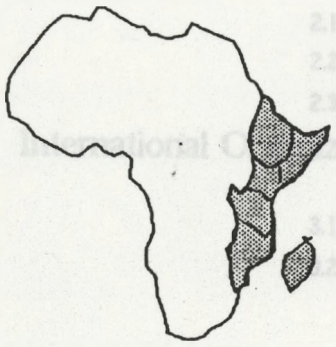


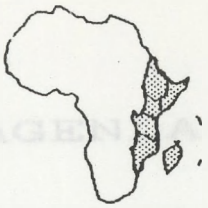
East-African Co-operation In Fundamental and Applied Marine Ecology

UNESCO/KBP/KMFRI Regional Workshop on Fundamental and Applied Marine Ecology

Mombasa, 6 - 9 April 1988

East African Co-operation
In Fundamental and Applied Marine
Ecology

Contents



East-African Co-operation
in Fundamental and Applied Marine
Ecology

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9.1 KMFRI

- 9.1.1 J.M. Kazungu
- 9.1.2 N. Muthiga
- 9.1.3 M.N. Mutua
- 9.1.4 M.O. Odido
- 9.1.5 E. Okemwa
- 9.1.6 S. O'Omolo
- 9.1.7 H.A. Oyieke
- 9.1.8 R.K. Ruwa
- 9.1.9 E.O. Wakwabi
- 9.1.10 G.M. Wamukoya

9.2 Ethiopia (Asmara University)
Prof.Dr. E.Bekele

9.3 Madagascar (CNRO)
Ms. H.Razafindrainibe

10. Annexes

- 10.1 Kenya-Belgium Project : An Overview
- 10.2 RECOSCIX-WIO : Project Proposal
- 10.3 FAME : Postgraduate Course VUB
- 10.4 VVOB : Flemish Association for Educational Programs Abroad
- 10.5 Mauritius : Albion Fisheries Research Centre
- 10.6 UNEP : Convention for Protection, Management and Development of Marine and Coastal Environment of the Eastern-African Region.

1. AGENDA

UNESCO/KBP/KMFRI REGIONAL WORKSHOP ON FUNDAMENTAL AND APPLIED MARINE ECOLOGY
6TH - 9TH APRIL 1988 - MOMBASA, KENYA

Subvention from UNESCO - Nairobi, Kenya

Organizer: Kenyan - Belgian Project in Marine Sciences

Venue: Nyali Beach Hotel - Tel. 471551/471567 Mombasa

Tuesday: 5 April : Registration of participants.

Wednesday: 6 April

8.30 - 9.00 : Registration of participants, administrative arrangements

9.00 - 10.30 : Opening session of the meeting :
Master of ceremony: Mr. Allela, Director KMFRI
Chairman: Prof M. Hyder, Nairobi University.
Vice-Chairman: Dr. E. Martens, Asst. Director KBP
Rapporteurs: Prof. Bathwondi- Mr. Okemwa

Introduction Mr. Allela, Prof. Hyder
Director KBP: Prof. Polk
UNESCO Representative: Kitaka
Belgian Government Representative: Mr. Beck

Official Opening: Government of Kenya Representative:
Mr. F.N. Nthenge, Dupt. Secr. Ministry Research Science & Technology

10.30 - 11.00 : Coffee break

11.00 - 12.30 : State of Research on Marine Ecology -
Review of national progress in Marine Sciences in the different countries represented.
(Mauritius - Ethiopia - Somalia)

12.30 - 14.00 : Break - Lunch

14.00 - 16.15 :- State of Research on Marine Ecology (Continuation)(Madagascar - Tanzania - Kenya)
- UNEP - Representative: Dr. B. Nielsen.
- Kenya National Council for Science & Technology: Mrs. G. Thitai
- Tanzania National Scientific Research Council: Prof: A.S. Msangi
- KBP - overview of ongoing research: Dr. E. Martens

16.15 - 16.30 : Coffee break

16.30 - 17.30 : Post-Graduate Course in Marine Ecology for the collaborating E. African countries - Prof. Ph. Polk KMFRI - KBP - Univ. NBI. - UNEP

18.00 : Drink Nyali Beach Hotel

Thursday: 7 April.

8.30 - 10.30 : Discussions on the setting up of a Regional Documentation Centre for E. African Countries: KMFRI - KBP - UNEP. Mrs. J. Mwobobia. Possibilities in other countries by the representatives.

10.30 - 10.45 : Coffee break

10.45 - 12.30 : Potentialities of a Regional Database for exchange of scientific data for E. Africa: KMFRI - KBP. Mr. P. Pissierssens. Possibilities in other countries by the representatives.

12.30 - 14.00 : Lunch

14.00 - 15.30 : Organisation to set up a Newsletter for the collaborating E. African Countries: KMFRI - KBP, Mr. P. Pissierssens. Representatives of other countries.

15.30 - 17.00 : Visit to KMFRI in 2 groups alternating:
1. Visit to Computer Section KMFRI and demonstration of computer connection for Regional Documentation Centre and Database.
2. Visit to the laboratories KMFRI.

Friday: 8 April

8.30 - 10.30 : Scientific contributions (4)

10.30 - 11.00 : Coffee break

11.00 - 12.30 : Scientific contributions (3)

12.30 - 14.00 : Lunch

14.00 - 16.00 : Scientific contributions (4)

16.00 - 16.30 : Coffee break

16.30 - 18.00 : Scientific contributions (3)

Saturday : 9 April

9.00 - 12.00 : Discussions on planning of activities - recommendations and adoption.

12.00 - 13.00 : Lunch

13.15 Departure for visit to Gazi at South Coast: Pilot culture of oysters and of marine algae.

2. Introduction

2.1 Prof.Dr. Ph.Polk, Director of the Kenya-Belgium Project in Marine Sciences

Let me be,today, very short. I like to thank, in the first place, Dr. E.Martens, Mr. P.Pissierssens, Mrs. M.Opiyo and Mrs. J.Ndau for all they work they did to prepare this workshop. I'm not sure that, without their energy, we would have had an organization of this workshop as we have. If there are any mistakes then it is my responsibility. All positive work is theirs.

I like to thank the Kenyan and Belgian authorities and UNESCO for all the administrative, financial and moral support. I like to thank the International organizations UNESCO, IOC and UNEP who helped us and are willing to help us in the future for the development of Marine Research in the Region.

And here, my wishes for the workshop are : That we develop a strategy to start the data-bank, that we develop a strategy to start the exchange of scientific literature, that we develop a strategy to start a newsletter... That we start the exchange of scientific results.
I know the programmes of IOC, UNEP and UNESCO: all of us have to know them. All these organizations like to have a data-bank and exchange of information. All these organizations have a program... All of them have some money. With a good co-ordination and organization, a follow-up of ideas, strategies and philosophy, we can and will succeed in the development of marine sciences in the region with their help.

In theory, the Kenya-Belgium Project will be finished at the end of this year. However, I hope that a new project will start. This new project ,the "Higher Institute for Doctoral and Post-doctoral Research and Education". will be a collaboration between the Kenyan and Belgian Government, implying the KMFRI and the Kenyan and Belgian Universities, with as speciality Marine Ecology. The new approach would be : the project will be open to the East African region, as will be the post-graduate course FAME, organized at the Free University of Brussels (VUB) , within certain limits.

I will give an introduction to this new Project: I hope you will give your remarks, suggestions and proposals. Indeed : IOC, UNEP and EEC requested me, in an informal way, to discuss an "East-African Consortium of Marine Laboratories", each with their own specialities (Chemistry,Geology,Aquaculture,Fisheries,...) interacting with each other and with specific European laboratories.

Let's start the workshop. Let's develop 100 new proposals, then we are sure 10 will be a success.

Thanks to all of you, to be present in Mombasa. The future of Marine Sciences in East Africa is in your hands.

2.2 SPEECH BY MR. M.BECK, REPRESENTATIVE FROM THE GOVERNMENT BELGIUM.

In October 1984 an Agreement between the Government of the Republic of Kenya and the Government of the Kingdom of Belgium in the field of Marine Ecology and the Management of the Coastal Zone was signed in Nairobi for an initial period of two years. This Agreement has since been extended until the end of this year.

The project had four objectives :

- the inventory and description of the different marine biotopes;
- the description of the trophics levels;
- the description of the interaction between the biological and chemical boxes, in order to understand the functionning of the different ecosystems;
- the management of the coastal zone including fisheries.

The laboratory of ecology and systematics of the University of Brussels is responsible for the scientific management of the project. The Kenya Marine and Fisheries Research Institute is the Kenyan counterpart.

The objectives of this project were very ambitious and were to be completed by generations of marine scientists but in order to build a house you must start with the foundations. The Kenyan-Belgian project is the foundation of the future programmes to be implemented in the field of Marine Ecology.

Your participation at this Workshop proves that we are heading in the right direction.

The organisation of this Workshop shows that the research being carried out under this project involves not only the Kenyan coast and should be extended to include the other countries bordering the Indian Ocean. The initial objectives of the bilateral project have also been surpassed by the actual evolution of the work accomplished and I am delighted - it is in this way that during the evolution of the research other aspects have appeared, only two of which are mentioned here:

- the necessity to improve information and its diffusion to the different research institutions concerned;

- the necessity to improve and to co-ordinate the training of the researchers.

It is obvious that such developments surpasse the possibilities of a single bilateral project, I am, however, very pleased to hear this, it is one of the many positive points of our action, that the project financed by the Kingdom of Belgium should prove

itself to be the heart and base of a more important action in relation to the Indian Ocean.

The interest shown in the project by UNESCO and UNEP proves to me that we were right to finance it.

Allow me to thank all the people and organisation who have allowed the organisation of this Workshop and, in particular, the Government of Kenya, Professor POLK and his team and UNESCO.

I hope that the resolutions and recommendations reached during this Workshop will not be simply filed and forgotten but will result in some concrete action being taken.

My Government eagerly awaits your findings.

Enjoy your work.

Thank-you.

2.3 MR. F.M. NTHENGE, DEPUTY SECRETARY MINISTRY OF RESEARCH, SCIENCE AND TECHNOLOGY

WELCOME ADDRESS TO THE PARTICIPANTS OF UNESCO REGIONAL WORKSHOP ON FUNDAMENTAL AND APPLIED MARINE ECOLOGY

Mr. Chairman
Distinguished scientists
Ladies and Gentlemen

It is my great pleasure and privilege to welcome you all on behalf of the Kenya government, on this occasion when Kenya-Belgium Project in marine sciences with cooperation from UNESCO holds this Regional Workshop on Fundamental and Applied Marine Ecology here in Kenya. I must first take this opportunity to express my heartfelt gratitude and thanks for the confidence and trust that Belgium and UNESCO have in our country, indeed as manifested by your being here. It is a further manifestation and indication of your readiness and willingness to assist developing countries, in particular those of East Africa Region in their effort to achieve marine scientific capability.

Mr. Chairman, I am aware that your concern today is in relation to Fundamental and Applied Marine Ecology. I believe, fundamental and applied research can be made to contribute significantly to national development especially in food output, which will be needed more and more by the ever increasing populations. This is a welcome concern which we all share, and I shall wish you the best in your deliberations. Before I address you on Fundamental and Applied Marine Ecology, let me use this opportunity to say something equally important in relation to the overall efforts by Eastern African countries to utilize aquatic resources, both inland as well as oceanic waters. Kenya attaches great importance to the training of qualified personnel without which our efforts to utisize aquatic resources would not be possible. It is my anticipation that workshops such as yours would assist the countries in this region in furtherance of their efforts to achieve a degree of self-sufficiency in manpower.

