

ANNUAL REPORT & ACCOUNTS 1999



National Aquatic Resources Research &
Development Agency
Crow Island
Mattakkuliya
Colombo-15

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MARINE BIOLOGICAL RESOURCES DIVISION

Marine Biological Resources Division is mainly responsible for conducting research towards management of marine living resources. Work plan of the division has 4 research programmes covering the currently important four major areas; resources assessment and management, conservation and management of coral reefs and associates, conservation and management of non targeted species such as marine mammals and turtles and special projects on coastal resources management.

Research projects carried out:

Programme 1: Assessment and Management of Fisheries Resources

Project 1: Assessment and management of large pelagic fisheries resources

This project was carried out to assess the level of exploitation of the large pelagic fish resources around Sri Lanka. The information was gathered through fisheries logbooks, collecting catch data from the existing fisheries. Biological and other relevant data were collected for stock assessment purposes. The data collected were entered into the database and updated the database. A checklist of sharks around Sri Lanka was prepared. The information on tuna species needed for IOTC was sent.

Project 2: Assessment and management of small pelagic resources

Catch effort statistics and length data were collected from Chilaw to Trincomalee. The catch data were incorporated into the database. Monthly fish production, effort, species composition changes were estimated. In addition reproductive status of the major species caught in the beach seines and cast nets were studied.

Project 3: Assessment and management of demersal fish resources

This project was carried out to assess the status of the demersal fisheries in the western and southern coasts. The information on fisheries such as catch, effort, and species composition was collected from Puttalam to Hambantota. It was observed that the multi day operation for demersal fishery was expanded rapidly during 1999 and production was comparatively higher than the year 1998. It was also observed this fishery could be further expanded particularly in the southern region.

Project 4: Assessment and management of prawn resources

The main objective of this study was to assess the exploitation level of the shrimp resources in the sea and the associated lagoons systems. The particular interest has been given to the recruitment process of the system. During the period January to December 1999 shrimp fishing activities in the western coastal waters (Hendala, Negombo, Chilaw and Puttalam) of Sri Lanka were monitored. Monthly production, catch rates, size ranges of the catch, species composition and reproductive strategies were studied.

Project 5: Monitoring of lagoon fisheries

This project aims to study the status of lagoon fisheries, to identify ecologically destructive fishing gear and methods and to find out the impact of human activities and environmental changes to the lagoon fisheries. The data collection was continued in Negombo Lagoon, and Chilaw Lagoon. Frame surveys were carried out in the Mawella Lagoon and in the Kalamatiya Lagoon. The database was updated with the collected data.

Programme 2: Coral Reef Research for Conservation and Management

Project 1: Monitoring the abundance of selected marine species and Conservation and management of coral reefs in marine protected areas.

The objectives of this study were to monitor the abundance of selected marine organisms such as Soft corals, gorgonians, tubeworms, orchid shrimps, fishes, and other invertebrates listed as protected organisms in the Fisheries and Aquatic Resources Act 1996 and the Fauna and Flora protection Ordinance of 1993 and monitor the status of coral reefs in Hikkaduwa Nature Reserve and the Bar Reef.

The following output came from this research project:

- Recommendations for management of protected species of fish and invertebrates
- Recommendations for management of fish species in restricted list
- Cause of reef damage due to human activities at the investigated sites

Programme 3: Conservation and management of marine mammals and turtles

Project 1: Survey on the turtle nesting beaches along the Southwest and Southern coastal belt of Sri Lanka.

The objective of this study was to gather information on the variations of nesting frequencies, status of the hatcheries, along the southern coastal belt of Sri Lanka. Four hatcheries in the Galle District and one in the Hambantota District were surveyed. A total of 221,950 sea turtle eggs belonging to the five species were incubated by these hatcheries and the average hatching success was 85%. The mortality rate of the hatchling was 3%. Total of 181,998 hatchling were released in to the sea. Scientific instructions were provided to upgrade the existing hatchery condition and proposals were made to establish a hatchery monitoring system. A grading criterion was established for nesting beaches considering various factors.

Programme 4: Natural resources management of coastal area

Project 1: Sida / SAREC Natural resources management project (Externally funded project - Sida / SAREC)

The following 3 components of the above project coming directly under MBRD were completed.

Title - Early life history and recruitment of demersal fauna in relation to environmental and Oceanographic aspects in the Negombo estuarine system.

Title - Assessment of bio-economics of demersal fisheries off Negombo; West Coast of Sri Lanka.

Title - Monitoring coastal reefs using underwater video techniques.

Project 2: Hambantota Integrated Coastal Zone Management Project (Externally funded Consultancy project) - Coastal and Marine pollution monitoring programme

The component on coastal fisheries assigned to MBRD has been completed.

Awareness Programmes

School awareness programmes were conducted on Marine Fisheries Resources and conservation of threatened species at the following schools

Mahiyanganaya Central College

Anula Vidyalaya

D.S. Senanayake College

Other Activities

Provision of facilities for the students to conduct their A/L projects.

Provision of facilities and guidance for the university students at Open University and Colombo University to carry out their research projects.

Identification and recording of incidents of stranded whales

Assembling of the blue whale skeleton, which is identified as the largest whale stranded in Sri Lanka.

Publications

Species Identification of the shark catches landed in the West Coast of Sri Lanka with special reference to the silky shark (*Carcharhinus falciformis*). Thesis submitted to the University of Sri Jayawardanapura for the fulfillment of M.Phil. Degree.

Rajasuriya, A., Maniku, M.H., Subramanian, B.R. and Rubens, J. 1999. Coral reef ecosystems in South Asia. In *Coral reef degradation in the Indian ocean*. Olof Linden and Niki Sporrang (eds.) CORDIO, SAREC Marine Science Programm, Stockholm. pp 11-24.

Report on the Chank Fisheries in the Hambantota District. Prepared by A. Rajasuriya. 20 p. submitted to the MFARD.

Report on Matara - Totamuna Fishing dispute - prepared by Dr. N. Karunasinghe' Analysis, reporting and making recommendations for the fisheries at Matara Thotamuna to provide a peaceful settlement for the dispute between the beach seiners and the minor fishing groups was carried out. This report has been requested by the Department of Fisheries on recommendation of a Public hearing on this matter. This report was submitted to the Director General, NARA on 16th December to be forwarded to the relevant authorities.

Report on the Population dynamics, stock assessment and exploitation of some commercially important fishes in Sri Lanka based on resource surveys data prepared by Mrs. R. Maldeniya'

Preparation of the map on the distribution of fish resources around Sri Lanka and in the Indian Ocean was prepared and distributed among the users.

Report was sent to secretary Ministry of Fisheries and Aquatic Resources Development of the needs for the development of offshore fisheries

- Information on catch, effort and size distribution of the catches of major tuna species was send to IOTC
- Information on multi-day boats and status of fisheries are provided to Dr. Hotta for the project report on Dickowita fishery harbour.

NARA played an important role providing its research findings in the preparation of the National Sea Turtle Action Plan, which was finalized in July 1999, together with the Department of wild life Conservation and IUCN.

Presented a scientific paper titled "A Classification of the Sea Turtles' Nesting Beaches of Southern Sri Lanka' at he 2nd ASEAN sea Turtle Symposium in Malaysia 14th - 18th July 1999 Saba, Kotakinabalu.

INLAND AQUATIC RESOURCES AND AQUACULTURE DIVISION

Inland aquatic resources and Aquaculture Division of NARA carried out research fewer than five main programmes towards its main goal of inland aquatic resources management, development and addressing of problems related to aquaculture systems and practices.

Ornamental fish culture
Inland aquaculture and fisheries management
Sea farming
Mangrove and wetland management

The research programmes and projects carried out in 1999 are as follows

Programme 1 - Shrimp/prawn culture and resource management

- Project 1: Health management in shrimp farming systems and hatcheries
- Project 2: Determination of the factors affecting survival level of giant freshwater prawn *Macrobrachium rosebergii* and economic feasibility of its culture
- Project 3: Evaluation of grow out conditions in different water management systems with special reference to the health of shrimps
- Project 4: Screening of carrier species in the wild for SEMBV at different taxonomic levels
- Project 5: Feasibility study on polyculture of *Penaeid* species in low salinity water bodies in Sri Lanka

Programme 2 - Ornamental fish culture

- Project 1: Assessment of freshwater ornamental fish resources in selected areas and building up of a brood stock of endemic fish bred for export
- Project 2: Experimental ornamental fish culture in small inland water bodies in Southern and Northwestern Provinces with special reference to economic, technical and sociological aspects.
- Project 3: Identification of factors causing major diseases of economic significance in cultured guppy in Sri Lanka.
- Project 4: Experimental trials on propagation of commercially important plants in ornamental fish industry.

Programme 3 - Inland aquaculture and fisheries management

- Project 1: Potential productivity of seasonal tanks to enhance fish production
- Project 2: Rice-fish culture integration with community participation in Sri Lanka
- Project 3: Classification of lowland perennial reservoirs of Sri Lanka based on fish production

Programme 4 - Sea farming

- Project 1: Determination of the factors affecting breeding, larval survival and farming of mud crab (*Scylla serrata*)
- Project 2: Determination of the factors affecting breeding, larval survival and culture of brackish water fish species
- Project 3: Mariculture of currently export oriented sea cucumber species *H. atra*

Programme - 5 Mangrove and wetland management

Project 1: Establishment of a mangrove park for educational and recreational purpose

Outcome of research projects

Shrimp/prawn culture and resource management

In order to address the production losses due to diseases in the shrimp farming industry, which are associated with deteriorating environmental conditions both within the ponds and in the external environment, reduced water exchanged systems developed in the other countries in the region were introduced and developed. The developed water management systems were closed, semi-closed, re-circulated and partially re-circulated systems. A biological filter with bivalves, seaweeds and with finfish was developed for the purpose of treatment of water before re-use. Moreover standards for discharge water were determined.

Among the introduced reduced water management systems, research findings revealed that the semi-closed water management system performed better than the other reduced water management systems in terms of both water quality maintenance and disease conditions of shrimps. It was also revealed that the promotion of recalculation system needs technical inputs such as retention time of effluent water in the bio-filter pond, reuse ratio which determines the flow or water exchange rate to maintain a given un-ionised and dissolved oxygen criteria which in turn determine the carrying capacity of the grow-out pond.

The research carried out with respect to the route of infection of White Spot Syndrome Virus (WSSV) revealed that the brood stock samples from different geographic locations in Sri Lanka subjected to 2-step nested PCR showed negative results. However, the clean brooders gave WSSV positive post-larvae indicating one possible route of infection occurs at the hatchery operation phase. This results urge the need for a more systematic study to screen all possible stages from brooder to post-larvae of stocking stage. The screening of wild carriers showed that several *Penaeid shrimps* carry WSSV while the sampled and tested crabs and game rids did not carry this virus. This research on screening is in progress.

