ANNUAL REPORT
& ACCOUNTS
2009

NATIONAL AQUATIC RESOURCES, RESEARCH AND DEVELOPMENT AGENCY
CROW ISLAND, MATTAKKULIYA, COLOMBO 15.

Our Vision

To be the premier institution for Scientific Research in Conservation, Management and Development of Aquatic Resources in the Region.

Our Mission

To provide innovative solutions for national development issues in the aquatic resources sector utilizing scientific and technological knowledge & resource base.

The main objectives and functions of the Agency are as follows:

- To ensure application and utilization of Scientific and Technological expertise for the implementation of national development programmes.
- To promote and conduct research activities directed at identification, assessment, management and development of living and non-living aquatic resources.
- To co-ordinate and provide advisory and consultancy services on matters relating to exploitation, management and development of aquatic resources.
- To undertake collection, dissemination and publication of scientific research information on aquatic resources & related subjects.
- To provide training

Our Logo

The Dolphin on the NARA logo symbolises, knowledge and intelligence in the sea, which NARA represents in the national context. The dolphin has been a friend of the man from time immemorial and also signifies conservation. Like the Dolphin the Agency represents freshwater as well as marine presence. The poise of the NARA Dolphin is charteristically confident and forward looking.

Content

National Aquatic Resources Research and Development Agency (NARA)

1. Corporate Information

The National Aquatic Resources Research and Development Agency (NARA) is the principal national institution charged with the responsibility of carrying out and co-coordinating research development and management activities on the subject of Aquatic Resources in Sri Lanka. NARA was established in the year 1981 by restructuring the Research Division of the Department of fisheries. In the restructuring process Research Division was amalgamated with the institute of Fish Technology which existed in the present premises of NARA at Crow Island, Mattakkuliya, to establish a fully fledged research agency, under an Act of Parliament, National Aquatic Resources Agency Act No. 54 of 1981 and amended subsequently by National Aquatic Resources Research and Development Agency Act No. 32 of 1996. NARA functions as a statutory body under the Ministry of Fisheries and Aquatic Resources.

Governing Board

The Governing Board constitutes appointed members and eight (08) Ex Officio Members in accordance of the provisions of the Act. Following members served as the members of the Governing Board in 2009.

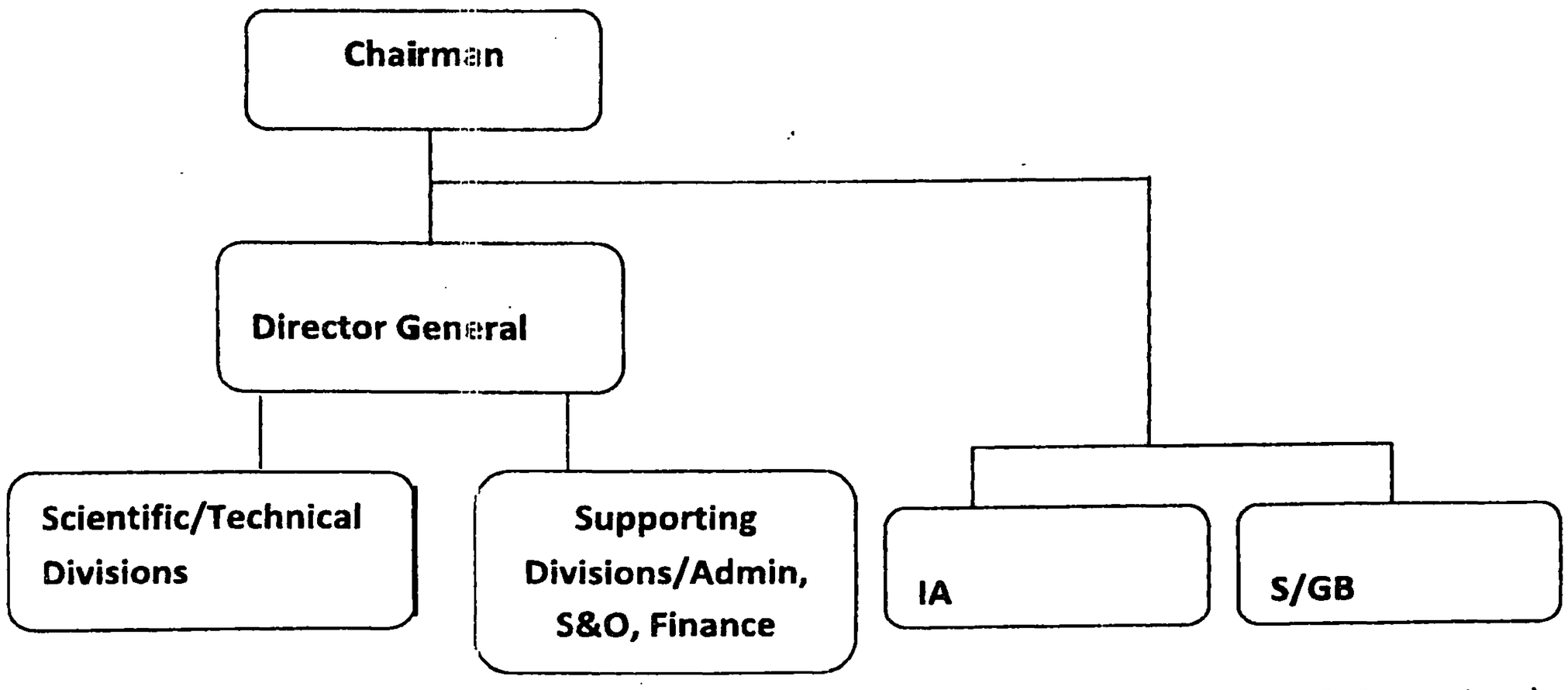
Appointed Members

Mr K Haputantri	Chairman/NARA
Mr Godfrey Cooray	
Dr (Mrs) P S R Amaratunga	
Mr M N D Peiris	
Dr S H K Samaraweera	
Mr Priyantha R Morapitiya	
Mr R D Pradeep Sanjeewa	
Mr H A W M J Senviratne	
Mr M A D Sunil Bertram	
Mr B.K.R.Gunasekara	
Mr M.D.Nalin William	

Ex Officio Members

Ms W S Wickramasinghe	Dy.Director, Dept. of Fisheries
Mr S W Pathirana	Director General Dept. of Fisheries
Mr A Kumarasiri	Director-Department of External Resources
Mr K V P Ranjith de Silva	Sec - Ministry of Ports & Aviation
Rear Admiral J S K Colombage	Director General
Rear Admiral T S G Samrasinghe	(Operation) Sri Lanka Navy
Rear Admiral Jayantha Perera	
Mr B J P Mendis	Surveyor General
Mr S M W Fernando	
Ms A M N Wijerathne	SAS - Ministry of Science & Technology
Ms K T R Prathapasinghe	Director General/NARA
Dr(Mrs)Champa Amarasiri	Director General(Actg.)

Organizational Structure



(IA – Internal Auditor, S/GB --- Secretary to the Governing Board, S & O – Service & Operations)

Organization

Mr K. Haputhantri continued as the Chairman until 31.07.2009 and Mr. Godfrey Cooray appointed as the Chairman/NARA with effect from 03.09.2009. Mrs K T R Prathapasinghe functioned as the Director General until 31.08.2009 and Dr(Mrs.) Champa Amarasiri continue this position on acting basis until end of the December.

In order to perform the mandated functions of the Agency the organization had been designed to constitute ten Research and Technical/Services Divisions ie. Environmental Studies. Fishing Technology, Hydrographic Office, Information and Technology Division, Inland Aquatic Resources & Aquaculture, Library & Information, Marine Biological Resources, Oceanography, Socio-Economic and Market Research, Post Harvest Technology supported by Administration, Services & Operations, Finance Division.

Heads of Divisions

Following officials officiated as Heads of Divisions during the year 2009.

Research Divisions

Mr S A M Azmy	Environmental Studies
Mr N B P Punyadeva	Fishing Technology
Mr M A Ariyawansa	Hydrographic Office
Dr H M P Kithsiri	Inland Aquatic Resources & Aquaculture
Dr S S K Haputantri	Marine Biological Resources
Dr [illegible] Tennakoon	Oceanography
Dr E M B R K Edirisinghe Dr.(Mrs.) K W S Ariyawansa	Post Harvest Technology
Mr K H M L Amaralal	Socio Economics & Marketing Research
Mr A B A K Gunaratne	Information Technology
Mr O K P Nandana(Actg) Mr s S KAriyawasam	Library & Information

Support Services Divisions

Mr Sumedha Jayasinghe	Administration
Mrs.R H P Ranasinghe	Finance

Mr D A Karunasena	Services & Operations
Mrs. L G N Perera	Chief Internal Auditor
Mr M D Senarathne	Internal Auditor (Actg.)

2. Research Highlights

Overall, the performance of research activities has been encouraging despite delays in releasing capital grant and downscaling of the budgetary allocations owing to world financial crisis.

Ocean Observation Centre continues round the clock during the period helping the Disaster Management Centre with timely advice on ocean based disasters.

- Fish forecasting project functioned very well, constantly improving the accuracy of the forecasts with active participation of the fishers and building up the confidence among multi-day fishermen.
- Assessment of stocks of selected fish resources such as Lobster, Sea Cucumber, Chang, Prawns and Ornamental sea fish continues successfully. Preparation of management plans with community participation too progressed as per planned.
- Details of performance of other research work carried out by respective divisions are discussed separately.
- The management wishes to place on record the continuous support extended by the Hon Minister, the Deputy Minister, the Secretary, the Governing Council, Trade Unions , Stakeholders in the fisheries industry and all our staff in achieving the above targets under difficult conditions.

3. Financial Highlights

The financial performance of the Agency showed constant improvements despite ever increasing costs of inputs such as wages and utilities associated with dwindling resources in the face of grave global crisis and aftermath of the unprecedented tsunami devastation.

The measures taken to control finances and maintenance of financial discipline during the period under review further supported this improvement. The measures include:

a) Centralization of procurement and adoption of transparent procurement guidelines.

b) Suspension of vehicle hiring system and maximum utilization of its own vehicles

c) Abandoning of the system of granting ad-hoc advances for R&D work

d) Rationalization of overtime payments

e) Suspension of issuing cash advances for fuel and streamlining of procurement of fuel for vehicles

f) Measures taken to improve self income and collection of dues

g) Minimization of wastage

h) Continuous monitoring of expenditure and progress

i) Constant consultation with Post Observation Committee (Pasu Viparam Kamituwa) and support from the staff and

j) Expeditious & judicious handing of disciplinary cases

4. Human Resources Information

Recruitments

Name	Designation	Date of appointment
Ms.S.S.D.G.Guruge	Secretary to the Governing Board and Legal Officer	2009.01.01
Ms.H.H.C.C.Perera	Research Officer	2009.01.26
Mr.Gamini Premachandra	Instrument Technician (on Contract Basis)	2009.02.01
Mr.K.D.S.Pushpakumara	Unskilled Labourer	2009.02.10
Ms.R.T.Bulathsinhala	Research Officer	2009.02.10
Mr.R.M.N.Danushka	Unskilled Labourer	2009.02.18
Mr.M.D.H.Priyanga	Research Assistant	2009.02.18
Mr.K.Milan Indika	Unskilled Labourer	2009.02.20
Mr.W.A.S.Perera	Unskilled Labourer	2009.03.02
Mr.K.Wasantha Rohan	Unskilled Labourer	2009.03.02
Mr.Ravindra Nalaka	Unskilled Labourer	2009.03.02
Ms.A.R.Wanigasekera	Clerk	2009.03.16
Mr.K.N. Sunethsiri De Silva	Research Assistant	2009.03.25
Ms.K.A.A.N.Jayarathna	Secretary to the Governing Board/Legal Officer	2009.04.15
Ms.K.B.G.Sunethra	Chief Librarian	2009.04.16

Mr.T.A.Wickramasinghe	Working Director	2009.04.06
Mr.H.D.N.Neyomal	Unskilled Labourer (On Contract Basis)	2009.09.07
Mr.G.Cooray	Chairman	2009.09.07
Mr.S.M.R.D.Karunarathna	Unskilled Labourer	2009.12.21

Departures of the service

NAME	DESIGNATION	DEPARTURE DATE	REASON FOR DEPARTURE
Mr.Sunil Warnakulasooriya	Unskilled Labourer	2009.01.18	*Retired*
Ms.R.T.Bulathsinhala	Research Officer	2009.02.27	Resigned
Ms.L.G.N.Perera	Internal Auditor	2009.03.15	*Retired*
Mr.S.S.C.Peris	Research Assistant	2009.03.20	*Retired*
Ms.N.I.Kalasinghe	Project Assistant (Management)	2009.04.23	Resigned
Mr.N.Suresh Kumar	Research Officer	2009.05.17	Resigned
Ms.W.P.Indrani Hemalatha	Unskilled Labourer	2009.05.27	*Retired*
Mr.K.Murugeshan	Unskilled Labourer	2009.06.26	Resigned
Ms.W.I.G.Morin Perera	Unskilled Labourer	2009.07.25.	*Retired*
Mr.K.Haputhanthri	Chairman	2009.08.01	Resigned
Ms.E.K.V. Samaraweera	Research Officer	2009.09.02	Resigned
Mr.W.M.A.Dayasena	Store Keeper	2009.09.22	*Retired*
Ms.K.T.R.Prathapasinghe	Director General	2009.10.02	Completed Contract period
Ms.C.H.Jayasinghe	Personal Assistant to the Director General	2009.10.23	Resigned
Mr.O.K.P.Nandana	Librarian	2009.10.27	Vacated of post
Mr.Anandalal Liyanage	Extension Officer	2009.11.30	*Retired*

Mr.U.L.Kinsley	Carpenter	2009.09.14	Resigned
Mr.N.N.E.Cooray	Research Assistant	2009.12.11	*Retired*
Ms.T.S.Dahanayake	Research Assistant	2009.12.01	Resigned

Unfilled Vacancies

Srl.No	Post	No of vacancies
1	Bungalow Keeper	1
2	Boatswain/Samudramaru	1
3	Caretaker	1
4	Carpenter	1
5	Chief Administrative Officer	1
6	Chief Cartographer	1
7	Chief Hydrographic Surveyor	1
8	Cook - Samudramaru	1
9	Coxwain	1
10	Director General	1
11	Draughtsman	2
12	Driver	5
13	Deputy Chief Cartographer	1
14	Deputy Director/Hydrographer	1
15	Electronics Data Processing Assistant	1
16	Electronics Engineer	1
17	Engine Room Assistant /Samudramaru	2
18	Extension Officer	1
19	Hydrographic Surveyor	1
20	Internal Auditor	1
21	Land Surveyor	2

Mr J M Ranjith / Store-keeper			
Ms L R Sunethra/ Librarian	Workshop on Library 2.0	National Science Foundation	1,500/=
Ms R H S P Ranasinghe /Accountant	Workshop on Improvement of the quality of financial accounting, financial management & financial reporting in the public sector	Ministry of Finance & Planning	-
Mr J K Rajapakshe/ Research Officer	2nd Advanced short course on GIS and Applications.	PGIS, University of Peradeniya.	30,000/=
Ms A M A S K Wijesinghe/ Personal Assitant to Chairman	Diploma in professional Secretaries	Department of Vocational Training	31,000/=
Mr Ananda Amarasinghe – Purchasing Officer/Supplies Officer	Diploma in Office Management	SLIDA	60,000/=
Mr P R P Perera/ Chief Store keeper	Training on Stores Management	INGAF	6,000/=
Mr H D Sunil Shantha/Electrician	Course on Electronics	Ceylon German Technical Training Institute	7,000/=
Ms D R Herath/ Research Officer	Workshop on Bioinformatics	Institute of Biochemistry	10,300/=
Ms.D N A Ranmadugala/ Research Officer			
Mr R H P Weligodapitiya/ Hydrographic Surveyor	MSc in "Geo – Informatics"	Institute of Postgraduate at Peradeniya.	80,000/=
Dr P K M Wijegoonawardena/ Research Officer	Intership Training	GEENTECH	20,000/=
Dr Champa Amarasiri/ Research Officer	National workshop on Monitoring control and surveillance	BOBP-IGO and MFAR	-
Mr N B P Punyadewa/ Research Officer			
Ms S B N Ahamed/ Research Officer	Workshop on Estimation of measurement uncertainty in routine analysis.	Industrial Technology Institute	8,475/=
Mr Sumedha Jayasinghe/ Administrative Officer	Diploma in English for Managers	Venura Collage	27,000/=
Mrs R H S Pranasinghe/ Accountant	Master of Public Management	SLIDA	100,000/=
Mrs. Ms.L.W.Chamindanie De Silva/ Accountant			
Secretary to the Governing Board & Legal Officer	Human Resources Development through proper disciplinary Management.	Centre for studies in Disciplinary Management	6,000/=
Mr V G Chandrasena/ Photographer	Diploma in Environmental Journalism.	Environmental Journalists Organization	4,100/=

Foreign Travel

Name	Purpose	Duration	Country
Mr A N D Perera S. Hydrographer	IHG/ICA Category A level 2 (2009 UTM Hydro II course)	11.01.2009- 29.05.2009	Malaysia
	Submission of project proposals(Seminar on latest Hydrographic Survey Technology)	04.11.2009- 07.11.2009	India
Mr S W S Weerasinghe Chief System Analyst	Technical Study on Electronics navigational chart production	26.01.2009- 20.02.2009	Japan
Mr P B Rathnapal S. Draughman	Technical Study on Electronics navigational chart production	26.01.2009- 20.02.2009	Japan
Mr J K Rajapakshe Research Officer	Professional Development Training Course (Application of GIS and RS for potential Fishery Zone)	15.02.2009- 28.02.2009	Thailand
	Training on bathymetric data management & using of existing models for inundation maps constructions, most vulnerable area of the coastal Zone of coast map IO countries.	12.07.2009- 19.07.2009	Thailand
Mr U W S Adikari Research Asst.	Professional Development Training Course (Application of GIS and RS for potential Fishery Zone	15.02.2009- 28.02.2009	Thailand
Ms W A H P.Wettasinghe Lab Attendent	Professional Development Training Course (Application of GIS and RS for potential Fishery Zone	15.02.2009- 28.02.2009	Thailand
Mr O V Premachandra Cartographer	09th North Indian Ocean Hydrographic Commission	25.02.2009- 26.02.2009	India
Mr K A Ranasinghe Hydrographic Surveyor	CARIS software workshop	16.02.2009- 20.02.2009	Thailand
Mr R H P Weligodapitiya Hydrographic Surveyor	CARIS software workshop	16.02.2009- 20.02.2009	Thailand
Mr H D Wimalasena Research Officer(Socioloy]	Training Programme on Coastal Fisheries Management	03.03.2009- 22.03.2009	Thailand
Dr Champa Amarasiri Act.D. Research & Development)	4th meeting of technical Advisory committee of the Bay of Bengal Programme	22.-03.2009- 23.03.2009	Bangladesh
	2nd Regional Consultation on preparation of management plan for shark fisheries	08.08.2009- 12.08.2009	Malc lives
	2nd workshop on the Assessment of fishery stock status in the South & South East Asia.	05.10.2009- 09.10.2009	Thailar d
Ms M H S Ariyarathne Research Officer	Training on Cage culture of Fish.	20.05.2009- 30.05.2009	Thailand
Mr R P P K Jayasinghe Research Officer	Seminar on " Transboundary coastal & marine protected areas with spawning grounds"	26.05.2009- 29.05.2009	Pakistan

Dr T K D Tennakoon Research Officer	25th General Assembly & 42 Executive Council Meeting(IOC)	13..06.2009- 27.06.2009	Paris
Mr K W R R Amaraweera Research Officer	Training on Advanced Freshwater Aquaculture	31.05.2009- 20.07.2009	Thailand
Ms B H B Jayamalee Silva Cartographic Draughman	Electronic Navigation Chart Preparation course.	06.07.2009- 07.08.2009	UK
Dr E M S Wijerathne Research Officer	Sabbatical leave	20.07.2009- 19.07.2010	Australia
Ms W N C Priyadharshanie Research Officer	"Student training programme on Observational Oceanography"	10.08.2009- 21.05.2010	Bermuda
Mr S S E L Kumara Hydrographic Surveyor	Training on bathymetric data management & using of existing models for inundation maps constructions, most vulnerable area of the coastal Zone of coast map IO countries.	12.07.2009- 19.07.2009	Thailand
Ms Y M R N Kumari Hydrographic Surveyor	Training on bathymetric data management & using of existing models for inundation maps constructions, most vulnerable area of the coastal Zone of coast map IO countries.	12.07.2009- 19.07.2009	Thailand
Mr K H M L Amaralal Research Officer	UNU – Fisheries Training Programme	13.09.2009- 12.03.2010	Iceland
Mr W D N Wickramaarachchi Research Officer	Technical Assistant programme for marine scientific Research	25.10.2009- 19.12.2009	India
Mr P Jayasooriya Hydrographic Surveyor	05th IHO Maritime safety information Training Course	26.10.2009- 28.10.2009	Oman
Mr A A D Amartunge Research Officer	Marine Environmental conservation Course	31.10.2009- 15.11.2009	Malaysia
Dr S S K Haputantri Research Officer	Bay of Bengal Large Marine Ecosystem project(BOBLEM) and inception workshop	02.11.2009- 06.11.2009	Thailand
Mr D D G L Dahanayake Research Officer	To Present a paper (05th International Student conference)	04.11.2009- 13.11.2009	Japan
Mr M A Ariyawansa Hydrographer	Seminar on the latest Hydrographic Survey Technology	10.11.2009- 14.11.2009	Japan

Court cases and Disciplinary inquiries

Court Cases

Labour Tribunal

(i) Inquiry is being held in respect of the application made by Mr J K Balapatabendi.

(ii) With regard to the applications made by Mr G Lamahewa and Mr J B A Magammana at the Additional Labour Tribunal, both applications are at the inquiry stage and inquired into separately.

(2) District Court – Negombo

Trial is pending in the land case of trhe Kadolkale Regional Research Centre at the District Court , Negombo.

(3) Files forwarded to Attorney General's Department for litigation

(i) The file of Mr N H Dassanayake, Research Officer who went abroad for post graduate studies and did not report back for duty after expiry of leave period has been forwarded to the Attorney General's Department in order to institute legal action against him and his two sureties on the grounds of breach of Agreement/bond entered into with the institution.. Accordingly all legal documents have been prepared already to file the case. Action to be filed in courts.

File has been forwarded to Attorney General's Department to institute legal action against Mrs.S Thalakada, Chief Librarian on the grounds that she has not reported for duty after completion of No- Pay leave abroad.

The file of Dr.(Mrs.)C V L Jayasinghe who handed over her resignation without serving the compulsory service period and/or repaying the bonded amount as per the agreement/bond entered into with the institution has been forwarded to the Attorney General's Department in order to institute legal action against her.

(iv) File has been forwarded to Attorney General's Department to institute legal action against Mr A W Gunasekara who resigned from service without serving the bonded period and his two sureties on the grounds of breach of Agreement/bond entered into with the institution. Action to be filed in courts.

(4) Disciplinary Inquiry

(i) Action has been taken in accordance with the final report of the disciplinary inquiry held against Mr N B P Punyadewa, Research Officer and Mr B L S Wimalasinghe, Transport Officer.

Welfare Activities

Following welfare activities were continued .

Annual New year Festival, Christmas celebrations, providing financial Assistance to members of the staff at the hour of need in the family lives.

In addition to the above, transport facilities provide to the staff to make easy their travelling.

5. Research Divisions

5.1 Environmental Studies Division

Head of the Division: S.A.M. Azmy

Overview of the year

The main function of the division is to conduct studies related to environmental aspects of aquatic resources with special reference to water pollution and assessment on environmental impacts and provide technical advice to government and other organizations on environmental management aspects. The staff strength during the period included five Research Officers, two Research Assistants, a Word Processing Operator and three Laborers. One Officer resigned and one labourer retired during the course of the year. During this period, the division implemented three projects related to Environmental Management and Pollution, a study project to cater to emergency situations such as fish kills and pollution and a project to improve the quality of the laboratory.

Activities undertaken

Programme		Project		Allocation (Rs / M)	Officer Responsible	Period	
						from	To
1	Environment	12.1	Impact of physical, chemical and biological parameters with reference to Nutrient circulation on fish abundance and distribution using numerical modeling - Udawalawe Tank	0.300	W.D.N. Wickramaarachchi / Dr. E.M.S. Wijeratne, Oceanography	Jan, 2009	Sep, 2009
2	Environment	12.2	Status, present trends and assessment of water pollution loads in river basins with respect to Catchment land use - Gin Ganga basin	0.40	A.A.D. Amaratunga / N.Sureshkumar	Jan, 2009	Sep, 2009
3	Environment	13.1	Study on Baseline Environmental Conditions in selected Inland waters	1.100	S.A.M.Azmy/ K.A.W. S. Weerasekara	Jan, 2009	Sep, 2009
4	Emergency Studies		Water pollution, Oil spills and Fish kill incidents		S.A.M. Azmy / N.Sureshkumar /	Jan, 009	Sep, 2009

					W.D.N. Wickramaarachchi/ A.A.D. Amaratunga / K.A.W. S. Weerasekara		
5	Capacity Building and Human Resource Development	14.3	Improvement of ESD laboratory to ISO 17025 standards	0.300	S.A.M. Azmy, N.Sureshkumar, W.D.N. Wickramaarachchi A.A.D. Amaratunga / K.A.W. S. Weerasekara /	Jan, 2009	[Sep, 2009

Progress

Project 01 (Project No. 12.1)

The objective of the project 01 (Project No. 12.1) was Development of maps using a numerical model and user friendly guide to identify seasonal abundance and distribution of fish in Udawalawe reservoir. This project is divided in to two parts mainly data collection, database preparation and model run. During the year 2009, it is supposed to collect required data and compiled into the relevant format suited for the numerical model. Accordingly the files of nutrients, physical parameters, rainfall, water issues, inflow data, calculating water budget of the reservoir, bathymetry file & bathymetric map, Data arrangement for fit into the model and trial run of the file in Linux operating system were done. (Pre and run data file in Linux operating system) initial model run was performed. All the primary data collection and data arrangement was completed as per the work plan. Further model output will be able to produce after validation of the results during 2010.

Progress (%) :-

Physical:- %	Cumulative target	100 %	Cumulative achieved	98 %

Project 02(Project No. 12.2)

Status, present trends and assessment of water pollution loads in river basins with respect to Catchment land use - Gin Ganga basin (Project No. 12.2). Project was initiated with the objectives of monitoring the surface water quality, assessment of pollution levels in surface waters, and identification of possible pollutants and sources.The other specific objective is to assess of aquatic pollution levels in selected streams of Gin Ganga basins. This is a two year project and data collected in this year for initiate the development of water quality index. The study was focused on surface water quality and assessment of pollution levels coming with

streams, view to assist in identification of threats to endemic inland fisheries, Seven months samplings were carried on this year in Gin Ganga basins. Samples were analyzed for important pollutions parameters in total of sixteen sampling locations during the study period. Study catchments mainly consists of natural forest, tea plantations, home gardens, annual crop cultivations etc., Results indicate that, variance of the bio-chemical oxygen demand is 7.0 ± 5 mg/l. As well as, variance of nitrate nitrogen and dissolve phosphate concentrations are 6.76 ± 0.8 mg/l and 6.6 ± 0.9 mg/l consequently. According to results, variance of turbidity levels and total suspended solids are 68.5 ± 10.6 NTU and 48.4 ± 8.3 mg/l consequently. Hence, the main reasons for the above results were over-use of fertilizer applications of recommended levels in mainly tea plantation and annual crop cultivation areas.

