Project: Coral Reef Research

October - Mapping of the nearshore coral reef at Kapparithota was carried out with the assistance of the National Hydrographic Office. A map with details of reef contours is in preparation, according to the data collected during the survey.

November - Preliminary investigations were carried out at the seaward side of the Mirissa headland to inventorise the coral reefs in terms of species diversity of fauna and flora. The present status of the reefs and reef degradation if present. Both locations are very picturesque as the coastline is very rocky with sandy coastal indentations. The investigations revealed that very small areas of fringing reef occurs at Niyanwella and at Paragalle. Coral mining was observed at Paragalla in a relatively small scale. In addition Tar Balls were common along this shoreline.

A presentation illustrated with slides, on activities of the coral reef programme was carried out for the USAID team during their visit to NARA on 10th Nov. '89.

A status report on the export of live corals was prepared and despatched to the Department of wild life on the request of Dr. S. Kotagama.

Ms. A. Rajasuriya was interviewed by Miss M. Berenger of the Extension unit for the VIZ - NEWS programme on 29th Nov. 89 at NARA about live coral and fish exports from Sri Lanka and its detrimental effects on the reefs ecosystem.

A preliminary site investigation was carried out with the visiting SAREC team to select undegraded sites to be compared with degraded sites prior to the commencement of the SAREC funded coral reef project. According to the information gathered during previous reef surveys the Bar Reef off the Kalpitiya peninsular was selected as the undegraded site.

The coral reef research team carried out investigations at the Bar Reef together with the SAREC team from 26th Nov. to 9th Dec. 1989.

Carried out under water investigations at the Kaneko Lanka Pearl Oyster farm in Galle to inventorise the reef associated organisms that use the Oyster rafts as aggregation sites. In addition a species count was done at the nearshore coral reef at Rumassala.

In addition to field surveys coral taxonomic work was carried out at NARA and all specimens collected during the surveys were cleaned and deposited in the reference collection.

Arjan Rajasuriya,
Officer, G.C.C.

11th January, 1990.

Auditor General's Department,
Torrington Square,
Colombo - 07.

20 December, 1990.

Chairman,
National Aquatic Resources Research and
Development Agency,

Report of the Auditor General on the Accounts
of the National Aquatic Resources Research and
Development Agency for the year ended December
31, 1989 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 and Development Agency for the year ended December 31, 1989 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 in terms of Section 14(2)(c) of the Finance Act, appear in the paragraph that follow. A more detailed report in terms of Section 13(7)(a) of the Finance Act was forwarded to the Chairman on 17 September, 1990.

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 reviews and tests were such as to enable as wide an audit coverage as possible within the limitation of staff, resources and time available to me. Sub section (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 in this report I am unable to express an opinion on the accounts presented. Main observations on these are as follows:-

<u>Deficiencies</u>	<u>References to paragraphs in this report</u>
(01) Accounting Policies	2:5:1
(02) Omissions from accounts	2:5:2
(03) Classification errors	2:5:3
(04) Inappropriate disclosures	2:5:4
(05) Absence of evidence for audit	2:5:5
(06) Non compliance with Laws, Rules, Regulations and Management decisions	2:5:6
(07) Identified losses	2:5:7
(08) Financial Claims	2:5:8
(09) Under statement of Assets	2:5:10
(10) Important deficiencies in financial statements	3:1
(11) Systems and Controls	4

2:2 Financial Results

According to the accounts, the operations of the Agency for the year ended December 31, 1989 had resulted in a surplus expenditure of Rs. 6,129,198 over the income as compared to a deficit of Rs. 6,335,457 in the previous year. The following statement gives a summary of financial results for the year under review and the previous year:-

Year ended December 31

	<u>1989</u>		<u>1988</u>
	<u>Rs.</u>	<u>Rs.</u>	<u>Rs.</u>
<u>Income</u>			
Government's Contribution	12,166,600		11,180,000
Misc. income	<u>188,157</u>	12,354,757	<u>142,435</u> 11,322,435
<u>Less</u>			
<u>Recurrent Expenditure</u>			
Administrative expenses	14,838,798		13,749,972
Establishment Exp:	825,822		1,348,420
Provision for depreciation	<u>2,819,335</u>	<u>18,483,955</u>	<u>2,559,500</u> 17,657,897
Expenditure over income		(6,129,198)	(6,335,457)
Adjustment for previous years		(1,058,134)	(37,962)
		<u>(7,187,332)</u>	<u>(6,373,419)</u>
Income b/f and balance in the expenditure account		<u>(20,548,220)</u>	<u>(14,174,801)</u>
Balance c/f		<u>(27,735,552)</u>	<u>(20,548,220)</u>

2.3 Financial Structure

The financial structure of the Agency as at December 31, 1989 as compared with that of December 31, 1988 is given below:

As at December, 31

	<u>1989</u>	<u>1988</u>
	<u>Rs.</u>	<u>Rs.</u>
<u>Resources</u>		
Govt's contribution Capital	39,553,380	30,770,080
Foreign Aid	39,811,261	11,086,698
Other contributions	<u>350,000</u>	<u>350,000</u>
	<u>51,979,089</u>	<u>21,658,558</u>
	=====	=====