A preliminary study was conducted to evaluate the potential of using low saline water resources of culturing of *Penaeid* shrimps in order to reduce the risk of WSSV and to Promote shrimpfish polyculture. Southern coast shows a significant potential for shrimpfish polyculture practice in low saline areas. The research on this aspect is in progress.

The research work on the fresh water giant prawn did not progress further as the hatchery facility was not in operation due to building renovation.

Ornamental fish culture

The research carried out on the utilisation of unused small water bodies in Southern and North-western Provinces revealed that this is a significant resource for the development of ornamental fish culture. The evaluation on the water quality parameters and the morphometry showed that most of these disused water bodies are suitable for ornamental fish culture in net enclosures. Trials carried out with 4m³ net cages and stocking densities of 100/m³ of molly and platy fish gave impressive survival rates over 80%. Community participatory research approach is utilised in determining the acceptance of the utilisation of such water bodies' socio-economically.

The research results showed that body and fin rot and parasitic infections in cultured guppy fish are of economic significance. Among the parasitic infections *Tetrahymena* causes many losses. It was found that *Tetrahymena* outbreaks occurred after a white spot or fin and/or body rot (bacterial infection) condition. It was also revealed that stress gill condition observed in many fish samples are associated with the high unionised ammonia and nitrite concentrations and high pH fluctuation within a day in water.

Inland aquaculture and fisheries management.

The studies on the potential productivity of seasonal tanks to enhance domestic fish production showed that the fish production of seasonal tanks is positively correlated to the chlorophyll content, conductivity and alkalinity of water. Hence, one or combination of more of these parameters can be used in determining the stocking densities of seasonal tanks. Work in progress to determine the suitable fish species for poly-culture and to develop a strategy for community-based aquaculture in seasonal tanks

The studies carried out so far on the fish production and fishing effort in selected perennial reservoirs in order to determine optimal fishing strategies for reservoir fishery showed that the capture per unit effort is significantly different between reservoirs. This indicates that the production capacities may reliably be used as a criterion to classify reservoirs in Sri Lanka and to treat them as separate fisheries management units.

Paddy cum fish culture trials is in progress in Tunkama, Embilipitiya in order to ascertain its feasibility to raise tilapia fish to supplement the fingerling production. The stocked tilapia brood stock one month after paddy seeding produced fish fingerlings within 45 days. Nevertheless the production of fish fingerlings was not impressive and further studies are needed to improve the production. It was also observed that the introduction of tilapia into paddy fields has an added benefit as a biological pest controller.

Sea farming

The studies on crab fattening showed that the process takes only 3 to four weeks and it did not depend on the initial size of the crab in terms of weight. At the termination of fattening process crabs attained a weight of 450 to 800g. Up to 7/m² stocking densities did not have any significant effect on neither final weight attainment nor duration of fattening process. Utilization of 9-m³ area for fattening gave a profit margin of Rs. 25000 per annum. Studies to determine the effect of sex of crabs and effect of cage size on the fattening process are in progress. Community participatory crab fattening is in progress to determine the socioeconomic feasibility.

Breeding trials were carried out with *Holothuria scabra* and *H. atra* between January and May and spawning found to be successful when adopting thermal stimulation technique. However, the culture process that has to be continued through the three larval stages were unsuccessful because of the presence of ciliates, which feed on the eggs, embryonic stages, and the larval farms of holothurians. It was also experienced that the brood stock is frequently affected by fungal attacks. Further research towards solving these problems were affected due electricity defaults of the Regional research Centre at Kalpitiya.

The research and demonstration marine fish-breeding hatchery at the Regional research centre is shaping with a view to increase the cultured diversity of fish such as sea bass, grouper and milkfish. This has been identified as an area needed to be attended, as there are no alternate species for shrimp farmers for crop rotation. The culture trials conducted with sea bass in cages showed a 68% survival and it was found that there was no significant difference between the shrimp feed and thrash fish used for feeding on the growth rate.

Mangrove and wetland management

Establishment of a mangrove park within the premises of Regional Research Center at Kadolkelle with a view to educate the public on the importance of wetland management, carry out collaborative research and to provide an opportunity for education as well as recreation.

Training and extension

- Conducted 10 training courses on ornamental fish culture and breeding at Dankotuwa, Ehaliyagoda, Kandy, Dambadeniya, Dekatana, Fisheries Training Institute and at NARA and for Industrial Development Authority of Western Province.
- Trained 30 Veterinary surgeons of the Department of Animal Health on fish disease diagnosis.

- Participated in 05 exhibitions to exhibit various aspects of ornamental fish and food fish culture.
- Disease diagnosis of ornamental fish samples submitted by the ornamental fish culturists
- Assistance to National Aquaculture Development Authority to set up the fresh water prawn hatchery at Pambala.
- Mangrove planting programme with Lions Club, Hikkaduwa.
- Management plan for conservation management in southern coast.
- Management plan for Negombo lagoon.
- Mangrove rehabilitation programme with Central Environmental Authority
- Organised a training workshop on fish disease diagnosis with Sri Lanka Association for Fisheries and Aquatic Resources.

Workshops/trainings/ seminars and conferences attended

- Workshop on zoning for coastal aquaculture at NARA
- Terminal workshop on the Disease Prevention and Health management of coastal shrimp aquaculture
- Workshop on shrimp health management, Thailand
- World conference on ornamental fish aquaculture, Singapore
- Expert consultation on best practices for shrimp aquaculture, Thailand
- Ad hoc expert consultation on aquaculture monitoring and variables, Thailand
- Seminar on instrumentation and its application at Sri Lanka Foundation Institute, Sri Lanka
- Seminar on Epizootic Ulcerative Disease Syndrome at NARA
- International workshop on aquatic animal health in rural aquaculture, Bangladesh
- International workshop on thematic review on management strategies for major disease in shrimp aquaculture in Sri Lanka
- Training on fish genetics, Deakin, Australia

Consultancies

04 site suitability reports for ornamental, food fish and shrimp culture
 12 zonal clearance reports to establish shrimp culture project
 120 inspection reports for the disbursement of re-structuring loan for shrimp farmers
 93 reports on PCR analysis of shrimp samples

Publications

- Jayasinghe, J.M.P.K. and Jayasekera, A.M. 1999. Aquaculture research needs, priorities and capacities in Sri Lanka. 4: Sri Lanka Journal of Aquatic Sciences.
- Kasthuriarathna, K.A.S., Wanninayake, W.M.T.B. and Edirisinghe, U. 1999. Effect of clam, *Meretrix casta*, and seaweed, *Gracillaria edulis*, populations on purification in shrimp farm effluent water in Northwestern Province of Sri Lanka. Fifth Annual Scientific Sessions, Sri Lanka, Association for Fisheries and Aquatic Resources.
- Rahman, M., Chadrapaul, S. and Siriwardena, P.P.G.S.N. 1999. Farmer training and extension: Key to health management in extensive brackish water shrimp aquaculture. Paper presented at the DFID/FAO/NACA Asia Regional Workshop on primary aquatic animal health care in rural, small-scale aquaculture development in Asia, Dhaka, Bangladesh.
- Siriwardena, P.P.G.S.N. 1999. Shrimp culture in Sri Lanka: The benefits, problems and constraints associated with the development and management and responses to address problems. pp 99-110. In FAO Fisheries Report No. 572, Supplement, Bangkok FAO Technical consultation on policies for sustainable shrimp culture. FAO, Rome. pp 266

- Siriwardena, P.P.G.S.N. 1999. Management strategies for major diseases in shrimp aquaculture in Sri Lanka. Paper presented at the FAO/NACA/WWF international workshop on thematic review on management strategies for major diseases in shrimp aquaculture.
- Siriwardena, P.P.G.S.N. 1999. A technical guide for best practices in shrimp aquaculture. Paper presented at the expert consultation on best practices for shrimp aquaculture, NACA, Bangkok, Thailand.
- Siriwardena, P.P.G.S.N. 1999. Aquaculture in Sri Lanka: Variables and terminology for aquaculture monitoring. Paper presented at the ad hoc expert consultation on variables and terminology for aquaculture monitoring in Asia, Bangkok, Thailand.
- Siriwardena, P.P.G.S.N., Wijegoonawardena, P.K.M. and Kithsiri, H.M.P. 1999. Research and development in shrimp health management. Terminal workshop on Disease prevention and health management of coastal shrimp aquaculture, NARA, Sri Lanka
- Wijsekera, R.G.S. 1999. Ornamental fish industry in Sri Lanka: Present status and future trends. Presented at Aquarama 99 in Singapore.
- Wanninayake, W.M.T.B. 1999. Experimental raft culture of green mussel, *Perna viridis*, in Puttalam Lagoon, Sri Lanka. Fifth Asian Fisheries Forum.
- Wanninayake, W.M.T.B., Hewavitharana, M.H. and Jayasinghe, J.M.P.K. and Edirisinghe, U. 1999. Oyster, *Crassostrea madrasensis*, in controlling suspended solid loading and chlorophyll concentration in effluent waters of semi-intensive shrimp culture system in Sri Lanka. Fifth Asian Fisheries Forum.

Fishing Technology Division

During the year 1999, three major projects were carried out.

Bottom vertical logline fishing experiments were successfully carried out off Kirinda. Work was done during the non-monsoonal months. The vessel NW 35 belongs to NARA and hired fishing boats were used for fishing trials. All fishing trials were done with the participation of the fishing community. Results indicate that this fishing method can successfully be carried out only when the sea is extremely calm.

Fish Aggregating Devices (FADs) were deployed off Weligama, Galle and Panadura. This technology can be used to exploit under utilized coastal resources such as Dolphin Fish and Rainbow runners.

Construction of an artificial reef at Kirinda was done as a habitat enhancement for spiny lobsters.

Mr. Punyadewa was appointed to the Division as a Research Officer. Fishing Gear Catalogue with technical information was published. Repairs were done to the vessel NW-35 and were utilized for most of the divisional research activities. 25 Hp OB engine was purchased to be used for other research activities of the division when NW-35 is fully occupied.

Dr. D.S. Jayakody - Head of the Fishing Technology Division visited SEAFDEC, Thailand for a period of 10 days.

Publications

Jayakody, D.S. and S. Sri Lai. (1999). Fishing Gear Catalogue with Technical Information.

OCEANOGRAPHY DIVISION

Programme 1: Offshore Oceanographic survey

Project 1: Monitoring of physical, chemical, geological and Biological properties of Sri Lanka's territorial water, using vessel "Sayuri"

SV Sauyri has made several cruises and 48 sand samples were collected from off Colombo. Sieve analyses were completed and the results contributed to NBRO for the report "Offshore handed over mining of Sand for the construction Industry. Few selected samples were also given to NBRO for the construction of motor for testing

Programme 2: Near shore oceanographic surveys and Data management

Project 1: Establishment of a National Oceanographic Data Centre (NODC)

International Research cruise data of World Ocean Circulation Experiment (WOCE) within Indian Ocean has been collected.