Progress (%) :-

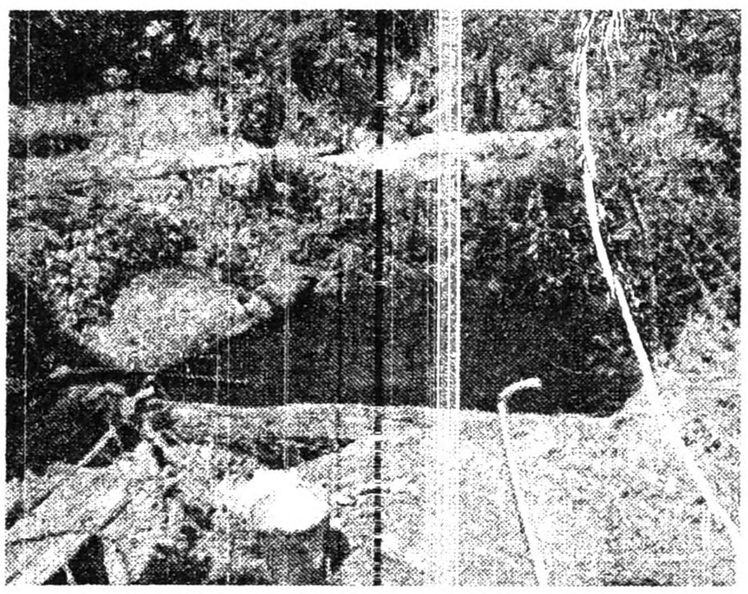
Physical:- %	Cumulative target	100 %	Cumulative achieved	100 %

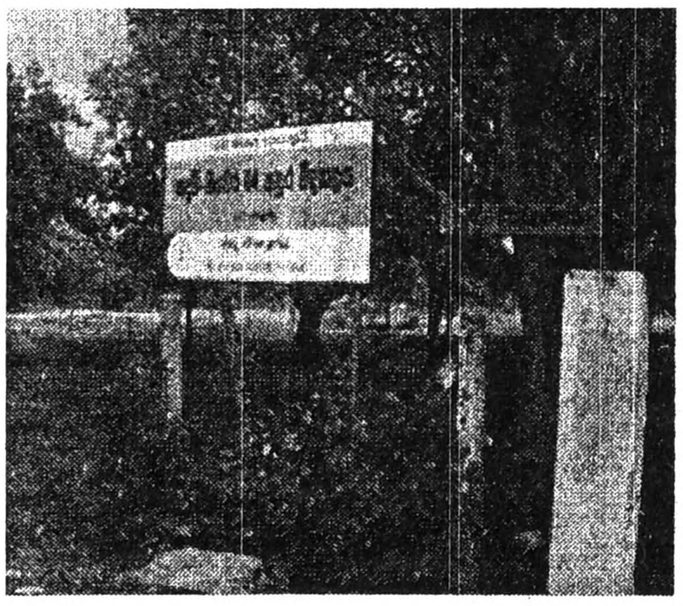
Project 03 (Project No. 13.1)

Study on Baseline Environmental Conditions in selected Inland waters project (Project No. 13.1) is a two year study. The objectives of this project were to determine the level of contamination of trace metals in the aquatic environment in the critical areas in the North Central Province, to study the extent of impacts of renal failure on farmers and fisheries community in the study area, and, to contribute to other studies being carried out on the health problem.

As an initial study, during the first year, we have collected the available literature on the chronic kidney disease. Based on the collected literature and during the preliminary study we have identified that Padaviya, Sripura, Kabithigollawa are the most vulnerable areas for the disease, and Padaviya area indicated the worst condition. Therefore it was decided to conduct field surveys in Padaviya area during the first year of the study. Sixteen sampling sites, mainly wells including two reference sites from Galgamuwa area, one reference site from Colombo District and twelve sampling wells from the study area (Padaviya A, B, and C Yaya) were selected for the study. The study was mainly focused on physico-chemical parameters of water including temperature, pH, total dissolved solids(TDS), turbidity, total hardness, temporary hardness, alkalinity, salinity, chloride, fluoride, trace metals, (Cr, Pb, Cd,), dissolved oxygen, ammonia, nitrate, nitrite, and phosphate. In addition, questionnaire was prepared to collect Socio-Economic data of the people of the study area by distributing it among school children. Results

for most of surface water quality parameters confined to the acceptable limits for fish & aquatic life. Fluoride levels varied in between 0.01to 1.60 mg/L by indicating the highest value from reference site at Galgamuwa (1.60 mg/L) where this area is not subjected to the above disease. Therefore, the possibility to suffer disease due to high fluoride levels could be ruled out. A questionnaire survey was carried out among school children (O/L and A/L) in three schools namely "Padaviya Mahasen Maha Vidyala", "C – Yaya vidyalaya" and "Piyawara -04 Anura vidyalaya" of the North Central Province. Socio-economic data of the people of these areas were collected including general information, food and water consumption pattern, farming activities, and diseases. According to the collected data, it was revealed that the most of the kidney patients are male and belong to average age group of 40 to 60 years. Considering the trace metal levels; Cadmium (Cd) concentrations were recorded in the range of 0.0883 mg/L - 0.393mg/L.Sampling was carried on monthly basis in above studies for a period of ten months from January to December and further studies will be continuing next year.





Progr Physical:- % Cumulative target 100 % Cumulative achieved 100 %

Project 04 (Project No. 14.3)

The objective of the laboratory improvement project was to cater the improvement of laboratory facilities of the division and to obtain ISO 17025 certificate. According to the allocation of the funds as a major activity, it was planned to rebuild the laboratory cupboards since laboratory infrastructure of the division was rendered to a dilapidated condition as a result of the tsunami in December 2004. In this regard, laboratory cupboards that were delivered did not conform to specifications and while the supplier was informed to remove the items, he had

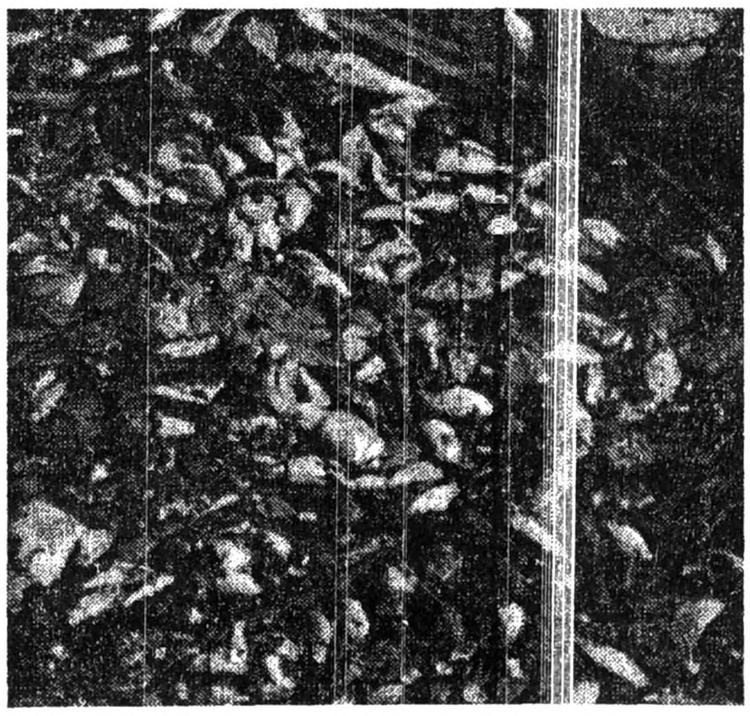
not done so and a new set of cupboards could not be ordered, however payments were not made for the defective items that were supplied. Further, the consultant was selected to implement to obtain the ISO 17025 certificate. Work was started by the consultant and will be continued in 2010.

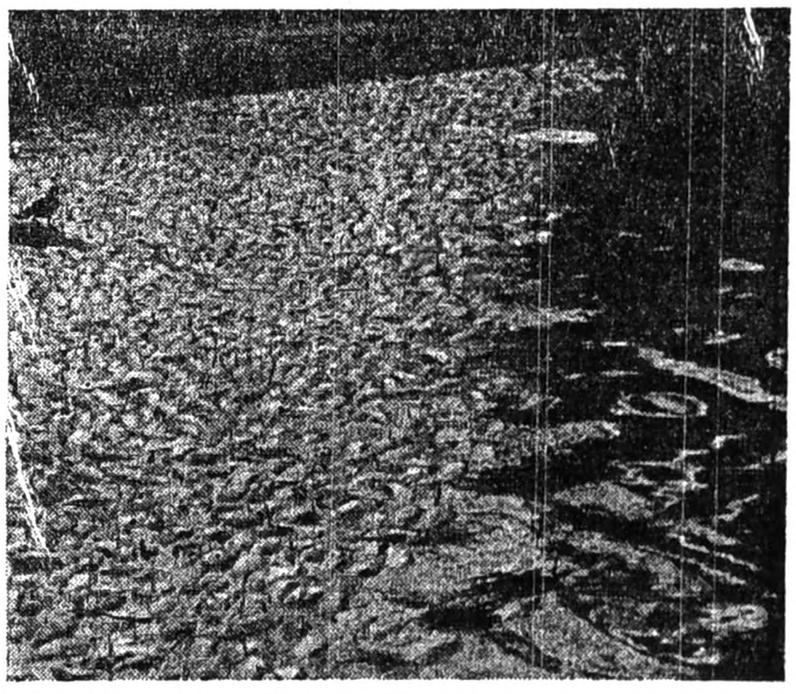
Progress (%) :-

Physical:- %	Cumulative targe	100 %	Cumulative achieved	70 %

Emergency Studies

During this period, five incidents of mass fish kill at Nalanda Reservoir, Beira Lake, Kandy Lake, Lunawa Lagoon, and Ratgama Lagoon were referred for investigations. Preliminary investigation was carried out to find out the causes for the fish kill. It has been identified that, most of the fish kill were happened due to low dissolved oxygen levels and also due to eutrophic conditions of the water bodies. Recommendations provided to fish kill reported in Ratgama lagoon is being implementing.





Fish kill incidents

Additionally, we have done several test services and Initial Environmental Examination Report for Cairn Lanka oil exploration activity and total earning for the year was Rs. 2,293,800.00.

In other activities, during this period, Research Officers participated at several scoping meetings related to EIA and IEE projects conducted by Central Environmental Authority and Coast Conservation Department to advise on management and conservation of aquatic resources.

EIA Scoping Committee Meetings, Site Inspections & Other

- Environmental Impact Assessment (EIA) meeting on Study of the proposed hotel project at Dutch Bay, Kalpitiya, conducted by Coast Conservation Department (CCD).
- Scoping committee meeting on proposed waste water disposal facility for Negombo municipal council area.
- Site inspection of the proposed waste water disposal facility for Negombo Municipal council area.
- Meeting on preparation / review of guidelines pertaining to management of Natural Resources at Central Environmental Authority (CEA).
- Initial meeting on proposal to set up tourist hotel in Periya Karukupone, Bangadeniya Chilaw at CCD.
- Meeting on permission to set up a washing plant, jetty and temporary storage facility near estuary of Kalu Ganga for offshore sand harvesting held at Kalido Beach, Kalutara.
- Scooping committee meeting on proposed water sport hotel at Kapplady, Kalpitiya held in CCD.
- Steering committee meeting on Colombo Port Expansion Project at Pothupitiya, Wadduwa conducted by CCD.
- Scooping committee meeting on Passekudah Resort-Sri Lanka Tourism Development Authority, held in CCD.
- Meeting on Strategic Environment Assessment for the Northern Province held at CEA.
- Scooping committee meeting on proposed water sport Boutique hotel at Kapplady, Kalpitiya held in CCD to evaluate IEE report.
- Special meeting at CCD on proposal to set up tourist hotel resort in Kalpitiya.
- Site inspection of the proposed 4.8MW Wind Power Project at Erumbukudal-Kalpitiya
- A meeting at CEA on proposed proposal to set up a luxury hotel at Kalutara.
- Preliminary meeting on proposed 500MW Natural Gas Power Project at Kerawalapitiya.
- Site inspection of the proposed 500MW Natural Gas Power Project at Kerawalapitiya.
- Preliminary meeting on proposal to develop a Saltern in Kuchchaweli, Trincomalee held on CCD.
- Meeting on find out a possibility to put seawater breakers for pumping of sea water through sea waves.
- Technical evaluation committee Meeting on proposed project to manufacture "Solar Salt" in Wayamba Saltern (Pvt. Ltd.) at Puttalam and Wanathawilluwa.
- Site inspection of the Passekudah Resort-Sri Lanka Tourism Development Authority.
- Special meeting at CCD on proposed treated waste water sea outfall at Lunawa.

- Technical evaluation committee meeting on IEE report on proposed wind power project at Narakkuliya held at CCD.
- Scooping committee meeting on proposed wind power project at Erumbukudal – Kalpitiya.
- Scooping committee meeting on proposal to develop a Saltern in Kuchchaweli, Trincomalee at CCD.
- Steering committee meeting on construction of Oluvil port held at CCD.
- The second monitoring meeting of 300MW combined cycle power plant at Kerawalapitiya – west coast power Ltd.
- Steering committee meeting on Colombo Port Expansion Project at Pothupitiya, Wadduwa.
- Initial meeting on proposed recreational complex on an island called "Bellangala Rock" in the mount Lavinia Sea.
- Scooping committee meeting on proposed 600MW expansion to 300 MW Puttalam coal power project – Phase II & III at Chief Secretary's office, Kurunegala.
- Scooping committee meeting on IEE of proposed 50 MW Wind Farm developments Project at Kalpitiya held at CCD.
- A meeting at CCD on proposed 35MW Renewable Energy Hybrid System of solar & wind combination power plant in Jaffna.
- The National Wetland Steering Committee Meeting No.11
- The National Wetland Steering Committee Meeting No.12
- The National Wetland Steering Committee Meeting No.13
- The National Wetland Steering Committee Meeting No.14

Visiting Lectures

A lecture on Disaster Management and Mitigation measures was delivered by Mr. S.A.M. Azmy at a seminar organized by the Sri Lanka Red Cross Society and Disaster Management Centre at Kalutara

A lecture on the impacts of Climate Change on the Fisheries and Coastal Sector was delivered by Mr. S.A.M. Azmy at a seminar on "Mainstreaming Climate Change into the Development Process" organized by the Institute of Policy Studies (IPS).

A presentation on mitigatory measures was conducted by Mr. S.A.M. Azmy was made at the Second National Communication Project at the Ministry of Environment.

Lectures on Fish Biodiversity and Conservation (AFM 06012) and Introduction to Aquaculture Systems and Management (AFM 06013) in Diploma in Aquaculture and Fisheries Management was conducted by Mr. W.D.N Wickramaarachchi at NIFNE.

Workshops

- Workshop on Numbers in Science; The right Way to handle quantitative data, organized by Young Scientists forum and SLASS – Section E2
- Workshop on Technology Needs Assessment for Climate Change at ITI
- Technical workshop on vulnerability and adaptation to climatic change in the water resources sector climate change division of the Ministry of Environment and Natural resources
- Workshop on mitigation of green house gas emotion and carbon trading on 09 January 2009
- Workshop and "shramadana" campaign on coral cleaning at Kapparatota Weligama, August 2009

Scientific Publications/Newspaper Articles & Other

- R. R. A. R. Shirantha, A. A. D. Amarathunga, and K. A. W. S. Weerasekera (August 2009). Assessment of ecological integrity of Kothmale upper-catchment of Sri Lanka through a study on invertebrate community. First National Symposium of Natural Resources Management. Department of Natural Resources, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka (56p)
- Wickramaarachchi, W. D. N., Sureshkumar N., Assessment of water pollution status in Hikkaduwa National Park. Symposium Proceedings of the Water professionals' day in October 01, 2009 (Full paper)
- K. A. W. S. Weerasekera, A. A. D. Amarathunga, N. Sureshkumar, S.A.M. Azmy and R. R. A. R. Shirantha (2009), Comparison of Physico-chemical Parameters of Uma Oya &Badulu Oya Sub Catchments (of the Mahaweli Upper Catchment) with special reference to the water pollution. Sri Lanka Association for Advancement of Science, Proceedings of the 65th Annual Session, Sri Lanka. 834/D, 211pp
- D. Amarathunga and N. Sureshkumar (2009). Comparison of Physico-Chemical Characteristic of the Feeding Tributaries and Nutrient Load bringing to Madu Ganga Lagoon. Sri Lanka Association for Advancement of Science, Proceedings of the 65th Annual Session, Sri Lanka. 426/D, 91pp
- B.R.C Mendis and U.A.D.P Gunawardena, (2009), Preliminary studies on sea grass habitat water quality and estimation of shrimp fishery productivity in the Negombo Lagoon (SLAAS) 451/D.
- B.R.C Mendis, (2009). Anthropogenic disturbance on nursery habitat function and with special reference to pollution in the Negombo Estuary. (SLAAS) 452/D.

Newspaper Articles

- Newspaper article on Kandy Borgambara Lake fish mortality on "Lankadeepa" on 18th November ,2009
- Dr. P.K.M.Wijegoonawardena, Dr.Palitha Kithsiri, K.A.W.Shyamali Weerasekara,and Janaka Pushphakumara

Voice Cuts

- News item on Sirasa T.V. Sinhala news telecast 31st October,2009 at 10.00 p.m and repeated telecast at 12.00 noon on 01st November,2009, regarding causes for fish mortality of Kandy Lake (Borgambara Lake) K.A.W.Shyamali Weerasekara

News item on Sirasa T.V, MTV and Shakthi by Mr. S.A.M.Azmy on Beira Lake Fish Kill

Internal Reports

- Report on investigation of causes for fish kill incident in Nalanda Reservoir (April 2009). K.A.W. Shyamali Weerasekara
- Report on investigation of causes for fish kill incident in Kandy(Borgambara)Lake (May 2009).W.D.N Wickkramaarachchi
- Report on investigation of causes for fish kill incident in LunawaLagoon (July 2009).W.D.N Wickkramaarachchi
- Report on investigation of causes for fish kill incident in Ratgama lagoon, Galle. (September 2009) A. A. D. Amarathunga
- Initial Environmental Examination Report of Three Dimensional Seismic Survey for Oil Exploration in Block SL-2007-01-001 in Gulf Of Mannar-Sri Lanka.(This report was prepared in coordination with other divisions of NARA).
- (October 2009)

Coordinator – S.A.M.Azmy/Head/ESD

- Report on investigation of causes for fish kill incident in Kandy(Borgambara) Lake (October 2009). K.A.W.Shyamali Weerasekara
- Research report on Rate of Iron Release from Ilmenite Containing Beach Sediment: Indigenous Bacterial Community vs a Potential Isolate- 25 October-19 December 2009 W.D.N Wickkramaarachchi
- Research report on International Training on Marine Environmental Conservation Programme in Malaysia from 1st November 2009 to 14th November 2009, funded by Malaysian Government A. A. D. Amarathunga
- The Effect of water quality of Sea grass habitats on commercially important shrimp larvae in the Negombo Lagoon.(M. Sc. Thesis Publication-University of Sri Jayewardenepura University Gangodawila, Nugegoda).

Trainings local & Foreign

Foreign

Technical assistance program of Marine Scientific Research (TAP-MAR) - 25th October 2009 - 19th December 2009 in India.
W.D.N. Wickramaarachchi
International Training on Marine Environmental Conservation Programme in Malaysia from 1st November 2009 to 14th November 2009, funded by Malaysian Government.
A. A. D. Amarathunga

Local

– Training on Introduction to Arc GIS 9.2 ,organized by FAO at mini auditorium NARA

A. A. D. Amarathunga, K. A. W. S. Weerasekera

– Diploma course in English for Professionals conducted by Sri Lanka Institute for Development Administration (SLIDA).

W.D.N. Wickramaarachchi, A. A. D. Amarathunga, K. A. W. S. Weerasekera

5.2 Fishing Technology Division

Head of the Division: Mr. N. B. P. Punyadewa

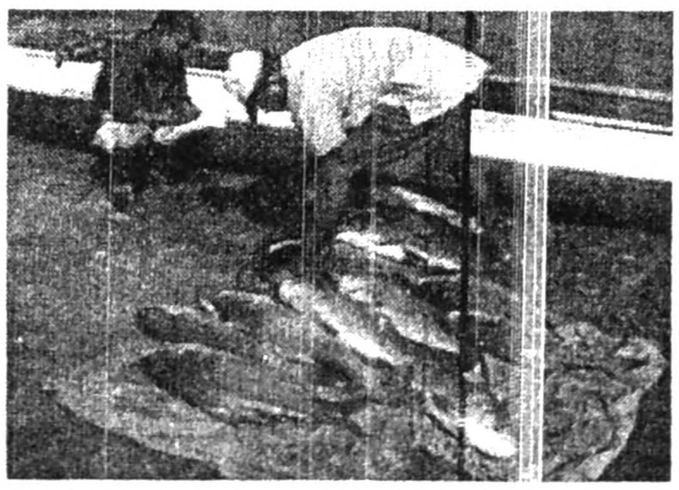
Proposed first project of the Fishing Technology Division was, to develop of an experimental fishing gear to exploit large *Catla catla* fish in Udawalawe reservoir in Sri Lanka. These fish species could be caught only in certain period of the year.

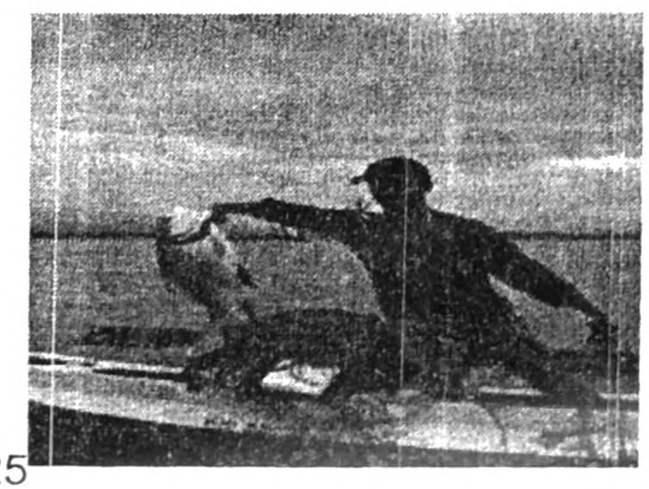
Currently they are using gill nets as main fishing gear. It was observed the existing fishing gears are not suitable for optimum harvest throughout the year and it was observed the harvest is consists with lot of small size Catla fish and catching efficiencies is very low. Therefore, development of new fishing method is advisable to them to sustainable harvest C*atla catla* fish throughout the year.

The second project was an assessment of technological knowledge of fishers on efficient fishing methods and related equipment used in offshore fishing. The coastal resources in the shallow seas off Sri Lanka are overexploited or optimally utilized. Of the few existing options left, the exploitation of offshore fishery resources is the most productive way to increase fish productivity of the island as the coastal states are given exclusive rights to exploit living resources in vast sea area by the recent United Nations jurisdiction. However, lack of expertise, facilities, well-equipped vessels and the financial assistance were found to be the constraints to develop this sector. The existing multi – day boats were of different design frequently without decent storage facilities with a great contribution towards post – harvest losses. Further, the technical knowledge of modern instruments relating to the fishing technology is very poor among the fishers. Therefore, the proposed investigation was conducted to review the technical knowledge of modern instrument and technology among fishers and efficacy and the existing facilities of the multi – day boats used for offshore fishery in the seas off Sri Lanka. The findings from the project can be used for the boat building industry and modernize the boats with more technical instruments and upgrade the knowledge of the fishing community.

Activities undertaken

Construction of experimental fishing gear and testing the vulnerability of these gears were done with the participation of the fishing community. First attempt was making the gill nets accordingly to new hanging ratios. It was practiced with the community participation. The second attempt was testing long line to find suitable bait for C*atla catla*. Catching data of the fishermen collected regularly and it was used to find fluctuations of the catching efficiencies throughout the year. All data collection through experimental fishing trials and sampling of other commercial catches in the reservoir. Data analysis and report writing have being done.





Conducting experiments in the field (Udawalawe Reservoir)

A questionnaire was prepared for the second project and multi-day fishermen were interviewed. Further an assessment was done for the available facilities of the multi – day boats used for resource exploitation in the offshore areas. Review the existing storage facilities and means and ways to reduce the post harvest losses. Assess the technological feasibility of the existing fishing vessels to exploit the offshore fishery resources and evaluate the technological knowledge of the existing fishing vessels crew to exploit the offshore fishery resources.

Programme	Project	Allocation	Officers responsible	Period from	Physical Progress	Financial Progress
Development of New Fishing Techniques.	Development of effective fishing gear to exploit large exotic cyprinids in in and reservoirs of Sri Lanka.	0.525 Million Rs	NBP Punyadeva AASH Athukoorala	2009 January to December		T- 100 % P- 89 %
Make a descriptive report on Technological knowledge of multi-day fishers and their using equipments.	Assessment of technological knowledge of fishers on efficient fishing methods and related equipment	0.30 Million Rs				T- 100 % P- 98 %

Performance

The project activities (experimental fishing) were started in February 2009. Under this project experimental fishing gears were constructed and fishing trials were carried out with community participation. It was observed from the catch composition from the experimental nets that large size of *Catla catla* fish were existed in the reservoir. From the experimental fishing operations it was observed that catching efficiency of the large *Catla catla* fish from the gear was sufficient. The availability of the *Catla catla* fish in the experimental fishing area were changed due to environmental condition of the reservoir in certain periods. Therefore, the catching efficiencies of the experimental gears were poor. Further, bottom set long line was tested to harvest *Catla catla* fish in the reservoir. It was observed form that method suitable bait should be introduced

for long line to attract the *Catla catla* fish. However, it is needed further alterations to the experimental gears and long line to enhance its efficiency.

The second project activities were started in January of 2009. Number of boat skippers and owners were interviewed randomly from the selected fishing harbors around Sri Lanka and detailed questionnaire was filled by the NARA staff. It is found that most of the fishermen are not fully skilled for the modern technology and modern fishing techniques. Further, most of are not aware of nautical charts and navigation rules in the off shore seas. Most of people used to fishing beyond the EEZ of Sri Lanka. They are wasting more fuel and time to reach fishing grounds. However, it is found that form the findings length more than 40 foot multi day boats are not economically benefited form offshore fishing. Further, fishermen were informed that fishers from the other country are fishing in the Sri Lankan premises. It is found that most of the interviewed fishermen's capabilities are poor for handling of modern technical instruments. It is due to lack of experienced and knowledge of the new technology.