A workshop such as the one you are holding today offers an excellent opportunity for an exchange of views and information; the success of this workshop, I believe depends to a large extent on the individual capability of the participants - the advantage of having qualified scientists is therfore rather obvious. To achieve a higher degree of self-sufficiency, Mr. Chairman, in this area, calls for co-operation amongst nations, organizations and above all willingness and readiness among the "haves" to share with the "have nots". Kenya is not blessed with facilities which can promote research and training. In spite of this, Kenya is more than determined to contribute the development of manpower by sharing her research facilities, by cooperating in all regional

endeavours geared towards the promotion of scientific capability. With trained manpower, I am sure Africa could go along way to alleviate food shortages, especially of protein shortages for instance by utilizing marine resources. Mr. Chairman, utilization of marine resources, will depend to a large extent on management organized on a national scale, which must be based on sound scientific information.

I am aware of the need by African countries to achieve advanced scientific capability, but we in the developing countries will not be in a position to achieve the status of most developed countries at once. But in trying we must address ourselves to all the problems. African scientists must endeavour to develop high technology, without which we shall not be in a position to fully utilize our aquatic resources. The situation is most critical when you take into consideration the 200 miles EEC, recently acquired by most coastal states.

Mr. Chairman, I must mention the importance of the environment and the need to preserve it for future generations. As population along our coast line increases competition of use of land and marine resources increases, and in doing so we pollute our creeks, beaches and occassionally our activities hasten shoreline erosion.

While I am still on the need for co-operation, Mr. Chairman, I would like to take this opportunity to commend the Kenya Marine and Fisheries Research Institute on the co-operation which has developed between the institute and the Free University of Brussels. It is through this co-operation that the Kenya-Belgium Project came to being. The first phase of the project was mainly on biological oceanography. The success of the project can be gauged by the number of publications from the Kenyan scientists, and the number of scientists who have undergone post-graduate training under the project. The project is in its second phase and would be appropriate to accommodate regional cooperation in scientific information exchange (RECOSCIX). It is common knowledge that high standard scientific capability is impossible without access to publication and occassional exchange of ideas and importantly scientists. For many developing countries, the cost of keeping subscriptions to all important scientific periodicals in getting too high. As a result of this, many are loosing tract of the quickly changing research and scientific development, within the RECOSCIX it will be possible to fill this gap by establishing within the region a quickly adaptable means of passing and retrieving such essential scientific information. Kenya with support from Belgium and U.N. bodies is offering facilities at KMFRI. , because of the importance the government of Kenya attaches to gathering of this nature.
Mr. Chairman, Kenya is looking forward for the recommendations of this workshop. Let us hope that at the end of your deliberations Africa will see a hope, a hope that will be translated into tangible progress and meaningful development of marine research in Africa.

With these remarks, Mr. Chairman, it is my great pleasure to declare this workshop officially opened.

3. INTERNATIONAL ORGANIZATIONS SUPPORTING MARINE RESEARCH IN EAST-AFRICA

3.1 UNESCO Summary of UNESCO's Activities in Marine Sciences

Dr.G.KITAKA

Unesco's activities in marine sciences fall under two separate programmes that are complementary, namely: (i) Programme x.4 (The Ocean and its resources) which is co-ordinated by the Intergovernmental Oceanographic Commission (IOC); and programme x.5 (Management of coastal and island regions) which is co-ordinated by the Division of marine sciences of UNESCO (OCE).

Programme x .4 comprises the following subprogrammes :

(i) Promotion of scientific investigation of the ocean and its resources;

(ii) Development of scientific knowledge with a view to the rational management of marine systems;

(iii) Ocean services, provision of oceanographic data, information, charts and warnings;

(iv) Strengthening of national and regional capabilities for marine research, ocean services, and training; and

(v) Strengthening of international oceanographic co-operation and formulation of intergovernmental policies. The IOC being intergovernmental in character, its assistance is channeled mainly through officially established IOC contacts in its member States. Additional information may be obtained from the secretary of IOC, UNESCO, Paris.

Programme x.5 comprises the following subprogrammes.

i) Development of syntheses of knowledge relating to interactions between terrestrial and marine environments in coastal and island systems. Much of this is done within the framework of Unesco's Major interregional Project on Research and Training leading to the Intergrated Management of Coastal Systems (COMAR), and in close collaboration with International non-government organisations that are members of the International Council of Scientific Unions (ICSU), e.g. the scientific Committee on Oceanic Research (SCOR), the International Association of Biological Oceanography (IABO), etc.

Its chief aims are to encourage studies by research institutions and to strengthen their capacities so as to gain a better understanding of the functioning of coastal systems and the changing patterns of their resources, and to promote regional and international co-operation in regard to research and training with a view to the management of coastal systems.

i) Establishment of the basis for the intergrated management of islands; and

(iii) Training of specialists with a view to increasing the number and raising the qualifications of researchers and specialists responsible for the management of coastal and island systems, particularly within the framework of COMAR and the pilot projects of the Man and the Biosphere (MAB) programme, as well as to facilitating co-operation in respect of the training of specialists between developing and technologically more advanced countries. Unesco's assistance for activities relating to this Programme is usually channeled through appropriate national institutions such as national marine research institutes and universities. Requests for such assistance may be addressed to the Director of Unesco's Regional Office for Science and Technology in Africa (ROSTA), for the attention of the Programme Specialist in Marine Sciences (Mr. G. Kitaka).

3.2. UNEP

3.2.1 The Regional Seas Programme for Eastern Africa

Dr. B. Nielsen

A regional seas programme for Eastern Africa was established under the UNEP umbrella by the Conference of Plenipotentiaries on the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region which was convened by the Executive Director of the United Nations Environment Programme (UNEP) at Nairobi from 17-21 June 1985.

Nine countries of the region and the European Economic Community were invited to participate in the Conference. France, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, United Republic of Tanzania and the European Economic Community participated in the Conference, while the Comores was absent.

The Conference adopted an action plan, a convention and two related protocols for the protection, management and development of the marine and coastal environment of the Eastern African region. The Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region and related Protocols were signed on 22 June 1985 by France, Madagascar, Seychelles and Somalia. The Convention and the two Protocols were signed by the European Community on 19 June 1986.

The Conference requested UNEP to serve as secretariat for the Action Plan, the Convention and the two Protocols. UNEP was requested also, to prepare, with the co-operation of the competent international and regional organizations and the Governments of the region, a detailed programme document describing the operational details of projects to be developed on the basis of priorities identified by the conference and present such a Programme document to a Bureau composed of representatives of France, Kenya, Madagascar, Seychelles and Somalia.

The draft Programme Document has been prepared by UNEP covering several activities of which three are major integrated projects given priority by the Conference of Plenipotentiaries.

These three projects are: (1) Protection and Management of Marine and Coastal areas in the Eastern African region, (2) Sources, Levels, and Effects of Pollutants in the Eastern African region and (3) Contingency Planning for Marine pollution Emergencies in the Eastern African region.

The Executive Director of UNEP agreed at the Conference to contribute during the 1985-1987 biennium, US$ 1,086,00 towards the implementation of the Eastern African Regional Programme, subject to the availability of matching funds provided through a Regional Trust Fund.

The Governments of the region agreed to pay the following amounts to the Trust Fund for the Eastern African regional programme:

	In US $ Dollars	
	1986	1987
Comores	12,100	15,100
France	62,500	78,000
Kenya	36.300	45,302
Madagascar	18,150	22,651
Mauritius	24,200	30,201
Mozambique	36,300	45,302
Tanzania	36,300	45,302
Seychelles	12,100	15,100
Somalia	12,100	15,100
Total	250,050	312,058

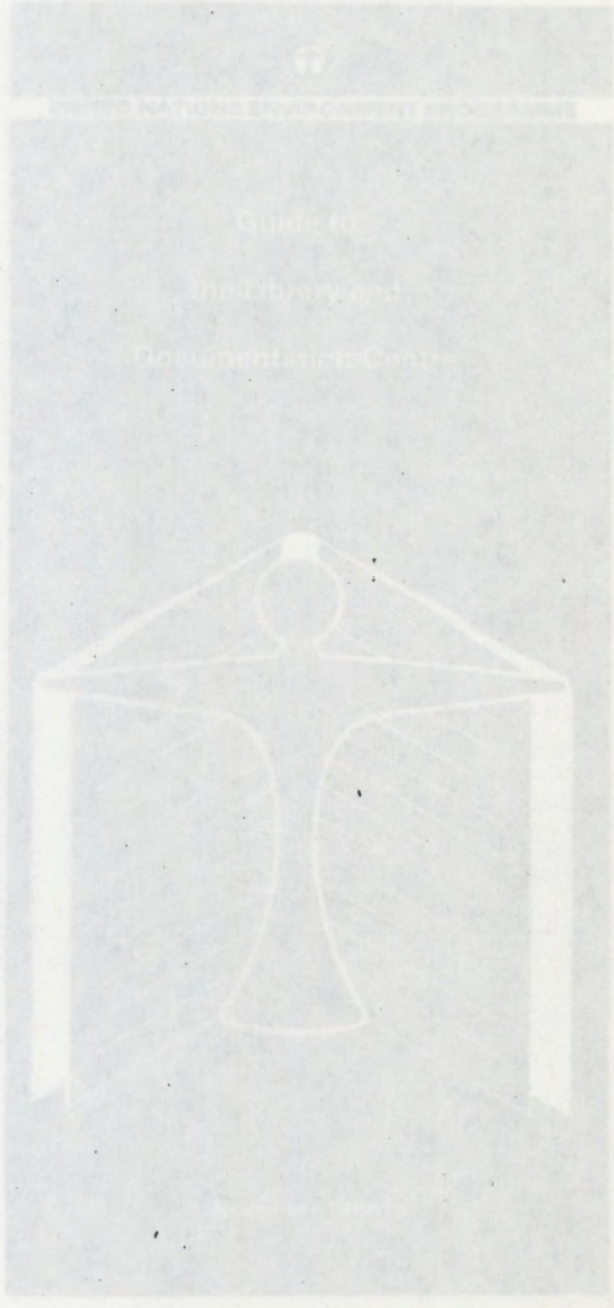
Due to the delay of the Government of the Eastern African region in fulfilling their commitments to the Trust Fund and to the Convention and its related Protocols for the Eastern African region, the Bureau meeting requested by the Conference of Plenipotentiaries to approve the Programme Document has been postponed by UNEP. As at 30 March 1988 the Government of the Seychelles had, as the only Government of the region, paid its total dues to the Trust Fund, namely US$ 27,200. The Government of France, who is the only other Government who has paid to the Trust Fund, has paid its contribution for 1986 US$ 62,500 only.

The Government of Somalia has ratified the Convention as the only Government of the region and it happened only lately. The Government of France, Kenya and Tanzania have officially declared to UNEP, during the Governing Council 8-19 June 1987, that they were in the process of ratifying or acceding to the legal instruments.