Project 2: Physical Oceanographic Survey in the coastal lagoons and Brackish water

Three Estuarine systems in different climatic zones were selected to assess the transient nature of the salinity. Monthly measurements of salinity in Puttalam, Negombo and Chilaw Lagoon, were analysed along with the meteorological and river runoff to quantify the response of these systems to climatic factors.

Compiled all the collected data within past years of Negombo, Munadal and Puttlam lagoons to prepare a master plan on saltwater intrusion with effects of Tidal phenomena

Project 3: Sea Level measurement & data collection around Sri Lanka's coastal water

Collecting of Sea level and tidal data were done throughout the year. Prepared and distributed tidal charts to International (GLOSS) and local agencies

Compiled all the collected data during past years to prepare a master plan on water exchanges of Coastal water bodies (Negombo, Mundal and Puttlam lagoons)

Project 4: Study and Classification of Tropical Shallow Water Estuaries

Three Estuarine systems in different climatic zones were selected to assess the transient nature of the salinity. Monthly measurements of salinity in Puttalam, Negombo and Chilaw Lagoon, were analysed along with the meteorological and river runoff to quantify the response of these systems to climatic factors.

Summary of the physical and hydrological characteristics are shown in the table below. The physical and hydrological characteristics of these lagoons create a structure within which the rates of biological processes are enhanced; hence lagoons are rich in natural resources such as fish, mangroves, salt marshes, sea grass beds and corals.

LAGOON	PUTTALUM	NEGOMBO	CHILAW
Length (Km)	44	10	4
Width (Km)	2-12	3.5	2
Surface Area (Sq.Km)	335	36.5	16
Average Depth (m)	1.7	1.25	1.0
Annual Rainfall (mm)	1200	2040	-
Annual Evaporation (mm)	1800	1440	-
River Discharge ($m^3 s^{-1}$)	5.00	20-225	nil
Annual Salinity Variation (PSU)	20-25	15	31
Annual Avg. Salinity (PSU)	38	20	20
Residence Time (Days)	50	2 to >10	4 to >50
Average Tidal Range (m)	0.25	0.20	0.15

Note: Cooperate plan has been prepared on the basis of above programme results. It's recommendations to solve Salinity problem in North western coastal belt which hardly effect the Prawn and Inland fishing industry are as follows

- I. Rehabilitate Dutch Canal to make proper water runoff and to build a fresh water tank which can supply freshwater 2-3M³/sec to it.
- II. To solve salinity problem in Mundal lagoon install sluice gates (to open mouth) or to pump water from Sea.

Publications

Jayasiri, H.B. and Rajapaksha, J.K. 1999. Salt and water balance in the Mundel Lake. A strongly choked lagoon, Sri Lanka. (Submitted to NARA Journal)

Rajapaksha, J.K., and Jayasiri, H.B. 1999. Restricted water exchange in tropical lagoon, The Negombo Lagoon on the west coast of Sri Lanka, Sri Lanka. (Submitted to NARA Journal)

Arulanathan, K. 1999. Salinity measurements and use of a new salinity scale. (Submitted to NARA Journal)

Tennakoon T.K.D., Uehara H., Ikegami Y. (Saga University of Japan). Nisantha Nanayakkara (University of Moratuwa), *"The prospects of OTEC plant in Sri-Lankan Energy Industry"*, International OTEC/DOWA Association Conference 99', Imari, Japan, November 1999

NATIONAL HYDROGRAPHIC OFFICE

The National Charting Programme is a continuous programme, which will be carried out over the coming years. Under this programme there are five (05) activities, which are interlined with the production of Nautical Charts, and creating of the hydrographic database. These activities are:

- a) Offshore data collection by SV "Sayuri"
- b) Near shore data collection by SB "Tharanga"
- c) Shoreline detail survey
- d) Data processing
- e) Compilation of cartographic work and printing of nautical charts.

Programme: National Charting Programme

Project: 1

Title: Hydrographic Data Acquisition by SV "Sayuri" in an offshore area of about 400 sq.km and 200 sq.km off the shores of Negombo and Weligama respectively.

Progress: Completed Weligama sea area, Offshore Negombo could not be completed (total of 65% completed).

Could not deploy the multibeam echo sounder system as anticipated. Three Hydrographic Surveyors resigned from NHO. Could not recruit new Hydrographic Surveyors to replace the ones who left, due to various constraints.

Project: 2

Title: Hydrographic Data Acquisition by "Tharanga" Boat in nearshore area of about 100 sq.km in the Negombo Lagoon and 100 sq.km in Mirissa-Dondra area.

Progress: 80% completed.

Due to constrain explained above.

Project: 3

Title: Shoreline detail survey 75 km from Dikovita to Lansiyagama & Negombo Lagoon

Progress: 90% completed.

Due to Land surveyors being utilized for some other urgent miscellaneous work.

Project: 4

Title: Data processing & fair sheet production of about 800 sq.km in the Mirissa Fishery Harbour & Its approaches.

Progress: 70% completed.

Expected amount of data has not been received due to constraints mentioned under program: 1

Project: 5

Title: Compilation, cartographic work & Printing of Nautical Chart covering the Mirissa Fishery Harbour and its approaches and Weligama (200 sq.km)

Progress: 85% completed.

Revised edition of the Colombo Sea Chart (65% of the work was completed)

Expected amount of data has not been received due to constraints mentioned under prog: 1.

Major miscellaneous Non-scheduled activities:

- a) Map showing Fishery Resources of the Indian Ocean (scale 1:10,000,000) was drawn and printed in colour.
- b) Poster depicting common marine food fishes in Sri Lanka (42 species) was drawn and printed in colour.
- c) Hydrographic survey for development of Dodanduwa fishery harbour was completed (CHFC)
- d) Hydrographic survey for coastal engineering investigations - Lansiyagama was completed (CCD)
- e) Improvement of data base for map details-completed (NHO)
- f) Bathymetric survey of Maussakelle reservoir - completed (CEB)
- g) Area and volumetric calculations for Maussakelle and Castlereigh reservoirs - completed
- h) Land survey of Welipatanvila Public aquarium site - completed (MFARD)
- i) Hydrographic survey for Fishery anchorages at Kudapaduwa - completed (CCD)
- j) Hydrographic survey for coastal engineering investigations - CCD (50% was completed, work continues).

SOCIO – ECONOMIC AND MARKET RESEARCH DIVISION

Programme 1 - Research on socio economic and marketing aspects of fisheries

Project 1: How to increase the export earnings of shark fin through improvement of the end product.

This study helped to understand the main constraints for the production; value addition, technology development and increase export earnings of shark fin industry in Sri Lanka. It will be helpful to producers and planners to implements new programme for the development of the industry.

Findings

Average wet fin production (per month) kg

Negombo	Beruwala	Mirissa
1660	1400	963

Composition of shark wet-fin collection (Average per month) kg.

Negombo		Beruwala		Mirissa	
Silky	60%		57%		55%
Blue	04%		05%		11%
White tip	06%		02%		20%
Hammer head	03%		03%		035
Treasure	27%		33%		11%

No of wet-fin collectors (persons)

Negombo	Beruwala	Mirissa
04	04	05

Project 2: A Socio Economic Study of Kraal (Ja-Kottu) Fisheries in Bolgoda Estuary, Sri Lanka.

Findings:

- Kraal fishery is a great support for number of people living in Bolgoda and Rekawa areas. That is fish vendors, rattan makers, fish assemblers and numbers of unskilled labourers are also depend on this fishery for their livelihood
- The structure of the kraal, materials to be used to construct kraals and way of construction kraals are different from Bolgoda estuary to Rekawa lagoon.
- Present kraal fishery is facing many problems, such as pollution, mangrove destruction, and high cost of kraal construction materials. As a result most the kraal fishermen those who have user rights to operate kraals are not operating kraals. The finding shows out of 50 kraal fishermen those who have user rights only 20 kraal fishermen operated kraals and out of 25 fishermen in Rekawa 9 kraal fishermen operated kraals.
- In both areas kraal fishermen get surplus shrimp/fish catches only during the peak months of kraal season. That is only during the months of March to April.
- Income from kraal fishery has varies in both areas. The findings show in Bolgoda after 7 days operation of kraals consisting of 78 traps these fishermen are able to earn Rs. 141925 while in Rekawa after 7 days operation consisting of 20 traps they are able to earn income-totalling Rs. 92000. The study reveals that the reason is in Rekawa most of the kraal catches consisted of most economically important shrimp species of *P.indicus*.
- Shrimp/fish marketing channel, findings shows each fisherman in Bologoda has links with 2 fish assemblers and boat shrimp purchasers and most of the kraal fishermen in Rekawa are selling their catches to an agent in Rekawa. Hence the existence of Kraal in Bologoda and Rekawa.
- Fishermen when they have extra shrimp/fish catches, send their catches to the central fish market in Colombo.

Project 3: How to increase export earnings and employment opportunities through development of ornamental fish production and culture.

Findings:

1. Sri Lanka has earned 473 and 526 million rupees by exporting ornamental fish in 1997 and 1998 respectively.
2. For the years 1997 and 1998, Sri Lanka has earned more than 50% of total ornamental fish export earnings by exporting ornamental fish to Japan, U.S.A. and Germany.
3. Guppy has been identified as the main export variety of fish water fish and presently, more that 50 different guppy varieties (Belong to *Poeilia sphenops* family) are being exported.
4. Five regular exporters handle about 80% of our ornamental fish export market.
5. For the year 1998, 66 Sri Lanka exporters have exported ornamental fish to 49 countries.
6. Many exporters (about 78%) export both seawater and freshwater fish varieties, and earn a comparatively high income especially through seawater varieties.
7. Ornamental fish exporters have to face several difficulties due to lack of adequate air freight facilities and services, inadequate stocks of both freshwater and sea water quality fish varieties etc..

8. Considerable number of recently started breeders / growers have been abandoned their breeding / growing due to market problems. As an example more than 40% of Colombo district small-scale fish growers who started recently under the assistance of the Sarvodaya Movement have abandoned their businesses.
9. Many growers, culture the ornamental fish in cement ponds than the mud ponds and the normal construction & material cost for a 10' x 10' x 1' 4" size cement tank is about 3500 rupees.
10. While about 29% of the total stock for exporting of ornamental fish is produced by the exporters themselves; 25% directly obtain from their out growers. The rest is obtained through the ornamental fish suppliers (32%) and the collectors (14%).
11. There is no proper co-ordination or communication among the small scale breeders, growers and establish exporters.

Project 4: Socio-economic aspects of ring net and drift gillnet fishery for small tuna varieties along the southern coast of Sri Lanka.

Preliminary investigations were carried out in January to plan the field programme for data collection. In these investigations all ring net and drift gill net operating landing centres were identified in the study area. Simultaneously craft and gear survey carried out to find out the total number of craft and gears in operation for the respective fisheries.