Physical Achievement: Cumulative target Cumulative Achievement

Project 1	*Cumulative target	100 %
	* Achievement	90 %
Project 2	* Cumulative target	100 %
	* Achievement	89 %

Financial Achievement:

Project 1	* Financial target	100 %
	* Achievement	90 %
Project 2	* Financial target	100 %
	* Achievement	98 %

Publications

4.1 Research papers: Under preparation
4.2 Research Reports: Under preparation
4.3 Booklets / Leaflets: Under preparation

Training / Awareness programmes conducted

Meetings were arranged with, Fisheries Inspectors and fishermen of in the reservoir. Experimental fishing trails were conducted with fishing community participation. Experiment findings were disseminating among the fishermen.

Constrain

Most field visits were cancelled due to lack of vehicles and experimental fishing trials were not carried out regularly.

5.3 National Hydrographic Division

Head of the Division: M.A. Ariyawansa

Overview of the Year

National Hydrographic Office provides services to assist safe and efficient navigation of ships. The principal service is the provision of nautical information, which includes nautical charts, data for coastal zone management, environmental protection and other related products and services. The provision of accurate and up to date charts offers significant economic and commercial benefits through facilitation of maritime trade and other marine activities.

Under the National Charting Programme for the year 2009 the following surveys were conducted.

Bathymetric survey of Tangalle including the land survey of the relevant coastal stretch
Bathymetric survey of Hambantota including the land survey of the relevant coastal stretch.
Preparation of Tsunami inundation maps Weligama and Colombo Establishment of differential GPS correction system for Sri Lanka.

Activities undertaken

Programme	Project	Officer Responsibl	From	To
1 Bathymetric Survey	Data Acquisition of Hambantota	S.R.C. Ranaweera R.H.P.Weligodapit	Jan.	Dec.
Land Survey	Relevant Land Surveys of Hambantota	C. K. Amarasinghe	Jan.	Dec.
Preparation of Inundation maps Weligama to Colombo	Compilation of relevant bathymetric data & preparation of Inundation maps	Y.M.R.N. Kumari	Jan.	Dec.

Performance

Progress - National Charting Programme

Progress (%) Physical :- 60 Financial:- 60 Initial allo
reduced by the treasury

Project 1.1

Data Acquisition

Progress(%) Physical :- 60 Financial:- 60

Project 2.1

Land Surveys

Progress(%) Physical :- 55 Financial:- 55

(Field work interrupted due to bad sea condition and delayed due to unavailability of funds in time)

Project 3.1
Preparation of Inundation maps Weligama to Colombo

Progress(%) Physical :- 100 Financial:- 100

Project 3.2

Data processing and cartographic work of above surveys

Progress(%) Physical :- 100 Financial:- 95

Project 4.1

Establishment of differential GPS Correction System

Progress(%) Physical :- 70 Financial:- 70

Publications

a). Publishing of Tangalle Nautical Chart

b). Updating and converting Colombo Chart to CARIS GIS

c). Updating and converting Negombo Chart to CARIS GIS

d). Inundation maps - Weligama and Colombo

Training / Awareness programme conducted

Foreign Training

1. Hydrographic Survey Category A (FIG/IHO/ICA) - 01 Officer
2. Coastal Mapping Modelling and risk assessment (Thailand) - 02 Officers
3. Training Programme Tsunami Modelling, Inundation and Remote Sensing (India) - 01 Officer
4. Maritime Safety Information (Oman) – 03 days - 01 Officer
5. Coastal Map IO Workshop on Drafting Project proposal (India) - 01 Officer
6. ENC Training in UKHO (5 weeks) - 01 Officer

Awareness Programme

a). Routine awareness programme in Hydrographic Surveying and Chart Production for Naval Officers and Seamen.

Non Scheduled Activities

DEOCOM Project

a). Preparation of charts for offshore seismic surveys.

b). Preparation of baseline maps.

c). Sedimentary basins and exploration blocks for Ceylon Petroleum Corporation.

5.4 Inland Aquatic Resources Research and Aquaculture Division

Head of the division: Dr.H.M.P.Kithsiri

Inland Aquatic Resources and Aquaculture Division is vested with the responsibility of management and sustainable utilization of inland aquatic resources and the development of environmental assessment and management of inland aquatic habitats in the country.

The key research areas cover inland aquaculture development, conservation of sensitive habitats, shrimp culture, coastal resources management, ornamental fish culture, health management and aquatic plant propagation. Several university students carried out their research dissertation work under the supervision of IARAD officers.

Division also conducts regular training programs on aquaculture especially for ornamental fish farmers and school leavers while providing services such as testing water, soil for proposed farms and testing of water quality and disease identification in order to facilitate the fisheries sector development.

Research finding were also disseminated via prepared leaflets, manuals and booklets and several community-participated projects are being carried out to transfer the technologies developed to the Industry.

IARAD has carried out 10 research projects in 2009 on the following thrust areas.

1. Aquaculture technologies development
2. Shrimp and fish health management
3. Wetland management
4. Inland fisheries management
5. Community participatory aquaculture

Activities undertaken

Programme	Projects	Allocation (Rs. M)	Officers responsible	Period
	5.1 Studies on the prevalence and control of *Monodon baculovirus* (MBV) in *P.monodon* hatcheries in Sri Lanka	1.875	Dr.P.K.M. Wijegoonawardena	2009
	5.2 Shrimp health and environmental monitoring	0.525	A.S.L.E. Corea	2009
	5.3 Investigation of bacterial pathogens in cultured ornamental fish and antimicrobial sensitivity tests for identified bacterial	0.750	P.P.M.Heenatigala	2009

	pathogens.			
	6.1 Assessment of the potential of utilizing abandoned lands in Nilwala basin for economically viable aquatic plant culture	0.150	U.S.P.K. Liyanage	2008-2009
	6.2 Commercial development of Inland Fishery	0.150	Dr.A.D.W.R.Rajapakshe Dr.H.M.P.Kithsiri Mr.U.S.P.K.Liyanage	2008-2010
	6.4 Exploitation of untapped fishery resources in reservoirs through proper management	0.150	D.A. Athukorala, P.A.D. Ajithkumara	(2009-2010
	7,1 Induced Breeding of Snake head (*Channa striata*)	0.225	M.H.S. Ariyaratne	2008-2009
	7.2 Integrated Aquaculture with Milkfish, Shrimp, Mollusks, and their Disease Control and Seaweed culture	0.750	P.A.D Ajith Kumara, K.W.R.R. Amaraweera, R. Weerasinghe and J.S. Jayanatha	Continuous
	7.3 Development of exotic and endemic ornamental fish breeding and aquatic plants propagation techniques.	2.250	Dr.H.M. Palitha Kithsiri Dr.Vasantha Palawattarachchi Dr. (Mrs.) I. Parakrama Ms. R. R. A. R.Shirantha	Continuous
	12.3.1: Hydrodynamic Monitoring in Negombo Lagoon	0.4	M . Gammanpila D.D.G.L. Dahanayake H.B. Jayasiri	Continuous

Studies on the prevalence and control of *Monodon baculovirus* (MBV) in *P.monodon* hatcheries in Sri Lanka

Officer Responsible: Dr.P.K.M.Wijegoonawardane

Objectives, activities carried out and results:

Objectives:

Investigate the prevalence of MBV in different life stages of *P.monodon* including brooders using wet mount observations, histological staining methods and molecular techniques (PCR).

i) To evaluate the accuracy of the wet-mount assay as a rapid diagnostic test in comparison to other methods

ii) To recommend measures to control the infection in shrimp hatcheries

iii) Recommend a suitable diagnostic method for rapid and accurate detection.

Activities carried out:

i) Screening of wild caught brooder (60 numbers) for the presences of MBV using PCR during the period October 2008-December 2009

ii) Screening of post-larval stages (1907 samples) obtained from shrimp hatcheries situated in the North western province for the presences of MBV using PCR, wet-mount assay and histology.

iii) Comparison of these test methods for their detection consistency by applying all test methods for the same sample (30 samples).

iv) As inconsistencies were noted when PCR tests (02) recommended by Office des Epizootics (OIE, 2006) were applied for diagnostics, further clarifications were performed to see whether the PCR primers have any mismatches at the primer sites due to strain variation. This was done through DNA sequencing of the amplified products.

v) A booklet is in preparation of MBV diagnostics.

Results:

i) The prevalence of MBV in *P.monodon* post-larvae varied between 15-65% which is moderate to high

ii) It was 11% in wild caught brooders and 9% in sub-adults. But the sub-adult sample number was quite low and more samples needs to be analyzed to get a broader idea how MBV is prevailing and impacting on the harvest.

iii) The comparisons made with the tests method clearly showed inconsistencies and in some samples the results of the wet mounts were not comparable with the results obtained using PCR methods. Even between the PCR methods the results had discrepancies which warrant investigating which method should be applied when PCR technique is needed to be used.

iv) The OIE, PCR protocols described in the OIE manual (Blecher and Young,1998 and Surachetpong *et al,* 2005) were compared and it was clearly evident that the method described by Blecher and Young,1998 cannot be recommended as a efficient protocol for screening as lots of different results were obtained than expected with some samples.

v) However, sequence analyses have shown that there were very few nucleotide changes at the primer sits when compared to the Sri Lankan isolates sequenced.

vi) It was proved from the results that the protocol developed by Surachetpong *et al,* 2005 is more efficient as a screening protocol than the protocol developed by Blecher and Young, 1998. However, this method is a single step PCR method and screening of samples carrying low vial burden may not be detected with this method due to lower sensitivity compared to a 2-step PCR method. Therefore a recommendation could be brought-up from this study that the Surachetpong *et al,* 2005 method should be developed and improved as a 2-step method and has to be validated for screening purpose for Sri Lanka.

vii) Correlation between MBV prevalence and time of occurrence was not found significant.

Progress:

Physical 85% Financial 95%

Constrains:

i) Some field visits were cancelled due to unavailability of vehicles
ii) Purchasing of Chemicals for DNA extraction and primers was delayed for about 3 months

Shrimp health and environmental monitoring

Officer responsible: A.S.L.E. Corea
The above project was changed in March by the Chairman and the project carried out thereafter was

Impact of stocking and rearing conditions of brood stock and larvae on health and performance of cultured shrimp.

Objectives
Condition of broodstock affect the quality of larvae produced and this in turn results in the disease conditions and mortality in growout ponds Therefore it was decided to follow the cycle from brooders to growout and find the conditions and the stress factors that contribute to disease.
Activities & Results

1. Brood stock collection Water quality of brood stock holding facilities at the level of collectors were monitored. The results indicated high ammonia levels in some holding tanks which causes stress to brooders. The number of brooders stocked in a single tank varied between 6 – 17 and due to space limitation their movements were restricted. This was also identified as a stress factor. Due to a brood stock disease which caused mortality at the hatchery level, brood stock collection and stocking by collectors was stopped and hatcheries obtained brood stocks soon as they were brought to shore.
2. Water quality in hatcheries Water quality in hatcheries were at a acceptable level with respect to the general water quality parameters. However in some hatcheries bacterial quality was poor even after passing through all the filtration systems. Brood stock holding facilities did not show any stress factors and larval quality reports were acceptable . However most hatcheries experienced brood stoke mortality and the hatchery production was limited due to lack of brooders .
3. Grow out facilities Water quality in grow-out facilities changed with the season and the other input conditions of the farms including location, use of probiotics, water management etc. During the mid year period from June to September mass mortalities were recorded in most farms in culture stages between 1.5 – 3 months. Some were confirmed as WSSV infections while others were also thought to have been caused by the same although not checked. The disease spread occurred irrespective of water quality and other environmental and management conditions.

Constraints

Most field visits were cancelled due to lack of vehicles and sampling was not carried out regularly. The results have been based on information from farms and hatcheries and only few samples were collected for analysis due to lack of transport.

Investigation of bacterial pathogens in cultured ornamental fish and antimicrobial sensitivity tests for identified bacterial pathogens. (P. P. M. Heenatigala)

Objectives, activities carried out and results:

Objectives

Objectives

- Identify pathogenic bacterial flora in ornamental fish.
- Identify the seasonal variation and geographical distribution of the bacterial pathogens in fish and most susceptible fish species for the identified pathogens.
- Develop a data base of current usage of chemotherapeutant in ornamental fish.
- Evaluate the efficacy of these drugs.

Activities carried out:

- Questioner was developed to collect the required data from Ornamental fish culturists.
- Field visits were made once in two weeks and disease infected samples were collected from Kalutara, Negombo, Gampaha, Rathnapura, Awissawella and Polonnaruwa areas where the ornamental fish culture is popular in the country.
- On farm analysis for diseases were carried out with the help of microscope to identify the diseases and for the parasitic diseases, treatments were recommended.
- When bacterial diseases were identified, bacteria were isolated and inoculated in the readily prepared Tryptic Soy Agar (TSA) plates under the aseptic conditions and transported to the laboratory for the further identification.
- Pure cultures were obtained from the bacterial cultures isolated in the field.
- Gram staining was done for the pure cultures.
- For the Gram negative rods and Gram positive coccus, various morphological and physiological tests were conducted to identify the bacterial species.
- Bio chemical tests were carried out for further identification.
- Antibacterial sensitivity test were carried out for 12 antibiotics for the identified pathogenicbacteria.

Results:

- 35 farms at different areas in the country were monitored during the study.
- As prophylactic treatments as well as for the treatments for the diseases following chemoteraputents were commonly used by farmers –

  Antibiotics - Tetracycline, Chloramphenicol, Sulfer methisole,

  Other chemicals - Potassium permanganate (Condish), Methylene blue, Copper sulphate, Salt, Triple mix, Neguan

- During on farm analysis,

  Bacterial disease conditions identified were – Dropsy, Columnaris and Septiceamia.

  Parasites identified were – Trochodina, Tetrahymena, Gyrodactylus, Dactylogyrus, Argulus, Odinium.

  Tetrahymena was recorded in the Negombo area only.

- 54 bacteria were isolated from diseased fish and out of them 38 were identified as disease causing bacteria.
- Among them four disease causing bacterial species were identified and those were belongs to genera - *Aeromonas, Columnaris, Pseudomonas* and *Vibrio*.
- *Aeromonas hydrophilla* was found to be the most dominant bacteria and it was 74% of the identified bacteria.
- In the identified bacteria, no seasonal variations or specific geographical distribution was observed with the samples analyzed.
- Antimicrobial sensitivity revealed that most bacteria having multiple antibiotic resistance.

Progress (%): Physical: 98 % Financial: 100%

Constraints:

- Lack of Vehicles.

Assessment of the potential of utilizing abandoned lands in Nilwala basin for economically viable aquatic plant culture

Officer responsible : U.S.P.K. Liyanage

Objectives :This project is targeted to utilize abandoned agricultural lands in the Nilwala basin for the economically valuable, export oriented aquatic plant culture and to introduce a none traditional income source for the affected farmers.

Activities and Results

Three abondoned paddy lands in Malimbada, Palatuwa and Godagama were selected for the culture. The soil samples were tested from the department of agriculture for the pH, conductivity, nutrients, Organic material and the soil type. Considering the Soil condition, Economical importance, Market demand, and the Environmental conditions Four species of ornamental aquatic plants (*Apenogeton natans, Apenogeton crispus, Echinodorus amazonica, Echinodorus cordifolius*) were selected to plant following the Randomized completely block design. The average plot size one m^2 and the plant density 25 cm. Extent of a plotting site is about 100 m^2. Growth of the plant is scheduled to be monitor twice a month (Plant height, Number Tillers).

Table 1. Soil characteristics of the different sites.

Parameter	Site 1	Site 2	Site 3
pH	5.05	3.49	5.15
Conductivity Dsm	3.19	8.01	8.95
Texture	Sandy loam	Sandy Loam	Sandy loam
Available Phosphorus (ppt)	6.46	4.54	8.45
Exchangeable Potassium (ppt	47.89	74.13	58.09
Organic matter (%)	14.27	15.11	9.01

Initially planted in the site 2 & 3. The site 2 (Palatuwa site) was completely unsuccessful due to the Iron toxicity. As a result of Ferrous ions are depositing on the leaves of the plants, they were brown color and after 2 weeks all were died. The site 3 Only Echinodorous species are very successful. Those plants are tolerate to both drought and floods. After four months of field establishment (Four month growth period) *Echinidorous Amazonica* reached to the harvesting stage while *E. cordifolius* followed five months. Significant harvest was not obtained from the

Apenogeton due to the loose condition of the soil. During the flooc period plants floated away from the site.

Table 2. Number of tillers harvested from the extent of m^2

Age	1 month	2 month	3 month	4 month	5 month
E. amazonica	0	0	10	12	22
E. cordifolius	0	0	8	10	16

Constraints ;

Unavailable of vehicles
Floods and droughts
Difficulties in finding the plants

Financial Progress:- Physical Progress : 75%

Commercial development of Inland Aquaculture

Officers Responsible: Dr.A.D.W.R.Rajapakshe, Dr.H.M.P.Kithsiri, Mr.U.S.P.K.Liyanage

Objective: Development of livelihood of the low income community ladies through ornamental fish culture

Introduction

Ayuda, Intercambio Y Desarrollo (AIDA) a Spanish non-profit international organization and National Aquatic Resources Research and Development Agency (NARA)) carry out project on "Community participatory approaches for rural aquaculture development of livelihoods in fishes in Hambantota district Sri Lanka. Under this programme community participatory ornamental fish culture project is carried out at Rekawa, Tangalle.

Activities Carried out:

- Stabilized the Ornamental fish Hatchery in the R.R.C.Rekawa. Hatchery consists of 56 tanks.

Tank size	Number of tank
5' x 8'	20

8'x 8'	20
4'x 4'	16

- Constructed 96 tanks for 24 beneficiaries.
  (8'x8' - 4 tanks and extra space for further development per household.)
- Stocked brood fish in NARA hatchery. Following fish were stocked.

Molly -	Silver Molly
	Black "
	Golden "
	Leopard "
	Marble "
	Black balloon Molly
	Silver balloon Molly
Guppy –	Rainbow
	Green Cobra
	Dragon Head
	Blon tuxedo
	Red Mosaic

- Water quality monitored daily.
- Breeding, fry collecting and rearing.
- Establishment of the Rekawa ornamental fish cultures ladies organization

Results

- Water quality parameters maintained within the acceptable levels.
- By December 300 guppies and 100 Mollies were given to each beneficiaries.
- Two trainings were given to beneficiaries in NARA and Angel Aquarium Lunugamvehera.

Constrains

Difficulties for purchase of brood stock
Lack of vehicle
Lack of disease diagnostic facility.

Progress (%)

Financial	100 %	Physical	90%

Exploitation of untapped fishery resources in reservoirs through proper management

Duration: 2 Years (2009-2010)

Officers Responsible: D.A. Athukorala, P.A.D. Ajithkumara

Objectives

The main objectives of this project are,

1. To study the present status of the fishery of selected reservoirs
2. To quantify the fishery potential of small sized fish species of selected reservoirs
3. To determine the optimum mesh size/s, time and depths to catch small size fish species in reservoirs
4. To make appropriate exploitation strategies to utilize small size fish species in Sri Lankan reservoirs
5. To disseminating the findings to the Ministry of fisheries for policy making

Methodology

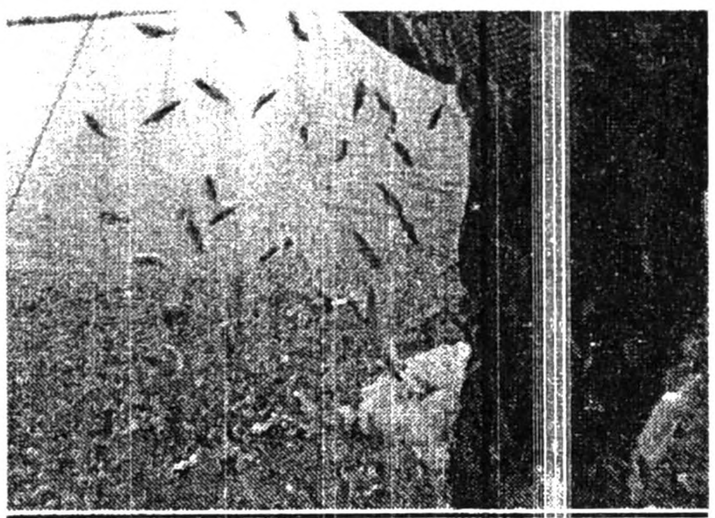
Awareness programmes for fishing communities of following perennial reservoirs in Anuradhapura and Puttalam districts were conducted using participatory rural appraisal and rapid rural appraisal methods.

1. Hurulu Wewa
2. Rajanganaya Wewa
3. Mahawilachchiya Wewa
4. Angamuwa Wewa
5. Thabbowa Wewa

The daily catch data on minor cyprinids was collected by the fishermen who engaged in minor cyprinids in the selected reservoirs. The data sheets were provided to fishermen to record the daily minor cyprinid catches. In addition, monthly field visits were done to collect the data on minor cyprinid fishery and cross check the data recorded by the fishermen.

It was planned to conduct fishing on experimental basis, in selected reservoir, with small mesh gillnets (15 to 37 mm) by permitting selected reliable fishers to catch small indigenous fish species in order to quantify the fishery potential of these small sized fish species. However it was unable to carry out this as requested fishing nets were not received in time.

Collected daily catch data on minor cyprinids were entered into the computer for analysis. Entered data were manipulated to perform the analysis.



Results

This project will be continuing until end of 2010. Next year filed data needed to complete the data analysis. However the results on the fishery potential according to the filed data gathered so far is given in Table 1.

Table 1: Average mean fish catch (kg fisherman^{-1} day^{-1}) and average annual fish catch (kg year^{-1}) of minor cyprinids in selected reservoirs. da = data is entering and analysing

Reservoir	Mean Catch (kg fisherman^{-1} day^{-1})	Fish Catch (kg year^{-1})
Hurulu Wewa	5.8	17400
Rajanganaya	28.3	84900
Mahawilachchiya Wewa	15.2	45600
Angamuwa Wewa	8.2	24600
Thabbowa Wewa	10.4	31200

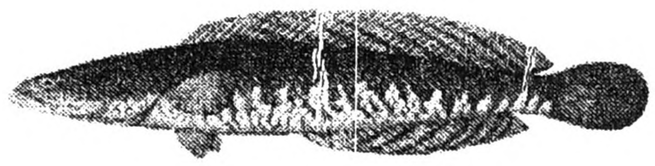
According to the data collected so far it was obvious that the most of the studied reservoirs contain sizable populations of minor cyprinids to withstand a fishery which fisherman can obtain an additional income in addition to the existing cichlid fishery.

Physical progress: 95%

Constraints:

1. Difficulties in obtaining vehicles for field visits at the beginning months of the year
2. Difficulties in obtaining funds for field visits at the beginning months of the year
3. Delaying in purchasing of fishing nets for experimental fishing.

Induced Breeding of Snake head (*Channa striata*)



Snake head (*Channa striata*)

Introduction

Snake head is a carnivorous fish not in use in aquaculture in Sri Lanka. The species is one of the most commonly cultured freshwater fish in Asia (Ling, 1977). The demand for the species is increasing and its market value is high (between Rs.250-300/kg in 2009).As the fish is tasty and nutritious it could be used in pond culture.

Currently there are plenty of abundant mud ponds in North-West province that previously used for prawn farming. These mud ponds could be use in snakehead pond culture. Though the collection of natural seed for the purpose may be an alternative, but it is not sustainable. According to Sahoo (2008) the easy availability of fingerlings are always considered important for successful culture of any fish species. So the seed production in hatchery will be the only alternative for obtaining optimum quantity of seed for the purpose through induced breeding.

Though culture, breeding and larval rearing technology of the major carps has been well established but particularly snakehead have been largely ignored. A review of the literature shows that no attempts have been made so far on captive breeding of this fish in Sri Lanka but some attempts have been made in India and they got successful results. Though the snakehead is carnivore it could be used in the closed aquaculture systems such as pond culture without any harm to the other native and exotic fish that used in Inland fisheries and aquaculture development of the country.

Objectives: Breeding Snakehead (*Channa striata*) using induced agents

Achievements : Successfully bred 4 pairs of fish using Ovaprim as induced agent. The natural environment in mud ponds in cages was provided and sexually matured fish was selected.

Physical progress : 100%

Financial progress :

Integrated Aquaculture with Milkfish, Shrimp, Mollusks, and their Disease Control and Seaweed culture

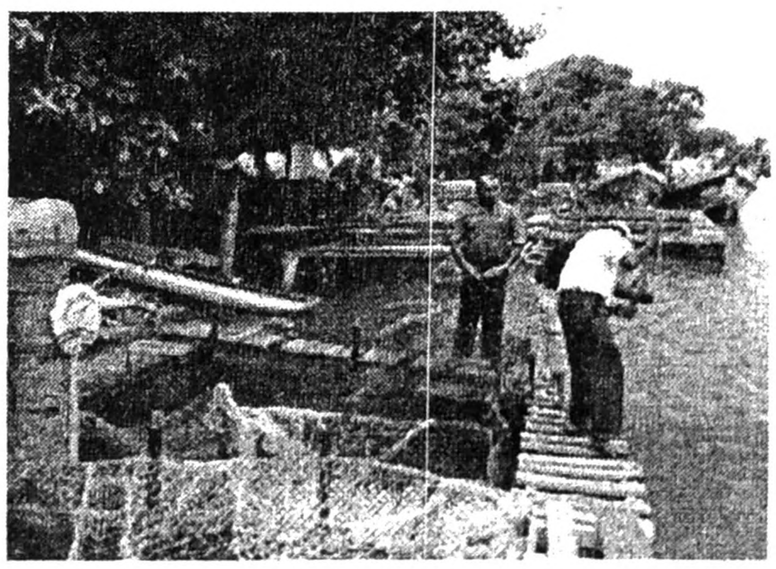
Responsible Officer(s): P.A.D Ajith Kumara, K.W.R.R. Amaraweera, R. Weerasinghe and J.S. Jayanatha

Objectives:

- To identify the potential of milkfish and shrimp integrated farming
- To study the mollusks and seaweed culture as effluent treatment method in pond/hatchery discharge water
- To identify the feasibility of milkfish culture as a tuna bait
- To manage the milkfish and sea bass broodstock
- To study the other marine edible/ornamental organism culture
- To optimal utilization of unused hatchery facilities at NARA regional research center in Kalpitiya

Activities carried out:

Extensive milkfish pond culture Determination of the factors affecting breeding, larval survival and culture of crystal red shrimp (*Caridina* sp) and seahorse (*Hippocampus* sp) Sea bass (*Lates calcarifer*) broodstock conditioning Seaweed nursery maintaining Indoor and outdoor live feed culture.



Results:

Cultured milkfishes attended to tuna bait size (20-24 cm and 80.0±8.0 g) within 110 days. It is

revealed that this extensive pond culture is economically viable to utilize non-conventional wild fishery resources of milkfishes. After completion of this experiment, around 700 advanced fingerlings were stocked in a mud pond which is built so as naturally water exchange with the lagoon with the idea of generating a brood stock.