The Kenya/Belgian Project in marine science,supported by the two Governments since 1984 and carried out in collaboration with the Kenya Marine Fisheries Research Institute (KMFRI), Mombasa, is viewed by UNEP as an excellent example of the kind of co-operation it would like to see developed between universities in developed countries and research and academic institutions in developing countries participating in the Regional Seas Programme. The present Regional Workshop on Fundamental and Applied Marine Ecology supported by UNESCO/KBP and KMFRI could serve, therefore, to stimulate further interest in regional co-operation within the context of the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African region as envisaged by the Governments of the region when they met in Nairobi, June 1985 and adopted the Plan, the Convention and the two Protocols. In order for such regional co-operation in marine science to progress further, it is necessary for the Governments of the region to

ratify or accede to the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African region and to pay their dues to the Trust Fund as agreed at the Conference of Plenipotentiaries.

The Executive Director of UNEP wrote to all Governments of the region on 7 April 1987 reminding Governments of their obligations. A second reminder will be dispatched in the very near future.



3.2.2 THE UNEP-LIBRARY

(no representative)

The UNEP-library will co-operate in the Regional Documentation Centre : it's CDS/ISIS Library Data-base will be available to the Region. UNEP will also send copies of available literature upon request. Hereunder you find the UNEP-Library Information Brochure. For more information you can write to the address mentioned in the brochure , to the attention of Mr. K.Grose, Chief Library and Documentation Centre.

LOCATION

The Library and Documentation Centre is located in LB building. Requests for information, assistance and answers to reference questions should be directed to the reference and loan desk, extn. 6223. The Library's mailing address is as follows:

Library and Documentation Centre
United Nations Environment Programme
P.O. Box 30552
Nairobi, Kenya

LIBRARY HOURS AND LOAN PROCEDURES

The Library is open from 8 a.m. to 5 p.m. Monday to Thursday, and from 8 a.m. until 2.30 p.m. on Fridays. No one is allowed to enter the Library outside these hours without permission from the Chief of the Library.

While all Library materials may be freely consulted in the Library by both UNEP staff and others, only United Nations staff based in Nairobi may take materials out on loan from Library. Consultants and short-term staff must request the UNEP staff member with whom they are working to check out material for them. Staff of other organizations or institutions may request material through an inter-library loan.

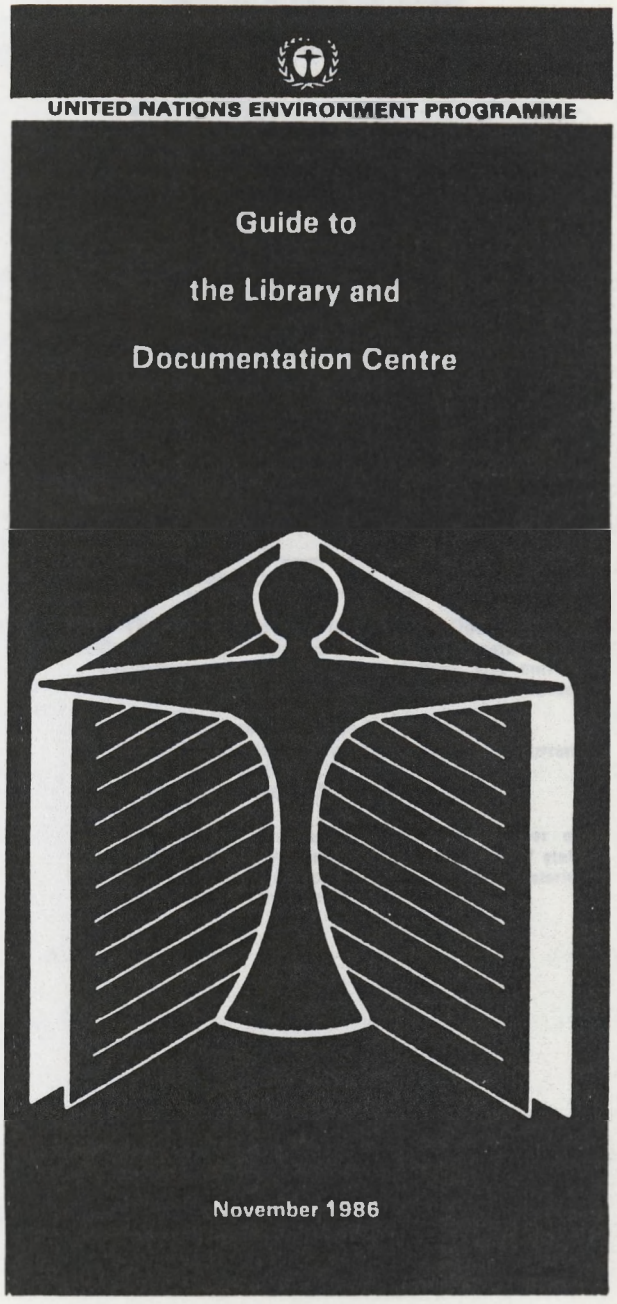
All classified material, documents and non-current issues of periodicals may be borrowed for a period of one month, and the loan can be renewed if requested. Current periodicals which are on display and newspapers can be checked out overnight or for a weekend. All material checked out overnight must be returned by 9 a.m. at the start of the next working day.

Each item borrowed from the Library must be checked out on the appropriate Loan Request Form. A separate form must be completed and signed for each item borrowed and presented at the circulation desk. Officers may authorize their secretaries to check out materials on their behalf.

Users are requested to collect and return library materials in person or through their secretaries, rather than through the inter-office mail.

Lost or mutilated materials will be replaced at the user's expense, as laid down in Staff Rule 112.3 on financial responsibility.

Printed in Kenya, (UNEP) No.86-6448 Nov. 1986 - 5000



ORIGIN AND PURPOSE

The Library and Documentation Centre was created in 1973. When the library first began operation, its collection comprised nearly 1,000 books on environmental issues donated to the United Nations Conference on the Human Environment (Stockholm, June 1972) by publishers from around the world.

The Library's purpose is to develop and maintain a collection of scientific and technical information on the global state of the environment which will assist the staff of UNEP in analysing trends, assessing problems and promoting activities leading to environmentally sound development. In addition, it acts as a depositary library for the United Nations and some of its specialized agencies.

THE COLLECTION

The collection is composed of books, periodicals, reports and documents in hard copy as well as on microfiche. Primary emphasis in collection development has been given to the subject areas most closely related to the programme interests of UNEP, which include:

Atmosphere and climate
Biosphere, ecology and conservation
Biota, fauna and flora
Desertification and arid land ecosystems
Development, economic and environmental aspects
Environmental education and training
Environmental health
Environmental law
Environmental management
Environmental monitoring and surveillance
Energy, including renewable resources
Food, agriculture and fisheries
Natural disasters
Oceans and coastal zones, including the Law of the Sea
Pollution and waste, waste utilization
Social and political environment
Soils
Technologies, environmentally sound and appropriate
Water

The collection has approximately 8,000 classified titles and subscribes to 450 periodicals. In addition, the Library maintains a number of special collections which include:

United Nations General Assembly documents (A series)
United Nations Economic and Social Council documents (E series)
United Nations Secretariat documents (ST series)
Documents of the United Nations Specialized Agencies
United Nations Environment Programme documents and project reports
Annual and technical reports of intergovernmental and non-governmental organizations and research institutes dealing with environmental and developmental concerns.

For material on microfiche or microfilm, readers with print-out facilities are available.

Material acquired by the Library from 1973-1977 is classified according to the Universal Decimal Classification while more recent material is classified according to a specially devised scheme. A card catalogue is maintained for all material acquired from 1973-1985 and computer-based information system, EPLIB, has been developed and is being used for material received from 1986.

Periodical literature is organized alphabetically, and can be searched by using the indexes and abstracts held by the Library.

United Nations documents are organized by United Nations document symbol and can be located through a number of indexing tools. Among them the most useful are:

Index to the Proceedings of the General Assembly
Index to Resolutions of the General Assembly
Index to the Proceedings of the Economic and Social Council
UNDOC: Current Index (United Nations Document Index).

LIBRARY SERVICES

The services of the Library and Documentation Centre include selection, acquisition, cataloguing, circulation, inter-library loan, reference and current awareness. Three publications are currently produced:

Acquisitions List (Series A)
Environmental Literature Update (current Awareness) (Series B)
UNEP documents (Series C).

The Library also supplies a limited number of dictionaries and other reference works to UNEP staff members on long-term loan. Requests for this material should be made at the loan desk.

3.3. COMARAF

GUIDELINES OF THE COMARAF PROJECT

Dr. S.G. Zabi

Laboratoire d'Ecologie Benthique
Centre de Recherches Océanographiques
B.P. V 18

A B I D J A N

Member of the COMARAF Project Regional Task Force.

Since the nineteenth session of the General Conference of UNESCO, Member States have attached great importance to coastal zones by developping research programmes with the general objective of improving scientific understanding of the coastal ecossytems functioning.

In order to achieve this objective, UNESCO has launched a MAJOR INTERREGIONAL PROJECT ON RESEARCH AND TRAINING, leading to the INTERGRATED MANAGEMENT of COASTAL SYSTEMS (COMAR).

The african component of this project is the COMARAF PROJECT which is or should be the concern of the following countries as participants : Angola, Benin, Cameroun, Congo, Côte d'Ivoire, Ethiopia, Reunion, Gabon, Ghana, Guinea, Guinea Bissau, Kenya, Madagascar, Mauritius, Mozambique, Nigeria, Senegal, Sierra Leone, Somalia, Tanzania, Zaïre.

The COMARAF Project aims at establishing a comprehensive framework for regional and sub-regional cooperation between the above mentioned countries in the study and rational management of coastal ecosystems.

The project is also designed to formulate and consolidate an integrated programme of research and training on the multi-disciplinary basis.

Several seminars and workshops have been organized in Africa to prepare the region for the COMARAF Project implementation.

The last 1986 meeting held in Dakar, Senegal, reviewed the project objectives and priorities, defined two main themes covering the differents ecosystems :

i) - the productivity of marine coastal zones ;

ii) - the hydrodynamics and the geology of coastal areas and of the continental shelf.

The Coastal Zones concerned may be known as lagoons, estuaries, mangroves, Coral reefs and nearshore continental shelf.

It was also decided to establish a regional network for exchange of information, scientific and technical litterature, with a view to management of marine and coastal resources.

It may also be important to mention that the project financial means have been made available by UNDP for an amount of 1 million us dollars for a three years period (mid 1987 to mid 1990).

The Regional Task Force expected to ensure the project follow up with the assistance a Chief Technical Adviser (C.T.A.) was officially created during its first meeting in Nairobi, Kenya (29 February to 4 March 1988).

3.4. IOC

TWENTY FIRST SESSION OF THE EXECUTIVE COUNCIL OF THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)- UNESCO. PARIS 7-15 MARCH 1988

Dr. A.S. Msangi

Report on the Second Session of the Regional Committee for Cooperative Investigations in the North and Central Western Indian Ocean (IOCINCWIO II) - Arusha, Tanzania 7 - 11 December 1987

This session was held about 5 years after the first one (IOCINCWIO I) which was held at the Unesco Regional Office for Science and Technology, Nairobi, Kenya, in October 1982. Originally it had been envisaged that these regional sessions of IOCINCWIO would be held every two years, and therefore the second session was held three years later than had been anticipated. The delay was attributable partly to budgetary constraints and logistic problems within the IOC and partly to the slow pace of development of marine science research in the member countries of the CINCWIO region.

The session was attended by 19 participants from the CINCWIO member states; 6 participants from other IOC member states, including the United Kingdom, the United States, the USSR and West Germany; one participant from the Unesco Regional Office in Nairobi and two officials from the IOC Secretariat. All but two members of the CINCWIO region (Somalia and Seychelles) were represented.