Utilisation

Fixed Assets at W.D.V.	41,943,412	21,870,394
Net Current Assets	10,035,677	(211,836)
	<u>51,979,089</u>	<u>(21,658,558)</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>	<u>Rs.</u>	<u>Rs.</u>	<u>Rs.</u>
Govt's grant for Capital Expenses		8,783,300	37,507,863
<u>Application of funds</u>			
Deficit	6,129,198		
<u>Less</u>			
<u>Items not involving movement of funds</u>			
Depreciation for the year	2,819,335		
<u>Add</u>	3,309,863		
Adjustments of previous year	1,058,134	4,367,997	
Additions to the fixed assets		22,892,353	27,260,350
			<u>10,247,513</u>
			=====

Increase in working capital as analysed below:

	<u>Effect on working capital</u>	
	<u>Increase</u>	<u>Decrease</u>
	Rs.	Rs.
Stocks	-	112,900
Debtors	250,969	-
Deposits receivable	71,250	-
Advances	329,307	-
Staff Loans	349,466	-
Cash and Bank balances	11,002,175	-
Creditors and Accrued Exp.	195,286	-
Deposits payable	-	665,622
Provision for Gratuitities	-	1,172,418
	<u>12,198,453</u>	<u>1,950,940</u>
	=====	<u>10,247,513</u>

2:5 Comments on Accounts

2:5:1 Accounting Policies

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

2:5:2 Omissions from accounts

- (a) Value of vessel 'Samudramaru' released to the Agency by the Ministry of Fisheries and Aquatic Resources in 1985 for research purposes has not been accounted for in the accounts.
- (b) Movable and Immovable assets belonging to the Ministry of Fisheries previously which are presently under the custody of the Agency have not been acquisitioned by the Agency and valued and taken into accounts in terms of Section 35 of the National Aquatic Resources Research and Development Agency Law No. 54 of 1981.
- (c) Fish stocks belonging to the Agency as at December, 31 1989 has not been valued and accounted for in the accounts.
- (d) An expenditure of a sum of Rs.67,614 relevant to the year under review has been omitted from the accounts.

2:5:3 Classification errors

- (a) Sums of Rs. 5,919 and Rs. 24,538 relevant to the years 1988 and 1990 respectively have been written off to the Income and Expenditure Account of the year under review as inappropriate.
- (b) Revenue expenditure such as food stuffs, consumables, stationery, repairs and maintenance expenses, vehicle Insurance, Spares and paper advertisements amounting to a sum of Rs. 172,682 has been capitalised.

2:5:4 Inappropriate Disclosures

- (a) A sum of Rs. 6,499 expended as welfare expenses has been debited to the Gratuity Payments a/c instead of Welfare Expenses a/c.

- (b) A sum of Rs. 5,555 spent for repairs to duplicating machines has been debited to service advance a/c instead of debiting to the repairs and maintenance a/c.
- (c) A sum of Rs. 1,250 spent for construction of the Main Road has been debited to Buildings a/c instead of debiting under the Main Pond a/c.
- (d) A sum of Rs. 50,000 paid against fuel during the year under review has been debited to the advance account instead of debiting to the fuel expenses account.
- (e) A sum of Rs. 14,904 spent during the year under review as paper advertisements for registration of suppliers for the year 1990 has been debited to the adjustments to the previous years account.

2:5:5 Evidence for Audit

Items valued at Rs. 75,586,921 representing fixed assets, current assets, current liabilities and expenses, could not be satisfactorily vouched or accepted in audit in the absence of list of fixed assets, physical verification reports, some of the confirmation letters in respect of assets and liabilities vehicle time sheets and monthly summary, list of vehicles, files pertaining to purchases, receipts and bills and some payment vouchers.

2:5:6 Non compliance with Laws, Rules, Regulations and Management Decisions

- (a) The National Aquatic Resources Management Council and the Scientific and Technical Committee had not been appointed in terms of Section 13 and 17 of the National Aquatic Resources Research and Development Agency Law No. 54 of 1981.
- (b) Although the monies received by the Agency should have been banked daily in terms of paragraph 4 of the Manual of Organisational procedure of the National Aquatic Resources Agency, there were instance that monies had been banked after seven days from the date of collection.

- (c) It was observed in audit that unaid salaries had been kept in the custody of the Agency by the Shroff for more than twenty days inspite of the fact that according to the Manual of Organisational Procedure of the National Aquatic Resources Agency that unpaid salaries should have been banked after 4 days.
- (d) In terms of Manual of Organisational Procedure of the National Aquatic Resources Agency a stock verification has to be carried out before end of the financial year, but during the year under review no stock verification and taken place.
- (e) In terms of Section 13(6) of the Finance Act No. 38 of 1971, the accounts for the year ended December, 31 1989 should have been made available to the auditors on or before 30 April, 1990, but the accounts were submitted for audit on 17 May, 1990.
- (f) Draft Annual Report was not submitted for audit in terms of Section 14(1) of the Finance Act No. 38 of 1971.
- (g) Reports in respect of stocks, Stores Items, Creditors and Debtors statements as required by the Auditor General in terms of Section 13(5)(B) of the Finance Act No. 38 of 1971, had not been submitted.
- (h) In terms of Financial Regulation No. 396(D) all cheques outstanding should have been cleared or taken into incomes a/c but no action had been taken in regard to clearing of cheques outstanding to the value of Rs. 37,064.
- (i) No procedures had been laid down in respect of control of vehicles in terms of para 9 of Public Administration Circular letter No. 264 dated 15 August 1984.