It was observed that low fecundity rate and high larval mortality rate from the hatching stage of crystal red shrimp. The period of larval rearing extended from 01 day old larvae to 10 day old during the two culture cycle. But all the newly hatched shrimp larvae were dead within 10 days after hatching. Moreover brood stock too collapsed after completion only two month conditioning period. It was observed that mortality rate exceeds 80% from 30-60 days of the fry rearing period in this study.

Eight fishes of sea bass were dead whereas they were in fiber glass tank during the 9th month of the rearing period after transferred from mud ponds. After clinical examine it was found that they were attacked by a crustacean parasite called anchor worm (*Lernaea* sp). After ten month culture period fishes attained 1500.0±350.0 g in weight and none were sexually matured. Three fishes showed growth retardation. Broodstock collapsed at the end of the year.

Progress: Financial 100% Physical 95%

Constraints:

We were advised to deviate from the original research plan due to uncertainty of the station ownership. According to that modification to the hatchery system and pond digging was abandoned for five month. Therefore, the scheduled hatchery work couldn't start. We intensified the renovation work after getting approval to restart the work. But the time that we start work was very critical for the replacement of fishes from the ponds. Because this dry period enhanced stress condition of fishes due to high salinity and high water temperature. As a result of that fishes were get caught to parasite attack and ultimately several brooder fishes were dead. Unavailability of ammonia test kit, pH meter and spectrophotometer also affected to the water quality measurement.

Development of exotic and endemic ornamental fish breeding and aquatic plants propagation techniques

Officers Responsible : Dr. H. M. Palitha Kithsiri, Dr.Vasantha Pahalawattarachchi, Dr. (Mrs.) I. Parakrama, Ms. R. R. A. Ramani Shirantha

Duration : January 2009 to December 2009

Objectives : Development of technology for breeding and culture of high demand exotic and endemic fish species namely, *Puntius cumingii, P. srilankensis, P. matenstyni* and *P. bandula.*

- *In-situ* and *ex-situ* conservation of endemic fishes
- Identification of areas/zones for conservation of endemic fishes
- Assessment of population status and to study the distribution patterns of endemic fishes
- Quality improvement of brood stocks of selected exotic fishes.

ACTIVITES CARRIED OUT:

Present research project was performed through four parallel components;

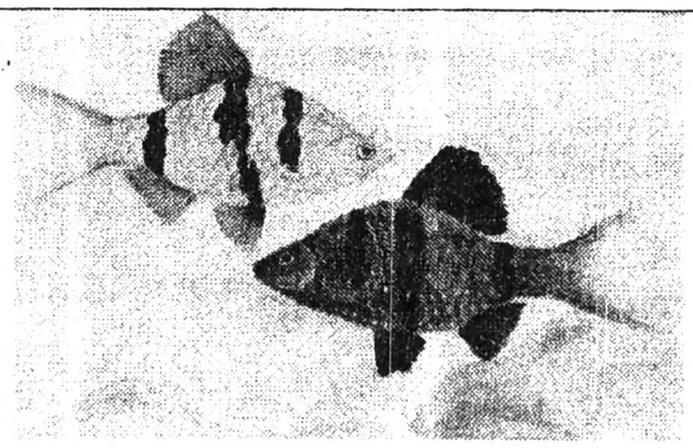
Component 1. Study on habitat preference, distribution pattern and wild population sizes of the selected endemic fishes of Sri Lanka.

From February 2009 Knuckles mountain area of the Mahaweli river basin was surveyed for the endemic fishes and some physical, chemical and biological parameters of their habitats were measured. Approximate population sizes were also estimated and selected individuals were brought to rear as brooders.

Producing a video documentary film, designing the updated poster and writing up the book on endemic fishes of Sri Lanka were also carried out.

Component 2. Development of captive breeding techniques for selected endemic ornamental fishes.

Breeding experiments were done for *Puntius bandula, P. srilankensis, P. martenstyni* and *P. reval* through out the year following the environmental manipulation procedure.



Puntius bandula

Component 3. Develop better culture techniques for selected endemic and exotic ornamental fishes

Experiment 1 . Effect of feeding lipid enriched artificial diets on the growth and survival of Oscar fingerlings. Experiment was conducted over 85 days to study effect of four different treatments of lipid enriched i. e. Olive oil, cod-liver oil and sunflower oil artificial diets cum ox heart (each in three replicates) on the growth and survival of Oscar fingerlings.

Experiment 2: Is feeding brood fishes of *Puntius reval* with astaxanthin enriched diets effective for the enhancement of fry survival

The experiment (in three replicates) was carried out to study fry survival success of *Puntius reval* independently fed with three different lipid enrichments mixed with emulsion of astaxanthin in three different concentrations i.e. 2, 4 and 6 mg per 100 ml emulsion/100 gm of feed, over the two month study period. After feeding treatment they were subjected to breeding trails and their fry were then reared over 45 days.

Experiment 3: Effect of feeding Vitamin E and cod-liver oil enriched artificial feed on the breeding, fecundity and fry survival of high demanded endemic fish *Puntius nigrofasciatus* (bulath hapaya).

More or less similar experiment was carried out to study the fecundity and fry survival of *P. nigrofasciatus* fed with artificial feed that has been independently enriched with Vitamin E and cod-liver oil and their combination. The fry obtained from the experimental brooders were reared for 2 months and their survivals were recorded.

The results of the three experiments of the component 3 were analyzed using the one way ANOVA.

Component 4. Several other minor experiments were also continuously carried out with an objective of developing high quality high demand brood stocks of commercially important exotic fish species

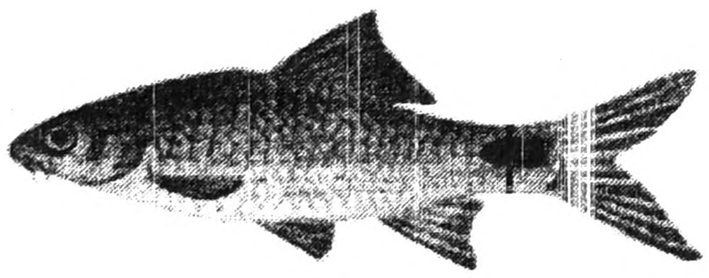
Result

Component 1. Field survey conducted in the Mahaweli ichthyological zone could rediscover the fish species *Labeo lankae* after 30 years from the Knuckle mountain range which has been assumed to gone extinct.

New locality i. e. Loggal Oya/Badulu Oya and interspecies differences was observed in rare fish species *Labeo* *fishery.*

Producing a video documentary film including visual of 39 endemic fish species was completed, writing up a book and deigning a poster on endemic fishes were partially completed.

Component 2. Successful captivity breeding trails were performed for all the targeted fish species including *P. martenstyni* which was the very first record of captivity breeding of the particular fish species in Sri Lanka.



P. martenstyni

Component 3:

Experiment 1: According to the One-Way ANOVA there is no significant different ($P<0.05$) in percentage weight gained, specific growth rate, food conversion ratio and percentage survival of Oscar fingerlings fed with different feed enrichments tested.

Experiment 2: The survival successes of the fry of *P. reval* fed with different feed supplement tested were significantly differ ($P<0.05$). It was highest in the *P. reval* fed with artificial feed enriched in 2 mg astaxanthin while it was the lowest in the *P. reval* fed with feed enriched in 4 mg astaxanthin. However, use of 4-6 mg of astaxanthin in enrichment emulsion is not seems to be having a significant effect on fry survival success and fecundity of *P. reval* since there had been records of very poor fecundity (< 5).

Experiment 3: Effect of feeding Vitamin E and cod-liver oil enriched artificial feed on the breeding, fecundity and fry survival of high demanded endemic fish *Puntius nigrofasciatus* (bulath hapaya).

More or less similar experiment was carried out to study the fecundity and fry survival of *P. nigrofasciatus* fed with artificial feed that has been independently enriched with Vitamin E and cod-liver oil and their combination. The fry obtained from the experimental brooders were reared for 2 months and their survivals were recorded.

The results of the three experiments of the component 3 were analyzed using the one way ANOVA.

Component 4.
Over 20 different verities of different species of livebearers purchased and now rearing as brood stocks.

CUMULATIVE IMPACTS/ISSUES :

Proper field visits can not be made due to vehicle unavailability. Due to insufficient number of fish rearing tanks some experiments will be continued until after the construction of new building.

Environmental Monitoring and Valuation of Mangroves in Negombo Lagoon

Component 12.3.1: Hydrodynamic Monitoring in Negombo Lagoon

Officer responsible : M. Gammanpila D.D.G.L. Dahanayake,H.B. Jayasiri

Objectives:

To study hydrodynamic process and it's impact on diversity, density and seasonal variation of plankton productivity & water quality of Negombo lagoon.

Activities carried out:

Collected regular data on limnological characteristics of six sampling locations in Negombo Lagoon

Evaluavated diversity, density and seasonal variation of zooplankton in Negombo Lagoon

Results:

High level of nutrients, especially phosphate concentration and some pollution indicator species showed that organic pollution in several locations of the lagoon. The results also showed that abundance of plankton was strongly influenced by the water circulation pattern and direct or indirect human impacts that occur in each study site of the estuary. It is pertinent to note that only treated effluents must be discharged into the lagoon.

Progress : Physical : 95% Financial progress – 105%

Constraints: Lack of water quality measurement instruments and laboratory facility Lack of boat operator attach to the station

Valuation of mangrove area, Kadolkele, Negombo for its sustainability & conservation

Officers responsible: D.D.G.L. Dahanayake H.D. Wimalasena and Dr.V.Pahalawatta arachchi

Objectives:

- Assess the biodiversity, direct and indirect uses in Kadolkele mangrove Park & determine the economic value.
- Assess the ecotourism potential of Kadolkelle Mangrove Park and examine the ways and means of marketing ecotourism services.
- Provide necessary information for local authorities and policy makers on sustainable management, utilization & conservation of Kadolkele Mangrove Park.

Activities carried out

Selection of sampling strategies was done based on the available data for valuation.

Questionnaire survey was carried out to determine the potential of eco tourism

development as well as valuing the recreational value of the mangroves. Comprehensive literature survey was carried out to obtain ecological values of the reserve and field survey was carried out in order fulfil the gaps. Data compilation and valuation was carried out mainly based of past references.

Results

The economic valuation of mangrove ecosystems is based on direct and indirect values of the particular eco system. Direct uses are identified as providing mangrove saplings for replanting programs, valuation of non timber forest products fodder/ firewood/ brush parks, housing construction, global and domestic recreation benefits. Non direct values of the reserve accounted for providing breeding ground, erosion control benefits, biodiversity, carbon sequestration benefits, storm protection benefits, pollution treatment benefits. Other possible alternative uses such as conversion of the land into housing constructions can not be overlooked as the reserve is situated in the heart of the city in Negombo and land value is very high compare to other remote mangrove areas. Also the valuing for conversion into aquaculture ponds also included. Monetary value of the indirect uses was accounted for US$ 73898 and the direct uses are accounted for US$ 7129 so that the total monetary value of the mangrove reserve at Kadolkele was estimated as US$81026.6/ year.

Progress : Physical : 95% Financial progress

Constraints: Lack of vehicles for field visits

Special programmes

Ministry of fisheries and aquatic resources (MOFARD) has planned to carry out community participatory aquaculture projects for the development of livelihood for the resettled fisher communities in the Nothern province. NARA has been given a task to carry out community participatory seaweed culture programme in Mannar, Jaffna and Killinochchi districts. Under this programme 250 cages were constructed and handed over to the selected fisher community in the selected districts.

Extension work

Student supervision

i) Mr W.P.H.S.Wicramasinghe (Internship), Wayamba University of Sri Lanka (1st December 2008-31st August 2009)

ii) Miss. C.Shanmuganadhan (Research Project), Wayamba University of Sri Lanka (March- August 2009).

iii) Miss. C.S.C.Liyanage (Hands-on training on PCR technique), July-October 2009).

iv) Miss. C.Shanmuganadhan (Internship), Wayamba University of Sri Lanka (March-August 2009).

v) Miss H.S.C.Gunaratne (Internship), Wayamba University of Sri Lanka (March- August 2009).

vi) Miss Naadhiya (Internship, 2 weeks), Uwa Wellassa University.

Constants and recommendation were made to the Ministry of Environmental and Natural Resources to have effective control on aquatic alien invasive species

Information and specific knowledge on endemic fishes was given to university and school students.

Acquired knowledge on successful breeding, culturing and rearing of the ornamental fishes and massive production of economically profitable live feeds have been transferred to the public through courses/workshops.

Data has been used for working out several issues related to lagoon environment

Workshops , Seminars & Meetings attended

1. Workshop on zonal plan for shrimp culture development in Trincomalee district (3rd March 2009) at NARA.
2. Workshop on Bio-safety verification and risk assessment at National level organized by (SLCARP), 24-26th November, 2009.
3. Attended the 3rd meeting of the SAARC working group on Biotechnology as a member of the national Committee on Biotechnology (4-5th June 2009, Sri Lanka).
4. Stakeholder workshop to formulate research prospects for the year 2009 at NARA on 11th September 2009.
5. Attended a training workshop on "Application of Animal Cell and Tissue Culture at AGBC, University of Peradeniya, 07-11th October 2009.

6. Meeting held for PIs of the FAO/TCP/SLR 3101 on formulation of a National Biotechnology Investment Plan on 23rd April 2009 (Project was submitted and accepted for consideration for funding).
7. NARA represented the National committee on live stock, aquaculture and fisheries under Sri Lanka Council for Agricultural Research Policy
8. Symposium on Alien Invasive species – Organized by the ministry of Environment
9. Annual sessions -- Sri Lanka Association for Fisheries and aquatic Resources
10. Annual sessions -- Institute of Biology
11. Annual sessions -- Sri Lanka Association for Advancement of Science
12. Priorities in Science and Technology taking into account the Human, Natural and Economic Resources of Sri Lanka - Organized by the General Research Committee of SLAAS
13. Science & Technology Development & Post-war Military Resources- Organized by the
14. General Research Committee of SLAAS
15. Workshop on project management and evaluation - Organized by the National young Scientists forum
16. Workshop on numbers in science: The right way to handle quantitative data- Organized by the National young Scientists forum
17. Workshop on weeds Organized by CARP
18. Workshop on development of Best management practices in aquaculture – organized by NAQDA
19. Meeting on Development of standards and treatment methods for aquaculture effluents - NAQDA
20. Aquaculture technical committee meetings - NAQDA
21. Shrimp culture Technical advisory committee meetings – NAQDA
22. Shrimp culture regularization committee meetings – NAQDA
23. Shrimp hatchery grading committee meetings – NAQDA

Eastern province shrimp culture development meetings -NAQDA

Committee member

1. National Committee on livestock, fisheries and aquaculture under CARP

2. National committee on biotechnology (NSF)
3. National committee on biotechnology (SLCARP)
4. Serving as the "Focal point" to OIE.
5. Uthuruvasanthaya livelihood development programme
6. SLAFAR committee members
7. SLAAS General research committee- committee meeting

Lectures delivered

1. For farmers in the industry and for students on disease identification, treatment and also practical classes were also conducted for the same resource persons.
2. Ten days Ornamental fish breeding culture and management training course was conducted in August 2009 at NARA head office.
3. Ornamental fish breeding culture and management training courses (one day, two days) were conducted at Kalpitiya, Dankotuwa, Jaela, Uva-Paranagama, Rekawa and Matara.
4. Delivered lectures and conducted practical classes on "Bacterial, fungal and virus diseases in ornamental fish" and "Ornamental fish diseases" for the training programs on ornamental fish breeding and culture.

    1. Lectures - For 06 programms
    2. No of practical classes - 03

5. Provided information and instructions to the ornamental fish farmers on fish diseases on their request.

6. An awareness programme was conducted on "Sea weed framing and processing" at community center, Kinniar, Trincomalee in eastern province organized by the JICA Ex-training Officers Association. Fifty participants from adjacent fishing communities participated to this two day workshop and got first handling technology of seaweed farming and processing as a cottage industry.

Under the "Uthure Wasanthaya" programme a field visit was carried out to select the suitable sites for development of aquaculture in northern region in the country. Culture of sea bass, seaweed, mollusks and sea cucumber has identified as priority areas in this study. We have been carried out community based livelihood development seaweed project under this programme.

Publications

Wijegoonawardane., P.K.M. (2009). Evidence of a new geographic record of infectious hypodermal and hematopoietic necrosis virus (IHHNV) found in cultured black tiger shrimp *(P.monodon)* from Sri Lanka. Abstract: 15th annual sessions of the Sri Lanka Association for fisheries and aquatic resources 19th June 2009, Sri Lanka, Book of Abstracts pp13.

Wijegoonawardane, P. K.M, Nusra Sittidilokratna, ; N. Petchampai., J.A .Cowley., N.Gudkovs., P. J. Walker (2009). Homologous genetic recombination in the yellow head complex of nidoviruses infecting *Penaeus monodon* shrimp (2009) Virology 390 (1):79-88.

Sittidilokratna, N., C.Chotwiwatthanakun., P.K.M Wijegoonawardane ., S.Unajak., A. Boonnad., W.Wangnai., J. A. Cowley., P.J.Walker (2009). A virulent isolate of yellow head nidovirus contains a deformed envelop glycoprotein gp116. Virology 384 (1):192-200

Chanthrika .S., P.K.M.Wijegoonawardane and Kottearachchi.N.S (2009). Genotypic variation in the white spot syndrome virus (WSSV) circulating in the shrimp farming industry in Sri Lanka. Proceedings of 9th Agriculture Research Symposium 11th-12th August 2009, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka pp274-279.

Distribution of Aquatic weeds and their impact on fisheries in Ampara district – (A.S.L.E.Corea 2009) Regional Symposium on Alien invasive species – Negombo Srilanka

Contributory factors for reduced farm performance during last five years - (A.S.L.E.Corea 2009) Annual sessions – Sri Lanka association for Fisheries and aquatic resources. , Colombo, Srilanka.

Seasonal variations in fish and aquatic plant diversity in the Anavilundawa reservoir – (M.S.S. Jayasekara[1] and A.S.L.E. Corea[2] –2009)- International symposium on forestry and environment. – Colombo, Sri Lanka.

Ornamental fish industry in Sri Lanka ; Present status and limitations.

Full paper -submitted for the NARA Journal ; Volume 4 1.

Study of pathogenic bacterial diversity associated with shrimp larvae in the hatchery system of Sri Lanka and there antibiotic sensitivity.

Full paper – Ready to be submitted.

- Ariyaratne, M.H.S. (2009). Feasibility of rearing of *Labeo rohita* (Hamilton) fry in cages with community participation: A case study. Journal of Sri Lanka journal of Aquatic Sciences, Sri Lanka, pp00-00(in referring)
- Ariyaratne, M.H.S. (2009). Use of low-cost aquafeed in GIFT Tilapia (*Oreochromis niloticus*) food fish culture in cages with community participation (Abstract only). Proceedings of the fifteenth Annual Session of the Sri Lanka Association for Fisheries and Aquatic Resources (SLAFAR), 19th June 2009, Sri Lanka Foundation Institute, Colombo 7, Sri Lanka.
- Ariyaratne, M.H.S. (2009).Potential of an Invasive aquatic plant Duckweed (*Wolffia* spp.) as a fish feed in Tilapia (*Oreochromis niloticus*) fry rearing. Proceedings of the 22nd Asian Pacific Weed Science Conference of Asian-Pacific Weed Science Society, G.C.University, Lahore, Pakistan 08-12 March, 2010. (Full paper has been sent)
- M. Gammanpila, D.D.G.L.Dahanayaka and H.B. Jayasiri (2009). Effects of Limnological characteristics on seasonal abundance and distribution of zooplankton of Negombo Lagoon in Sri Lanka. Proceedings of international conference on "knowledge management for sustainable development" held on December 10-12, 2009 in Katmandu, Nepal.

Reports

1. Site suitability report for the proposed aquaculture practices in the Northern province under Uthuruvasanthaya programme.
2. Fish mortality in Kandy Lake (29.10.2009)
3. Fish mortality in Negombo lagoon (29.10.2009)
4. Fish death (Tilapia) in the lake of National Zoological Gardens (29.04.2009)
5. Quarterly reports to Office des Epizootics (OIE) -04 reports on status of Aquatic Animal Diseases.
6. Services to ornamental and shrimp farming industries on disease outbreaks
7. Contributed as a member of the team in preparing the "National Biotechnology Policy" document for Sri Lanka (NSF).
8. Progress report on the aquaculture component of the project: Development of Commercial Inland Fisheries (RG/2006/TFRD/003)

Books, Booklets, Leaflets and posters

1. Discus mason athikaramu
2. Pokuna hedata, athata mitata coi – carp masun wawamu
3. Coi-carp mathsya wagawa
4. Fighter breeding
5. Endemic fishes prohibited for export
6. Endemic fishes restricted for export
7. Live feed for ornamental fishes

8.Trainings

1. Cage culture training in Thailand (10 days)

Consultancy work carried out:

1. Analyzed disease fish samples and recommended treatments for the disease fish submitted by fish culturists (13 samples)

5.5 Marine Biological Resources Division

Head of the Division: Dr. Sisira Haputhantri

Overview of the year

The Marine Biological Resources Division (MBRD) is responsible for carrying out research towards management, development and conservation of marine living resources. The research projects carried out by MBRD in 2009 included, Management oriented research projects on coastal and offshore fisheries Conservation of coral reefs and threatened marine fauna Genetic studies on marine fisheries.

MBRD is in the process of capacity enhancement of the staff for marine resource surveys and stock assessments since 2008. Few marine resource surveys on selected fisheries resources: lobster, shrimp, beche-de-mer, chank and ornamental fish were also conducted during 2009 in the north-western, southern and the eastern coastal waters of Sri Lanka. These were carried out under the project jointly funded by the Canadian International Development Agency (CIDA) and International Funds for Agriculture Development (IFAD). Food and Agriculture Organization (FAO) technically assists to enhance the capacity of the division to undertake marine resource surveys and stock assessments.

Apart from the above activities, four research projects were carried out by MBRD in 2009 using treasury funds. The division took part in providing recommendations in settlement of resource utilization related disputes too.

Activities undertaken

Project	Allocation	Officer responsible	Period	
	(Million Rs.)		From	To
Monitoring and assessment of coastal fishery resources	1.875	S.S.K. Haputhantri	(Continuous)	
Monitoring and assessment of ffshore fisheries		C. Amarasiri	(Continuous)	
Monitoring of coral reefs using resilience factors	0.300	A. Rajasuriya	2009	
Identification of sea cucumber and jellyfish species present in Sri Lankan waters using molecular genetic techniques	1.125	D. Herath	2009	2010

FAO/IFAD/CIDA/NARA Capacity Enhancement for Marine Resource Surveys and Stock Assessments for Selected Fisheries/Resources in the Coastal Waters of Sri Lanka (CENARA).		C. Amarasiri	2008	2010

Performance

Monitoring and assessment of coastal fishery resources

Fish landing data and the information related to the fishing operations were collected in the coastal fishery at the major fish landing sites in the western, southern and the eastern coasts of Sri Lanka. The Chilaw fisheries district was further selected for an in depth study to investigate the impacts on herring fish stock due to the morning and night fishing operations conduct by small mesh gillnets. Accordingly, biological fish samples taken at the fish landing sites were analysed to study the reproductive biology of herrings. The percentage contribution of herrings to the total catch was found to be considerably higher in the morning landings than the night landings. Gillnets having the mesh sizes relatively smaller (less than 1") are widely used for morning fishing operations and this is significantly caused for catching under size immature herrings. On the other hand, spawning herrings are mostly targeted in the fishing operations conducted during the night. More than 50% of matured fish were recorded in the night catches during the period from April to July and this was almost 100% in April. The study further revealed that the adverse impacts on the herring fish stock are more likely due to the morning fishing operations conducted by gillnets of mesh sizes below 1" than the night fishing operations conduct during the spawning season by small mesh gillnets.

Progress (%): Physical: 95% Financial: 75%

Monitoring and assessment of offshore fisheries

This is an ongoing project and the main objective of the project is producing the national statistics and studying the stock status of offshore large pelagic fishery resources. The catch and effort data collection programme is carried out at the major fishery harbours with the help of field samplers. Based on the data, 2009 production was estimated at 101,785 tons. It was observed that the trip duration of multiday boats is becoming short when compared with the same estimated for the previous years. Skipjack tuna was the main target species and it

accounted for 51,608 tons. Further, both yellowfin tuna and skipjack tuna production was little higher when compared with the previous year. Around 79% of the offshore catch comprises of tuna species out of which skipjack tuna represents 51% followed by yellowfin tuna (23%). Normally peak production of skipjack tuna is during the Southwest monsoon period (May to August) but, a change in this pattern was observed during this year. This may be associated with the change of monsoon pattern. Small tuna varieties and small sizes of skipjack and yellowfin tuna were dominated in the catches specially in the Southern coast and this may be due to the frequent use of ring nets. The longline is becoming popular among the fishers resident in the West, North West and East coast of Sri Lanka.

Progress (%): Physical: 95% Financial: 75%

Monitoring of coral reefs using resilience factors

The primary resilience factors monitored were the status of corals in terms of bleaching and evidence of diseases and percentage of live corals. Reef surveys were carried out in Hikkaduwa National Park, Bar Reef Marine Sanctuary, Pigeon Island National Park, Kathiraveli, Kayankeni, Kathankudi, Kalawanchikudi and Kalmunai. Results of the surveys indicated that the highest stress factors were present in the east coast where coral bleaching and diseases affecting species in the family Poritidae was present. In the Hikkaduwa National Park there was bleaching and diseases affecting the family of Faviidae more than other corals. The percentage of live corals was highest in the Bar Reef Marine Sanctuary in the Puttalam District and in Kayankeni in the Batticoloa District.

Progress (%): Physical: 90% Financial: 75%

Identification of Sea cucumber and Jellyfish species present in Sri Lankan waters using molecular genetics techniques

There are no records available on the species or the biology of jellyfish found in and around Sri Lankan waters. Therefore, it had become an urgent need to collect information on the jellyfish of Sri Lanka. Furthermore, the government of Sri Lanka was concerned with the species of jellyfish exported in bulk from Sri Lankan waters and the effects of this on the biodiversity and beach activities of the coastal areas. Following this concern, a study was proposed to identify the presently exported jellyfish species commonly referred as the "mushroom jelly" to provide the information to the relevant authorities.

There are 24 identified species and 4 unidentified species of Sea cucumber occurring in Sri Lankan waters. Sea cucumbers are very difficult to distinguish using morphological features only. Therefore, to establish a method that could be used for the identification of species of sea cucumber using a molecular method was carried out under this study.