The session was preceded by a three day symposium which reviewed progress in marine science research in the region since IOCINCWIO I and prepared the agenda for the session.

The following main topics of oceanography were discussed:

1. Ocean Dynamics and Climate

It was noted that the Indian Ocean Climate Studies Panel of the Joint SCOR-IOC Committee on Climatic Changes and the Ocean (CCCO) had considerably advanced plans for TOGA and WOCE in the region. The session urged interested institutions and scientists in the region to study the Draft Plan for the World Ocean Circulation Experiment (WOCE) and to determine specific national interests in WOCE. It also urged the IOC and Unesco to support the attendance of scientists from the region at the International WOCE Symposium, to be held in 1988, as well as at a Regional WOCE Workshop, to be held in 1989.

2. Ocean Science in Relation to Living Resources (OSLR)

The Regional Committee decided to carry out a Cooperative Project on the Oceanography and Pelagic Resources of the Western Indian Ocean through a network of interested institutions and scientists led by an Expert Steering Group. The Expert Steering Group was charged with the general supervision and co-ordination of the project and with the additional task of studying the problems associated with the use of research vessels in the region. It also requested the Secretary of IOC to organise an Advisory Mission to look into the problem of regional research vessels.

3. Ocean Science in Relation to Non-living Resources (OSNLR)

The Committee noted that there was at the present time no firm basis for the establishment and development of regional activities in the field of Ocean Science in Relation to Non-living Resources. It was agreed that the prospects in terms of institutional interests and capabilities should be studied with a view to identifying useful regional projects in this field.

4. Marine Pollution

The Committee noted that the scientific and technological basis for a programme on Marine Pollution Research and Monitoring in the region was still not very strong. It was appreciated however that experts of the region associated with the work of IOC, FAO and UNEP had undertaken an assessment of the state of marine pollution in the western Indian Ocean in the context of the UNEP Action Plan for the East African Region, as an input to a continuing IOC-UNEP review of the state of health of the ocean. The Regional Committee adopted a proposal on a Pilot Project on Monitoring Marine Petroleum Pollution aimed mainly at monitoring petroleum in sea water and on beaches. It was decided that for those institutions in the region that were interested and had the necessary capabilities, the monitoring of petroleum in marine organisms (especially those of commercial importance) could be undertaken under the project. It was considered necessary to monitor certain parameters of petroleum pollution that would facilitate identification of likely sources of polluting petroleum. It was therefore recommended that those institutions willing and able to do so should monitor trace elements such as selenium and vanadium in pollutant oil, as well as use crude oil standards in addition to chrysene standards.

5. Integrated Global Ocean Service System (IGOSS)

It was agreed that a basis for building up the IOC-WMO Integrated Global Ocean Services System in the region still needed to be developed. It was noted however that IOC had gradually been developing regional components of the IOC Global Sea-level Observing System (GLOSS) as well as assisting interested member states under the IOC-VCP or through bilateral arrangements, with the installation and operation of local tide gauges. The Regional Committee decided to nominate a Regional Co-ordinator to oversee the

development of a Regional Component of the IOC Global Sea-level Observing System (GLOSS) and called on its member states to each nominate a National Co-ordinator for GLOSS to work with the Regional Co-ordinator.

The Committee noted with appreciation and gratitude the assistance received from the U.S.A., the U.S.S.R., Portugal and China in the provision of tide gauges to member states of the region and from Great Britain in providing training in sea-level measurements to marine scientists and technicians from the region.

6. Marine Scientific Information Exchange

The Regional Committee welcomed a proposal to develop regional cooperation in marine scientific information exchange with a view to the creation of a regional component of ASFIS. It noted with appreciation the experience obtained from the Kenya-Belgium Project in Marine Sciences and decided as a first step to carry out a 15-18 months pilot phase project in the region, based at the Kenya Marine and Fisheries Research Institute.

7. Training, Education and Mutual Assistance (TEMA)

The Regional Committee decided to promote greater effort by member states to develop endogenous marine science capability through self reliance as far as possible and through cooperation with other countries. The Committee recorded its appreciation of on-board training opportunities offered to local marine scientists by foreign research vessels (e.g. those of USSR and West Germany) carrying out oceanographic research expeditions in the EEZs of member countries of the region. It was pointed out that for maximum benefit to be derived from such opportunities, the local scientists should be involved at every stage of the expedition - planning, execution, analysis and enterpretation of data.

The Committee also pointed out the great need for the establishment of postgraduate training programmes in the Universities of the regions, especially in the areas of Chemical Oceanography, Physical Oceanography, Marine Geology and Marine and Ocean Engineering. It urged the Secretary of IOC to liase with Unesco and explore the possibility of reviving or salvaging the Unesco-ECA Project on the Development of Marine Science and Technology in Africa (1981) which had been worked out to a stage that was ready for implementation.

Election of Chairman and Vice Chairman

The Regional Committee elected Professor A.S. Msangi (Tanzania) to serve as Chairman for another term and Dr. S. Ragoonaden (Mauritius) to be the Vice Chairman.

A.S. Msangi,
CHAIRMAN - IOCINCWIO

15 March, 1988

4. Kenyan-Belgian Project in Marine Science
An Approach to bilateral co-operation in Marine Sciences.

The goal of the KBP is to obtain an integrated and multidisciplinary research program.
For the initiation of this bilateral agreement, which the KBP is, we have taken into account the advice and resolutions of the International Organizations and we have tried to avoid the mistakes apparent in existing projects. It is important to have appropriate laboratory space (air-conditioned and well maintained) for the equipment and trained staff to operate and maintain the infrastructure.
Our principal aim is therefore to link research, infrastructure and education and to give the project an interdisciplinary character.
The research is mainly done in the country where the project is based, namely Kenya, in order to avoid situations where African researchers stay for some time at European Universities, working on typical European problems to obtain their PhD. Upon return in their country, they don't have the infrastructure, nor enough basic scientific elements to apply their knowledge in their country.

The basic idea that we elaborated in the KBP consisted of sending a Belgian Expert for some weeks to Kenya, to do research together with a Kenyan homologue on a specific local problem. After that, a research planning is made up. The Document in Annex gives you the list of researchers working in the framework of the KBP and their respective research subject.
Until now we had the collaboration of Belgian experts in the following fields : Librarian Sciences, Data-base Management, Biological Oceanography (Plankton, Primary and Secondary Production), Chemical and Physical Oceanography and Ecophysiology.
When necessary, an African scientist is send to a Belgian laboratory for a short period in order to specialize. Up to now we obtained 4 fellowships for the FAME course (2 years duration) and 5 fellowships for short-term training. Upon return they will bring the necessary infrastructure to continue their work in Kenya.
The Scientific Publications are written by the Kenyans in collaboration with the Belgian experts.
Besides the Belgian Experts, we had also scientists from other countries : Prof. Yarish from the Stamford University-USA for Macro-algae, Mr. J.Weston from the Friends World College-USA working on Biological Oceanography.

Apart from the research, for which we have a basic laboratory where the biological and chemistry research is in full expansion, we would like to draw your attention on 2 logistic units, founded by the KBP : the Documentation Centre and the

The Documentation Centre

With the funds allocated to the KBP, it was quite impossible to establish a complete library on Marine Sciences. This, not being a priority, we opted for selective literature.
Prof.Dr. L.Egghe of the LUC (University of Limburg, Belgium) gave several seminars for the researchers of the Kenya Marine and Fisheries Research Institute (KMFRI), Mombasa on the possibilities and ways to get scientific literature. The requests from the scientists are collected by Mrs. Mwobobia, the Librarian of the Institute . Up to recently, the searches were then sent to Prof. Egghe, who executed the searches in the DIALOG Data-base. Then, abstracts were sent back to Mombasa, where the scientists could make a selection and then get copies of the literature from the LUC. Recently, however, we have started doing the searches in DIALOG in our Computer Section which proves to be a more efficient approach.

Apart from the literature, obtained through the LUC, all Belgian experts, coming to Mombasa, bring specific literature as well.
In two years, we have collected more than 50,000 pages of scientific literature, consulted intensively, not only by researchers from KMFRI, but also from e.g. the University of Nairobi.

We can therefore conclude that we achieved a considerable success with a minimum of expense.

The Computer Centre

The Computer Centre was established in 1985 by Ms. W.Ogaye (KMFRI), Mr. H.Onyango (KMFRI) and Mr. P.Pissierssens (KMFRI-KBP). It's history and todays activities are described in detail in Chapter 8.

Possibilities of Expanding the KBP

In Kenya, we have established good contacts with the University of Nairobi, the Government Chemist's Department-Mombasa, the Fisheries Department and with the Wildlife Departments in Mombasa, Malindi, Lamu and Shimoni.
The integration, specialization and rationalization of means has given us the possibility to omit the duplication of heavy infrastructure and to optimize it's usage.

The Documentation Centre as well as the Computer Centre can be developed for the whole region and the publication of a Regional Newsletter would be very useful. These topics are discussed in detail in Chapter 5.

It should be possible for an expert coming to Mombasa to train not only one or two Kenyans but a few other scientists from the region as well. The progress in Marine Sciences for East-Africa would be tremendous because in a few years time the region

would have it's own experts !

Concerning the post-graduate course "Fundamental and Applied Marine Ecology" organized at the Free University of Brussels (VUB), we could give priority to students from East-Africa.

The research, principally done in mangroves creeks and on coral reefs is in accordance with the priorities of the International Organizations concerning the preservation of flora and fauna of the Indian Ocean Region and log-term exploitation of Coast Resources.
We therefore hope to develop the research in the whole East-African region in collaboration with the International Organizations.

CONCLUSION

After two years of co-operation, the KMFRI possesses a basic infrastructure for thematic biological and chemistry research, a Documentation Centre and a Computer Centre.
The current descriptive research has to be integrated in a functional model.
At present, the fundamental research, essential to establish good management, has resulted in an experimental oyster culture and a small scale algae culture.

Speaker : Dr. E. Martens, Kenya-Belgium Project

5. Regional Information Exchange in the East-African Region

5.1 Documentation Centre

Many Universities and Scientific Institutes are facing financial limitations. Usually the first victims in budget restrictions are the Libraries. Periodicals which are essential for Research are no longer subscribed to, leaving Scientists in a position isolated from the current research continuously advancing in the rest of the world.

Exchange between Libraries from the various Institutes are scarce in the Region. Therefore Scientists are not aware that valuable literature may be available somewhere in East-Africa.

Requests for literature *person to person* to Scientists overseas can take quite long (up to several months).

For the above reasons, a Regional Documentation Dispatch Centre would prove to be extremely useful. A proposal, named Regional Co-operation in Scientific Information Exchange in the West Indian Ocean (RECOSCIX-WIO) has been designed :

A Regional Dispatch Centre will carry out the following duties :

= Aquatic Sciences and Fisheries Abstracts (ASFA) : A CD-ROM version of this Data-bank will be located at the RDC.

= WIO Regional Library Database (WIOLIB) : This data-bank, centralized at the RDC will include the following information :
- Periodicals (related to Marine Sciences) available in the libraries of the Region.
- Important reference works (related to Marine Sciences) available in libraries of the Region.
- Publications of the Institutes in the Region.
- UN-publications and reports.
- UNEP Library Data-base link : this data-base will also be available to the Region.
- International Interlibrary Lending Service : after selection of titles, obtained from the different available data-bases,copies can be obtained through the network.
- Electronic Mail : if the hardware is available and communication is possible, messages can be exchanged through an electronic (PC-PC) network.