2:5:7 Losses Identified

- (a) A sum of Rs. 679,910 is shown as Staff debtors as at December 31, 1989 and a total of Rs. 21,674 inclusive of the Petty Cash Imprest was due from 7 employees

who had left the service of the Agency , No provision has been made in the accounts in regard to this doubtful debt.

- (b) It was observed in audit that the restaurant of the Agency called 'ADIYA' had made an operational loss of Rs. 56,109 during the year under review.

2:5:8 Financial Claims

- (a) A sum of Rs. 816,047 paid as advances during 1987 and 1988 for supplies and services were outstanding as at December 31, 1989.
- (b) Petty Cash advances amounting to Rs. 88,327 to officers of the Agency was outstanding as at December 31, 1989 spreading over for a period of 6 months to more than 4 year period.
- (c) A balance of Rs. 22,263 from the loans and advances paid to employees from 1982 to 1988 could not be recovered as the employees had left the Agency.

2:5:9 Idle, Slow moving and under utilised assets & labour

- (a) Fish breeding tanks were not operating from the last five years.
- (b) A Bank Account bearing No. 6600102565 with a credit balance of Rs. 10,674 has not been operating during the year under review.
- (c) Six motor vehicles were lying idle for more than a year.
- (d) Spare parts dismantled from vehicles including a lot of other equipments were lying idle for more than a year.

2:10 Under statement of Assets

Dollar Account balance of Rs. 10,416,206/40 at the Central Bank as at December 31, 1989 had been taken into the books

As Rs. 8,853,775/44.

3. Financial and Operating Review

3:1 Financial Results

Operational deficit for the year under review was Rs. 6,129,198 as against operating deficit of Rs. 6,335,457 in the previous year thus resulting an operating progress of Rs. 206,259 in the year under review. It would serve no useful purpose by analysing these variances in view of the materially unstable financial behavior of the Agency as stated below:

The Agency practically continues to adjust in every subsequent year the errors and omissions observed in the financial results in the financial statements submitted by the Agency. Accordingly the deficit of Rs. 6,335,457 shown in the accounts for the year 1988 has been adjusted by Rs. 1,058,134 during the year under review. Similar adjustments taken place during the past four years are as follows:

<u>Year</u>	<u>Financial Result (Rs.)</u>	<u>Adjustments done in the subsequent year (Rs.)</u>
1985	(1,974,832)	(110,123)
1986	(4,538,360)	(8,326,598)
1987	(3,858,065)	(37,962)
1988	(6,335,457)	(1,058,134)

It is difficult to take for granted that any similar adjustments would not be effected in the subsequent years in the financial results or the financial position of the year under review. Therefore it is not possible to establish a bonafide accuracy of the financial results or the financial position of the accounts that have been submitted.

3:2 Transport Fleet

The transport fleet of the Agency during the year under review consisted of 28 vehicles compared to the transport fleet of 25 vehicles in the previous year.

Running and maintenance cost of this transport fleet for the year under review was Rs. 2,067,942 compared to an expenditure of Rs. 1,594,175 in the previous year. Some of the important statistical data in regard to the use of vehicles are shown below:

Total Kilometers done	Rs. 358,447
Fuel consumption in Litres	Rs. 68,265
Average performance per Litre per K.M.	Rs. 5.25
Total expenses incurred for fuel	Rs. 704,006
Average cost of fuel per K.M.	Rs. 1/96
Total expenses incurred for repairs and maintenance	Rs. 1,363,936
Average cost per litre on repairs	Rs. 3/80

3:3 Budgetary Control

There shows a significant variance in the Budget and the actual position. The Budget has not been used as the administrative guide.

4 Systems and Controls

Deficiencies observed during the course of audit were indicated in my detailed report to the Chairman. Special attention is needed to the following areas of control:

- (a) Finance
- (b) Advances
- (c) Purchases
- (d) Fixed Assets
- (e) Budget
- (f) Accounting

Sgd:.....

Auditor General

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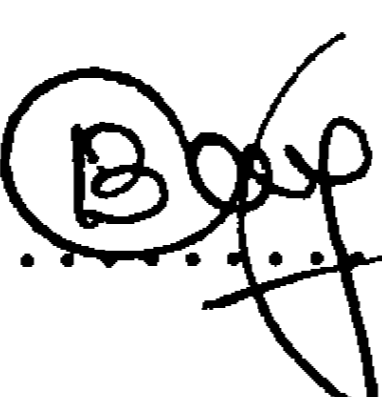
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