Jellyfish samples were collected from Modara, Negombo, Chilaw, Kalpitiya, Beruwela, Galle, Kalmunai and Batticaloa. The mitochondrial COI region of the extracted DNA was PCR amplified and sequenced. These sequences were used to identify the species using The GenBank database of The National Center for Biotechnology Information (NCBI). The commercially exported species of jellyfish caught from Kalmunai (Mushroom jelly) was identified as belonging to the species *Crambionella*. A large mushy purplish coloured jellyfish collected from Negombo, commonly known as 'Eth hori' was identified as *Cyanea capillata*. A similar specimen with spots was collected from Modara. A species of jellyfish collected from Pambala (Chilaw) which possessed a rigid bell, 8 arms and had spots on it's bell was identified by sequence comparison as belonging to the species *Acromitus*. Similar specimens collected from Kepungoda were also identified as belonging to the same species by sequencing. The size and the pattern of the spots of these different individual specimens varied but the remaining features were identical. Other jellyfish specimens collected during 2009 but which have not yet been sequenced include, cuboid jellyfish collected from Modara and Uswetakkeyyawa, Sea nettle collected from Wattala and Galle, moon jelly collected from Beruwela. Several unidentified jellyfish were collected from Kalpitiya, Pambala and Batticaloa.

Sea Cucumber specimens were collected from Kirinda, Kalpitiya and Batticaloa. The DNA of these specimens was extracted and the mitochondrial COI region was amplified using PCR primers. The sequencing of these PCR products will be done in 2010.

Progress (%): Physical: 95% Financial: 54%

FAO/IFAD/CIDA/NARA Capacity Enhancement for Marine Resource Surveys and Stock Assessments for Selected Fisheries/Resources in the Coastal Waters of Sri Lanka (CENARA)

This project is jointly funded by the Canadian International Development Agency (CIDA) and International Funds for Agriculture Development (IFAD). Food and Agriculture Organization (FAO) technically assists to enhance the capacity of NARA for undertaking marine resource surveys and stock assessment in respect of selected fish resources: Chank, sea cucumber,

lobster, marine ornamental fish and shrimp in the coastal waters of Sri Lanka. The project started in 2008 and the duration of the project is three years.

The second phase of the sea cucumber and chank survey in the East coast of Sri Lanka was conducted from July to August, 2009. The survey results indicate that almost all the diurnal stocks show signs of over exploitation, i.e. low volume of high value species, declining CPUE and shifting of shallow fishing grounds to deeper areas. Further, it was observed that many of commercially important species have been overexploited or some have totally disappeared from the habitats and that some species which were not of value in the past have now become important and dominant in the catch. However, the stocks of nocturnal species (*Thelenota anax* and *Stichopus chloronotus*) are in a satisfactory level but it is necessary to introduce management measures especially controlling the fishing effort and imposing a minimum harvestable size in order to ensure their sustainable utilization. The catch and effort data collection programme of sea cucumber was carried out in the North West coast during the fishing season. Based on the resource survey conducted in the last year in the North West coast, a management area was demarcated and at present a management plan is being prepared in collaboration with the government officials and other stakeholders. It is attempted to introduce the co-management concept for this management area. A comprehensive investigation on the possibility of introducing new management measures, in particular, banning of night diving for a particular period of the year and also controlling the fishing effort is being undertaken at present.

Marine aquarium fish resources were assessed from Unawatuna (Galle District) to Polhena (Matara District), Kathiraveli to Kalmunai in the Districts of Batticoloa and Ampara and in the Bar Reef Marine Sanctuary. Data were collected on the abundance of marine aquarium fish, benthic organisms and substrate cover. The results of this survey will be used to manage the marine aquarium fish industry in the coastal waters within the study areas. Several meetings have already been conducted to establish Fisheries Management Committees in the study areas. A reef cleaning programme in Kapparatota / Weligama to improve the status of the reef habitat was also conducted.

Two shrimp trawl surveys were conducted using commercial trawl nets in October 2008 and January 2009 in the North West Coast. In addition, a catch and effort data (fishery dependent data) collection programme was carried out throughout the year 2009. As per the two surveys conducted in October 2008 and January 2009, the estimated total shrimp biomass was 2.29 t

and 1.33 t respectively. For biomass estimations, 100 % trawl net efficiency was assumed. The estimated catch per month ranged from 2.30 t in January 2009 to 5.20 t in March 2009. The results of the study are being used to formulate a community based co-management plan for sustainable management of shrimp resources.

Progress (%): Physical: % Financial: %

Other activities undertaken

- Industrial training in Aquatic Biotechnology, Fish Biology and Population Dynamics was provided to 3 final year undergraduate students from the University of Kelaniya for 6 weeks.
- MBRD has made a valuable contribution to the ongoing potential fishing zone forecasting project of NARA by collecting and analysing offshore fisheries data.
- MBRD guided a number of A/L students to carry out projects in the fields of marine fisheries and fish biology.
- Provided exhibits and specimens for various educational exhibitions.
- Identified and established a method for the identification of the species of fish in canned fish samples (for the Sri Lanka Standards Institute).
- In preparation of the profile on environmental degradation, resource management issues and options for their solution for Negombo lagoon (under the financial assistance of the SAREC), a reasonable contribution was made by MBRD in preparation of the chapter on fisheries and livelihood.
- A desk-top EIA study was carried out by NARA before commencement of the seismic survey for hydrocarbon exploration in the offshore block (SL-2007-01-001) situated off the Puttalam Peninsula - Gulf of Mannar. A reasonable contribution was made by MBRD to assess the impact of the seismic survey on marine fish, crustaceans and sea turtles.
- The General Sir John Kotelawala Defence University, Sri Lanka appointed Head/MBRD as the examiner to evaluate the MSc project report of Commodore J.J. Ranasinghe who followed a MSc (defence studies) degree in Management. Head/MBRD also acted as a member of the thesis defence committee.
- Assisted the National Aquaculture Development Authority in conducting in-situ experimental culture of live rock in the reef lagoon at Kapparatota.

– Collected and identified coral specimens for the coral display at the National Maritime Museum in Galle.

– Played a key role in preparation of guidelines for marine mammal watching.

– Prepared a logbook to obtain data on the for marine mammal watching

– Played a key role in the process of declaring the Gulf of Mannar as a Man and Biosphere Reserve.

– The coral reference collection was updated with additional specimens.

– Organised a seminar on fish biology and marine fish for the A/L students at the " Dayata kirula" – 2009 programme held in BMICH, Colombo.

– Conducted a rapid study on the probable impact to the fishing industry due to the proposed project of implementation of waste water disposal system for Ratmalana/ Moratuwa industrial & residential areas. This was conducted as per a request made by the National Water Supply and Drainage Board.

– Conducted a rapid assessment on beach seine fishery in the Chilaw, Negombo, Kalutara and Tangalle AD Divisions for recommending to the Department of Fisheries to issue new operating licences for beach seines. This was conducted as per a request made by the Department of Fisheries.

– Conducted a rapid craft survey on offshore / deep sea fishing vessels.

Publications

Research papers

– Haputhantri, S.S.K., J. Moreau and S. Lek, 2009. Exploring gillnet catch efficiency of sardines in the coastal waters of Sri Lanka by means of three statistical techniques: a comparison of linear and non-linear modelling techniques. Journal of Applied Statistics 36: 167 - 179.

– K. A.T. Dananjanie, M.D.S.T. de Cross and D.C.T. Dissanayake, 2009. Gillnet selectivity and food and feeding habits of *Sphyraena obtusata* and *Sphyraena jello* in the coastal waters off Negombo, Sri Lanka. Journal of the National Aquatic Resources Research and Development Agency of Sri Lanka 39: In press.

Reports

– Herath D.R., Ranmadugala D.N.A. and Dissanayake D.C.T., 2000. Report on the progress of Jellyfish research carried out at NARA. Report submitted to the Ministry of Fisheries and Aquatic Resources.

- Herath D.R. and Ranmadugala D.N.A., 2009. Report on the identification of a shark sample. Report submitted to the Ministry of Fisheries and Aquatic Resources.
- Dissanayake D.C.T. and Atukorala, A.A.S.H., 2009. Status and Management of Sea Cucumber fishery in Sri Lanka. Project Report (draft) submitted to the FAO/CIDA/IFAD project.
- Haputhantri, S.S.K. and H.D. Wimalasena, 2009. Fisheries and livelihood. In Arulananthan, K., Amarasiri C., Sureshkumar N. and Haputantri K. (eds.). Negombo Lagoon: A report on status of environment, resource, exploitation and management options. NARA & SIDA. Sri Lanka. In press.

Other publications

- Ranmadugala D.N.A. and Herath D.R. Identification of Jellyfish being exported from Sri Lanka. NARA Puwath, Vol 1 No.s 2-3, 2009.
- Ranmadugala D.N.A. and Herath D.R. Marine Turtle Conservation (Poster).

Trainings/workshops attended

- APFIC (Asia Pacific Fisheries Commission) and FAO (Food and Agriculture Oganization) regional consultative workshop on "Practical implementation of the Ecosystem Approach to Fisheries and Aquaculture in the APFIC region" held on 18-22 May 2009, Colombo, Sri Lanka.
- BOBLME (Bay of Bengal Large Marine Ecosystem) Project inception workshop held in Bangkok, Thailand on 3rd – 5th November, 2009.
- Workshop on the assessment of the state of fishery resources in the South and Southeast region held in Bangkok, Thailand on 5th – 9th October, 2009.
- Seminar on transboundary coastal and marine protected areas with special priorities for spawning grounds held in Karachi, Pakistan on 27th – 28th May, 2009.
- Seminar on Biotechnology and Genetically Modified Food. 20th February 2009. The United States Embassy.
- Workshop on Best practices for safe use and management of Agricultural Biotechnology: Experiences from USA and South Asia. 17th March 2009, Sri Lanka Council for Agricultural Research Policy (CARP) & Michigan State University, USA.

- Training programme on economics and trade related issues in Biotechnology in Sri Lanka. 21st April 2009, Sri Lanka Council for Agricultural Research Policy (CARP) & United Nations Food and Agriculture Organization in Sri Lanka (UNFAO-SL).
- Training workshop on Bioinformatics - 19th to 21st September 2009 European Molecular Biology Network (EMBnet) and Institute of Biochemistry, Molecular Biology and Biotechnology, University of Colombo.
- Workshop on Animal Cell and Tissue Culture. 17th to 21st October 2009. Agricultural Biotechnology center, University of Peradeniya.
- Workshop on Bio-safety: Status verification and risk assessment at national level. 24th to 26th November 2009, Sri Lanka Council for Agricultural Research Policy (CARP), Ministry of Environment and Natural Resources, Postgraduate Institute of Agriculture (PGIA) and National Science Foundation (NSF).
- Seminar on stategies for the development of inland fisheries and aquaculture in Sri Lanka organised by Sri Lanka Council for Agricultural Research Policy (CARP) held at NARA on 5th June 2009.
- Postgraduate trainning in Marine Biology and Population Dynamics for six months at the University of Iceland, Iceland.

5.6 Oceanography Division

Head of the Division: Dr .T .K. D. Tennakoon

Development of Satellite based fishery forecasting system for Sri-Lanka

The Oceanography division of NARA has been strengthened its capacity for the development of satellite based fishery forecasting system. Satellites and other oceanographic data were processed, analyzed and used to generate weekly fish forecast based on oceanographic parameters. The forecast enabled to minimize their search time, optimized the catch per unit of effort (CPUE) and quality fish landings thereby promoting offshore fishery sector in Sri Lanka. Weekly tuna fish abundance forecast send to vessel owners and skippers through E-mail, fax and on telephone requests. The forecasts were directly sent to the vessels at sea via SSB radio during every Monday between 1100 – 1200 hrs

As the Sri Lanka longline fishery stretches over a large ocean extent, the spatial variability of forecasting parameters is significant. Yellowfin tuna is considered to be thermocline associated (Francis 2002) and the highest correlation is found in the temperature ranges between 18-26°C. Thermocline variability in space and time is essential to adopt into the forecasting system. Fishing depth of yellowfin in the northeast is shallow 50-75 m in NE while it is 80-120 m in the south which is comparatively deep. The weight of yellowfin tuna in the northwest (~20-30 kg) is nearly half compared to the northeast. Yellowfin tunas are believed to be two stocks (T.Nishida 1992) in northwest and the northeast. Therefore fishing area is divided in to 3 namely northwest (NW), northeast (NE) and south (S) for further analyses of fishery and environmental data. Favorable oceanographic parameters will be adopted to improve the existing fishery forecasting system. As new parameter thermocline depth information also included into the forecast in order to determine the longline hooking depth in fishing operations.

Parameter	**Northwest**	**Northeast**	**South**
Sea surface temperature (°C)	28.0-29.5	28.25-30.0	28.5-29.5
Sea surface chlorophyll (mg m^{-3})	0.2-0.4	0.1-0.2	0.15-0.25
Sea surface height (cm)	195-205	205-215	195-210

Positioned fishery data collection was continued with the distribution of fishery logbooks (Fishing Diary) to the tuna longline/Gillnet vessels. Fishery data entry and uploading into the fishery database "Tuna Base" was completed. Argo floats data from 2006 to 2009 was processed

for vertical temperature and salinity profiles. The profiles are stored systematically in a database "Argo Base".

Awareness programs were conducted for multi-day vessel owners and skippers on "New technologies for off-shore fishery sector in Sri Lanka". Five awareness programs were successfully completed in Negombo, Beruwala, Galle, Matara and Hambantota in year 2009. The financial support was given by Sri Lanka Board of Investment (BOI) as NARA proposal.

Operation of Ocean Observation Centre

Ocean Observation Centre has been monitoring and gathering real time and near real time ocean physical environmental data around Sri Lanka waters from reliable sources since 2007. Data are analyzed and synthesized to generate new information, and information products are being designed to meet the needs of scientific community. Main goal is to implement an end-to-end system with the capability to detect, model, and ultimately forecast changes in the ocean conditions around Sri Lanka waters. The data, which are intended for use in oceanographic and other interdisciplinary scientific research, is freely available in OOC database.

With respect to ocean based disasters, the centre collaborates with the Ministry of Fisheries and Aquatic Resources (MFAR), Disaster Management Centre, (DMC) and the Department of Meteorology to provide the necessary technical information and guidance for early warning and mitigation of impacts from natural ocean disasters. Centre is also maintaining a physical ocean environmental database for future needs.

Global climate change has become a worldwide concern. Ocean observations and researches are therefore becoming increasingly important to forecast abnormal weather and climate variability to prevent properties and human lives. Thus, Ocean Observation Centre (OOC), needs to be further strengthened its technical capabilities and man power.

The following activities were conducted;

- Developed a data downloading panel for enhance daily OOC activities and display
- Developed a website to display real time and near real time Oceanographic and ocean weather
- Submission of weekly tide tables to relevant authorities including MFAR
- Supply of tide tables and prediction to Ceylon Fisheries Harbor Cooperation for harbor maintenance and development.

- Tsunami simulation exercise is conducted on 14th October 2009 in association with Disaster Management Centre
- Public awareness programmes
- Online ocean observation status and predictions on line display to DMC, Jayawardhanapura University and Deyata Kirula in association with scientific exhibition.
- Training workshop on Ocean based disasters to the official of Kalutra DMC and Red Cross Society
- Awareness programs for school and university students, NAVY officials
- The two underwater earthquakes were recorded during the year 2009, which had potential tsunamis. One earthquake was occurred on 11th Aug. at Andaman Nichobar with a magnitude 7.6 and other one was on 21st September at Java –Indonesia with a magnitude of 7.0. Necessary actions were taken to mitigate the above mentioned incidents.

Coastal sea Level monitoring and Modeling

The sea level is associated with many kinds of motions in the sea caused by astronomical forcing, meteorological and hydrological forcing. Not only does the sea surface respond to short-term diurnal, seasonal and inter-annual changes, but it also responds to changes in freshwater inflow, heat flux and other factors that are linked to climate change processes. Short-term and long-term sea level studies are extremely important for sustainable management of coastal environmental and essential mitigation measures. Particularly real time sea level data are vital for monitoring of high frequency oscillations cause by tsunamis and storm surges etc. Thus real time data are crucial for guidance of ocean based disaster early warning and mitigation activities. Sea level variation also has much practical application for the both operational and engineering designing of coastal constructions.

During past two decades NARA has been collected sea level data at different parts along the Sri Lanka coast using portable type tide gauges. Three permanent real time sea level monitoring stations at Colombo (2004), Trincomalee (2005) and Kirinda (2006) have been established in collaboration with international agencies. These three stations are part of Indian Ocean Tsunami Early Warning System (IOTWS) and Global Sea Level Observing System (GLOSS). Sea level data collected at different parts along the coast have been analyzed to examine the seiches, tides, seasonal cycle and trend around Sri Lanka Waters.

During year 2009, Sea level monitoring programme had been continued in order to obtain real time data for early warning and mitigation of ocean based disasters. In addition, long term sea level data was used for estimating long term sea level changes (trends). In addition to maintain of existing sea level stations, two real time sea level monitoring stations have been established to cover the southern and northern part of Sri Lanka. Results from the study have been published in peer review international journals.

Development of oceanographic data base

The available oceanographic data from 1982 has been collected into one database under the several categories (Bathymetry, biological, chemical, physical, satellite, geological and coastal oceanography, LiDAR, research papers and manuals). The data collected under the above categories were stored in a computer and data base will be created in future, with proper mechanism to access for the researchers.

Development of storm surge model

Sri Lanka is an island located in the northern part of the Indian Ocean and has potentially favourable conditions for surges and other high frequency ocean waves generated by both atmospheric disturbances and internal waves, due to its location, continental shelf geometry and slope bathymetry, and meteorological and hydrographic conditions. In this study, Princeton Ocean Model has been be applied to cover the Sri Lankan Waters to simulate hydrodynamic, temporal behavior, hydrography and to forecast storm and other high frequency oscillations. The model has 330 x 260 grid cells in the horizontal and grid resolution is about 15 km with 16 sigma vertical levels. One of the significant properties of this model is that all basic topographic features are resolved. The necessary data for the model forcing such as wind and wind curl, heat fluxes, surface temperature, initial and bathymetry have been obtained from various reliable sources. Initial model runs were made with limited forcing and compared with near real time hydrographic and oceanographic observations from various sources. . However, sufficient time period is required to establish an operational storm surge model and also high capacity computer facilities are required to run the model in near real time basis for forecasting of oceanographic conditions and storm/surge conditions.

Other key factor is that the accuracy of input data to the model, particularly bathymetry and regional wind data are scarce, thus available data from various reliable sources are need to be collected. The completion of this activity could take several months or year. In addition to modeling automatic marine meteorological stations are needed to obtain real time data for model validation and early warning.

Monitoring of ocean status on the Coastal ecosystems of Sri Lanka

Ocean is a very complex system and all its processes govern by physical, chemical and biological properties. Coastal fishery is major component of the economy of the country and strongly linked with oceanographic processes and parameters. The scope of this project is to monitor the ocean status in respect to productivity, ocean pollution, algal blooms. Also, it will assist to understand the fish abundance in certain time and area. Therefore, interdisciplinary study was carried out off Tangalle, in Hambantota. Field visits were carried out off Tangalle 2009. Data collection and sampling were performed at 7 locations off Tangalle using 15 feet fibre glass boat with OBM. Sampling was not carried out during the rough sea conditions. Samples were collected and analysed for phytoplankton, zooplankton, chlorophyll. Also, Salinity, temperature and chlorophyll profiles were made using CTD profiler to understand the vertical variation. Vertical profiles show that maximum chlorophyll levels are recorded at the depth range of 30-50 m. Its indicated that higher phytoplankton density disperse within the depth range of 30-50 m. Thus fish may aggregate to this depth range for feeding. Also, yellowfin tuna prefer to spend most of their time just above the thermocline which is 100 m off Tangalle.

Evaluation of impact of climate changes and anthropogenic activities on coastal ecosystems

Periya Kalapu in Ampara was studied to evaluate the impact of climate change and anthropogenic activities. This is an estuary which is exposed to excessive sediment supply that is a typical feature of bar built shallow estuaries in tropics. The estuary is connected to the sea in two months via two mouths, located at the northern and southern ends of the estuary. However both mouths remained closed by sand bars in other months, resulting no direct water exchange between the estuary and the sea.

This was once a high productive brackish water body, yielding substantial fish production, especially for shell fish. The dynamic and sensitive ecosystem has received the full brunt of the 26 December 2004 Tsunami, resulting in the ecological changes. The continuous flows of

excessive freshwater from several drainage inlets, transformed the lagoon into a freshwater lake except for the intermittent opening of the mouth either by naturally of by anthropogenically during the North East monsoon period. So the ecosystem seems to be predominantly a freshwater lake except for a short period of time.

This remains as major impediment to quantify the changes of this ecosystem due to the climate change, extreme events or anthropogenic interventions.

Establishing nutrient dynamics and their impact on the microbial biomass in coastal water bodies

The major objectives of the study were to identify pollution status of the coastal water bodies and formulate relationship between the nutrient dynamics and the microbial population. Those data/information was necessary to address issues/problems in the sustainable development & management of coastal resources, and conservation. The Puttalam Lagoon is selected as a study area, as it has only limited data gaps to fill. Sampling is conducted at once a month at seventeen sampling locations situated within and associated waters of lagoon. The study reveals that high nutrient load during the Northeast monsoon showed the high abundance of phytoplankton and zooplankton population. Zooplankton abundance of the lagoon varied from 60-175 indivi./l dominating Nauplii larvae and calanoid copepods which are accounted for 32-56% and 34-52% in respect to monsoon periods. Chlorophyll-*content* indicated that the lagoon is in mesotrophic state with a range of 2.4-9.4 µg/l. However, high chlorophyll-levels were observed during the period of southwest monsoon. Study also concluded a significant seasonality of bio-physical characteristics in relation to flushing characteristics and meteorological forcing in the Puttalam Lagoon.

Monitoring of shoreline changes

Shore line changes are a one of the critical problems facing Sri-Lanka as an Island state. According to the literature, around 80% of coastline of Sri Lanka is under erosion while the balance (20 %) is facing to the acceptation process.

The monitoring program on shoreline changes along the coastal belt was started in year 2008. But the study was completed only Kottegoda-Kalametiya coastal belt due to financial constraint though it was proposed to monitor from Matara to Patanangala

Results are under processing at present. In addition to the field work, obtained two Satellite images in 112 km length Southern coastal belt from Mirissa to Amablanthota from of Indian National center for ocean Information Services (INCOIS) to find out how coastline has been changed along the time period of 2001 - 2006. Both data taken from field and satellite images are required another year to compare /interpret a firm decision.

Assessment of placer mineral deposits in eastern province- Frame survey of Kalmunei to Sangamankanda

Since, land based resources are limited and prone to end up due to the over exploitation, the attention on ocean based resources was highlighted for fulfilling the future demand. Thus, the coastal line, (1740km^2) with numerous mineral resources was aimed to assess for future use.
The current research was mainly focused on sand and heavy mineral sand resources along the Kalmunai area and 125 of grab samples were collected on beach and near shore area with 1km interval systematic grid system.
Sieve analysis was done for 76 samples and quality checks were done for sand extraction. Almost 65 percent of the analyzed samples were good in quality for sand exploitation for engineering constructions. The primary analyses of sediments for heavy mineralcscwas shown that 1-10% variation of heaviness were in surface sediments. However, geophysical explorations, especially seismic sub-bottom survey is needed to be carried out for estimation of total volume of the deposit.

Assessment of Physicochemical parameters, heavy metals and impact of climate change in sensitive habitats-Bar Reef Marine Sanctuary

The study was carried out for the period of 10 months at four locations of Puttalam lagoon and six locations of Bar Reef habitat. The main objectives were to build up of coherent data/information to assess the impacts of climate change and quantification of the anthropogenic impacts on the sensitive habitats. Twelve parameters of bio-physical and chemical properties were successfully analysed during the study period. Nutrients were at desirable level. Although physical damages to the reef by destructive fishing methods could be seen, anthropogenic impacts on water quality of the Bar Reef area was seem to be very low. Temperature seems to be the most striking parameter which affects the reef healthiness and it was varied between 26.8 to 32.3 °C. Six silt traps were also installed in the reef bed at two occasions to study the sediments types which settled on the reef bed. High sedimentation rate

can be seen during the south west monsoon period. Heavy metal analysis could not be carried out due to financial constrains.

Publications

- Gammanpila.M, Dahanayaka, D.D.G.L and Jayasiri, H.B., (2009). Effects of some anthropogenic activities on limnological characteristics, seasonal abundance and distribution of zooplankton of Negombo Lagoon. International Conference on Knowledge Management for sustainable Development, 10-12, December, 2009, Kathmandu, Nepal.
- Jayasiri, H.B. W.N.C. Priyadarshani, K. Arulananthan and K.M.B.C. Karunathilake (2009). Water quality assessment in relation to flushing characteristics in Puttalam Lagoon, Northwest coast of Sri Lanka.Fourteenth International Forestory Symposium, 18-19, December, University of Sri Jayawardenapura, Sri lanka.
- Jayasiri, H.B. and D.D.G.L Dahanayaka., (2009). Use of chlorophyll-a to determine the trophic status of coastal lagoons in Sri Lanka. Symposium Proceedings on Water professionals' Day, 01 October 2009, Peradeniya, Sri Lanka.
- Jayasiri, H.B and D.D.G.L Dahanayaka, (2009). Salt water intrusion and its impact on Koggala Lagoon and associated waters, Southern coast of Sri Lanka. Accepted for Journal of National Science foundation.
- Jayasiri, H.B and E.M.S Wijeratne (2009). Oil dispersion and status of planktonic organisms in Koggala Lagoon. Journal of National Aquatic Resources Research & Development Agency. Vol. 39

Books

A guide to the Marine Plankton, Gulf of Mannar and Palk Strait, Sri Lanka, Published by National Aquatic Resources Research and development Agency, Colombo ,Sri Lanka. Author: H.B Jayasiri, Oceanography Division, ISBN: 978-955-8014-13-4

5.7 Post Harvest Technology Division

Head of the Division :Dr. E M R K B Edirisinghe

Dr. K W S Ariyawansa

Overview

The post harvest technology division has implemented four research projects, and one test service program during the year 2009. Further, numbers of public awareness programs were also carried out during the period.

The quality control laboratory of the division provided testing service to the industry. Both microbiological and chemical analysis laboratories have been engaging with expanding the services as per ISO 17025 quality certification.

At present, division is staffed with 08 Research Officers (1 is on study leave and 1 on is sabbatical leave), 06 Research Assistants, 01 Data Entry Operator and other supporting staff, comprising 02 Laboratory Attendants and 06 Labourers.

Projects

Project	Component	Allocation (LKR)	Officer/s Responsible	Period From-To
11. Quality Assurance of Fish Products & Utilization of Fish waste and near shore boats	11.1 Development of appropriate Quality Assurance methodologies of Handling and Processing of Fish from Offshore and near shore boats	0.955	P. Ginigaddarage	One year
	11.2 Development of Value Added products from Aquatic Resources	0.375	S. Ariyaratna/ S. Ahmad	One year
	11.3 Establishment of PCR based methods for identification of food borne pathogens	0.375	S. Ariyawansa/ P. Ginigaddarage	Two years 2009-2010
	13.2 Study of Assessment of heavy metals in fresh water fish and selected marine fish	1.0	K. Jinadasa/ R. Edirisinghe	Two years 2009-2010
	14. 1 ISO 17025 certification of PHTD laboratories and test	1.5	S. Ariyawansa K. Jinadasa	Continuous

	services to the industries		P. Ginigaddarage S. Ahmed	
	14.2 Upgrade of PHTD laboratories	1.5	A. Karunasena, R. Edirisinghe	Two years

Performance

Quality Assurance of Fish Products & Utilization of Fish waste and near shore boats

Component 11.1 Development of appropriate quality assurance methodologies on handling and processing of fish from offshore and near shore boats

a.Investigation of certain ad-hoc post harvest treatment practices on histamine forming micro flora during the ice storage of skipjack in boats

This study was carried out in order to investigate the effect of addition of sugar to fish which is an ad-hoc post harvest treatment on histamine forming micro flora during the ice storage of skip jack tuna in boats.