The RECOSCIX-WIO Project Proposal has been proposed to the Region during the Second Session of the IOC Regional Committee for the Co-operative Investigation on the North and Central Western Indian Ocean (Tanzania,Arusha, 7-12 december 1987).The Regional Committee decided to adopt the project in principle and the implementation of the first phase in practice. The Regional Committee invited the Kenya Marine and Fisheries Research Institute (KMFRI) to act as the Dispatch Centre for the RECOSCIX-WIO Project during the Pilot Phase, in view of the existence of the required facilities there at this time.

IOC and UNESCO are now searching funds for the first phase of this Project, as well as for the following phases.

Improving effective transfer,co ordinative and referral system.

What is a documentation Centre?

A documentation centre is an institution that acquires, processes and disseminates information to persons requiring it. It offers services such as question and answer services, current awareness service (accessions lists, contents pages and selective dissemination of information (SDI) and computer searches, it produces indexes and bibliographies. The documentation centre also has access to other information sources like data bases and libraries and documentation centres all over the world.

A documentation centre usually specializes in a specific subject area and deals with a particular group of users. A documentalist identifies a group of people with common interest who are growing in information awareness and provides them with a specialised services, e.g. SDI.

What is the role of documentation centre?

In order for a documentation centre to serve the public efficiently and effectively, users needs and their information seeking behavior must become a central focus of the centre's system. Information strategies should therefore be carefully planned in order to supply people, directly and indirectly with the right information at the right time.

How documentation centres help researchers in their research projects.

Research is vital for development. Researchers need current information in order to plan and sustain their research progress. Unavailability of new knowledge is however a pressing problem to researchers in developing countries. They need information about similar work being done elsewhere, especially in countries with similar problems, and also need in depth information that is necessary to test results and evaluate their work. This information can be found in documentation centres. Researchers also need information to further thier professional acumen. This need can be satisfied if a researcher's profile is known and the researcher is kept on the SDI services of a documentation centre. Other useful services that would offer current information include the current awareness services (accessions lists, monthly bulletins, content pages, abstract journals indexes) and computer searches from other data bases.

Searching.

The search software is user-friendly and there is virtually unlimited space on the disc for 'help' information. People who are already familiar with the procedure of making an online search using Dialog comman language are comfortable with 'Compact Cambridge'. For searchline fields available in CD-ROM see attached sample. The main benefit of CD-ROM is unlimited access

to information at a fixed cost, i.e. without online charges. You can afford to format and reformat your search strategy until you have retrieved the information you need. There are two search levels, i.e. menu driven and command level. The menu driven search level is designed to enable the user to start searching without prior knowledge of search techniques. The command level is fast and similar to DIALOG command language.

Remarks

CD-ROM products are giving more people than ever before access to vast amounts of information by enaling users to search for themselves because time is not a cost factor.

Costs for aquiring data are known upfront. This will enable the users mangers or administrators to budget more accurately for the purchase of the data base or its updtates.

Users for the online searching can be trained at lesser expense.

More libraries and information centres and other research institutes will be able to subscribe to data bases relevant to them. This means that they will be able to search locally, encountering none of the negative aspects of remote online aaccess, i.e. telecommunications, connect-time charges, poor response times in busy periods and bad connections.

CD-ROM for information dissemination.

At present, a formatted Compact Disc Read only Memory (CD-ROM) disk, which is made out of plastic and measures 12cm diameter and 1.2 mm thick, can store vast quantities of information (more than 100,000 fully indexed pages). The disk weights only a few grams. It offers reliability, permanence and durability. Compact disks are not affected by sticky materials, cratchces, rough handling, etc.

Hardware.

Compact disk systems are likely to be based on standard micro computer hardware such as IBM PC, MS-DOS, etc. Micro computers interfaces to access compact disks are already available from manufacturers such as Sony, Hitachi and Philips.

The software and data base(s) can be recorded into one disk effectively combining software distributin with data publishing. The user need only turn the computer on to access the data and the system will automatically load from the comact disc.

ASFA on CD-ROM.

ASFA is available on CD-ROM as "COMPACT AQUATIC SCIENCES AND FISHERIES". The aquatic sciences and fisheries Abstracts data base is a complete international data base available exclusively from Cambridge Scientific Abstracts.

The compact Cambridge ASFA CD-ROM contains all the information in the DIALOG ASFA data base from 1982-1986 and updated quartely. It includes citations and absracts selected from leading journals as well as reports, monographs, dissertations, grey literature and proceedings. The coverage includes all biological and ecological aspects of marine, fresh water and brackish environments, fisheries aquaculture and other living resources, pollution, oceanography, marine meteorology and climatology and marine technology.

Workshop topics

The working of a documentaion centre will be explained. Different information technologies will be presented which might serve as models for possible implementation in the region.
The RECOSCIX -WIO Proposal will be explained in detail.
A demosnstration will be offered of on-line use of the DIALOG data-base.

Speakers : Mrs. J.Mwobobia, KMFRI Librarian
Mr. P.Pissierssens, KMFRI-KBP Computer Section

5.2 Regional Data-Exchange

Many marine researchers in the East-African Region are working on identical or closely related subjects. It is clear that data, coming from this research are important not only for the one scientist, but for the whole region. Modeling of the marine ecosystem as well as handling oil spills and other ecological disasters could be better handled if more data could be used the region.

We mention the National Oceanographic Data Centres (NODC's) existing in the framework of the International Oceanographic Data and Information Exchange (IODE) System. Unfortunately, so far only Tanzania has a designated National Agency (phase before NODC) and Madagascar has nominated a National Co-ordinator for IODE.

For immediate use by the researchers a system can be envisaged with which data can be pertained by researchers from the region in an organized and controlled way. The Regional Dispatch Centre, already mentioned in the former topic, could be used here as well.

The data could be exchanged by electronic means, using either PC-PC links (if available) or floppy-disks.

However, we wish to stress the importance of the definition of rules which should control the use of scientific data : especially unpublished data should be well protected !

Workshop topics

It should be discussed if and how a data-exchange network can be organized. Special attention should be given to the protection of unpublished data and the follow-up given by the member countries and Institutes to requests.

Speaker : Mr. P.Pissierssens, KMFRI-KBP Computer section

5.3 Regional Newsletter

A Regional Newsletter can be envisaged in which all sorts of relevant information can be communicated to the Region.
We suggest the following topics :

- This is ... : in which an Institute will present itself to the Region. All Scientists, Scientific Programmes, special infrastructure, Research Vessels, Co-operation Projects etc. etc can be presented.
- Important Regional or International Workshops, training courses, meetings, visits from important specialists.
- The availability of new scientific data-sets.
- New arrivals in the libraries.
- Scientific Staff changes
- UN announcements
- ...

This Newsletter can be sent to all the Marine Science Institutes in the Region, to UN and other International organizations and to important Marine Stations in the rest of the World.
It is clear that this will be a unique way to promote Marine Sciences in East-Africa .

Workshop topics :

The necessity and practical organization of this Newsletter can be discussed.

6. The Higher Institute for Doctoral and Postdoctoral Research and Education.

Dear Colleagues,

I will be very short again. I will tell you about some ideas I like to discuss with you and with the Kenyan and Belgian authorities.
The idea to discuss this possible new Kenyan-Belgian project with you is for the following reasons : I hope it can be a prototype, a pilot project, a part of a 'Consortium for Marine Sciences in the Region. The Complete Consortium has to be build in full collaboration with your countries and European Countries. The Complete Consortium should be full working in 1992 ..... A Consortium between the East African countries and the EEC. countries. With the collaboration of UNEP, IOC, UNESCO, FAO .... Let me tell you it's easy .....

The idea is a Master degree in Marine Sciences can be obtained in some E.African countries, or other countries all over the world. If possible, the thesis to obtain a Master degree shall be done with material of the country itself. It's possible. The Belgian customs didn't understand why I came back to Belgium with hundreds of books with water or samples of mud ... but the thesis of Oteko is done on Kenyan mud in Belgium, the thesis of Okemwa on Kenyan copepods.
But the research for a Ph.D, I think, must be done in the country itself !! on the priorities of the country, so fitting in a Regional Project indeed, a Regional project reflects the priorities of the countries, or has to reflect it.
In Kenya, we have, at the University of Nairobi, or Kenyatta University, or Moi University, some excellent experts - professors. In that case, there is no problem for promotion for Kenyans. In Belgium, we have some excellent experts in Marine Sciences : a few of them came up to 4 times, to work with Kenyan counterpart (see annex : Kenyan-Belgian Project). The work of some Kenyan experts are progressing towards a Ph.D!!
I propose an agreement between the Kenyan Universities, KMFRI and the VUB to collaborate in Marine Sciences on the Ph.D level.
In collaboration, the needs of the country will be discussed. The Kenyan expert, having a master degree, will work in Kenya under the super vision of a Kenyan and/or a Belgian Expert. The Belgian expert will work for 1 or 2 months in Kenya, but not only for the Kenyan experts : KMFRI will open her doors for East Africans. This approach would have a tremendous advantage : on a stay of 1 or 2 months high-level specialization, with seminars given by the different experts, the same approach, the same methodology, an intercalibrated research will be carried out. I think this is possible, if this Kenyan-Belgian Project will start in January 1989. But: we will do only "Marine Ecology", even, with some specializations.
But there is Physical Oceanography, Mariculture, Chemical Oceanography, Geological Oceanography, Fisheries, Law of the Sea.

An East African Consortium has to be complete : make every specialization.
Belgium doesn't have all these experts. In any case, is too small, to support such a Consortium alone.
But France and Germany, U.K. and Denmark, Italy and Holland, Belgium and Portugal and Spain : they have.
And Mozambique and Tanzania, Kenya and Somalia, Ethiopia and the Seychelles, Mauritius, Madagascar and the Commoros : they have, or their specialities at the moment, or their needs !! That the Marine Ecologist from the Region are coming to the Kenyan-Belgian Project, once a year, intercalibrating their research, discussing their results. But that the Kenyan expert in Mariculture, Physics or Chemistry, is going to work in an Italian-Somalian, Tanzanian-Danish or Seychelles-France bilateral project : all of them fitting in an EEC - East African Consortium.....
That Recoscix will be a tool to start next week, let our, your newsletter be printed, in two weeks. Let's discuss this idea, lets work on it.
When I, personally, can be a catalysator for such a Consortium, I like to try to sell this idea!

Thank you

Prof.Ph.POLK

7. Marine Ecology Research in East-Africa

7.1 Ministry of Agriculture, Fisheries and Natural Resources, Mauritius

D. Gangapersad (Coastal and Marine Conservation Unit)

The Island of Mauritius is of Volcanic origin and covers about 1860 km , with the highest mountain peak at some 825 metres. Mauritius is found 853 km east of Madagascar. It is the political centre of the sovereign state of Mauritius which also includes the islands of Rodrigues, Agalega, Tromelin, Cargados Carajos (St. Brandon) and the Chagos Archipelago and any other islands comprised in the state of Mauritius (1974: 74 and Amendment Act N:4, 1982).