Data collection began in March and ended in December. The progress of the data recording activity of respective fishermen has been monitored monthly.

Data collected from March to November has been analysed. Table I, II, III and IV indicates the monthly gross income of craft owners and monthly net income of crewmembers of each fishery.

Project 5: Sri Lanka Fisheries Year Book - 1999

The 3rd volume of the Sri Lanka Fisheries Year Book is ready for distribution. First copy was handover to the Honourable Minister of Fisheries and Aquatic Resources Development. As in the past complementary copies will be distributed among the identified users. Additional copies are priced at Rs. 150.00.

This publication provides Fisheries sector statistics collected from various sources. It will be a useful document for those who are interested in fisheries sector specially planners and decision makers.

Publications:

1. Sri Lanka fisheries yearbook, 1998
2. The role of Fishermen's Co-operatives in their well being and Fisheries Development.
3. Study of Fish marketing systems and markets.
4. Socio-economic study on coral mining in southern area.
Ice Production and requirement study in Sri Lanka (Phase ii).

Post Harvest Technology Division

Programme 1 - Research on post harvest technology related to fisheries

Project 1: Use of HACCP programmes to study the Post Harvest losses & problems in Shrimp industry during larval rearing, culturing, processing and investigations into the Introduction of a value added products using shrimp.

Food handlers hand were free from *Staphylococcus aureus*. Bacterial levels observed have not been reached to critical levels, but TBC level was just below the standard limits.

Water and ice used at shrimp processing factories did not have potable water quality for microbiological standards.

Project: Evaluation of quality and post harvest losses in fresh fish and Dried fish products in Sri Lanka.

Survey was carried out in Ice Plants to investigate the quality of ice used in fishery industry in Southern coastal area and to screen the control point of *Escherichia coli* (*E.coli*) contamination of ice. Sixteen ice plants have been investigated for, block ice/ flake ice, and crushed ice, were sampled and analysed for Aerobic plate count (APC), Coliform, Fecal coliform, and *E.coli*.

Results indicted that the quality of the ice made in those plants was not within the acceptable range.

Project 2: Study the microbial profiles in fresh water fishes and the Quality Assessment and improvement of the qualities of the Fresh water fish.

This experiment attempts to present microbiological parameters of cultured fish in relation to Spoilage and contamination and discuss it in the light of the data derived from marine fishes.

The bacterial indices of the water and mud were also determined from places where fish samples were collected. The fishes included in this study cultivation lake associated with Udawalawa reservoir and Parakarama Samudra.

The highest *Fecal coliforms*, *E.coli*, Coliforms were present in inlet undo and water samples in Chandrika wewa. The load of coliforms and Fecal-colifom were much higher in water than in the mud samples. The *Colarae* and *Salmonella* were absent in all ponds. The presence of *Fecal coliforms*, *Coliforms* & *E.coli* is significant in Chandrika wewa than other ponds.

Microbial profiles indicate that most of the water sources were found contaminated with *E. coli*.

Project 3: Development of Convenient Foods using under Utilized Fish.

Utilization of fresh water fish resources to make convenient foods will make better lively hood for those fishing communities involved directly and indirectly.

Study

Maldives fish processing was carried out using fresh water spp. The difference between Maldivian fish purchased from fish markets and laboratory were evaluated chemically organoleptically. There is no significant difference between maldivian fish purchased from fish market and the laboratory processed variety.

The products development includes Maldivian fish from freshwater species. Jaadi from freshwater fish species as ingredient for fresh water species.

Project 4: Development of Depuration and Processing Methods for the utilization of the cultured and wild molluscs in Sri Lanka.

In addition to the two systems of depuration (UV sterilized water and Salt water system) tested in the previous year, a geographical survey was carried out from July to December 1999, in four lagoon areas where edible bivalves are inhabiting naturally to investigate the extent of microbial flora which may cause health hazards to man as a result of consuming raw or slightly cooked bivalves as a delicious diet.

An efficient depuration product was developed.

Project 5: Survey of fish /Shrimp waste resources, quality deterioration due to disease and environmental problems, development of technologies for utilization and reduction of waste resources.

The fresh water fish species were collected from Udawalawa, Victoria, Gampaha, Thabowwa, Minneriya and Chilaw areas.

Shrimps consisted of 80-85% moisture, 8- 12% protein, 0.6-1% fat and other minor compounds such as ash and metals. The fatty acids of shrimps were consisted of 15 – 40% of saturated fatty acids, 10-25% of monounsaturated fatty acids and 15-46% of polyunsaturated fatty acids. Altogether nearly 28 fatty acids were detected from the shrimps and the major fatty acids recorded were palmitic, stearic, oleic, arachidonic, eicosapentaenoic and docosahexaenoic acid. *P. indicus* obtained from Negombo reported to have highest percentage of omega 3 (n-3) PUFAs. Generally sea shrimps seem to have a higher level of n-3 polyunsaturated fatty acids in their lipids, important as a pharmaceutically important fatty acid for human health.

Product can be used for the in cooperation in animal feed. This program was conducted jointly with Maharagama pradeshiya sabawa and MFARD to prepare fishmeal from fish wastes.

Generally fresh water fish species contained low amount of histamine, 1 to 43 ppm of body weight, than some marine fishes such as tuna and mackerel. Some indigenous species contained relatively higher amount than others. This experiment will be continuing in year 2000.

Project 6: Purification and stabilization of fish oil and shark liver oil to be Used in the enhancement of fish oil based products

Project 7: Development of convenience food, food supplements using aquatic plant resources

A cordial from "Kerala Fruit" (*Sonneratia spp*) has being developed.

2. Seminars, workshops conducted /participated:

The members of IPHT participated in following seminars and workshops.

“Project for improvement of quality infrastructure for the Fishing – Industry Training Laboratory personnel “ from 11th to 18th in Sweden.

Participated in a workshop on analysis of fish and drinking water according to EU `regulation held on 11 –12 March 1999.

As a resources person, attend to the training program on “ Post Harvest Technology” for members of National Fisheries Cooperative Society at Negombo on 05th July 1999.

Workshop on “Fish Quality Management”

Conduct for district fishery extension officers, harbour managers, fishery Inspectors and other officials of CFC, CFHC, DFAR and MFARD, at “Savsiripaya” Colombo-7 on 20th October 1999.

On training of school teachers in unit V of “Marine Living Resources Technology” in Tangalla Area,

On “ Post Harvest Technology of fisheries” organized by Fisheries Training Institute Negombo and MFARD.

Organized the “Aqua Food Festival” conducted by IPHT on 05th September 1999, for the Minister of Fisheries & Parliamentary consultancy team.

Participated and worked with Swedish consultants for accreditation programme from 8 – 10th March 1999.

Successfully completed the course on Design & Analysis of Experiment conducted by the Postgraduates Institute of Agriculture Peradeniya from 6- 10th Sept. 1999.

2.1 Workshops conducted:

Conducted the following p training programmes by IPHT NARA Scientific methods of producing Maldives fish, fish curing and dried fish

Scientific methods for producing dried fish - Co-operative society of Fishermen, Negombo -05/ 05/1999

Scientific methods for producing Maldivian fish, fish curing and dried fish / organized by Co-operative society of Fishermen Negombo, Kandakuliya - 18/10/1999

Improved fish handling methods on Fish quality management, organized by Sri Lanka / Sida project at Savsiripaya - 20/10/1999

3. Supervision of students

Members of the staff supervised following undergraduate / Post graduate students in their Research projects

Project: Histamine content of Fresh water fish Species in Sri Lanka(1999)

Name of the student : V.D. Samarakkody
Name of University : University of Peradeniya
Degree : B.Sc.(Agric)

Conducted the laboratory practical classes at IPHT , NARA for the postgraduate students following the M.Sc programme in Aquaculture and Fisheries Management, University of Kelaniya, 10th and 12th July 1999.

4. Consultancy:

Responsible for handling clients' samples that are submitted to the Quality Control Laboratory for microbiological analysis and issuing reports for same.

Year	No. of Reports	Total revenue (Rs)
1999	190	467,551.00

5. Publications

1. The M.Phil thesis, title: '**Composition and Stability of Fish Lipids**', by E.M.R.K.B. Edirisinghe was submitted to the faculty of Graduate studies, University of Sri Jayawardenepura, Sri Lanka on 20th August 1999. The viva voce examination was held in 07th December 1999 and the degree was awarded under pending approval of the university results board.
2. The M.Phil thesis, title: '**Composition and stabilization of liver oils of selected Shark species**' by C.V.L. Jayasinghe was submitted to the faculty of Graduate Studies, University of Sri Jayawardenepura, Sri Lanka on 11 th November 1999.
3. Edirisinghe, E.M.R.K.B., Jayasinghe, J.M.P.K. and Chandrika, J.M. (1999). **Assessment of Fatty Acid Profiles in Cultured and Wild Shrimps**. Proceedings of the *5 th Annual Scientific Sessions of the Sri Lanka Association for the Fisheries and Aquatic Resources (SLARAF), Colombo, Sri Lanka, 23 – 24 June*.
4. Edirisinghe, E.M.R.K.B., Perera, W.M.K. and Bamunuarachchi, A. (1999). **Comparison of Different Extraction Methods Used for Large Scale Production of Fish Oils**. Proceedings of the *2 nd Research sessions of the faculty of graduate studies, University of Sri Jayawardenepura*, p 21, 23 rd October (Full paper in print)
5. C.V.L. Jayasinghe, .R.K.B., Perera, W.M.K. and Bamunuarachchi, A. (1999) **Influence of preservatives on quality of liver oil extracted by ensilage and steam rendering methods**. Proceedings of the *2 nd Research sessions of the faculty of graduate studies, University of Sri Jayawardenepura*, p 18, 23 rd October (Full paper in print)
6. Ganegama Arachchi G. J, Perera W.M.K, Jayasinghe J. M. P. K. , Jayasooriya S., Hettiarachchi K, Chandrika J M (1999) An abstract to be published at 5th annual session of Sri Lanka Association for the Advancement of Science on **Quality and post harvest losses in off-shore fisheries in Southern and Western Coasts of Sri Lanka**
7. K.W.S. Ariyawansa (1999) A full paper on" **Bacterial profiles in shrimp culture systems affected by white spot Epizootic**" was submitted for publication in journal of Animal Production.