Skip jack tuna samples were collected from one day boats and they were analysed for histamine concentration since the histamine content gives a clear idea on the fish spoilage. Two fish sample sets were taken into consideration. One sample set was stored in normal ice (no addition of sugar) and the other sample set was kept under ice storage where sugar was added to ice. The ratio of sugar to ice is as same as fishermen use when they go fishing.

Samples were kept for 20 days at chilled condition with above mentioned two types of ice (one sample set with sugar and one sample set without sugar) and taken for analysis in 3 days intervals.

Results were analysed statistically by using "Wilcoxon match paired signed rank test" of minitab software which is considered as the most appropriate test.

<u>Prepared data set for analysis – used means of replicates</u>

Histamine content of fish stored in Ice with Sugar	Histamine content of fish stored in Ice Without Sugar
0.870	0.870
1.725	1.725

30.375	27.840
30.915	31.380
28.725	29.730
23.520	9.360
4.440	5.625
6.900	8.310
8.970	28.890
17.850	18.495
51.495	17.100
11.175	14.310

Obtained P-Value (0.769) is greater than the desired significance level of 0.05.

Therefore it can be concluded that the histamine value of fish stored in ice with sugar is as same as the histamine value of fish stored in ice without sugar.

a. ***Investigation of effect of gutting and evisceration of skip jack tuna upon ice storage***

This study was carried out to investigate the effect of gutting and evisceration of skipjack tuna upon ice storage. Since the histamine level is a good indication of fish spoilage samples were analysed for histamine content.

Skip jack tuna samples were obtained from a one day boat and they were divided into two groups. One set of samples were gutted and eviscerated while the other set was kept without gutting and eviscerating. Both sample sets were stored under chilled conditions and samples were analysed at three day intervals for 24 days for the histamine concentration.

Results were analysed statistically by using "Wilcoxon match paired signed rank test" of minitab software which is considered as the most appropriate test.

Prepared data set for analysis – used means of replicates

Histamine content of fish - Non gutted	Histamine content of fish - Gutted
7.80	5.13
2.80	1.80
37.10	2.78

4.08	1.62
11.75	14.90
21.43	15.21
28.09	27.42
16.84	3.32
26.00	25.91
114.81	73.06
71.18	93.81
520.83	234.99

Obtained P-Value (0.033) is less than the desired significance level of 0.05.

Therefore it can be concluded that the histamine value of the non gutted fish is significantly higher than the histamine value of the gutted fish.

b.Survey on the correct reasons for quality deterioration and PHQL

Study was carried out to find out the main reasons for the quality losses of fish from offshore fishery and introduction of systems for better fish handling practices in offshore fishing boats (OFBs). This was addressed in relation to the primary fish handling of offshore boats and analysis of samples for physical and chemical quality parameters.

Investigation of present post harvest quality depreciation percentages of *Katsuwonus pelamis* (skipjack) produced offshore fishing boats (OFB' s) in Sri Lanka:

This study was planned to investigate current levels of quality depreciation percentages of skipjack landed from OFB's in terms of commercial fish grading system. These data could be compared with past reported data in order to study progress of primary fish handling and preservation in OFB's. At present data from 28 OFB's have been collected from southern coastal areas.

A guide was prepared on better post harvest practices in Sinhala language.

Physical progress	Financial progress
92	102

Development of Value Added products from Aquatic Resources

a. Investigation of utilization of fish waste for the production of bio gas

Production of bio gas is a biological process and the anaerobic bacteria responsible for digestion of fish waste. Successful digestion defends upon achieving and maintaining proper pH (7.5-8.5), temperature (30-35 ^{0}C) and regular feeding of fresh material to the reactor. As first step we have planned to find the mixing ratio of water and fish waste which reach the suitable range of pH for growth of anaerobic bacteria responsible for production of methane gas. Tested mixing ratio of water in to fish waste were no-1- 10ml: 2g , no-2- 10ml: 4g, no-3- 10ml: 6g , no-4- 10ml: 2g, no-5- 10ml: 2g and sample No-02 was used to continue in this project using prepared reactor. Fluctuations of pH value of mixture inside the reactor were measured by using discharge effluent.

But we could not get the successful sing of production of bio gas until the end of year 2009. This projectshould be continued to obtain good results in future.

b.Development of high quality seaweed production procedures

The study was conducted to evaluate the proximate composition and caloric values of some selected aquatic plants. Three seaweed species, belonging to the family *Gracilariaceae* (*Glacilaria edulis, Glacilaria saliconia* and *Glacilaria sp.*) and freshwater aquatic plants (*Kappaphycus alvarezii, Ipomoea aquatica* and *Aponogeton crispus*) were collected and analysed. *Glacilaria edulis,Glacilaria saliconia* and *Kappaphycus alvarezii* were collected from cage cultures while *Glacilaria sp., Ipomea aquatica* and *Aponogeton crispus* were collected from wild. The samples of seaweed were collected from Kalpitiya and the samples of fresh water aquatic plants were collected from Mihinthale.

Moisture, ash, crude protein, crude fat, crude fiber and carbohydrate contents of the six aquatic plants are shown in Table 1.Moisture and total ash contents of the aquatic plants were ranged from 24.98 to 93.66 % and 2.90 to 27.65 % of the dry matter (DM), respectively. The crude protein contents varied within the range of 5.46 to 19.62 % of the DM and the lowest values were 5.46 and 5.60 % of the DM for *Kappaphycus alvarezii* and *Glacilaria edulis,* respectively. The crude fat contents were very low ranged from 0.26 to 1.89 % of the DM. The carbohydrate and crude fiber contents of these aquatic plants varied largely from 2.88 to 40.85 % of the DM and 11.71 to 74.59 % of the DM, respectively. The caloric values of *Glacilaria edulis, Glacilaria*

saliconia and *Glacilaria sp.* were 3119.6, 3221.8 and 3296.9 cal/g, respectively. The predominant nutrients of these freshwater aquatic plants were total ash and crude fiber. These aquatic plants can be considered valuable source of nutrients without concerning their toxic and anti nutritional factors.

Table 1. The proximate composition (%) of aquatic plants

Species (n= 4)	Moisture	Ash [a]	Protein [a]	Fat [a]	Fiber [a]	Carbohydrate [a]
Glacilaria edulis	83.49	12.55	5.60	0.26	16.94	10.67
	± 0.83	± 0.52	± 0.11	± 0.11	± 0.14	± 0.14
Glacilaria saliconia	42.14	16.98	10.48	0.47	26.81	26.19
	± 0.61	± 0.37	± 0.26	± 0.02	± 1.01	± 0.57
Glacilaria Sp.	91.94	14.54	18.03	0.29	15.32	4.18
	± 0.19	± 0.79	± 0.30	± 0.06	± 0.65	± 0.07
Kappaphycus alvarezii	24.98	27.65	5.46	0.73	11.71	40.85
	± 0.28	± 0.16	± 0.16	± 0.02	± 0.21	± 0.31
Ipomoea aquatica	87.43	9.65	17.35	1.09	74.59	-
	± 0.22	± 0.08	± 0.25	± 0.05	± 0.12	
Aponogeton crispus (flower)	93.66	6.69	19.62	1.89	34.27	2.38
	± 0.25	± 0.08	± 0.06	± 0.02	± 0.25	±0.25
Aponogeton crispus (root)	77.94	2.90	13.93	0.49	22.15	13.36
	± 0.06	± 0.05	± 0.10	± 0.01	± 0.23	± 0.07

Determinations based on dry matter.

Physical progress	Financial progress
78	100

Establishment of PCR based methods for identification of food borne pathogens

Objective: Establish PCR based methods for *Vibrio parahaemolyticus* and Salmonella.

PCR based methods to test for *Vibrio parahaemolyticus* and Salmonella were established in the laboratory. PCR was performed for *tox*R (regulatory gene) for suspected isolates of *V. parahaemolyticus* as described in Kim *et al.,* 1999; Tada *et al.,* 1992 whereas for Salmonella as mentioned in Malorny *et al.,* 2003.

Bacterial isolates for PCR analysis

Extraction of DNA

Colonies of bacterial isolates from Nutrient Agar were mixed with 500 µl of sterile de ionized water inside Eppendorf tubes (for *V. parahaemolyticus* 3% NaCl was added to NA) .This was mixed well by using vortex mixer. The suspension was heated for 10 min in a heat block and then cooled on ice immediately. Cell debris of these cell lysates was pelleted by centrifugation (at 13000 rpm for 2 min) and the supernatants were used as DNA templates in this PCR assay.

PCR Analysis

The reaction mixture for *V. parahaemolyticus and Salmonella* analysis consisted of 1.2 µl of the DNA templete, 11.9 µl of de ionized water, 2 µl of 10X buffer, 1.6 µl of 2.5 mM concentration of dNTP, 1.6 µl of Magnesium Chloride, 0.1 µl of taq DNA polymerase and 0.8 µl of each primer. 18.8 µl of PCR master mixture was aliquot into PCR tubes (20 µl). The amplification conditions were

Vibrio parahaemolyticus

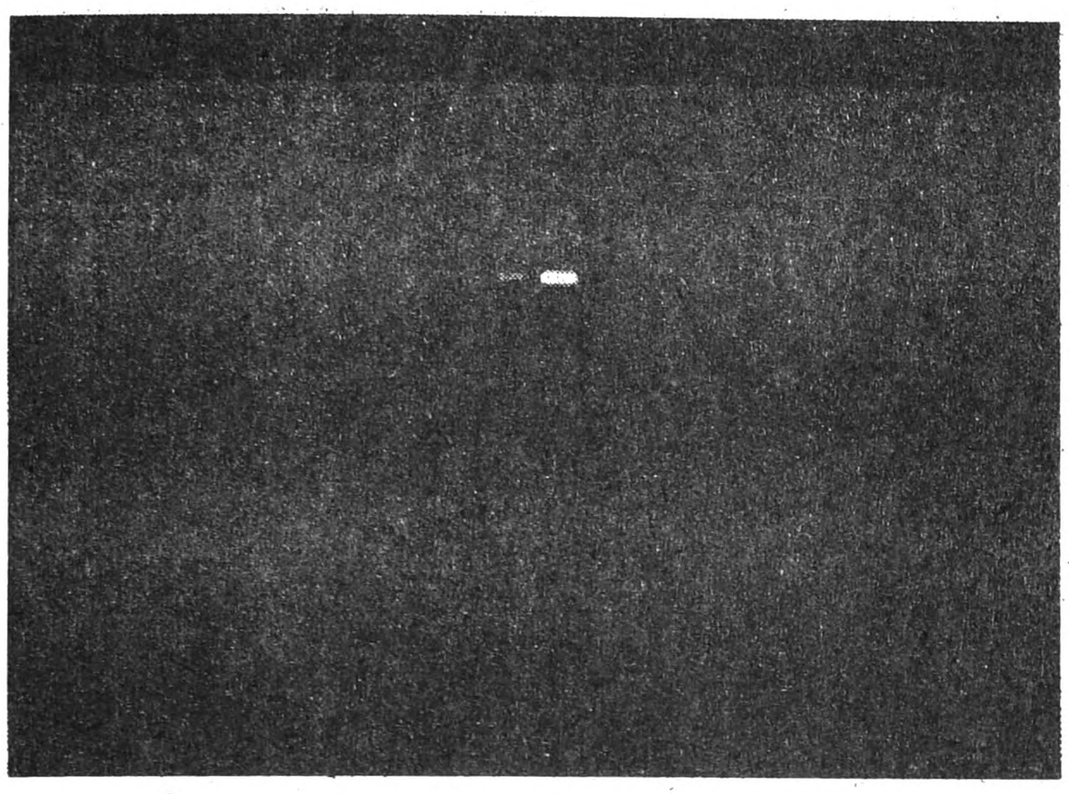
Preincubation at 96°C for 5min
Denaturation at 94°C for 1 min
Annealing at 63°C for 1.5 min } 20 cycles
Extension at 72°C for 1.5 min
Final extension at 72°C for 7 min
Store at 4°C

Salmonella

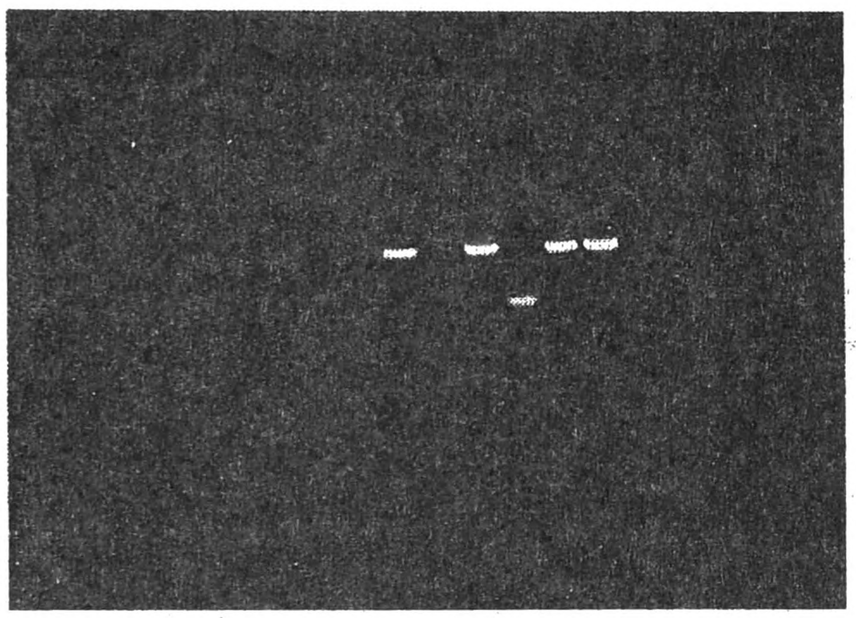
Preincubation at 95ºC for 1 min
Denaturation at 95ºC for 30 seconds
Annealing at 64 ºC for 30 seconds } 35 cycles
Extension at 72 ºC for 30 seconds
Final extension of 72 ºC for 4 minutes

Nine microliters of the reaction mixture was mixed with 1 µl of gel loading buffer and the mixture was resolved by electrophoresis in 2% agarose gel. The electrophoresis gel was placed centrally on the transilluminator and observed. The presence of the goal band was compared

with the DNA molecular weight standard (100 bp marker). If the gene was present, a DNA band was visualized on an agarose gel.



The presence of *V. parahaemolyticus*by detection of *tox*R-*gen*e (368bp)



The presence of Salmonella spp by detection of Inva *gen*e (284bp)

Progress	Physical%	Financial%
	94	92

Study of Assessment of heavy metals in fresh water fish and selected marine fish

The project has been designed to study the heavy metal concentration of selected marine fish spp and freshwater spp in north central province.

a. ***Analysis of heavy metals in marine water species***

Project will continue till June 2010, final results and length weight relationship will be found after June 2010.

The temporary results are as follows (after 6 month of analysis)

No of samples	Mean Hg (ppm)	Mean Pb (ppm)	Mean Cd (ppm)

Yellow fin Tuna	115	0.30	0.11	0.01
Sword fish	147	0.94	0.07	0.08
Marlin	24	0.49	0.05	0.02
Red snappers	28	0.16	0.04	0.01
Groupers	15	0.23	0.06	0.007

329 samples were analyzed for 3 metals, namely Hg, Cd and Pb.

b. Heavy metal analysis in freshwater species in north central province

Anuradapura district was selected in 2009 and Polonnaruwa will complete in 2010.

Freshwater species selected for the analysis are Tilapia, Weligouwa, Loola, Hunga, as well as few aquatic plant species.

Samples are taken from seven reservoirs, Rajanganaya, Kalawewa, Padawiya, Thuruwila, Wilachchiya, Karapithkada and Koobichchiyankulama.

Samples were analyzed for Hg, Cd, Pb,Cu, Fe, Zn, Cr and Co.

Two sampling rounds have been completed (Up to now 135 fish samples collected).

Analysis required to be continued.

c. Effect of Processing on the chemical Composition of Holothurians available in Sri Lanka

Holothurians (sea cucumbers) are traditionally consumed raw, dried and boiled in many tropical and subtropical countries. However, the most important sea cucumber product is the dried body wall that is marketed as beche-de-mer (trepan or hai-som). The local demand for sea cucumbers available in Sri Lanka and its variation during processing have not studied sufficiently.

Present study compares the chemical compositions of fresh and processed sea cucumbers, *Actinipyga miliaris* and *Bohadschia similis* harvested from Dutch bay, off Kalpitiya. Fresh sea cucumbers were processed using different methods according to the size of the individual and species. The evisceration is performed either by cutting the anus, followed by removal of the viscera by firmly squeezing the body or by cutting along the length of the body, followed by removal of the viscera. All of the sea cucumbers were boiled and dried in open sun. The chemical composition, i.e. water, ash, protein and fat contents were measured prior to and after processing.

According to the results, moisture, ash, fat, protein and carbohydrate contents of fresh body wall were 74.90-89.80%, 2.89-14.32%, 0.16-0.86%, 3.67-14.05% and 0.38-6.03%, respectively.

From fresh sea cucumbers, *Actinipyga miliaris* recorded the 13.11%, and *Bohadschia similis* 45.9% protein in processed samples.

The moisture content decreased to 17.81-31.1% during processing, but, fat and protein contents increased 0.75-5.45% and 40.22-45.9% respectively of the two species. The level of ash also increased 19.52-32.71%.

Progress	Physical%	Financial%
	96	126

ISO 17025 certification of PHTD laboratories and Test Services to the Industry

The programme has been designed to provide certification services for fish, sea foods, water and ice to improve the quality of the products. More than 1200 samples received from exportable fish, fishery products and water from the industry were tested and quality certificates were provided. Quality Control Laboratory has been upgraded to ISO 17025:2005. The microbiology unit of PHTD was audited by the Sri Lanka Accreditation Board (SLAB). Internal audits and required verifications were done by the laboratory technical staff. The income generated in 2009 was 42% higher than the previous year (2008).

No. of samples analyzed	:	1213
Total earnings	:	Rs 4,017,580.00
No. of reports issued	:	232

Progress	Physical%	Financial%
	98	133

Upgrade of PHTD laboratories

A plan has been forwarded to develop the infrastructure of the laboratory and is now being processed. Approval has been obtained for expansion of funds from IFAD. It is required to recall tenders. Some renovations were done in microbiology unit of PHTD.

Progress	Physical%	Financial%
	60	113

Research Publications/ Papers/ Presentations

1. Ariyawansa K.W.Sujeewa., Norrakiah Abdullah Sani and Laina Munid. 2009: Prevalence of Toxic Genes of *Vibrio parahaemolyticus* in Shrimps (*Penaeus monodon*) and Culture environment. ***International Food Research Journal*** 16:89-95. (http://www.ifrj.upm.edu.my/issues.html).

2. A.S.D.P.T.K. Jayawardene, E.M.R.K.B. Edirisinghe, S.B.N. Ahmad and T.V. Sundarbarathi. 2009. **Nutritional composition of some selected aquatic plants,** Abstracts of papers, Fifteenth Annual Scientific Sessions, Sri Lanka Association for Fisheries and Aquatic Resources.

3. Effect of Processing on the chemical Composition of Holothurians available in Sri Lanka

4. T.A.D.W. Karunarathna1, E.M.R.K.B. Edirisinghe, B.K.K.K.Jinadasa and T.V.Sundarabarathi- Proceedings of the Fifteenth Sessions of the Sri Lanka Association for Fisheries and Aquatic resources, 19th June, 2009, Auditorium of Sri Lanka Foundation Institute, Colombo-07.

Staff Training

Research Officers and research assistants have participated in local training pograms in relation with ISO quality systems at SLAB and ITI.2 Research Officers - Internal Auditing of Laboratory management systems 27th -28th August 2009 at SLAB.

Booklets

Year – 2009 Technology Transfer programmes				
	Schedule Date	Funded /organized by	Location	Type of training
01	06/01/2009 7/01/2009	ICEIDA	Oddamavadi - fisheries co-operative society	Training on fish product processing and hygienic practices during handling and processing of fish
02	085/01/2009 09/01/2009	ICEIDA	Wakarei- fisheries co-operative society	
03	05/01/2009 12/01/2009	ICEIDA	Kadiraweli- fisheries co-operative society	
04	20/01/2009 21/01/2009	ICEIDA	Panama- fisheries co-operative society	

05	22/01/2009 23/01/2009	ICEIDA	Pothuwil- fisheries co-operative society	
06	24/01/2009 t25/01/2009	ICEIDA	Ulle- fisheries co-operative society	
07	01/02/2009	NARA project – 11.2	Mattakotuwa / Mahawewa	
08	09/02/2009	NARA project – 11.2	Naththandia fisheries co-operative society	
09	11/02/2009	NARA project – 11.2	Thoduwawa / Marawila-fisheries co-operative society	
10	17/02/2009 20/02/2009	ICEIDA	Muththur - Trincomalie-fisheries co-operative society	
11	19/02/2009 20/02/2009	AIDA	Kattakaduwa - Matara-fisheries co-operative society	
12	01/03/2009 03/03/2009	ICEIDA	Kandakuliya - Kalpitiya-fisheries co-operative society	
13	05/03/2009 06/03/2006	CARITAS	Battaramulla	
14	30/03/2009, 01,02,03,05,06, 08,11,16,17,18, 19,20,21,22/04/ 2009	NARA project – 11.2	Ja – Ella electorate (all the Samurdie divisions)	
15	12/05/2009 14/05/2009	NARA project – 11.2	Matara- fisheries co-operative society	
16	10/06/2009 11/06/2009	NARA project – 11.2	Kottegoda- fisheries co-operativesociety	
17	27/06/2009 28/06/2006	ICUN	Negombo - Pallansena-fisheries co-operative society	
18	03/07/2009 06/07/2009	Uthuru Wasanthaya	Mannar - Pallimunei-fisheries co-operative society	

19	16/07/2009 17/07/2009	NARA project – 11.2	Mirissa – Harbour	
20	03/09/2009 04/09/2009	NARA project – 11.2	Mirissa - Weheragalla-fisheries co-operative society	
21	16/09/2009 19/09/2009	Uthuru Wasanthaya	Silawathura - Arippu-fisheries co-operative society	
22	25/09/2009	BOI	Negombo	presentation on Quality control and On board fish processing
23	01/10/2009	BOI	Bentota	presentation on Quality control and On board fish processing
24	02/10/2009	BOI	Galle	
25	03/10/2009 04/10/2009	JICA	Kurusagahapaduwa - Thoduwawa	Training on fish product processing and hygienic practices during handling and processing of fish
26	07/10/2009	BOI	Hambanthota	presentation on Quality control and On board fish processing
26	08/10/2009	BOI	Matara	presentation on Quality control and On board fish processing
28	13/10/2009 15/10/2009	VIDATHA	Fish processing unit - NARA	Training on fish product processing and hygienic practices during handling and processing of fish
29	24/10/2009 25/10/2009	JICA	Kalpitiya	Training on fish product processing and hygienic practices during handling and processing of fish
30	20/11/2009 22/11/2009	JICA	Thangalle	
31	19/12/2009 21/12/2009	NARA project – 11.2	Polonnaruwa (Welikanda)	Training on fish product processing and hygienic practices during handling and processing of fish

A guide was prepared on better post harvest practices in Sinhala language Training / Awareness programs conducted.The division has conducted number of extension programs to transfer post harvest related technologies such as fish handling, processing and preparation of fish products. Number of programs was conducted of fisherman, Fisherwomen industrial people and for various community levels. Details are given as follows.

5.8 Socio-economic and Marketing Research Division

Head of the Division: Mr. K. H. M. L. Amaralal

The main functions of the division include social economic and marketing studies in the fishing industry including the welfare of the fishermen as well as their dependents and analysis of fish marketing system and its impact on consumers.

Research projects conducted in the year 2009

Sri Lanka Fisheries Year Book 2008

Fishing gear marketing; problems and opportunities

Comparative study of market players in the supply chain of marine fresh fish

Economic efficacy of foreign fishing vessels calling at Sri Lankan harbors

Activities

Under the above 04 projects following activities were carried out by the research team of the division.

Primary and Secondary data collection

Data analysis

Literature review

Report writing/annual publications

Programme	Project	Allocation (Rs)	Responsible Officer	Duration
Socio-economic & Marketing	1.Sri Lanka Fisheries Year Book 2008 (15.1.2)	300000.00	HD Wimalasena	One year
	2.Fishing gear marketing; problems and opportunities (10.1)	400000.00	KHML Amaralal & MMAS Maheepala	One year
	3. Comparative study of market players in the supply chain of marine fresh fish (10.2)	300000.00	HD Wimalasena & KHML Amaralal	One year
	4.Economic efficacy of foreign fishing vessels calling at Sri Lankan harbors (10.3)	200000.00	KHML Amaralal & MMAS Maheepala	One year

Performance

Publication of Sri Lanka Fisheries Year Book-2008

The publication of Sri Lanka Fisheries Year Book- 2008 is completed.

Progress: Physical 100% Financial 98%

Fishing gear marketing; problems and opportunities

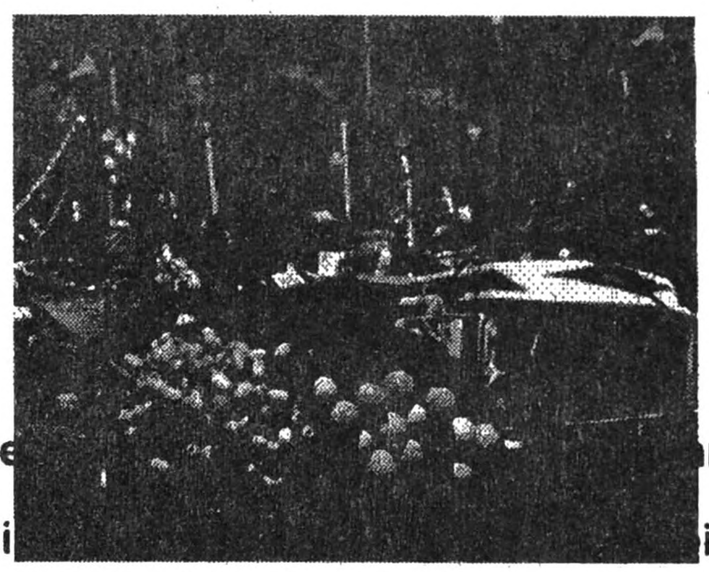
This project was implemented at five fishery harbors namely Tangall, Mirissa, Beruwala, Negombo and Kalpitiya. Although the study mainly concerned about fishing gear, engine of the boat and technological instruments which are used by the fishermen were also considered. In the study, Multi day, one day (OFRP) and the traditional boat owners and skippers were interviewed as respondents. Drift net of 6' ply size, long line and the flying fish gill net (Piyamassa dela) are the common fishing gears of the Multi day boats. Nearly 30 to 50 drift net pieces and 200 to 500 hooks are used in a multi day fishing boat. Flying fish gill net is used for catching the bait for long line. Ceynor, J B fishing and Malbar Ropes are the popular fishing net producers of the country. Durability of the net is around 7 to 10 years except Piyamassa net. All multi day boats are equipped with a radio, a GPS and a compass as fishing technological instruments. Some multi day boats have a fish finder, but it is very rarely used. All fishers that were interviewed in the study did not have any formal training for fishing and practicing technical instruments. Flexible (sliding) knot is the main difficulty with the fishing net.