Sovereignty over territoral waters is legistlated under the Territotial Sea Act and Continental shelf Act of 1970 and the Maritime Zone Act of 1977 which extends the territorial sea to 12 nautical miles. Furthermore, Mauritius claims full and exclusive rights over the continental shelf which comprises "the seabed and subsoil of the submarine areas the extends beyond the limit of the territoral waters throughout the natural prolongation of the large territory of Mauritius to the outer edge of the continental margin" (Mauritius Revised LAWS, 1981: 542). And a 200 nautical miles Exclusive Economic Zone extending from the straight base line system used to measure the extent of the territoral sea and over which the state claims among other privileges, the " sovereign rights for the purpose of exploration, exploitation, conservation and management of all resources" (Mauritius Revised laws, 1981:542). Finally the state claims traditional fishing rights over the northern and distant Saya de Malha Bank.

The Exclusize Economic Zone of Mauritius covers an area of 1.7 million km^2 .

Presently work in relation to marine resources concentrate on the lagoon and outer-reef area only, with research expeditions in the EEZ being carried out as and when foreign vessels make themselves available in agreement with Government's priorities.

The shallow lagoon of an area of 243 km^2 is formed by coral reefs (total length 150 km). The enclosed lagoon represents a valuable ecosystem and at the same time harbours a very fragile environment maintained under complex equilibrium. It is intensively exploited by some 2600 professional fishermen landing some 1300 tonnes of fish annualy.

Apart from legal fishing activities, the lagoon ecosystem has to take the load of illegal fishing methods, sand and coral removal, localised pollution problems, impact of human

recreational activities, outfalls of municipal sewage, dumping of solid wastes, run-offs from agricultural activities, siltation, seepage from coastal habitats and industries, and also damage caused during cyclones.

The combined effects of all these on the lagoon has given way to an imbalance. Signs of such pollution problem are evident:

1) eutrophication of some areas on the west coast associated with sewage outfalls;
2) population explosion of sea urchins;
3) frequent occurences of the red tide phenomenon;
4) localised population explosion of the crown of thorn (Acanthaster plancii);
5) dead coral communities.

Conscious of the fact that such a level of marine environmental degradation will not only, affect the living resources of the lagoon, but will have a direct negative effect on the economy, the Mauritian government has decided to give all due importance to Marine Ecology. Futhermore, the awareness created both at decision-making level and at national level, to the effect that the environment in general, is suffering from the impact of socio-economic activities (housing, sewage, communiction, industries, tourism, recreation, etc.) has led to the creation of a National Environment Commission, chaired by the Prime Minister of Mauritius. There is also a National Environment Committee which is chaired by the Minister of Housing, lands and Environment. Different appropriate sub-committees and task-forces have also come up to deal with specific problem areas.

The sub-committee on Coastal and Marine Resources, chaired by the Minister of Agriculture, Fisheries and Natural Resources, has looked into the multiple facts of problems linked whth the coastal and marine ecosystems. A series of recommendation were made. Presently, Government is taking the following actions with a view to ensure that:

a) control is exercised on the discharge of pollutants and on the use of pesticides that may persist in the environment and accumulate in the living organisms;
b) the extinction of endangered, vulnerable and rare species of flora and fauna is avoided;
c) existing nature reserves are properly managed;
d) a resource is not overexplioted so that sustainable yield can be maitained;
e) the mangrove swamps, coral reefs and other coastal and marine habitats are properly managed and maintained.

Government has recently taken the decision to:

a) ban the sale of local corals and shells;
b) restrict the exploitation of marine aquarium species (some 100,000 of fish and invertebrates are removed annually for export);
c) ban the fishing, landing and sale of marine turtles.
d) control the exploitation of natural oyster beds.

In view of the fact that base-line studies on the physical, chemical and biological aspects are required to assess scientifically the " state of health" of the coastal and marine ecosystem, to monitor the changes and trends in the marine environment and to have at hand the necessary data for programme setting, planning and implementation, the Ministry of Agriculture, Fisheries and Natural Resources has set up a Coastal and Marine Conservation Unit. This is a first step towards "Marine Ecology" studies. The work ahead is gigantic, but with new facilities and additional staff, there is hope that results will soon start appearing.

A project proposal for the creation of a Marine Conservation Centre has already been submitted. It also includes the creation of Marine Parks.

Under the COMARAF Programme (1st phase), (UNESCO Sponsorship) the team in Mauritius has already started the study of the relationship between nutrient levels and productivity at selected sites of the lagoon. Data on these parameters will be collected as a baseline and also for comparative analysis of sites situated in different environments to try to find impact of inputs from land-based sources on the lagoon environment: eutrophication, exchange of materials in the lagoon, pollution, etc.

Following the workshop on coral reefs proposed later this year, our scientists will be trained to study coral reefs and use methodologies taught during the workshop. This will result in broadening the participation of Mauritian scientist in the COMARAF project.

A vast programme will be undertaken by the coastal and Marine Conservation unit and the University of Mauritius with the help of Aix-Marseille University. This study programme will include; geology, sedimentology, coral reef ecology, effluents and pollution, aquaculture and management of living resources, coastal zone management, remedial measures for the protection of the lagoon and reef systems. A survey of Rodrigues Island in relation to marine conservation was carried out in January 1988. A survey of mangrove areas has also been completed.

Government is also presently studying the legislation with a view to amend existing laws and regulations, to add new ones so as to consolidate the legal framework for prevention and enforcement so as to control degradation and to preserve the coastal and marine environment.

Annexes comprise of:

1) Activities of the Fisheries Research and Development Division
2) Some notes on corals

Facilities available in Mauritius:

A: Public Sector:

1) The Albion Fisheries Research Centre including a freshwater giant prawn hatchery;
2) The Marine Shrimp Experimental Centre (hatchery and ponds);
3) the La Ferme Fish Farm for freshwater aquaculture (prawn and carps);
4) three 10.m long fibresglass vessels for outer-reef work, especially in connection with Fish-Aggregating-Devices (FAD) for pelagic fishery.

B: Private Sector:

1) Fresh water prawn hatchery (Camaron Co. Ltd. Mon Treson Mon Desert S.E.);
2) Fresh water prawn farm (Ferney S.E.);
3) Barachois (marine fish farms) for culture of finfish, oysters and crabs.

Fisheries Services:

a) the Fisheries Research and Development Division
b) the Fisheries Protection Service.

Address: Coastal and Marine Conservation Unit, Fisheries Services, Ministry of Agriculture, Fisheries and Natural Resources, 3rd level, E. Anquetil Building, PORT LOUIS, MAURITIUS. Tel. 012091-99.

7.2 University of Asmara, Ethiopia

Marine Ecology Research Activities on the Red Sea Coast of Ethiopia.

by Prof.Dr. E. Bekele

The various aspects of Marine Ecology of the Red Sea is little studied despite of the fact that it is believed to have high potential of natural resources. Such lack of study was partly due to the lack of trained man power and proper marine research and teaching institution. The demand to overcome such shortages resulted in the establishment of Marine Biology Unit in the University of Asmara. At present members of the unit and their associates researchers in Addis Ababa University are involved in various research activities such as monitoring programme, M.Sc. thesis research projects, Fish taxonomy, and Fish Genetic variation studies on the Red Sea Coast.

I Brief Background

The Red Sea coast of Ethiopia is the only marine environment of the country. This coast is believed to be with high potential of natural resources, fish or non-fish. Nevertheless, there is no concrete available data. Works that have been done are of the 19th and early 20th century. These could not manifest the actual biological, economic, geological, cultural, social, etc. features of it.

With such scanty information :-

(a) there is no way of indicating the actual potential of the coast;
(b) no means is possible to utilize the natural resources on a sustainable basis;
(c) it is possible to formulate plans and management decisions;
(d) there are various shortcomings to assess the impact of man on the marine environment;
(e) sites cannot be chosen to be protected, to be preserved, to be made national parks, or to be conserved, etc.

Therefore, there are needs of :-

(1) Surveying the coastal environment
  1.1) for geographical mapping;
  1.2) to select sites for research activities;

(2) Undertaking and participating in various research activities
  2.1) to investigate the distribution of fauna and flora;
  2.2) to study the existing ecosystems and their interrelationships that will lead to formulate possible means and ways of their proper utilization

scientifically, academically, economically, culturally, socially, etc.

2.3) to plan means of approaching the problems of the coast including pollution.

These, by and large, are believed to facilitate better understanding of the different ecosystems within our marine environments.

II MARINE BIOLOGY UNIT
ASMARA UNIVERSITY, ASMARA

The Marine Biology Unit is a young unit that budded from the Department of Biology. Its life started in mid 1985, but ameliorated as the strongest unit of the Department. This is therefore, to give some information about this unit.

1) Man Power

The unit was first organized with 2 foreign experts and 3 Ethiopian junior staff. After a time of one semester 2 Ethiopian staff were added. Now (academic year 1987/88) the unit has the following man power.

SEMESTER I		SEMESTER II	
Foreigners (Ph.D)	- 4	Foreigners (Ph.D)	- 5
Ethiopian (M.Sc)	- 2	Ethiopians (M.Sc)	- 2
(B.Sc)	- 5	(B.Sc)	- 5
Lab. tech	- 1	Lab. tech	- 1
TOTAL	- 12	TOTAL	- 13

2) Working Facility

2.1) The unit has one research laboratory in Dogali Campus (Asmara University). The laboratory, though very small, possesses few equipments including microscopes, deep freezer, a refrigerator, etc.

2.2) The unit has one dark room with photographic equipments that can develop and print

2.3) The unit has also a research station at Massawa. The station consists of

a) 3 laboratories of which two are with concrete tables for the installment of aquaria and for other practical aspects.
One of these two labs. is being used to do preliminary works of various researches and is also utilized for student subject practicals.

b) a rubber boat (65 HP) for research activities around the waters of Massawa.

c) a refrigerator, a kitchen, bedrooms, and a large

room reserved for a museum.

The station is used by students that stay there 2-5 days during various field practicals and senior projects, as well as, by staff members who do sampling every two weeks regularly.

3) Training

The unit, being under the department of Biology, was delivering some marine biological courses for the last three academic years. This was to introduce some courses and to gain experience before implementing its full programme.

3.1) Starting 1987/88 academic year, it began training undergraduates (2nd year) students that will graduate in Marine Biology and fisheries.

3.2) The unit has prepared a proposal to start "Postgraduate Studies" in Marine Biology. According to the proposal enrollment will be effected in 1988/89.

3.3) Training of its Ethiopian staff is essential for its further growth. Therefore,

a) One staff member is currently doing for his Ph.D in Southampton, U.K., specializing in Biological Oceanography.

b) Another is prepared to go to the U.S.A. for M.Sc.

In addition to these, there are two who are making preparations for their M.Sc.

c) A laboratory technician is getting training in Italian laboratories currently and is expected to be back by the end of this academic year.

d) The remaining staff members are expected to get training best on the availability of fund and other possible means

1. Fisheries Biology Ph.D
2. Marine Ecology Ph. D
3. Coral Reef * Ecology - M.Sc
4. Population Biology of Fish - M.Sc.

4) Research Activities.

Members of the unit are involved in various research activities.