8. K.W. S. Ariyawansa (1999) a paper presented at 5th annual session of Sri Lanka Association for Fisheries and Aquatic Resources on “ **Antibiotic sensitivity of bacterial isolates from *Penaeus monodon* cultured in semi-intensive systems**”
9. K.W. S. Ariyawansa (1999) An abstract to be published at 5th annual session of Sri Lanka Association for the Advancement of Science on “ **Application of a HACCP plan for the evaluation of microbiological quality of cultured shrimps (*Penaeus monodon*) at processing.**
10. Jayasinghe P.S., Fonseka T.S.G., Bamunuarachchi A. (1999) **Quality of Jaddi in Sri Lanka.** (1999) *The 5 th Annual Scientific Sessions of the Sri Lanka Association for the Fisheries and Aquatic Resources (SLARAF), Colombo, Sri Lanka, 23 – 24 June.*
11. Jayasinghe P.S., Fonseka T.S.G., Bamunuarachchi A. (1999) **C omparative Study of laboratory prepared and Commercially prepared jaadi**
Proceedings of the *2-nd Research sessions of the faculty of graduate studies University of Sri Jayawardenepura*, p 21, 23 rd October (Full paper in print)
12. Jayasinghe P. S., Fonseka T.S.G., Bamunuarachchi A.(1999) **Fish in Vinegar and salt** the *5 th Annual Scientific Sessions of the Sri Lanka Association for the Fisheries and Aquatic Resources (SLARAF), Colombo, Sri Lanka, 23 – 24 June.*
13. Senadheera S.P.S.D. , Hettiarachchi M, (1999) “**Efficiency of Quinaldine Sulphate an anesthetic agent for the ornamental carp (*Cyprinus carpio*) in sumulated packaging for long distance transport**”.
14. Ganegama Arachchi G. J., Jayasinghe J.M.P.K, Perera W. M. K, Jayasooriya S Hettiarachchi K. (1999) A paper presented at 5th annual session of Sri Lanka Association for Fisheries and Aquatic Resources on **Handling Practices and Post Harvest Losses in Tuna Fishery from Multi Day Off-Shore Boats**, Operating from Fish Landing Site Negombo, Sri Lanka.
15. Ganegama Arachchi G.J, Jayasinghe J.M.P.K, Serasinghe, B.S.G.N.N., Wijesinghe, D.G.N.G (1999) A paper presented at 5th annual session of Sri Lanka Association for Fisheries and Aquatic Resources on **Assessment of Quality and Post Harvest Losses of Landings Multi day Boats at Beruwala**, Sri Lanka.
16. Ganegama Arachchi G.J, Ariyadasa K.G.C., Perera W.M.K., Jayasinghe J.M.P.K.(1999) A paper presented at 5th annual session of Sri Lanka Association for Fisheries and Aquatic Resources on **Investigation on Quality Aspects of Tuna Fishery from Off-Shore-Muliti Day Boats at Fish Landing Site, Negombo in Sri Lanka.**

Division of Environmental Studies

The work programmes of the division were designed with the objective of conducting research studies related to the aquatic environmental quality and impacts of pollution of aquatic environment with respect to conservation and management of the aquatic resources in the country. Four NARA funded projects and one externally funded project were included for the programme for year 1999. In addition provision of consultancy and advisory services and laboratory test services were also a significant portion of the work carried out. Emphasis was given to strengthen the infrastructure facilities of the laboratory in order to accredit the laboratory under ISO.

Programme 1 - Research and Development

1.1 Study of the water quality status and pollution levels in the marine coastal waters of Sri Lanka

This study was carried out with the objectives of compiling the baseline data on the quality of water and pollution status of coastal waters and establishing a comprehensive database on the water quality. This nature of exercise was specifically needed for the determination of sensitive areas, for the management planning and decision on the development activities in the coastal zone.

Deferent geographical areas i.e. Hambanthota, Matara and Galle district were included in the Year 1999. Important coastal water bodies were sampled and the data are being incorporated in to the database.

1.2. Study of the Effects of Land based Pollution in Selected Areas on Water Quality and Aquatic Organisms

This project was carried out to study the status of pollution of the effluent receiving water bodies and for purpose of determining the effects on the changes in water quality for aquatic organisms.

It was realized that the depletion of aquatic environment evident due to the land based pollution caused by human activities. The study areas Negombo Lagoon suffer from the runoff from industries (katunayaka and Ja-Ela), agriculture, Negombo Urban area and from maritime activities i.e. Fisheries. Studies on the benthic organisms and water quality in areas liable to above pollution sources were studied. The results are being now analysed. Once the changes in community structures with respect to water quality are identified studies will be focused on the impacts on the individual level.

1.3. Study on the persistent/toxic chemical residues in fish, sediment and water

This project was conducted to determine the levels of chemical contaminant (toxic and radioactive) in the edible fish varieties and in the marine environment of the country. However commencement of the study delayed until June 1999 due to the non -availability of adequate staff.

As a preliminary study Negombo fish landing site was selected to obtain the sample edible fish species. The study was carried out as a collaborative study with the Atomic Energy Authority (AEA) and Radioisotope Center of the Colombo University. The samples were collected and processed to the required level by the NARA and analysed at AEA for gamma radiation. First series of samples were submitted for trial analysis at the AEA.

1.4. Assessment of ground water resources, quality and impacts of human activities (Sida / SAREC Funded)

The project was carried out with the view to determine the quality of ground water in Kalpitiya Peninsula and to make recommendations on the sustainable utilization of ground water resources. The Sida/SAREC provided the financial assistance for the project. Even though the ground water resource in the Puttalam District is heavily exploited for agriculture and shrimp culture purposes. Very little information is available on the quality ground water and quantities that can be extracted in a sustainable manner. The assessment of the water quality has been done with regards to the use i.e. domestic, agriculture and shrimp farming. Arrangements have been made assistance from a collaborative resource personnel is to do the quantitative aspects.

Programme 2 - Consultancy and Advisory services and contributions for environmental management in the country

The objectives of this programme are to provide necessary assistance to implementing agencies on environmental conservation aspect and development plans and to assist the industrial sector to assure the product quality and quality of effluent.

The environment management tools such as Environmental Impact Assessment Process, Environmental Protection licensing have come in to effect in the country and the out come of these activities necessary for the implementation of above programmes.

2.1. Hambanthota Integrated Coastal Zone Management Project

2.2. Study on the distribution of Filamentous Green Algae in Negombo Lagoon

2.3. Provision of water quality test reports

Industrial Effluent (for EPL), Aquarium Water, Potable Water, Water for various industrial processes.

2.4. Activities related to EIA process

Scoping and the Evaluation of EIA/IEE reports and making contributions for the preparation of EIA Reports.

2.5. Serving in inter agency committees for environmental management matters

Programme 3 - Emergency Environmental Problems

Study on the impacts of oil and fertilizer contamination of sea off Bundala due to a ship accident which took place on 27th Sep.99' was initiated.

Programme 4 - Environmental Education and Awareness building

- Conducting an environmental science course unit in Dept. of Zoology of University of Sri Jayawardenepura and Agriculture Faculty of University of Peradeniuya.
- Provision of facilities and suppression for research projects of University Students.
- Contribution for the development of curriculum for the Postgraduate Diploma in Environmental Science, The Open University of Sri Lanka.
- Field Excursion Class for the Undergraduates of the Sabragamuwa University.
- Awareness programmers for school children.

Programme 5 - Implementation of laboratory quality management system (ISO Guidelines)

Upgrading of the ESD laboratory and regularizing the analytical quality control system to accredit under the requirements of ISO Guide 25 is a very important activity. Necessary steps for the strengthening of manpower and provision of infrastructure are being done for the successful implementation of this programme.

Training Programmes Attended

One Officer obtained M.Sc. in Environmental Technology and Management at AIT, Bangkok. One officer attended. Short-term training on Applicant of stable isotope and direct $^{14}\text{CO}_2$ absorption techniques in Pakistan, Integrated coastal resources management in Thailand and Laboratory quality assurance in Sweden were attended.

Publications

1. M.Sc. Thesis-S.A.M. Azmy - Asian Institute of Technology, Bangkok, Thailand.
Title: Kelani and Kalu Rivers in Sri Lanka - Pollutant Transport to the West Coast and Options for Management. - August 1999.
2. Report on the preliminary investigation of the Oil spill from the spill wreck off Bundala National Park. - Submitted to Marine Pollution Prevention Authority. - September 1999.
3. Presentation on Environmental Impacts of Oil Spills to marine Eco system, presented at the seminar organised by Marine Pollution Prevention Authority in collaboration with Neo Synthesis Research Centre held in ITI, Colombo. - November 1999.

LIBRARY AND INFORMATION DIVISION

1. Acquisition of Library books and Periodicals

- (a) Books, Periodicals, Reprints, FAO Reports, and Other publications have been received, duly accessioned and entered into the registers as usual. (11 Titles of Journals and 208 titles of books).
- (b) Journals and Newsletters were duly displayed on display stands in alphabetical order during the month and were then arranged in journal racks properly.

2. Resources Sharing

- (a) Bibliography on Freshwater Fisheries is in progress.
- (b) Bibliography on prawn culture is in progress.
- (c) Building up of a Sri Lanka collection of scientific and Research papers on Aquaculture and fisheries related subject was halfway completed and will be carried out during next year.

3. Current Awareness Services and Press clipping Indexes

Extended current contents and press clippings services to Internal and External users.

4. Internet and E-mail Services

Dedicated line from Indexes for Bulletins of Fisheries Station Ceylon Sri Lanka Telecom was installed. Computer network for the library was completed with assistance of National Treasury and SIDA / IT Project funds. Internet browsing facilities available at the library.

5. Library Databases

Data are being entered for existing Databases.

6. SIDA Funded Information Technology Project

This project was initiated in August 1999. A Tender was offered for cabling and for equipment to install Local area Network within NARA. Setting up of main server for NARA is being done.

7. Secondary Data Base Service

Subscriptions were made to obtain the Aquatic Science and Fisheries and Fisheries abstract, for two year, 1999 and 2000. Few CD-ROMs are made available for searching abstracts in the field of Aquatic Resources.

8. Creation of CD-ROM on Fresh Water Fishes

Data base structure was defined and Database has been prepared. It is in the data entering process.

9. Revitalization and Acceleration of Aquaculture Development Project

Suitable areas were identified for 03 Aquaculture species for the coastal stretch from Chilaw to Kalpitiya. A workshop was held in 20th January 2000 to review the output of the project with the assistance of national and international consultant from FAO. Preparation of maps for Southern province at final stage.

10. Ornamental Fish Culture, Breeding and Management Course

Four Training Programs were held during the year, first was held from 15th July - 6th August with 90th participants. Second was held on 15th October on a request made by Lanka Professional Ornamental Fish Breeders Association 65 participants were trained. Third was held on a request made by Industrial Development authority (WP) on 06th and 7th December 54 participants were there in it. Fourth was held on 16th - 17th December with 69 participants.

11. Media and Awareness workshop on Lobster Fishery

An awareness workshop on Lobster Fishery was conducted on 28th of December. Lobster Fishermen, Research Personnel, Lobster product exporters, custom officers, representatives from authoritative bodies contribute to law draft legislations on lobster fishery and print and electronic media personnel actively participated in this workshop. A report was made and was sent to Director General.

12. Development of Infrastructure Facilities in the Division

Physical infrastructure in the division was developed.