Wide range of nets is used by one day (OFRP) fishers, namely, Hurulla *(Amblygaster sirm)*, Bolla *(Selar crumenophtthalamus)*, Sudaya *(Sardinella albeella)*, Halmassa *(Stolephourus sp)*, pokirissa *(Lobser)* net. Cey nor, JB fishing, Jefergy, Tone and Corona are the famous fishing net producers for one day fishing operations as well. Both Tone and the Corona nets are very famous at the Negombo area. Some one day fishers use long line that contains around 100 hooks.

Law quality and colour fading are the main failures with nets. Though, some one day fishers use GPS for finding fishing grounds but they did not have any formal training for the use of GPS. Therefore, many fishers requested a formal training on how to use GPS for finding fishing grounds.

Traditional fishing boats (Oru) are used for inshore fishing. Trammel net (prawns net), Sudaya and Kumbala nets are the main fishing nets used by traditional fishers. Although, engine repair facilities are available at the habour premises, chargers for the technicians are very high.

Progress: Physical 100% Financial 98%



of marke rine fresh fish

galle, Mi itiya fishery harbors. The data were collected from fishermen and fish assemblers. In addition socio-economic profile of fish assemblers also investigated. The wholesale retail prices of marine fresh fish in the Colombo region obtained from secondary data. The supply chain of marine fresh fish is dominated by the private sector. The contribution of Ceylon Fisheries Cooperation (CFC) in supply chain revealed that the minimal effect on fish prices at consumer level.

Progress: Physical 100% Financial 98%

Economic efficacy of foreign fishing vessels calling at Sri Lankan harbors

Foreign fishing vessels which are fishing beyond EEZ of Sri Lanka are permitted to unload fish at Sri Lankan fishery harbors since 1990s. Foreign fishing vessels are an important and also controversial system in Sri Lankan fishery industry. Under the approval of Department of Fisheries and Aquatic resource, foreign fishing vessels, fishing beyond the EEZ of Sri Lanka, are allowed to land fish at Mutwal fishery habour. This system is functioning as a joint venture and Board of Investment (BOI) has offered some concessions to the foreign vessels for the sake of enhancement of the foreign investments in Sri Lanka. Ceylon Fisheries Cooperation (CFC) is the main partner institute in the foreign fishing vessels system. CFC has collected 20 rupees from each kilogram of exported fish as a service charge and has bought some quantity of fish which are being graded as grade 3 under the CFC decided price. Since 2007, service chargers were not collected by CFC and the proportion of grade 3 fish handled has been decreased year by year. On the other hand Cyclone Fishery Habour Cooperation (CFHC) has taken one rupee from each Kg of unloaded fish as a service charge. Although the exporters claimed the importunacy of this system to the Sri Lankan fisheries industry, Multi day fishers have refused this system concerning the price fluctuations at the local markets.

Tropic and Global fish company are the main fishing companies that are getting habour facilities. Supplying berthing facilities for foreign vessels CFHC (Ceylon Fishery Habour Cooperation) has

earned Rs: 8,038,844.00, Rs: 4,984,118.50 and Rs: 5,427,786.52 in 2007, 2008 and 2009 respectively. CFC (Ceylon Fishery Cooperation) has bought 646, 502, 1573.2, 1031.7 and 66

1 metric tons of fish from foreign fishing vessels in 2004, 2005, 2006, 2007, 2008 respectively.

In 2008, 528,196 kg and 3,719,930 have exported to the Sashimi and Europe markets respectively.

Progress: Physical 100% Financial 98%

Publications/ Reports

- Multi-day fishers' perceptions on mother vessel system
- Social economic and commercial impacts of disease outbreaks of shrimp farming in the north-western province of Sri Lanka
- Sri Lanka Fisheries Year Book-2008

Trainings

- One officer participated for a 03 week training programme on Coastal Fisheries Management in Thailand
- One officer participated for a 03 month part time training programme on Survey Research Methods at the University of Colombo.
- One officer left from the country for a six month training program, fisheries policy and planning, in Iceland.

5.9 Information Technology Division

Head of the Division: Mr. A.B.A.K. Gunratne

Overview of the year

The Information Technology Division is responsible to provide an IT platform for information gathering, processing, sharing and dissemination among all stakeholders for management, conservation and development of aquatic resources.

The Division working with computer application development, providing of Internet services, Geographic information systems (GIS) and remote sensing.

During the year the division was involved with two NARA funded project and three external projects. In addition to the project works, day to day operational activities in providing IT services were done.

Activities undertaken

Programme	Project	Allocation (Rs.M)	Officer Responsible	Period
15.3 Capacity enhancements for dissemination of Information	15.3.1.1 Development and upgrading of NARA website and other Internet Services	2	A.B.A.K.Gunaratne	Continuous
	15.3.1.2. Setting up of online project Management Information System	1	A.B.A.K.Gunaratne	2008 2009

Performance

Development and upgrading of NARA website and other Internet Services

Main objective of the project is to disseminate the information via World Wide Web and to provide other Internet services for scientific staff of NARA and its stakeholder with a view of facilitating information sharing. Expected target was achieved during the period.

Staff engaged with PC repairing and upgrading work there were 96 major repairs and 11 computers were assembled by the division. Inform Database that used to evaluate research cost of the Institutions engaged in CARP network, was submitted to CARP.

Progress (%) : Physical 100 Financial : 100

Setting up of online Project Management Information System

Required Software and hardware received at the year and. Installation of software was completed. Preparation of database is being carrying out at the year end.

Progress (%) : Physical 90 Financial : 100

External funded Projects

- NAQDA funded project on zoning for shrimp farm development in Trincomalee District
- Report was completed. Attend to two meetings on the request with government officials in Trincomalee districts.
- The division involved with Initial Environmental Impact Assessment for seismic survey for oil exploration by CARAIN / INDIA Company.
- Bathymetry survey of Batticaloa Lagoon – Project initiated on end of November. Data collection is being carrying out.

Publications

Reports:

A.B.A.K.Gunaratne , Zonal Plan for Shrimp culture Development – Trincomalee District

Other Activities

- INFORM database was submitted to Centre for Agriculture Research Policy (CARP)
- IFAD / NARA Project Monitoring and Evaluation – Mr.A.B.A.K.Gunaratne appointed as M & E Officer for NARA's project component.
- A.B.A.K Gunaratne , Head Information Technology, was appointed as Acting Extension Officer on 01st December 2009.

5.10 Library and Information Division

Head of the Division: O. K. P. Nandana (January – April)

B. G. Sunethra Kariyawasam (April – December)

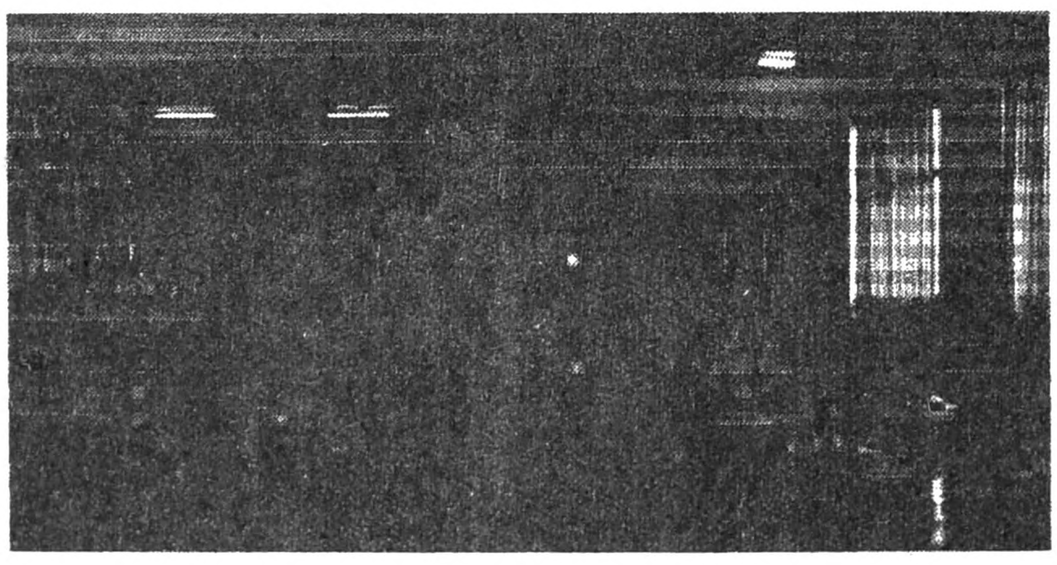
Overview of the year

The main responsibility of the library and information division is to ensure the information need of the readers engaged in the study and research of aquatic resources through the collection, management and dissemination of new information in the field of aquatic resources.

As a special library, it is mainly focused in assisting the subject specialists to access the scientific knowledge disseminated from various information sources so that they could be motivated in their innovative research studies.

The key services provided by the information centre include Lending & reference of books, Searching electronic catalogues, Compiling databases, Current Awareness Services, Selective Dissemination Services, Institutional membership, Compiling of paper clipping collection, Photocopying, Scanning, Compiling of Research Reports & Theses collection, Sale & reprinting of NARA publications.

At present, there are two professional librarians at the information division and vacancies exist for two more librarians and a data entry operator (English). Therefore the routine flow of effective services and the development activities of the library are curtailed due to the lack of staff.



Activities undertaken

Project	Activities	Allocation	Officer Responsible	Period
Collection of library sources	Procurement of books & Journals	.85	BGS Kariyawasam OKP Nandana Sunethra Liyanarachchi	January-December
	Collecting Research Reports and Papers		BGS Kariyawasam OKP Nandana	January-December
	1.3 Obtaining Donations		BGS Kariyawasam	April-December
Management of Library Collection	2.1 Editing & Updating of Library Catalogue	.85	BGS Kariyawasam Sunethra Liyanarachchi	October-December
	2.2 Subject classification & filing of library resources		BGS Kariyawasam	April-December
	2.3 Conservation of library books and Journals		BGS Kariyawasam Sunethra Liyanarachchi	October-December
3. Information retrieval	3.1 Current Awareness Service (CAS)		BGS Kariyawasam	April-December
	Selective Dissemination Service (CAS)		BGS Kariyawasam	April-December
	Creating Databases & Indexing Services		BGS Kariyawasam	April-December
	3.4 Exchange Services		BGS Kariyawasam Sunethra Liyanarachchi	April-December
4. Publishing NARA Journal & Publicity Service	Distribution & reprinting of Nara publications		BGS Kariyawasam Sunethra Liyanarachchi	January-December
	Publishing scientific Journal information related to fisheries & aquatic resources NARA Journal		Dr. Ranjith Edirisinghe Deshini Herath BGS Kariyawasam	continuous

Performance

Acquisition of Library Resources

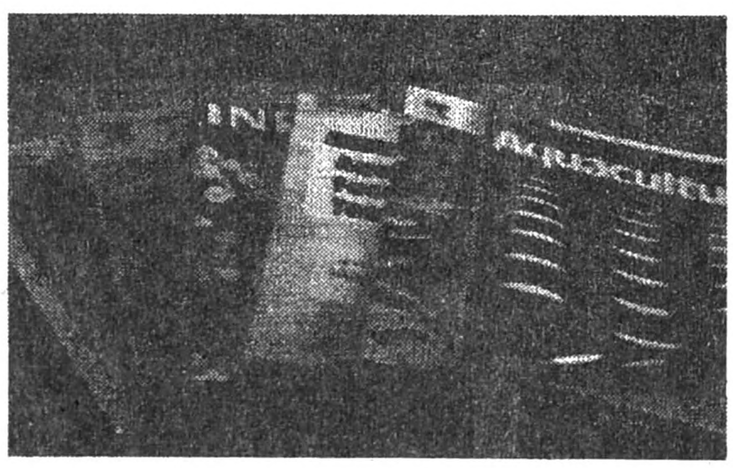
Subscriptions were made for journals and books were purchased and donations were received. Statistics of journals and books acquired are given below-

Method of Acquisition	**Quantity**	***Purchasing***
Colombo International Book Fair	79 – Books	
Donations		
National Library of Sri Lanka	786 – Books & Technical Reports	
Dept. of Census & Statistics and		
Other Institutional and Private	36 – Books	

Journal subscription

Only six titles of scientific journals were purchased to the library due to insufficient funds. List of purchased journal titles is given below.

1. Aquaculture
2. Estuarine Coastal & Shelf Science
3. Fisheries Research
4. Journal of Aquatic Food Product Technology
5. Info fish International
6. National Geographic



Research Reports and Theses

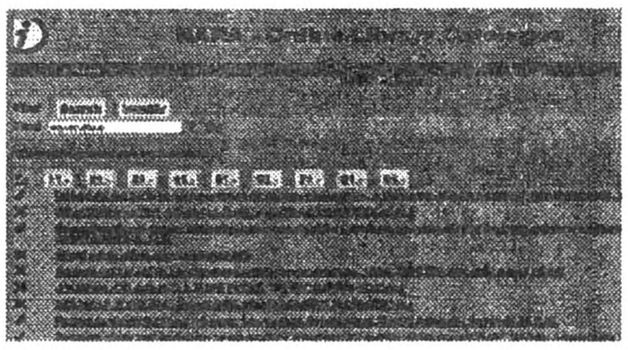
The collection of Nara Research Reports, Postgraduate Theses and Research Papers were reorganized. 38 Research Reports, 04 Postgraduate Theses and 04 Research Reports have been collected.

Progress (%) Physical (90%) Financial (75%)

Resource Management

Open Public Access Catalogue (OPAC) was maintained and Unclassified titles were classified and added to the database. Library advisory committee and sub committee meetings held and decisions for library and development were taken.

Progress (%) Physical (50%) Financial (-)



Information Retrieval

In order to retrieve information from journal articles, theses, newspaper clippings and research reports, IT was used and 4 databases were compiled using WINISIS software. Details of data entry for the year is given below:

Name of the Database	Quantity of Data
• Journal Article Index	1074
• Theses Database	60
• Research Report	148
• Newspaper Article Index	29

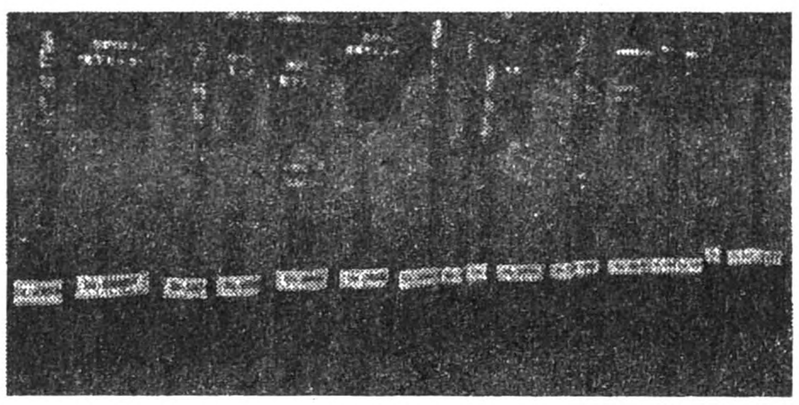
Library has provided services for the undergraduates and scientist who come from different institutions. Total numbers of users were 298. Publication Exchange programme was also carried out with other institutions.

NARA researchers were participated workshop on SCOPUS database organized by the NSF. The library took initiative in sending the participants to the workshop.

Progress (%) Physical (100%) Financial (-)

Library Management

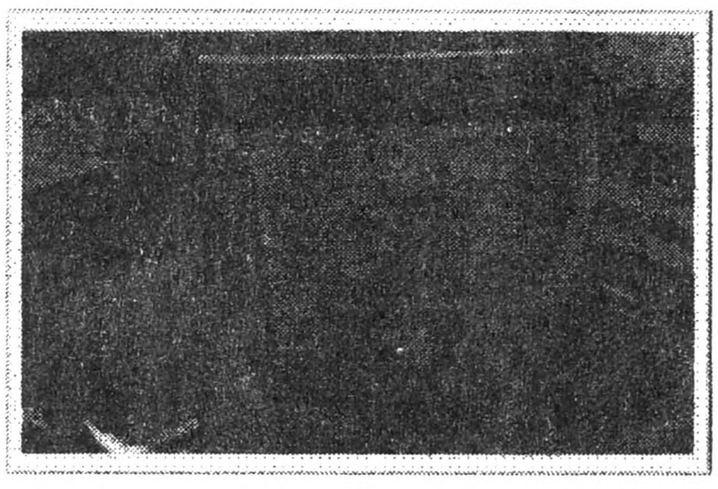
83 books & 103 journals were bound this year and tender was called for book conservation and preservation.



Progress (%) Physical (75%) Financial (75%)

NARA Journal & Publicity Service

Sales of NARA publications were done by the library & the total amount received through sale during the year was Rs. 108,350\=



We were able to read 1st proof of the NARA journal Vol. 39. Vol. 39 was handed over to translation into Sinhala. New information was given to update the institutional web page.

Training programmes and workshops attended

Workshop on library 2.0 – organized by the NSFNACLIS

Seminar - organized by the SLLAWorkshop on Joomla open source Software for web designing

organized by the NSF

Progress (%) Physical (70%) Financial (100%)

6.Ancilliary Services

6.1 Service and Operation

Chief Engineer/ Head of the Division: *C. Eng. D.A.Karunasena*

Overview of the Year

Service & Operation Division is a supportive division of the institution. S & O division provide and maintain all the services and develop the infra-structure facilities in line with work programs of the institution,

In normal practice at the beginning of the year, for capital nature divisional work program, the approved amount of fund allocation is announced and for Service and Operation Division it was Rs.11.0 million. But at the beginning of second quarter of the year, funds were badly restricted that resulted temporally suspension of most of planned activates. With an appointment of new chairman in September 2009, funds started to release for the divisional activities. Therefore implementation of work started to progress from latter part of the year. As a result during the year, in over all capital nature work nearly 70% physical progressed.

Operation and Maintenance of vehicle fleet of the institution is a part of the divisional activity and Rs. 3 million was the allocation for the year from capital budget addition. During the year nearly 70% of physical progress was achieved and due to delay in procurement process and lack of funds for the 4th quarter affected for the progress of work. Therefore nearly 30% work was shifted to following year.

Staff of the Division:

During the period divisional staff positively contributed for the achievement goals of division which were planned. The staff of the division for the year was as follows:

Chief Engineer	01
Supervisory / Technical staff	04
Clerical staff	02
Skilled craftsmen	07
Semiskilled craftsmen	05
Total	**19**

The operational activity of the vehicle fleet and the general administrative function of drivers were under S & O division for many years and because of decision of management it was taken over by the Administrative Division. Therefore 26 Drivers were transferred to Administrative Division since January 2009. But in November 2009 again operational activity of the vehicle fleet was transferred back to S & O division, allocating vehicles and drivers to research and technical divisions.

Capital Nature Works;

Program:	Project: Allocation Rs. Million	Responsible Officer	Period
3.1Civil Construction:			
3.1.1Renovation of Two Laboratories of Inland Aquatic Resources division	0.300	D. A.Karunasena Mrs. C. Uadawatta Mr. P.S.Ranaweera Mr. W. K Ratnapla	01/02/09 04/03/09
3.1.2 Water Proofing of Inland Aquatic Resources Division Laborites	0.540	D. A.Karunasena Mrs. C. Uadawatta	04/09/09 28/11/09
3.1.3 Construction of Quarantine Building For Inland the Aquatic Resources Division	3.800	D. A.Karunasena Mrs. C. Uadawatta Mr. P.S.Ranaweera	04/01/09 30/ 05/09
3.1.3 Rehabilitation of Bio Technology	0.880	D. A.Karunasena Mrs. C.	04/09/09 20/12/09

Laboratory of Marine Biology Division		Uadawatta Mr. P.S.Ranaweera Mr. K. W.Ratnapla	
3.1.4Rehabilitation of Bo – Malluwa and Positioning new Buddha statue (religious purpose	0.550	D. A.Karunasena Mrs. C. Uadawatta Mr. P.S.Ranaweera Mr. W. K Ratnapla	10/10/09 25/12/09
3.1.5.Fencing of Land Boundary at RRC Kalpitiya 3000 feet length – Phase 1	1.850	D. A.Karunasena Mr. P.S.Ranaweera Mr. W. K Ratnapla	04/01/09 20/ 12/09
3.1.6.Fencing of Land Boundary at RRC Kalpitiya 1200 feet length – Phase 2	1.850	D. A.Karunasena Mr. P.S.Ranaweera Mr. W. K Ratnapla	04/11/09 20/ 12/09
3.2.Mechanical/ Engineering Services			
3.2.1 Production of 25 Mol dive Fish making Devises on request of MFAR	0.140	D. A.Karunasena Mr. W. K Ratnapla	01/04/09 28/05/09
3.2.2 Instillation	0. 140	D. A.Karunasena	04/ 06/09

18000 BTU Air Conditioners For the IARD Office		Mr. W. K Ratnapla	28/07/09
3.2.3.Rehabilitation of L P Gas line of Quality Control Laboratory of Post Harvest Technology Division	0.450	D. A.Karunasena Mrs. C. Uadawatta Mr. P.S.Ranaweera Mr. W. K Ratnapla	10/09/09 20/12/09
3.2.4Installation of 60000 BTU x 2 Air Conditioners For the Main Auditorium	0. 560	D. A. Karunasena P.S. Ranaweera	11/10/09 28/12/09
3.2.5.Installation of18000 BTU x 2 Air Conditioners For the Gust House RRC / Kalpitiya	0. 300	D. A. Karunasena P.S.Ranaweera	11/11/09 22/12/09
3.3Electrical Engineering / Services			
Installation of low Energy Consume CFL Bulbs For the Library and Quality Control Lab	0 .100	D. A.Karunasena Mr. W. K Ratnapla	01/09/09 20/11/09
Installation of 95 mm power cable And Distribution panel For IARD Division	0.450	D. A.Karunasena	01/10/09 20/12/09

Power Room			
3.4.Rehabilitation of Vehicles			
(11 nos)	3.000	D.A. Karunasena B.L.S. Wimalasinghe (*Transport officer*)	02/01/09 20/11/09

Civil Construction

Renovation of Two Laboratories of Inland Aquatic Resources Division laboratory.

Material procured and work carried out S & O divisional staff.

Progress: Physical 100% Financial 100%

Water Proofing of Inland Aquatic Resources Division

Tender was called and for the work in 1st quarter and finalized the tender processes in 2nd quarter of the year. Fund released on 4th quarter and work was implemented.

Progress: Physical 90% Financial 80%

Construction of Quarantine Building For Inland the Aquatic Resources Division

Progress: Physical 25% Financial 20%

The work was assigned in 2008 to ICTAD M7 Grade Contractor and due to poor and substandard work performance of the contractor work was delayed and decision was taken to terminate the contract.

Rehabilitation of Bio Technology Laboratory of Marine Biology Division

Tender was called and for the work in 3rd quarter in 2008 and finalized to implement 4th quarter 2008. But due to restriction of funds implementation had to post pond to 2009. But release of funds delayed up to 4th quarter 2009. As Fund released on October 2009 work was commenced and 95% work in physically has been completed during the year.

Progress: Physical 95% Financial 90%

Rehabilitation of Bo – Malluwa and Positioning new Buddha statue (religious purpose).

Work was planned in October 2009 and executed in November and December 2009.

Progress: Physical 100% Financial 60%

(total *claim has not submitted before end of the year by the contractor).*

Fencing of Land Boundary at RRC Kalpitiya 3000 feet length – Phase 1

Fencing line had to change due to intervention of fishery community of the area. Issue was sorted out by the management of NARA leaving part of land for the community and that resulted delay of fencing. The fencing task was assigned to State Engineering Corporation.(SEC) Main material that is chain links and Concrete Fence posts were procured and provided by NARA to reduce the overall cost of the project. Phase 1 completed 2600 feet fencing with provided material.

Progress: Physical 86% Financial 100%

Fencing of Land Boundary at RRC Kalpitiya 1200 feet length – Phase 2

2nd phase of Fencing also assigned to the State Engineering Corporation (SEC). Due to delay of release of funds (20% mobilization advance) for SEC, execution of work delayed up to December 2009

Progress: Physical 50% Financial 50%.

(Note: Part of work shifted to 2010.)

Mechanical/ Engineering Services

The Ministry of Fisheries & Aquatic Resources was requested to produce and supply 20 Nos Maldives Fish processing equipment in Mid July for their extension work program. Fabrication of these units were completed within a month and generated income of Rs.140,000.00 net profit earned was Rs. 40,000.00 from the work

Physical Progress 100% Financial Income 100% (Rs.140, 000.00)

On request of Inland Aquatic Resources Division (IARD) Office, new 18000 BTU One Air Conditioner was installed to the Division

Physical Progress 100% Financial Progress 100%

Nearly 22 years old Liquid Petroleum Gas (LP) line of quality control laboratory of Post Harvest Technology Division was and found major portion was deteriorated and organized to replace in par with ISO requirement of safety of laboratories.

Physical Progress 100% Financial: 0%

(*due to non availability of fund for the year posted the payment for 2010*)

14 years old 60000 BTU Two split type Air Conditioners units of Main Auditorium found life span was over and further maintenance is uneconomical and organized to replace with new units.

Physical Progress 100% Financial: 100%

Electrical Engineering / Services:

Under electrical power energy saving program, areas where use for more electrical lighting scheduled to install Electronic blast type florescent systems for the reduction of power consumption .The Library and Quality Control Laboratory of post harvest technology division identified for the year 2009 and installation was completed.

Physical Progress 100% Financial Progress 100%

During Tsunami in 2004 Inland Aquatic Resource Development Division and Post harvest technology Division power distribution line were damaged and temporary line was set-up to carry out the divisional works. Those lines were renovated with 250 Amp new distribution line inclusive of safety systems.

Physical Progress 100% Financial Progress 100%

Rehabilitation of Vehicles (11 nos)

There are 26 vehicles in NARA fleet and 11 of them fleet taken for rehabilitation during the year at total cost of Rs. 4,221,969.41 from capital budget. The vehicles under rehabilitation were 57-4053, 50-4415, 58-1378, 32-3417, 58-1012, 62-2177, 32-7196, 61-0012, 300-7308, 61-4803 and GD- 8084.

Addition to above Rs.3,593, 399.50 spent for services, running repairs, license and insurance of the fleet during the year. Out of 26 vehicles 03 vehicles identified for disposal due aged and uneconomical for further use. 21 vehicles from the balance 23 vehicles effectively utilized for the running of 492,632 km during the year.