4.1) The major research programme that has been undergoing since 1985 is "Monitoring Programme". Within this programme are included studies as :-

a) "Investigation of the Meiofauna of the Red Sea Coast around Massawa".
- Nov. 1985 - June 1986
- Terminated because the individual responsible for this work went back to his country (GDR).

b) "Small scale quantitative and qualitative study of the zooplankton of Ethiopian Red Sea coast: Massawa".
- Nov. 1985 - June 1986

- March 1986 - still continuing

c) "Macrofaunal associates of some seaweeds from the intertidal zone of Red Sea at Massawa".
- Jan. 1986 - (suspended).

d) "Phytoplankton study of the Ethiopian Red Sea coast around Massawa".
- Feb. 1986 - Still continuing

4.2) New research activities started in Nov. 1986 under the "Monitoring programme".

a) "Measurements of Primary Production in shallow waters around Massawa"

b) "Investigations about hydrochemical conditions of the coastal area of the Red Sea near Massawa"

c) "Preliminary Survey of the coral reef around the coastal waters of Massawa"

4.3) There were two MSc. Thesis research projects that started in 1986. These were finished and defended in June 1987. The research projects were done in collaboration with the School of graduate Studies, Addis Ababa University. The titles of these projects were :

a) "Food and size composition of *Epinephelus chlorostigma* (Valencinnes, 1828) Pisces: Serranidae in some coastal areas of the Ethiopian red Sea with notes on the taxonomy and distribution of the family" (June 1986- May 1987)

b) "Benthic Macrofaunal diversity and productivity of the Red Sea Coast around Jewalit (Massawa)." (Oct. 1986- April 1987)

4.4) Work on fish taxonomy of the Red Sea.

"Taxonomic identification of Red Sea fishes of Commercial Importance."
(January 1986- suspended)

4.5) "Genetic Variation Studies on some Economically important Fish Species and their patterns of distribution"

4.6) Research, reorganizing and other developmental activities with expatriate participation.

a) Two Italian experts having two Ethiopian staff co-workers have started (March 1987) a preliminary work for a long-term research on fishery biology under the title of "General considerations and Operative Programme for a long-term Research on Fishery Biology along the Ethiopian Coast of the Red Sea."
This work is planned to continue for at least 3 years.

b) A third experts in collaboration with Ethiopian

staff has started reorganizing and modifying the Museum of Asmara University (in the main Campus). There is also a plan to set up a museum in the Marine Biology Section at Massawa. The problem to starting setting it up is shortage of materials for shelves.

c) The staff members and the technician of the unit have started installing aquaria (aid from Italian Government) in the unit in the Department of Biology (within the Main Campus) and in the Station at Massawa. However, the installment in the marine biology station at Massawa using sea water is meant for a preliminary follow-up.

5) Future plans :

5.1 To upgrade the unit to Departmental level.
5.2 To have 2 large laboratories per subject practicals and 1 small laboratory for research activities in the main campus, Asmara University.
5.3 Further training of Staff members.
5.4 Training of laboratory technicians sending one every year for at least 6 months to Italian Laboratories for the next 3 years.
5.5 Organizational work at Massawa, Marine Biology Station :

a) Having a museum in the Marine Biology Station.
b) Fulfilling the required water supply, electric power supply and others to install all the 20 aquaria in the 2 aquaria rooms of the station.
c) Fulfilling all the required laboratory facilities in the labs of the stations.
d) Constructing a jetty along the shore of the station.
e) Constructing additional houses in the campus of the station.

7.3 SOMALIA

Prof. M.H. Giorni Mohamed

In 1984 the Government of the Democratic Republic of Somalia approached the Executive Director of UNEP with a request for assistance in assessing the coastal and marine environmental problems of the country and in drawing up a national action plan for the protection, management and development of its marine and coastal environment.

In response to this request and in close co-operation with the relevant national authorities a multidisciplinary mission was organized by UNEP in collaboration with FAO, UNESCO, IMO, IAEA, ESCWA and IUCN. The terms of reference of the mission specifically included consideration of problems related to:

- contingency planning for marine pollution emergencies, including incidents within ports and port generated pollution;
- development of national capabilities for the monitoring and control of marine pollution through training of staff and acquisition of equipment; and
- development of national legislation for the protection and management of marine and coastal environments.

SOURCES OF MARINE POLLUTANTS IN SOMALIA

Based on Somalia's level of development, its industrial locations, its land use practices, and it's agricultural and fisheries technologies, the costal ecosystem of Somalia is not at present severely impacted by land-based sources of marine pollution. Somalia is a country of light industries most of which are located in the coastal population centres of Mogadishu, Kismayo, Brava and Berbera. The only oil refinery just south of Mogadishu imports roughly 160.000 tons of oil per year. However from the plant very little effluent actually reaches the sea. Consequently, its immediate impact on the coastal ecosystem is minimal. Of all the industries in the country, only the tanning factories may deliver a significant input of contaminants to the marine environment and underground waters. However, measurements of the levels of chromium as well as other heavy metals in the effluent and surrounding wells has started. PCB's from local industrial sources are not a problem and very low level PCB residues, found in the fish probably originate from aerial transport.

In Somalia most of all the prime arable land lies in the Shabele and Juba river basins. The Shabele river fans out in the coastal

low lands forming swamps and wetlands, whereas the Juba river enters the sea just above Kismayo. Several types of chlorinated and organo-phosphorous products, are used continually on farms and plantations in this region and thus residues find their way to coastal waters via both rivers and land run-off. In addition to the pesticides used in the Agricultural Sector, the Ministry of Public Health has been spraying DDT in towns as part of its antimalarial programme. It is clear that residues of this persistent pesticides enter coastal waters and in the food chain.

The only environmental date available on pesticides are those from selected fish collected in the Mogadishu area during the last three years (see table 1 and 2: the concentration of the lindane in muscle ranged from 7 to 80 ppb wet while those for total DDT were between 26 and 360 ppb wet (Ahmed M. M. Department of Chemistry-Somalia National University).

CATASTROPHIC EVENT (MV Ariadne grounding)

A periodic accident of ships in nearshore waters often results in alocalized input of contaminants into the marine environment. Such was the case with the MV Ariadne, a container ship carrying a variety of toxic chemicals which went aground in Mogadishu harbor on 24 August 1985. In this occasion, the Department of Chemistry of the Somalia National University participated in the salvage operations. Periodic measurements of sodium pentachlorophenate were carried out.

Somalia is a developing country and, as such, has many priorities which may overshadow the necessity of surveillance and control of sources of pollutants. In the present there is a five year government plan for environmental protection and marine resources management.

The government is eager to assess the current situation with respect to marine pollution in order that it protects its coastal resources for future generations.

TABLE 2

Sodium pentachlorophenate concentrations in contaminated waters in the port of Mogadishu.

Date	Concentration (ppb)
26.9.85	-
29.9.85	-
1.10.85	1
2.10.85	138
4.10.85	8
5.10.85	-
6.10.85	1
7.10.85	60
8-10-85	103
9.10.85	3
10.10.85	-
11.10.85	-
13.10.85	-
14.10.85	2
16.10.85	-
17.10.85	2

TABELLA N°1

Il valore medio dei pesticidi calcolati in base al % di grassi nel fegato e nel muscolo

Specie del pesce	grasso in %	HCH in ppm	DDT in ppm	Eptachloro
Cernia rossa fegato (9)	2,7	0,415 (0;013-2,120)	6,530 (0.128-35,230)	0.068 (10.014-0.400)
Cernia rossa muscolo (9)	1,1	0,570 (0,013-2.140)	1,550 (0,128-6,480	0,023 (0.014-0.070)
Cernia nera fegato (4)	2,95	0,803 (0.16-1.650)	10,23 (0,5-38,100)	0.063 (0;014-0.070)
muscolo (4)	1,02	0,485 (0.013-1.114)	5,75 (0,65-13,550)	0.128 (0.014-0.288)
Tonno fegato (10)	4,00	1,150 (0,013-2,500)	0.893 (0,4-2,270)	0.122 (0.014-0.387)
Tonno muscolo (10)	0,87	1,100 (0.013-3,000)	1,045 (0,5-2,300)	03256 (0.014-0.750)
Dentice bianco e nero (3)	3,82	3,260 (1-8,000)	6,480 (0,1-15,000)	0.653* (0.014-1.931)
Pesce gatto fegato (1)	1,49	0,454	3,464	0.014
muscolo (1)	0,80	0,472	5.790	0.014
Triglia fegato (1)	3,00	0.592	9,580	0.014
muscolo (1)	1,56	0.866	6,866	0.014
Pesce elettrico fegato (1)	41,00	0,217	1,058	0.026
muscolo (1)*	0,56	0,469	5,875	0.014
Sardina	0,18	7,239	138,700	0,014

7.4. Research on Marine Ecology in Madagascar

Mrs. H. Razafindrainibe

The C.N.R.O. (Centre National de Recherches Oceanographiques) leads investigations dealing with marine themes. In relation with Universities for training courses in this field and within bilateral or international projects he loads multidisciplinary researches among which is marine ecology especially physical and chemical oceanography and as a support of biological investigations.

I. Research Programmes

Before 1980 hydrological characteristics of coastal and narrow offshore waters (currents, physical and chemical parameters) were studied by many authors among whom PITON, MAGNIER, FRONTIER, ANGOT furnished reports on water conditions and primary production mainly in bay areas and on the continental shelf. Concerning mangroves few reports were available. VASSEUR, KIENER and other authors pointed out descriptive aspects and data on ecology of such a system.

Since 1980 marine ecology is considered within multidisciplinary research programmes and concerns mainly physical and chemical water conditions, marine resource biology and exploitation. Research programmes on shrimp nursery and shrimp biology allow to point out ecology of coastal areas.

I.1. Physical and chemical water conditions

They are studied as well as in coastal area than on the whole continental shelf. Most of the works concern the northwestern part of Madagascar. From 1983 to 1986 a UNESCO project MAG/81/T01 was devoted to this subject. One part of the project was attributed to current measurements in the vicinity of Nosy-Be. MAGAZZU, ANGOT and RANDRIANASOLONJANAHARY (1984), MAGAZZU (1984), RATOMAHENINA and CREAZZO (1984) reports state the results obtained.

During a year period (June 1986 to June 1987) physical and chemical water conditions in the neighborhood off Nosy-Be are observed within the ETAPHYC programmes. Among stations studied are mangrove area and water conditions in a bayoff the isle.

I.2. Marine Pollution

This subject was studied within the first project hereabove cited. Superficial MBAS measurements and industrial pollution census along the coasts are conducted. RANAIVOSON and MAGAZZU (1984) state the situation in their report.

I.3. Mangrove area

It is studied mainly within programme on aqualculture and shrimp.

II. Ongoing Programmes and proposals

As cited above research on marine ecology is mainly considered as a support of biological and exploitation investigations. A subject on study since a few years is mangrove and coastal areas. An interregional programme on costal management has been recently discussed (COMAR Project).

As a continuation of research on oceanographical conditions tide movements will be studied in different parts off Madagascar. Installation of maregraphs will be soon undertaken.

III. Institutions and means

The main institutions and laboratories involved in marine science are the CNRO of Nosy-Be which is rattached to the Ministry of Research and the S.M.T. (Statin Marine de Toliara) rattached to the University of Madagascar.

III.1. CNRO

The Centre has three research departments: physical and chemical oceanography department, biological oceanography department and the fisheries department. The scientific staff is composed of 12 oceanologists, physician and chemical engineers and fisheries biologists. The three departments are equipped with the necessary instruments.

A microcomputer working under the CPM system is available at the Centre.

As a support of his scientific activities the Centre is doted with a library specialized in oceanography and fisheries. This library contains about 1500 books, 1000 periodical titles and receives about 500 documents per year. It is on an exchange basis with a hundred institutes and laboratories of forty countries including Madagascar. It is responsible for the edition of the scientific documents of the Centre, and its reprography instruments will soon be completed.