13. Rekawa Research Station

Auditorium is updated with modern Audio-Video equipment and furniture. A reception desk was installed. Fixing of curtains was completed.

14. Exhibitions and awareness programmes

- (a) Float for 5th year celebrations of the Government.
A float was launched for 5th year celebration procession, exhibiting the activities of Ministry of Fisheries and Aquatic Resources.
- (b) Exhibitions at Dhammissara Vidyalaya, Nattandiya, and St Sebastian College, Kandana.
- (c) Multimedia presentations were made for Provincial Council Ministers conference. Which was organized by the MFARD.

15. Training

- (a) Ms. Vinitha Rupasinghe attended a two-day training course on WINISIS Library package at NARESA.
- (b) Mr. Ajith Gunaratne attended Training on marine remote sensing in Thailand from 01st - 12th November 1999.

16. Translations

Annual Report for 1995 and 1996 were translated into Sinhala and Tamil.

17. A report on Y 2K Compliance

A Report on Y 2K Compliance for the equipment and computers existing at NARA was prepared to be submitted to MFARD.

18. Whale Stranding

A great whale of about 78-foot long was stranded at Weligama, Kapparatota Beach on 23rd June. The whale carcass was lodged about 200 m away from the shoreline in the sea. a crew from NARA, with Mr. Anandalal Liyanage as the leader was sent to the place to recover the carcass. Mr. K. Amarasooriya of MBRD identified the whale as abaleen whale, which belongs to order baleonoptera. The carcass was cut open and its baleen plates and head part was almost destroyed by ambergris-seekers along the shore.

19. Publications

- (a) NARA Journal (Volume No 35) was published during the year.
 - (b) NARA Puwath
 - (c) Annual Report for 1995 and 1996 were published.
- On going publications**
- (d) Indexes for Bulletins of Fisheries Stations in Ceylon
 - (e) NARA Journal No. 36.

GENERAL ADMINISTRATION

- (1) Appointments - 20 - Casual - 05
Permanent - 09
Contract - 06
- (2) Resignations and Retirements - 11
- (3) Vacations of posts - 03
- (4) Assessments were made on 56 persons during the year 1999 and promotions were made based on the results
- (5) Five staff members have made foreign visits on their personal expense and personal leave (Personal visits)
24 staff members have participated in trainings/study tours and conferences.
(Foreign visits)
- (6) Disciplinary Inquiries
Labour court cases
 1. Mr. Gration Fernando
 2. Miss. Suramya Wijesekara - This case which is field vs the agency is being heard now.
 3. Mr. Upali Edirisinghe - This is being heard at the labour courtsSupreme court cases
 1. Mr. T.S. Dharmarathna
 2. Mr. K.G.P. Wickramasinghe
 3. Mr. Denise FernandoThese cases are being heard.
Formal inquiry against the accountant Mr. Y. Samarathna is being conducted

Appointments made during 1999

1. Mrs. J.M.W. Kalawila - Secretary to the Governing Board
(Permanent)
2. Mrs. Sonali Nishantha Gunasinghe - Translator (Casual)
3. Mr. J.K. Rajapaksha - Research Officer (Permanent)
4. Mr. H.B. Jayasisi - Research Officer (Permanent)
5. Mrs. R.K. Wijegunasekara - Research Officer (Permanent)
6. Mrs. S.P.S.D. Senadheera - Research Officer (Permanent)
7. Mr. P.A.D.A. Kumara - Research Officer (Permanent)

8. Mr. N. Suresh Kumar - Research Officer (Permanent)
9. Mr. B. Galappaththi - Chief Administrative Officer (Permanent)
10. Ananda Amarasinghe - Sampler (Casual)
11. Mr. A. Suriyakumar - Sampler (Contract)
12. Mr. M.D. Wijewicrama - Sampler (Contract)
13. Mr. K.A. Ranasinghe - Surveying Recorder (Contract)
14. Mr. E.B.P. Saman Kumara - Coxswain (Contract)
15. Mrs. H.A.D.N. Leelananda - Landscape Officer - (Contract)
16. Mr. N.B.P. Punyadeva - Research Officer - (Permanent)
17. Mr. Amal Abewikcrama - Clerk (Casual)
18. Mr. Lasantha Kumara - Research Assistant (Casual)
19. Mr. T.H. Sunil Shantha - Labourer (Permanent)
20. Mr. P.A.D. Sunil - Surveying Recorder (Contract)

Retirements during 1999

1. Mr. H. Tilakabandu - Chief librarian
2. Mr. P.V. Chandrasena - Store Keeper
3. Mr. K.A. Dayasena - Driver
4. Mr. K. Rupamurthi - Consultant Economist

Resignations during 1999

1. Mr. N. Thyshyanthan - Hydrographic Surveyor
2. Mr. W.M.T. Fonseka - Hydrographic Surveyor
3. Mr. A.R. Jayakody - Hydrographic Surveyor
4. Mr. A.H. Wijeyathilaka - Hydrographic Surveyor
5. Mrs. Lalitha Adepola - Draughtsman
6. Mrs. N.R. Thajudeen - Typist English)
7. Mr. M.K.V. Wijegunasekara - Clerk
8. Mr. W. Weerakumara - Lab Attendant

Vacations of Posts

1. Mr. M. Welu - Senitary Labourer
2. Mr. S. Karunapala - Labourer
3. Mr. T. Arul - Research Assistant

Foreign Visits

NAME	COUNTRY	PURPOSE	PERIOD	DL/PL	FUNDS	ACTG. ARRANGEMENT
Mr.D.A.Karunasena Chief Engineer	Sweden	Post Graduate Diploma	09.01.1999 - 31.10.2000	D/L	Maritime University.	Mr.J.B.A. Magamma Mr.M.K.K. Nanayakkara
Mrs.P.K.M. Wijayagoonawardena Research officer	Thailand	Molecular Diagnosis for Shrimp Viruses in Asian Region.	10.02.1999-13.02.1999	D/L		Mr.H.M.P. Kithsiri
	Thailand & Malaysia	Personal Tour	15.04.1999-22.04.1999	P/L	Own expenses	Mr.H.M.P. Kithsiri
Mr.M.A.Ariyawansa Hydrographer	United Kingdom	Seminar on Maritime Boundary Delimitation	22.03.1999-23.03.1999	D/L	NARA Funds	Mr.P.N. Kodikara
	U.S.A	Test for purchase of Multi beam Echo Sounder system.	25.07.1999-09.08.1999	D/L	NARA expense	Mr.P.N. Kodikara
Mr.K.M.A.R.C.K. Amarasinghe Land surveyor	Japan	Hydrographic Training course-JICA.	31.03.1999-08.11.1999	D/L	Japanese Government	Mr.P.N. Kodikara
Mrs.C.H.Jayasinghe P.A. to D.G	Thailand	Personal; Tour	09.04.1999-18.04.1999	P/L	Own expenses	Mrs.A. Gunawarden
Mr.N.H.Dassanayake Research Officer	Thailand	Study tour – Integrated Coastal Resources Management	17.05.1999-06.06.1999	D/L	SIDA/SAREC Project	Dr.C. Amarasiri
	Sweden	Project for Improvement of quality infrastructure for the Fishery Industry	11.10.1999 - 15.10.1999	D/L	Institute of SIDA	Mr.S.A.M. Azmy
Mr.R.G.S.Wijesekara Research officer	Singapore	World conference on Ornamental fish aquaculture Aquarama 99'	03.06.1999-06.06.1999	D/L	National Science Foundation	Miss.M.H.S .Ariyaratne
Dr.S.C.Jayamanne Research Officer	Philippines	ADB –RETA –5766 Sustainable Management of Coastal Fish Stocks in Asia.	06.06.1999 – 12.06.1999	D/L	ADB-RETA-5766 Project	Mrs.V. Pahalawatta arachchi
	U.S.A.	Ecological Modeling and taxonomic Identification of Sri Lanka benthic invertebrates.	06.12.1999 - 22.12.1999	D/L	Sida/SAREC funds	Mrs.V. Pahalawatta arachchi
Mr.S.W.S.Weerasinghe Chief System Analyst	U.S.A	Test for purchase of Multi beam Echo Sounder system.	25.07.1999-09.08.1999	D/L	NARA expenses	Mr.H.G.B. Vidyasri
Miss S.Sugandi Data Entry Operator	India	Personal Tour	02.07.1999-16.07.1999	P/I	Owen expenses	Mr.N. Liyanapathirana
Mr.P.D.K.D. Amarasooriya Research Officer	Malaysia	2 nd Asian Symposium and workshop on Sea Turtle Biology and Conservation.	14.07.1999-19.07.1999	D/L	National Science Foundation	Mr.P.A.T .Fernando
Dr.(Mrs.)C.Amarasiri	Sweden	Sida/SAREC /NARA Finalizing the writing up of project proposal for 2000/2002	24.07.1999-31.07.1999	D/L	SAREC Project	SAREC work- Dr.J.M.P.K. Jayasinghe. Division work- Mrs.R.R.P. Maldeniya
Mr.E.M.S.Wijeratne Research Officer	Sweden	for Ph.D. Studies	01.08.1999-31.10.1999	D/L	SAREC Project	Mr.J.K. Rajapakshe

Mr.H.M.P.Kithsiri Research Officer	Australia	Training on Fish Genetics	02.08.1999- 02.09.1999	D/L	Science & Technology Personnel Development Project(ADB Loan)	Mrs.P.K.M. Wijaya-goonawardena
Mrs.K.S.Seetha Research Assistant	Japan	Training in Dry Processing of Fish-Japan.	03.08.1999- 28.08.1999	D/L	Science & Technology Personnel Development Project(ADB Loan)	Mrs.J.M Chandrika
Mrs.E.K.V.Samaraweera Research Officer	Norway	For M.Sc. studies	20.08.1999- 06.2001	D/L	NORAD Fellowship program.	Mr.P.A.T. Fernando
Dr.P.P.G.S.N. Siriwardena Research Officer	Thailand & Bangladesh	Terminal Workshop on disease prevention & health management in Coastal Shrimp culture	16- 24.04.1999 13- 15.04.1999	D/L	FAO	Dr.W.M.T.B. Wanninayake
	Thailand	Ad hoc Expert Consultation on variables & Terminology for Aquaculture Monitoring in Asia.	13- 16.09.1999	D/L	FAO	Dr.W.M.T.B. Wanninayake
	Bangladesh	Asia Regional Scoping Workshop – Primary Aquatic Animal Care in Rural, small-scale Aquaculture Development in Asia.	17.09.1999- 10.10.1999	D/L	FAO & NACA	17-30.09.1999- Dr. Wanninayake. 01.10.1999- Dr.S.C. Jayamanne
	Philippines	Management strategies for major diseases in shrimp aquaculture.	28.11.1999- 30.11.1999	D/L	FAO	Dr. Wanninayake
	Bangladesh	Case study on Shrimp aquaculture	13.12.1999- 24.12.1999	P/L	(NACA) Network of Aquaculture Centres in Asia Pasific.	Dr. Wanninayake
Mr.K.S.Hettiarachchi Research Assistant	United Kingdom	Training in Food Microbiology	01.09.1999- 28.09.1999	D/L	Science & Technology Personnel Development Project(ADB Loan)	Mr.S.P. Jayasooriya
Mr.M.H.S.K.Abeyratne Research Assistant	U.K	Personal Tour	15.09.1999- 30.09.1999	P/L	Owen expenses	Mr.R.W. Fernando
Mr.B.H.M.N. de Silva Research Assistant	Korea	Third IOC /KOICA/KORDI Training course on Marine and Coastal Environment Conservation	28.09.1999 – 11.10.1999	D/L	Korean International Co-operation Agency. (KOICA)	Mr.P. Jayasooriya.
Mrs.R.K.V.J.Gunasekara	Pakistan	Regional Training course on Application of Stable Isotope and Direct ¹⁴ Co ₂ Absorption Techniques in the Analysis of Marine Pollution.	04.10.1999 – 13.10.1999	D/L	International Atomic Energy Agency.	Mr.N.H. Dassanayake
Dr.D.S.Jayakody Director General	Thailand	Training-Fishing Technology	10- 19.09.1999	D/L	SAREC Project	The Chairman
Mrs.N.R.Thajudeen Typist(English)	U.S.A	Personal Tour	08.10.1999- 07.11.1999	P/L	Own expenses	Mrs.G.D. Thilakalatha