Hiring of Vehicles

During the year four passenger vans were hired without Drivers and fuel for the cushioning of transport activity for research & development work. The cost of hiring was Rs.1,363,906.32 and those vans were utilized for 100,362 km of running in research and related work.

	Cost for the Year Rs	Cost for the Year Rs	
		For NARA Fleet	Hired vehicles (4 nos)
a) Rehabilitation of vehicles		4,221,969.41	
(From Capital Budget)			
b) Running repairs, Services cost			
Insurance & License fee		3,593,399.50	
(From recurrent Budget)			
c) Vehicle Hiring charges		-	1,363,906.32
e) Fuel Cost		3,490,979.00	829,598.70
d) Total operated	(km)	492,632	100,362
e) Total run km as % from total 592994 km		83%	17%

* exclude Drivers salary, Overtime and Bata and maintenance staff cost

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கணக்காய்வாளர் தலைமை அதிபதி திணைக்களம்
AUDITOR GENERAL'S DEPARTMENT

මගේ අංකය
எனது இல
My No AF/B/NARA/FA/09

ඔබේ අංකය
உமது இல
Your No.

දිනය
திகதி
Date 01 October 2009

The Chairman,

National Aquatic Resources Research and Development Agency

Report of the Auditor General on the Financial Statements of the National Aquatic Resources Research and Development Agency for the year ended 31 December 2009 in terms of Section 14(2)(c) of the Finance Act, No.38 of 1971.

The audit of Financial Statements of the National Aquatic Resources Research and Development Agency for the year ended 31 December 2009 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 Section13(1) of the Finance Act, No. 38 of 1971 and Section 32 (3) of the National Aquatic Resources Research and Development Act, No 54 of 1981. My comments and 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 furnished to the Chairman on 26 March 2010.

1.2 Responsibility of the Management for the Financial Statements.

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Sri Lanka Accounting Standards. This responsibility includes: designing, implementing and maintaining internal control relevant to the preparation and fair presentation of Financial Statements that are free from material misstatements, whether due to fraud or error; selecting and applying appropriate accounting policies; and making accounting estimates that are reasonable in the circumstances.

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කොළඹ 07, ශ්‍රී ලංකාව
දුරකථනය
தொலைபேசி 2691151
Telephone.

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ஈ- மெயில் onggov@sltnet.lk
E-mail.

NATIONAL AQUATIC RESOURCES RESEARCH AND DEVELOPMENT AGENCY

CONSOLIDATED CASH FLOW STATEMENT

FOR THE YEAR ENDED	31.12.2009		31.12.2008
CASH FLOWS FROM OPERATING ACTIVITIES			
	RS	RS	RS
SURPLUS (DEFICIT) FROM ORDINARY ACTIVITIES	(30,039,707.27)		(23,622,339.00)
NON-CASH MOVEMENTS			
DEPRECIATION	69,722,245.66		73,897,311.00
AMORTIZATION OF DEFERRED EXPENDITURE	(18,066,425.65)		(15,914,501.00)
PROVISION FOR GRATUITY	7,934,683.23		6,734,093.00
GRATUITY PAYMENTS	(4,520,180.00)		(3,655,716.00)
INTREST EXPENSE	174,729.00		374,414.00
GAIN (LOSS) ON SALE OF PROPERTY PLANT & EQUIPMENT	(114,143.50)		571,402.00
INVESTMENT INCOME	(13,811,057.34)		(12,494,197.00)
BAD DEBTS	0.00		1,500.00
ADJUSTMENTS FOR FIXED ASSETS TRANSFERS	0.00		59,210.00
(INCREASE)/DECREASE DECREASE IN STOCKS	112,780.30		467,235.00
(INCREASE)/DECREASE IN TRADE & OTHER RECEIVABLES	(51,094,445.10)		(12,814,962.00)
(INCREASE)/DECREASE IN PREPAYMENTS	(575,589.41)		86,639.00
INCREASE/ (DECREASE) IN PAYABLES	(3,907,009.34)		(16,661,416.00)
INCREASE/ (DECREASE)IN ACCRUED EXPENSES	7,023,354.76		2,398,179.00
NET CASH FROM OPERATING ACTIVITIES		(37,160,764.66)	(573,148.00)
CASH FLOW FROM INVESTING ACTIVITIES			
PURCHASE OF PROPERTY PLANT AND EQUIPMENT	(9,639,731.03)		(25,688,613.00)
INTEREST ON TREASURY BILLS & FIXED DEPOSITS	13,811,057.34		11,301,397.00
MOBILIZATION ADVANCE RECEIVED FOR RESEARCH VESSEL	50,000,000.00		
PROCEED FROM SALE OF PROPERTY PLANT & EQUIPMENTS	135,000.00		64,750.00
NET CASH USED IN INVESTING ACTIVITIES		54,306,326.31	(14,322,466.00)
CASH FLOWS FROM FINANCING ACTIVITIES			
CAPITAL GRANT	12,050,701.86		19,604,179.00
REPAYMENT OF BORROWINGS	(1,795,863.00)		(1,839,852.00)
NET CASH FLOWS FROM FINANCING ACTIVITIES		10,254,838.86	17,764,327.00
NET INCREASE IN CASH AND CASH EQUIVALENTS		27,400,400.51	2,868,713.00

AS AT	31.12.2009	31.12.2008	Net increase
CASH & CASH EQUIVALENTS			
FIXED DEPOSITS	107,244,989.28	78,441,200.00	
CASH AT BANK	9,267,143.23	10,670,532.00	
	116,512,132.51	89,111,732.00	27,400,400.51

NATIONAL AQUATIC RESOURCES RESEARCH AND DEVELOPMENT AGENCY

STATEMENT OF FINANCIAL POSITION

AS AT	Notes	31.12.2009 Rs. Cts.	31.12.2008 Rs.
ASSETS			
NON-CURRENT ASSETS			
PROPERTY, PLANT AND EQUIPMENT	1 - 3	1,161,824,912.80	1,222,350,666.44
WORK IN PROGRESS	4	424,089.01	
CURRENT ASSETS			
INVENTORIES/STOCKS	5	2,821,633.41	2,934,413.71
TRADE AND OTHER RECEIVABLES	6	79,947,073.79	28,852,628.69
PREPAYMENTS	7	824,970.53	249,381.12
INVESTMENTS ON FIXED DEPOSITS	8	107,244,989.28	78,441,200.00
CASH AND CASH EQUIVALENTS	9	9,267,143.23	10,670,531.63
TOTAL ASSETS		1,362,354,812.05	1,343,498,821.59
LIABILITIES			
CURRENT LIABILITIES			
PAYABLES	10	13,788,474.28	17,695,483.62
ACCRUED EXPENSES	11	26,287,654.87	19,264,300.11
		40,076,129.18	36,959,783.73
NON-CURRENT LIABILITIES			
PAYABLES			599,439.80
DEFERRED INCOME	12	287,543.59	287,543.59
PROVISION FOR GRATUITY	13	52,733,536.73	49,319,033.50
		53,021,080.32	50,206,016.89
TOTAL LIABILITIES		93,097,209.47	87,165,800.62
NET ASSETS/EQUITY			
ACCUMULATED FUND	14	1,049,716,854.46	1,006,752,565.58
RESERVES	15	219,540,748.12	249,580,455.39
TOTAL NET ASSETS/EQUITY		1,362,354,812.05	1,343,498,821.59

THE SIGNIFICANT ACCOUNTING POLICIES AND THE NOTES, SHEDULES THEIRIN FORM AN INTEGRAL PART OF THESE FINANCIAL STATEMENTS.
THE FIGURES IN BRACKETS INDICATE DEDUCTIONS AND NEGATIVE VARIANCES.

APPROVED AND SIGNED ON BEHALF OF THE BOARD.

Dr.Hiran W. Jayawardene	Mr. Manesh Katulanda	Mrs. Preethika Ranasinghe
CHAIRMAN	DIRECTOR GENERAL	HEAD/FINANCE

COLOMBO
14th JUNE, 2010

NATIONAL AQUATIC RESOURCES RESEARCH & DEVELOPMENT AGENCY

FINANCIAL PERFORMANCE

FOR THE YEAR ENDED		31.12.2009	31.12.2008	VARIANCE
	NOTES	*Rs. Cts.*	*Rs.*	*Rs.*
OPERATING REVENUE				
GOVERNMENT GRANT	16	185,017,340.47	175,628,934.14	9,388,406.33
OTHER INCOME	17	35,856,700.60	48,312,270.96	(12,455,570.36)
		220,874,041.07	223,941,205.10	(3,067,164.03)
OPERATING EXPENSES				
PERSONNEL EMOLUMENTS	18	120,623,826.06	108,816,884.58	11,806,941.48
TRAVELLING & SUBSISTENCE	19	894,140.95	1,242,979.32	(348,838.37)
SUPPLIES & CONSUMABLES USED	20	1,733,442.80	1,588,634.23	144,808.57
MAINTENANCE EXPENDITURE	21	9,598,859.56	9,882,236.53	(283,376.97)
CONTRACTUAL SERVICES	22	22,674,288.90	21,168,610.36	1,505,678.54
RESEARCH & DEVELOPMENT EXPENDITURE	23	35,545,878.20	38,931,838.26	(3,385,960.06)
DEPRECIATION & AMORTIZATION EXPENSES	24	69,722,245.66	73,897,311.00	(4,175,065.34)
OTHER OPERATING EXPENSES	25	3,634,887.46	3,319,184.64	315,702.82
TOTAL OPERATING EXPENSES		264,427,569.59	258,847,678.92	5,579,890.67
SURPLUS (DEFICIT) FROM OPERATING ACTIVITIES		(43,553,528.52)	(34,906,473.82)	(8,647,054.70)
NON OPERATING REVENUE / EXPENSES				
TOTAL NON-OPERATING REVENUE/EXPENSES	26	13,513,821.25	11,284,135.28	2,229,685.97
NET SURPLUS(DEFICIT) FOR THE PERIOD		(30,039,707.27)	(23,622,338.54)	(6,417,368.73)

1.3 Scope of Audit and Basis of Opinion

My responsibility is to express an opinion on these financial statements based on my audit. Audit opinion, comments and findings in this report are based on review of the Financial Statements presented to audit and substantive, tests of samples of transactions. The scope and extent of such review and tests were such as to enable as wide an audit coverage as possible within the limitations of staff, other resources and time available to me. The audit was carried out in accordance with Sri Lanka Auditing Standards to obtain reasonable assurance as to whether the financial statements are free from material misstatements. The audit includes the examination on a test basis of evidence supporting the amounts and disclosures in financial statements and assessment of accounting principles used and significant estimates made by the management in the preparation of financial statements as well as evaluating their overall presentation. I have obtained sufficient information and explanations which to the best of my knowledge and belief were necessary for the purpose of my audit. I therefore believe that my audit provides a reasonable basis for my opinion. Sub - sections (3) and (4) of Section 13 of the Finance Act. No.38 of 1971 gives discretionary powers to the Auditor General to determine the scope and extent of the Audit.

2. Financial Statements

2.1 Opinion

So far as appears from my examination and to the best of information and according to the explanations given to me, I am of opinion that the National Aquatic Resources Research and Development Agency had maintained proper accounting records for the year ended 31 December 2009 and except for the effects on the financial statements of the matters referred to in paragraph 2.2 of this report, the financial statements have been prepared in accordance with Sri Lanka Accounting Standards and give a true and fair view of the state of affairs of the National Aquatic Resources Research and Development Agency as at 31

December 2009 and the financial results of its operations and cash flows for the year then ended.

2:2 Comments on Financial statements

2:2:1 Presentation of financial Statements

Although the draft financial statements, along with the relevant schedules should be presented before 60, days of the closure of the year of accounts for audit in terms of public Enterprises circular No.PED/12 of 02 June 2003 the draft financial statements had been presented for audit on 12 March.

2:3 Accounting deficiencies

The following matters were observed.

(a) A sum of Rs.51,536,637 paid in the year 2009 for the planning production, inspection, supply and launching a research vessel had been shown in the balance sheet as current assets and the financial loss of Rs.3,328,260 incurred in the year 2009 due to the selection of an unsuccessfull supplier had not been disclosed in the financial statements.

(b) Without being vested the lands belonging to the Kalpitiya and Rekawa Regional Centers in the NARA, the revaluation values amounting to Rs.2,058,062 and Rs.25,530,000 respectively had been included in the financial statements.

(c) Land and buildings belonging to the Trincomalee Regional Centre had been possessing by the Navy since the disturbance period and the value of buildings amounting to Rs.6,867,600 had been shown in the financial statements by depreciating annually but the value of land had not been shown under assets.

2:4 Receivable Loan Balances

According to the debtors age analysis, loan balances totalling Rs.2,105,812 which had remained un recovered for a long time were observed in the financial statements. Details are given below.

Description	1-2 years	2-3 years	3-4 years	4-5 years	Over 5 years	Total
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Debtors	-	-	-	-	486,995	486,995
Project debtors	-	-	415,320	-	3,680	419,000
Advance on Purchases	-	-	-	-	6,478	6,478
Service Advances	575,247	-	-	-	599,510	1,174,757
Staff Loans	-	-	-	2,000	16,582	18,582
						2,105,812

The following observations are made in this regard

(i) Out of the value of trade and other receivable loan balances of Rs.2,821,633, the age analysis had been presented only in respect of the value Rs.2,105,812.

(ii) According to the above information on loans 39 percent of total debtors remained receivable for more than 5 years and the value of such balances amounted to Rs.1,113,245.

2:5 Lack of evidence for audit

The following items of accounts could not be satisfactorily vouched / verified in audit due to non rendition of the following evidence.

(a) Three files in respect of vehicles and the file relating to the disposal of idle assets requested for audit.

(b) The file relating to the construction of the Kalpitiya boundary fence by incurring an expenditure of Rs.1,835,721.

(c) According to the accounts presented the value of fixed assets as at the end of the year under review amounted to Rs.1,161,824,913 and the verification reports and the detailed fixed assets register to establish the ownership, existence and the value of the assets valued at Rs.67,865,450 of the total value.

(d) Confirmation of balances of Trade debtors and project debtors totalling Rs.8,262,277

(e) Replies to 12 audit queries issued to the Chairman of the NARA relating to the year under review had not been answered even by 25 July 2010. The value of transactions involved on these audit queries amounted to Rs.10,639,478.

2:6 Non-compliance with Laws, Rules, Regulations and Management decisions

The following instances of non-compliance were observed.

	Reference to Laws, rules, regulations etc.	Non-compliance
(a)	Section 11(b) of the Finance Act No.38 of 1971	Without the prior approval of the Minister of Finance and the Minister of the relevant Ministry, a sum of Rs.100,598,900 had been invested in fixed deposits during the year 2009. Further, the Treasury bills of Rs.85,598,900 had been encashed in the middle of the year.
(b)	Financial Regulations (F.R) of the Republic of Sri Lanka	
(i)	F.R. 1647(e) and Schedule vi of volume ii of F.R.	An updated register of vehicles had not been maintained.
(ii)	F.R. 1645 (a) and F.R 1647 (a)	Updated log books in respect of 21 vehicles had not been maintained.
(c)	Establishments Code of the Republic of Sri Lanka Chapter 11	Without a scheme of recruitments approved by the Director General of the Department of Management Services, recruitments and promotions had been done.

(d)	Public Administration Circular No.22/99 of 08 October 1999.	Fuel allowance of Rs.56,500 had been paid during the year 2009 to an officer who was not entitled for official vehicles.
(e)	Circular No.DMS/D/3/NOR/05 dated 30 January 2007 of the Department of Management Services	
(i)	Section ix	(a) Without obtaining the prior approval of the National Salaries and Cadre Commission and the Director General of Management Services, a sum of Rs.408,000 had been paid to 17 officers as Divisional Head allowances during the year 2009.
		(b) A special allowance at Rs.1,500 per month had been paid to two drivers in the year 2009.
(ii)	Section viii	(a) Without the approval of the National Salaries and Cadre Commission and the Department of Management Services, the 3rd step of the salary scale of Rs.41,455 (HM-1-2) had been paid to the Board Secretary and to the Legal Officer post as the initial salary.

		(b) The female officer who had been appointed as the Chief Librarian in April 2009 had been placed in the middle level management services grade and paid an initial salary of Rs.25,640 (MM-1-1).
	(iii) Section v	The Accountant recruited in May 2007 had been given the 8th step of the salary scale of MM-1-1 and paid Rs.30,575 as the initial salary. Due to non compliance with the instructions of this section the over payment of salaries made as at 31 December 2009 amounted to Rs.159,880 and the total EPF and ETF contributions amounted Rs.23,981.
(f)	Management Services Circular No.28 of 10 April 2006 and No.28(ii) of 01 August 2006.	Without obtaining the prior approval of the Director General of Management Services and without getting an assurance of the Department of National Budget on the availability of provisions, recruitments had been made to 12 posts during the year 2009 and the salaries and allowances and EPF and ETF contributions amounting to Rs.2,566,889 and Rs.385,032 respectively had been paid.

3. Financial and Operating Review

3:1 Financial Review

3:1:1 Financial Results

According to the financial statements presented the operation of the Agency had resulted in a deficit of Rs.30,093,707 for the year ended 31 December 2009 as compared with the deficit of Rs.23,622,338 for the preceding year thus indicating an increase as of deficit by Rs.6,417,368 in the financial results.

3:2 Operating Review

3:2:1 Management Inefficiencies

The following matters were observed.

(a) Four and six employees of the Agency had been released to 4 external institutions on permanent and temporary basis and the salaries and allowances overtime and traveling allowances relating to the period of release had been paid by the Agency. Accordingly, the expenditure incurred as salaries allowances travelling and overtime allowances during the year 2009 not affected the productivity of the agency amounted to Rs.1,307,656.

(b) The approved cadre of the Agency had included 4 fitters but the actual cadre was 3 .One of them had been released to an another institution since 11 April 2005 and the salaries of him had been paid by the Agency. Accordingly the Agency had incurred a sum of Rs.1,379,240 on this employee for the period 11 April 2005 to 31 December 2009.

(c) Instead of following the approved procedure for the electronic Technician Post within the approved cadre, an employee had been recruited on salary of Rs.50,000. The salary scale approved for this post is MA-2-2, that is Rs.14,280. The prior approval of the Department of Management Services had not been obtained for this recruitment and a sum of Rs.550,000 had been paid in the year 2009 as salaries. Due to non recruitment of a permanent employee in accordance with the approved scheme of recruitment the Agency had suffered a loss of Rs.392,920.

(d) An officer of the Ministry of Fisheries and Aquatic Resources had been appointed to act for the post of a Working Director in the year 2009. Eventhough there was no evidence available in the Agency about his attendance, an assigned vehicle and a driver had been attached to him. The value of fuel given to him and the value of salaries allowances overtime and combined allowances paid to the Driver during the year under review amounted toRs.43,750 and Rs.138,854 respectively.

(e) The providing of security services to the Agency had been taken from the Fishery Harbours Corporation since several years without calling for market quotations and the security officers had been deployed without enquiries the requirement of the Agency. A sum of Rs.213,496 had been paid during the year under review for the providing of security services.

3:2:2 Identified Losses

The following matters were observed.

(a) As a sum of US $15,000 had been paid for the repair of "Sayuri" vessel destroyed by Tsunami disaster in excess of the insurance identity of US $7565 received for repairs loss of Rs.780,000 had been incurred by the Agency.

(b) The Agency had suffered a loss of Rs.24,413 as a result of purchasing 755 sanitary items at prices quoted in excess of the stated prices.

(c) The Agency had to suffer a loss of Rs.29,752 due to noncompliance with the correct tender procedure and guidelines.

(d) The circuit bungalow at Kalpitiya had been given for accommodation free of charge from several years. The amount due from the parties who had been provided accommodation without charging fees during the year under review amounted to Rs.37,400.

(e) Although an expenditure of Rs.22,680 had been incurred for advertisements published in the Daily News for the sale of discarded vehicles by auction, those vehicles had not been auctioned

(f) The foreign travel advance of Rs.389,794 given in the year 2009 had been written off against the profit of the preceding year. The approval of the Board Directors had not been obtained thereon and the journal entries in this regard had also not been approved.

3:2:3 Assets Management

The double can and the croo cab bearing numbers 50 & 4415 and PY-0027 respectively belonging to the Ministry and used by the Agency for 3 years had not been transferred in the name of the Agency up to now.

3:2:4 Exceptional items

3:2:4:1 Transitions of contentious nature

The following matters were observed.

(a) A sum of Rs.1,085,947 had been recovered as the royalty expendiure of the agency in respect of SIDA Project.

(b) A sum of Rs.270,052 which had not been included in the estimated expenditure had been taken from the SIDA project by the officers of the NARA as the project consultancy allowances.

(c) Although according to the estimated budget of the SIDA Project, provisions for the acquisition of capital goods had not been made a computer valued at Rs.194,783 had been procured.

(d) According to the agreement the project had been completed at 30 September 2006 and a project report should have been submitted to the SIDA at the end of the project nevertheless such reports, had not been prepared and submitted even by March 2010.

3:2:5 Payments extraneous to the objectives

A sum of Rs.260,619 had been paid to the welfare society extraneous to the objectives of the Agency.

3:2:6 Idle resources

Action had not been taken to remit the excess money to those donor institutions by which each project was funded after completion of projects in accordance with agreements. A sum of Rs.1,217,326 to be remitted to the SIDA had been retained idle in the Agency for more than 4 years.

4. Systems and Controls

Deficiencies in systems and controls observed during the course of audit were brought to the attention of the Chairman from time to time. Special attention is needed in respect of the following areas of control.

(a) Vehicle Maintenance
(b) Human Resources Management
(c) Construction Contracts
(d) Income
(e) Advances
(f) Debtors

H.A.S. Samaraweera
Acting Auditor General.

Action taken by the Management - 2009

2.2 Comments on Financial Statements

2.2.1 Presentation on Financial Statements

Steps have been taken to comply with the requirements of the circular of Public Enterprises Department.

2.3 Accounting deficiencies

(a) Actual financial loss which occurred due to the difference in exchange rate was Rs. 599,027.20 as properly accounted in the succeeding year when it was recorded

(b) The land in Kalpitiya and Rekawa belongs to Land Reform Commission and Divisional secretary of Tangalle respectively. The process of acquiring is being followed up to obtain the title dead.

(c) At the moment the premises are occupied by Sri Lanka NAVY, Nara is in the process of getting it released. Once it is released to NARA, action will be taken to get the ownership of the land. Thereafter, the value of the land will be shown in the assets of NARA.

2.4 Receivable Loan Balances.

(i) The report prepared by the committee appointed to study and report the recoverability of these advances and loans has been submitted. Necessary action will be taken when the approval is obtained from the Governing Board.

(ii) The report prepared by the committee appointed to study and report the recoverability of these advances and loans has been submitted. Necessary action will be taken when approval is obtained from the Governing Board.

2.5 Lack of evidence for audit

(a) The request for this file has not been made in writing to the respective Heads, however requested details are available for audit.

(b) The request for files has not been made in writing to the respective heads. However files/documents related to the construction of Kalpitiya boundary fence are available for audit.

(c) All verification reports and the register for fixed assets were available and submitted to the Auditors on their request, except the deed of the land at Kalpitiya, Rekawa and Trincomalee. Other necessary documentations to establish the ownership and existence is available.

(d) Confirmation letter for all debtors have been sent. But no reply was received.

(e) Agreed with the delay. Necessary action has been taken to reply the audit quarries within the given period.

2.6 Non-compliance with Laws, Rules, Regulations and Management decisions

(a) These deposits were made with the approval of Governing Board of NARA. However steps will be taken to comply with the requirement of the Treasury circular issued in this regard.

(b) (i) An updated register of vehicles is now available and could be submitted for audit.

(ii) All log books were updated and could be submitted for audit.

(c) Action has already been taken to obtain the approval from Director General of Dept. of Management Services for recruitments and promotions.

(d) Noted. Action has been already taken to stop the payment of fuel allowance.

(e) (i) (a) Head of allowances were made with approval of Governing Board of NARA. However the guidance has already been requested from Salaries and cadre commission. On receipt of their recommendation action will be taken.

(b) Special allowances for drivers were made with approval of Governing Board of NARA. However the guidance has already been requested from Salaries and cadre commission. On receipt of their recommendation action will be taken.

(ii) (a) The guidance has already been requested from the Salaries and Cadre Commission, on receipt of their recommendation action will be taken.

(b) The guidance has already been requested from the Salaries and Cadre Commission, on receipt of their recommendation action will be taken.

(iii) The guidance has already been requested from the Salaries and Cadre Commission, on receipt of their recommendation action will be taken.

(f) The guidance has already been requested from the Salaries and Cadre Commission, on receipt of their recommendation action will be taken.

3. Financial and Operating Review

3.1 Financial Review

3.1.1 Financial Results

Noted to pay more attention to improve the financial result.

3.2 Operating Review

3.2.1 Management Inefficiencies

(a) Agreed with the comments. All these employees were released at the request of relevant authorities and all details with copies of requested letters were submitted with our reply to the auditors. Some of them were recovered from the respective authorities.

(b) Agreed with the comments. All these employees were released at the request of relevant authorities and all details with copies of requested letters were submitted with our reply to the auditors.

(c) Noted. Action has already been taken to terminate the contract appointment. New appointment will be made as per the rules and regulations laid down by the Department of Management Services.

(d) Noted. Action has already been taken to terminate the appointment and driver has been attached to the Service and Operation division.

(e) Action has been taken to expedite to obtain the security service calling quotation.

3.2.2 Identified Losses

(a) Inquiry is already been commenced with regard to this payment. Action will be taken on receipt of their recommendation.

(b) Action has already been taken to make the purchase after following a correct procedure and action will be taken to recover any losses from the employees who directly responsible.

(c) This matter has been referred to the Audit and Management Committee. On receipt of their recommendation necessary action will be taken.

(d) Action has already been taken to rectify those irregularities and at present no accommodations are permitted for external parties.

(e) Agreed, action will be taken not to recur this type of errors in future.

(f) In the absence of specific details, unable to submit the reply.

3.2.3 Assets Management

Repeated requests has been made to the ministry to transfer the ownership of vehicles to NARA, But not yet succeeded. Noted to expedite to obtain the ownership of vehicle.

3.2.4 Exceptional items

3.2.4.1 Transitions of contentious nature

(a) Noted to comply for future projects.

(b) Noted to comply for future projects.

(c) Noted to comply for future projects.

(d) Noted to comply for future projects.

3.2.5 Payments extraneous to the objectives

Welfare Society is consisting the employees of NARA and no outsides. These payments are made for the activities directly related to the employees of NARA. As such, we believe these expenses are within the NARA objectives.

3.2.6 Idle resources

According to the records maintained at NARA amount outstanding for the year ended 31st December 2009 was Rs. 192,816.96 that retained to meet the payment of publishing the project report but not Rs. 1,217,326 as stated in the Audit report.

4. Systems and Controls

Action has already been made to pay special attention in respect of the areas that you have mentioned in the report. Stick internal controls adopted to overcome lacking areas.

Dr Hiran w Jayewardene
Chairman- NARA

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