Dr.W.M.T.B. Wanninayake Research Officer	Thailand	Study Tour – (Shrimp Health Management)	01.10.1999-23.10.1999	D/L	SAREC Project	Miss Soma Ariyaratne
Dr.J.M.P.K.Jayasinghe Research Officer	Thailand	Study Tour – (Shrimp Health Management)	01.10.1999-23.10.1999	D/L	SAREC Project	Mr.R.G.S. Wijesekara
Mr.K.Atulanathan Research Officer	Sweden	For Ph.D. studies	01.10.1999-31.12.1999	D/L	SAREC Project	
Mrs.K.W.S.Ariyawansa Research Officer	Sweden	Project for Improvement of quality infrastructure for the Fishery Industry	11.10.1999 - 15.10.1999	D/L	Institute of SIDA	Miss G.J.Ganegamarachchi
Mr.A.B.A.K.Gunaratne Information Officer	Thailand	Training course on Applications of Marine Remote Sensing	01.11.1999 - 12.11.1999	D/L	National Space Development Agency of Japan (NASDA)	Dr.S.C. Jayamanne

Foreign Visits

SUBJECT AREA					FUNDING SOURCE/S
	<wks	2-4wks	1-2months	>2 months	
Post Graduate Diploma	-	-	-	*	Maritime University.
Molecular Diagnosis for Shrimp Viruses in Asian Region.	*	-	-	-	ACIAR
Seminar on Maritime Boundary Delimitation	*	-	-	-	NARA Funds
Test for purchase of Multi beam Echo Sounder system. (2 PERSONS)	-	*	-	-	NARA expenses
Hydrographic Training course- JICA.	-	-	-	*	Japanese Government
Study tour – Intergrated Coastal Resources Management	-	*	-	-	SIDA/SAREC Project
Project for Improvement of quality infrastructure for the Fishery Industry (2 PERSONS)	*	-	-	-	Institute of SIDA
World conference on Ornamental fish aquaculture "Aquarama 99"	*	-	-	-	National Science Foundation
ADB –RETA –5766 Sustainable Management of Coastal Fish Stocks in Asia.	-	*	-	-	ADB-RETA- 5766 Project
Ecological Modeling and taxonomic Identification of Sri Lanka benthic invertebrates.	-	*	-	-	Sida/SAREC funds
2 nd Asian Symposium and workshop work shop on Sea Turtle Biology and Conservation.	*	-	-	-	National Science Foundation
Sida/SAREC /NARA Finalizing the writing up of project proposal for 2000/2002	*	-	-	-	SAREC Project
for Ph.D. Studies (2 PERSONS)	-	-	-	*	SAREC Project
Training on Fish Genetics	-	-	*	-	Science & Technology Personnel Development Project(ADB Loan)
Training in Dry Processing of Fish.	-	*	-	-	Science & Technology Personnel Development Project(ADB Loan)
For M.Sc. studies	-	-	-	*	NORAD Fellowship program.
Terminal Workshop on disease prevention & health management in Coastal Shrimp culture	-	*	-	-	FAO

Ad hoc Expert Consultation on variables & Terminology for Aquaculture Monitoring in Asia.	*	-	-	-	FAO
Asia Regional Scoping Workshop – Primary Aquatic Animal Care in Rural, small-scale Aquaculture Development in Asia.	-	*	-	-	FAO & NACA
Management strategies for major diseases in shrimp aquaculture.	*	-	-	-	FAO
Case study on Shrimp aquaculture	-	*	-	-	(NACA) Network of Aquaculture Centres in Asia Pasific.
Training in Food Microbiology	-	*	-	-	Science & Technology Personnel Development Project(ADB Loan)
Third IOC /KOICA/KORDI Training course on Marine and Coastal Environment Conservation	-	*	-	-	Korean International Co-operation Agency. (KOICA)
Regional Training course on Application of Stable Isotope and Direct ^{14}C Absorption Techniques in the Analysis of Marine Pollution.	-	*	-	-	International Atomic Energy Agency.
Training-Fishing Technology	-	*	-	-	SAREC Project
Study Tour- (Shrimp Health Management) (2 PERSONS)	-	*	-	-	SAREC Project
Training course on Applications of Marine Remote Sensing	-	*	-	-	National Space Development Agency of Japan(NASDA)

NATIONAL AQUATIC RESOURCES & DEVELOPMENT AGENCY

BALANCE SHEET AS AT 31.12.1999

225,415,380	Capital Grant	(13)		283,215,380.00
267,395,586	Revaluation Reserve	(14)		267,895,663.60
143,840,997	Foreign Grant	(15)		143,840,997.00
22,330,225	Local Grant	(16)		22,330,225.00
(347,331,968)	Excess of Expenditure Over Income			(397,097,359.97)
311,650,220				320,184,905.63
	Fixed Assets			
81,708,955	Free Hold Land	(17)	81,708,955.00	
9,493,508	Lease Hold Land	(17)	9,493,508.00	
65,189,620	Buildings	(17)	71,792,379.03	
1,679,000	Machinery	(17)	1,530,900.00	
41,106,825	Equipment	(17)	51,090,523.23	
6,942,642	Computer & Printers	(17)	6,592,089.63	
12,068,076	Vehicles	(17)	10,598,454.84	
630,478	Bicycles	(17)	466,429.00	
5,896,547	Furniture & Fittings	(17)	6,191,398.79	
4,203,165	Library Books	(17)	4,611,760.36	
126,520	Fish Tanks	(17)	110,705.00	
469,887	Engineering Equipment & Tools	(17)	449,333.00	
35,613	Admiralty Charts	(17)	31,390.20	
86,175,946	Boats & Vessels	(17)	75,404,174.00	
315,726,782				320,072,000.08
	Work in Progress			2,730,324.12
	Current Assets			
1,830,998	Stock as at 31.12.1999	(18)	3,090,873.45	
2,049,089	Debtors & Prepayments	(19)	2,417,571.49	
186,472	Deposits	(20)	203,472.00	
1,841,997	Advances	(21)	489,465.03	
6,225,313	Debtors (Employees)	(22)	7,157,292.00	
4,000,000	Cash in Transit		-	
4,881,586	Cash in Hand & at Bank	(23)	7,886,617.37	
21,015,455				21,245,291.34
	Current Liabilities			
15,110,744	Creditors & Accrued Expenditure	(24)	12,716,202.25	
224,344	Project Creditors	(25)	220,830.57	
1,223,474	Consultancy Projects	(26)	1,563,448.09	
16,558,562				14,500,480.91
4,456,893	Net Current Assets			6,744,810.43
(8,533,455)	Deferred Liabilities	(27)		(9,362,229.00)
311,650,220				320,184,905.63

Prof. P. W. Epasinghe
Chairman

Dr. D. S. Jayakody
Director General

M. D. Senarathne
Accountant

NOTE OF THE AUDITOR GENERAL

The accounts of the National Aquatic Resources Research and Development Agency for the year ended 31 December 1999 were audited under my direction in pursuance of provisions in Articles 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 on these accounts that should be published in terms of Section 14 (2) (c) of the Finance Act are contained in my report of even date addressed to the Chairman of the National Aquatic Resources Research and Development Agency.

(S. C. Mayadunne)

Auditor General

08 October 2001

Auditor General's Department

Colombo 07.

The 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 31 December 1999 in terms of Section 14 (2) (c) of the Finance Act No. 38 of 1971.

The audit of accounts of the National Aquatic Resources Research and Development Agency (NARA) for the year ended 31 December 1999 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. In carrying out this audit, I was assisted by a firm of accountants in public practice. My observations which I consider should be published with the annual report of the Agency in terms of Section 14 (2) (c) of the Finance Act appear in this report. A detailed report in terms of Section 13 (7) (a) of the Finance Act was forwarded to the Chairman of the Agency on 12 January 2001.

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 the extent of such review and tests were such as to enable as wide an audit coverage as possible within the limitations of staff, other resources and time available to me. The audit was carried out in accordance with Sri Lanka Auditing Standards methods and practices to obtain reasonable assurance as to whether the financial statements are free of material misstatements. The audit included examination of evidence supporting the amounts and disclosures in financial statements and assessment of accounting principles and significant estimates and judgements made in the preparation of financial statements, evaluation of their overall presentation and determining whether accounting policies adopted were appropriate, consistently applied and adequately disclosed. Subsections (3) and (4) of Section 13 of the Finance Act No. 38 of 1971 give discretionary powers to the Auditor General to determine the scope and extent of the audit.

2. Accounts

2.1 Audit Opinion

Except for the effects of the adjustments arising from the matters referred to in paragraph 2:4 of this report, I am of opinion that the financial statements have been satisfactorily prepared to present fairly in all material respects, the financial position of the Agency as at 31 December 1999 and the results of its operations and Cash Flow for the year then ended in accordance other than the standard referred to in this report with Sri Lanka Accounting Standards and the stated accounting policies as set in Notes No. 1 to 10 to the financial statements.

2.2 Financial Results

According to the accounts presented, the working of the Agency during the year under review had resulted in a deficit of Rs. 49,765,392 compared with the deficit of Rs. 53,210,366 for the preceding year. The following statement gives a summary of the financial results for the year under review and the preceding year.

Year ending 31st December

	1999		1998	
	Rs.	Rs.	Rs.	Rs.
Income				
Government Contribution	49,500,000		46,100,000	
Sundry Income	3,522,251		2,285,734	
		53,022,251		48,385,734
Expenditure				
Administration	76,356,052		73,218,705	
Establishment	8,009,545		5,775,219	
Depreciation	23,228,650		28,541,544	
	107,594,247		107,535,468	
Less:				
Amount Recovered from Projects	(4,806,604)	(102,787,643)	(5,939,368)	(101,596,100)
Deficit for the year		(49,765,392)		(53,210,366)
Accumulated Deficit Brought forward	(347,331,968)		(241,168,188)	
Prior Period Items	-	(347,331,968)	(52,953,414)	(294,121,602)
Accumulated Deficit Carried forward		(397,097,360)		(347,331,968)

2.3 Financial Structure

According to the accounts presented, the financial structure of the Agency as at 31st December 1999 compared with that as at 31st December 1998 is given below.

	As at 31 st December			
	1999		1998	
	Rs.	Rs.	Rs.	Rs.
Resources				
Government Contribution		283,215,380		225,415,380
Foreign Aid	143,840,997		152,694,772	
Adjustments for Special Dollar Account Balance	-	143,840,997	(8,853,775)	143,840,997
Other Contributions		22,330,225		22,330,225
		449,386,602		391,586,602
Revaluation Reserve		267,895,664		267,395,586
Accumulated Deficit		(397,097,360)		(347,331,968)
		320,184,906		311,650,220

Utilization

Fixed Assets at written down value	244,667,826	229,550,836
Vessel "Samudra Maru"	75,404,174	86,175,946
Work in Progress	2,730,324	-
Net Current Assets	(2,617,418)	(4,076,562)
	<u>320,184,906</u>	<u>311,650,220</u>

2.4 Comments on Accounts

2.4.1 Inappropriate Disclosures in the Accounts

Following inappropriate disclosures in the accounts were observed.

- Revenue expenditure of the Rs. 1,903,994 had been capitalized and disclosed under Motor Vehicles Account and purchase of computers during the year under review amounting to Rs. 133,050 had been written off as revenue expenditure.
- Building maintenance expenditure of Rs. 6,865 had been erroneously accounted for as maintenance expenditure of furniture and fittings.
- Prepayment of insurance premium amounting to Rs. 8,490 paid on cash in transit policy of the Agency had been treated as expenditure of the year under review.

2.4.2 Omissions in the Accounts

Following omissions in the accounts were observed.

- No provision had been made in the accounts in respect of long outstanding advances and loans given to the employees totalling Rs. 224,451, the recovery of which is doubtful.
- No provision had been made for obsolete stocks of library books.

2.4.3 Overstatements and Understatements in the Accounts

Following overstatements and understatements were observed.

- Non-refundable tender deposits, interest income, repairs and maintenance cost of equipment and security charges had been overstated by Rs. 113,173 due to posting errors.
- Prepayments, fuel charges and maintenance expenses on Research Centres had been understated by Rs. 9,587 due to posting errors.
- Provision for gratuity amounting to Rs. 15,645 had been understated due to incorrect calculation of the periods of service of six employees.

2.4.4 Accounts Receivable and Payable

Following observations are made.

- Receivables (projects) amounting to Rs. 223,513 did not represent any realisable value.
- A sum of Rs. 6,107,506 had continued to be shown as arrears of rates and taxes payable to the Colombo Municipal Council for the period of 1982 to 1996.
- Out of debtors, deposits and advances, balances totalling Rs. 1,081,171 and Rs. 127,570 were outstanding for period ranging from one to five years and over five years respectively.
- Out of the Project creditors balances Rs. 220,831 was outstanding for a period of over 5 years.

(e) Special advances totalling Rs. 193,879 paid to the staff during the period 1991 to 1999 had not been recovered up to end of the year 1999.

(f) Refundable tender deposits received during the period 1997 to 1999 totalling Rs. 141,000 were remaining uncleared as at end of the year.

2.4.5 Lack of Evidence for Audit

The following items in the accounts could not be satisfactorily vouched or accepted in audit due to lack of evidence indicated against each item.

Item	Value	Evidence not made available
	Rs.	
(a) Debtors, deposits and petty cash advances	2, 430, 447	Confirmations
(b) Creditors, project creditors, accruals and consultancy project	220, 836	Confirmations
(c) Security arrangement made with the Ceylon Fishery Harbours Corporation	1, 837, 193	Contract agreement.

2.4.6 Non-compliance with laws, Rules, Regulations Management Decisions etc.

Instances of non-compliance observed in audit are given below.

Reference to Laws, Rules Regulations and Management Decisions	Particulars
Finance Act No, 38 of 1971	
(a) (i) Section 12 (b)	Approval of the relevant Minister with the concurrence of the Minister of Finance had not been obtained for the form and contents of the annual accounts.
(ii) Section 13 (5) (d)	An internal audit programme had not been settled in agreement with the Auditor General and half yearly internal audit reports for the year 1999 had not been submitted, as prescribed.
(iii) Section 13 (6)	Report on accounts as specified by the Auditor General had not been furnished along with the accounts. Accounts were rendered for audit only on 25 October 2000.
(iv) Section 14 (1)	A copy of draft annual report had not been submitted within four month after the end of the financial year.
(b) Financial Regulation	
No. 104	Action had not been taken to recover a loss of Rs. 81,920 from relevant parties relating to the four vehicle accidents.

(c) **Sri Lanka Accounting Standards**
No. 18

Vehicles repair costs had been capitalized.

(d) Treasury Circular No. 842 of
19 December 1978

Values of individual assets were not shown
in the Register of Fixed Assets.

(e) Treasury Circular No. MF/6/1/1/96 of
20 April 1996. (Paragraph 2.4)

Accounting statements in respect of foreign
exchange obtained and expended had not
been submitted by four officers.

(f) Public Enterprise Circular
No. 116 of 24 January 1997

Four vehicles of the Agency had been
released to the Ministry of Fisheries and
Aquatic Resources Development and a sum
of Rs. 335,539 had been spent for maintenance
and other expenses of those vehicles.

2.4.7 Transaction not supported by Adequate Authority

Following instances were observed.

- Out of the Capital grant provided by the Government, a sum of Rs. 15,303,403 remaining unspent had been utilised to meet recurrent expenditure.
- Board approval had not been obtained to insure motor vehicles used by the Agency, the ownership of which remains with third parties.
- The Treasury approval had not been obtained for the write - off of bad debts amounting Rs. 1,858,167.
- The Board approval had not been obtained for the write back of creditors amounting to Rs. 188,265.

3. Financial and Operating Review

3.1 Financial Results

The working of Agency during the year ended 31 December 1999 had resulted in a deficit of Rs. 49,765,392 as compared with the deficit of Rs. 53,210,366 for the preceding year thus showing a decrease of Rs. 3,444,974 in the deficit. This can be analysed as shown below.

	Variance		Rs.
	Favourable Rs.	Adverse Rs.	
Receipts			
Government Contribution	3,400,000	-	
Sundry Income	931,824	-	
Interest Income	304,694	-	
Other Contributions	-	1,132,766	
	<u>4,636,518</u>	<u>1,132,766</u>	3,503,752
Expenditure			
Administrative Expenses	-	2,020,925	
Establishment Expenses	-	3,350,747	
Depreciation	5,312,894	-	
	<u>5,312,894</u>	<u>5,371,672</u>	(58,778)
Net decrease in deficit			<u>3,444,974</u>

3.2 Apparent Management Inefficiencies

Following observations are made.

- (a) A sum of Rs. 12,460 belonging to the Agency had been lying at the Hulftsdrop District Court since 1985. No action had been taken to settle this matter.
- (b) A sum of Rs. 25,527 being surcharge recoverable from an employee in connection with a cash shortage in March 1993 had not yet been recovered.
- (c) In Trincomalee, buildings had been erected on land not belonging to the Agency. Buildings on this had been revalued at Rs. 4,031,200.
- (d) A sum of Rs. 143,000 being purchase advance paid to a private institution November 1996 had neither been recovered nor goods received to the Agency.

3.3 Repairs and Maintenance of Research Vessel - "Samudra Maru"

The research vessel "Samudra Maru" handed over by the Ministry of Fisheries and Aquatic Resources Development in February 1985 remained inoperative until 31 December 1999. The vessel had a crew of ten.

Following observations are made.

- (a) A total sum of Rs. 15,488,449 had been spent on repairs and maintenance during the 13 years ended 31 December 1998.
- (b) A sum of Rs. 149,110 had been spent on maintenance during the year.
- (c) The cost of spare parts purchased by the UNDP amounted to Rs. 20,310,000.
- (d) The vessel 'Samudra Maru' has been idling during the year due to a major overhaul.

3.4 Uneconomic Transaction

A sum of Rs. 36,619 had been overpaid for purchase of carpets to the Agency auditorium due to incorrect measurements.

3.5 Idle Resources

A certain portion of land, research vessel "Samudra Maru" three vehicles and some building space remained idle during the year under review. Suitable action had not been taken by the Agency to utilize these resources or to take appropriate alternative course of action. These resources were idling for periods ranging from one to thirteen years.

3.6 Identifies Losses

Following observations are made.

- (a) Two officers who had gone on scholarships to foreign universities on bonds had not returned after completing the scholarships. The Agency had referred this matter to the Attorney General in order to take appropriate legal action to recover the cost of Rs. 2,467,370.
- (b) Cost of repairs to vehicles arising out of accidents during the year amounted to Rs. 529,316. However, the claim settled by the insurance company was only for Rs. 129,037, resulting in a loss of Rs. 400,279 to the Agency.

3.7 Cost of Personnel

A comparative statement of average cost of personnel for the years 1999 and 1998 analysed under each category is given below.

Category	No. of Employees		Average Cost per Employee	
	1999	1998	1999 Rs.	1998 Rs.
Executives	78	68	143,962	163,338
Non-Executives	219	234	80,607	76,829
	<u>297</u>	<u>302</u>	<u>97,246</u>	<u>96,308</u>

3.8 Budgetary Control

Significant variations were observed between the budget and the actual income and expenditure during the year under review thus indicating that the budget had not been made use of as an effective instrument of management control.

3.9 Corporate Plan

Although a Corporate Plan covering the period 1996 - 2000 had been prepared, it had not been approved by the Board of Directors.

4. Systems and Controls

Deficiencies observed during the course of audit were brought to the notice of the Chairman of the Agency by my detailed report furnished in terms of Section 13 (7) (a) of the Finance Act.

Special attention is needed in respect of the following areas of control.

- (a) Fixed assets
- (b) Debtors and creditors
- (c) Advances for purchase
- (d) Budget
- (e) Vehicle utilisation
- (f) Review and appraisal of operations and records by the Internal Audit
- (g) Tender procedure
- (h) Accounting
- (i) Segregation of function and delegation of authority

(S. C. Mayadunne)
Auditor General

National Digitization Project

National Science Foundation

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