The Centre, in relation with the University, can receive training course fellowships especially from Schools specialized in Oceanography (Centre Universitaire Regional de Toliara), or students from the Department of Hydrology of the Polytechnique.

III.2. S.M.T. and University of Madagascar

S.M.T. depending to the University of Madagascar is involved in marine science as a research station and contributing to formation of students in applied oceanography.

The CUR de Toliara is the main institution providing formation in Oceanography. The current level is D.E.A. (Diplome d'etudes Approfondies)

7.5. TANZANIA

7.5.1 RESEARCH IN MARINE ECOLOGY IN TANZANIA :AN OVERVIEW

A.M. Nikundiwe (Director, Institute of Marine Sciences, Zanzibar, University of Dar Es Salaam)

Institutions that deal in marine ecology research in Tanzania include the Institute of Marine Sciences, Zanzibar, the Department of Zoology and Marine Biology, the Department of Geology, the Department of Botany of the University of Dar es Salaam as well as the Tanzania Fisheries Research Institute (TAFIRI). To a lesser degree some research is being carried out by the staff members of the Mbegani Fisheries Development Centre, located south of the town of Bagamoyo and the Kunduchi Fisheries Institute, located just north of the city of Dar es Salaam.

For the sake of simplicity our research efforts are reported here in terms of subjects we deal with:

1. BIOLOGY

A. FISHERIES: There has been an attempt to provide continuity to the tradition established by the defunct East African Marine Fisheries Research Organization (EAMFRO) by concentrating our efforts on fish stock assessment and by studying the basic biology of the commercially important species. At the Institute of Marine Sciences in Zanzibar, particular attention is being paid to the small pelagic species - sardines (Sardinella spp) and the Indian mackerel (Rastrallizer kanagurta.

Investigators who continue to provide leads in this area include M.A.K. Ngoile, N.S. Jiddawi, C.A. Muhando, E. Kingsland (IMS), G.L. Mziray (Zoology), P.O.J. Bwathondi, E.S. Makwaia, L.B. Thwani, (TAFIRI) and C.D. Msumi (Mbegani).

B. CORAL ECOLOGY

Early studies on the taxonomy and ecology of the East African corals were conducted by Hamish Hamilton. To date, his M.Sc. thesis forms a bench mark for further studies. Recently, studies on the coral reefs have been stimulated by the threat posed by dynamite fishing along the entire coast of Tanzania. Our efforts so far have been to survey the "state of health" of our corals. Just

how much destruction has taken place and by what means. The picture that is emerging is alarming and the survey, we hope, will be the basis for a management policy. [M.P. Pearson, E. Kingsland, J.S. Julian, (IMS)].

C. BENTHIC ECOLOGY

The biology of seaweeds has been the subject of intensive investigations by K.E. Mshigeni and his students. Attention has been paid to the ecology of the species which potentially are of economic importance. These studies constitute sufficient basis for starting seaweed farming for species such as Eucheuma, Gracilaria, Hypnea and Sargassum. [K.E. Mshigeni, A.K. Semesi (Botany), J.P. Shunula (IMS)].

D. PLANKTON

Studies on zooplankton of the Zanzibar and Pemba channels were conducted by Okera in the late sixties/early seventies. Recently similar investigations were carried out by Taje and Mohammed. For his Ph.D. degree studies, Bryceson examined seasonal variation in the phytoplankton off Dar es Salaam. Our plans now are to revive and give stronger impetus to studies on phytoplankton and zooplankton. [F.E.M. Msuya, M.S. Kyewalyanga, M.O. Mohamed (IMS)].

E. MANGROVE ECOLOGY

Mangroves as an ecosystem have been investigated in the past five years. This work was given a filip by a research grant from the United Nations University. A workshop on the status of mangroves in Tanzania was held early last year. The results and recommendations emanating from the workshop have been summarized in a special publication sponsored by the faculty of Science and the Tanzania National Scientific Research Council. We expect to see more involvement in mangrove studies when the CAMARAF project comes on steam [J.R. Mainoya, (Zoology), A.K. Semesi, and F.F. Banyikwa (Botany)].

2. CHEMISTRY

The quality of the seawater, which is being threatened by industrial wastes and sewerage disposal from urban areas, has been investigated by different groups at the University of Dar es

Salaam, using various techniques. This monitoring programme will continue and future work will include petroleum pollution studies. Another research front has been to examine seasonal variation in nutrients and the effects of these variations on zooplankton production [W.M. Kudoja (J.A. Machiwa (Zoology); S.M. Mohamed, A.J. Mmochi, A.E. Minani (IMS)].

3. PHYSICS

Currents, waves, and tides have been studied by a number of investigators. Because of lack of equipment for physical oceanography studies, investigations have largely been confined to numerical modelling. With the installation of tide gauges in Dar es Salaam, Zanzibar and later Mtwara, we are in a position to monitor closely sea level fluctuations along our waters. [K.M.M. Fwiza (Zoology), B.A. Manja (Maths), O.U. Mwaipo, J. Francis, A. Ngusaru (IMS)].

4. GEOLOGY

Work on marine geology began with investigations on the tratigraphy, tectonics, and sea level changes in the last 250,000 years in the Dar es Salaam area. This specific investigations on the sediments of the Mikumi and Karoo basins, areas which were once covered by the sea. Moving close to the marine environment, current investigations are now being conducted on the analysis of heavy mineral sands occurring along the Tanzanian beaches. This work is now being extended to the littoral zone. Sediment transport studies are to be initiated soon in selected estuarine areas. [C.Z. Kaaya, N. Nyandwi, A.N.N. Muzuka, Y.W. Shaghude, D.C.P. Masalu (IMS), M. Fay, S. Kapilima (Geology)].

5. OCEAN ENGINEERING

Ocean engineering is our lattest addition in our development efforts. Attention will be paid initially to beach erosion problems and later to offshore structures. [A.Dubi, M.D.M. Mrawira (IMS)].

7.5.2 Tanzania Fisheries Research Institute

Prof.Dr. P.O.J. Bwathondi, Director General

1. Establishment

The Tanzania Fisheries Research Institute (TAFIRI) was established by the Act of Parliament (No.6 of 1980) to cater for fisheries research throughout the country (both marine and freshwater). The Institute has three centres on the inland waters i.e. Mwanza (on Lake Victoria), Kigoma (on Lake Tanganyika) and Kyela (on Lake Nyasa) and one centre in Dar Es Salaam to cater for marine fisheries research.

2. Research Activities

Over the past eight years (since its inception) most of the fisheries researches have been based on freshwater fishes and only a handful on marine fishes.

(a) For example in Lake Victoria, research has been carried out on the Ecology and biology of *Haplochromis* and Lungfish, (*Protopterus aethiopicus*), the biology and fishery of Nile perch (*Lates niloticus*), ecology of the food of the Nile perch (the freshwater shrimp-*Caridina* spp) and the fishery of other lake species.

(b) In Kigoma, research has been carried out on the biology and fishery of *Boulengerochromis* spp., *Lates stappersii*, *Stolothrisa*, *Limnothrisa* and *Limnotilapia*. Further work is being carried out on marketing of all fishes at Kigoma landing beaches and the main market.

(c) In Lake Nyasa, work has been carried out on the biology and fishery of *Ospharidium* spp. in the lake. Further work is being carried out on the role of women in the marketing of fish in and around Lake Nyasa. Future work is planned to research on the ecology, bioproductivity and fishery of Lake Nyasa fishes (to be carried out collaborately with Malawi, Mozambique and Tanzania, financed by the British Government through ODA.

(d) More work on the biology and fishery of small water bodies (dams and small lakes) have been carried out. The small water bodies studied included Mindu Dam (Morogoro), Metra Dam (Dodoma and Iringa Regions) and Nyumba ya Mungu Dam (Kilimanjaro and Arusha Regions).

(e) On the Indian Ocean little has been carried out on the fishery of the area. Work has been done on the fishery of coraline fishes around Dar Es Salaam Region; the biology and fishery of small pelagics around Dar As Salaam; the biology and fishery of the by-catches of prawn trawl fishery.

3. Future Research on Marine Ecology studies

(a) Further work is envisaged on the ecology and fishery of coraline fishes of Tanzania. It is now known that the illegal dynamite fishing has destroyed most of the corals along the entire Tanzanian coast. The extent of the damage has not yet been ascertained but it is feared to be quite substantial. It will be proper to study the ecology and the fishery of this area and compare it to what is known in the neighboring areas (which have not been heavily affected by dynamite fishing).

(b) Research on the Ecology of mangrove fishes did start at the institute in collaboration with ODA but has since stopped due to technical problems. Tanzania, with a coastline of more than 800 km and large mangrove forests especially at lagoons and near river deltas offers good habitat for the study of the mangrove ecosystems. The major mangroves are found in Tanga and coast Regions. There are reports that Tanga mangroves are endangered by pole cutters (selling poles to Kenya and Arab countries) and salt makers (clearing mangroves to make salt pans and also using mangroves as firewood to dry up salt water in large metal pots so as to recover the salt). This practice is well documented and is being tackled by relevant Institutes. The Rufiji mangroves are threatened by pole cutters (for export to Arabian countries), salt makers and farmers. Most salt makers clear the mangrove to create room for salt pans whereas farmers clear the mangroves (those close to the terrestrial environment) to create room for rice cultivation. The Government of Tanzania, through her various institutions has been informed of the consequences of such clearances and is taking appropriate actions to stop this.

(c) The water chemistry and pollution of the coastal waters ought to be considered. Tanzania, like most developing countries does not have serious pollution problems. Most of these problems emanate from urban sewage disposal systems, small scale industrial waste disposals and oil pollution due to oil tankers trafficking the coastline. As a fisheries Institute our attention will be focused on the effects of such pollutants to the fishery and to the consumers. The water chemistry analyses should be directed to the University of Dar Es Salaam (IMS) and other relevant institutions.

(d) Marine Bioproductivity (Primary Productivity and Zooplankton) studies.

Fisheries biology studies will not be complete if the knowledge of the food of the fish is not known. In East Africa, there are two main seasons, namely the Southern monsoons and the Northern monsoons. Each monsoon season is characterized by the direction of the wind and the speed of the current and the rains that are associated with them. Primary productivity should be high during the periods when a lot of nutrients are being discharged into the ocean and also when there is good mixing of bottom and upper layers (cf. upwelling in the Somali coast). Future work on the primary productivity and zooplankton studies are envisaged.

7.6 KENYA

7.6.1. UNIVERSITY OF NAIROBI

Contribution to Marine Research in Kenya

Prof. Hyder

Since there are other participants from Kenya representing other bodies concerned with research in Marine Ecology present at this Workshop, the representative of the University of Nairobi will restrict himself to the involvement of the latter.

The University's basic input into the National research effort is to train skilled manpower in the various aspects of Aquatic Sciences at the undergraduate levels. This it does in various Departments, principally the Zoology, Botany, Chemistry and Meteorology Departments. However, in order to accomplish this, the University is involved in the discovery of new knowledge and compilation of information by research work. Research is done by staff and postgraduate students. At the undergraduate level the Zoology Department offers a two-unit option in Aquatic Ecology in third year, approximately half of which is dedicated to Marine Biology and Ecology. Each unit comprises 24 hour lectures and 10 3-hour practicals. Part of the practicals include a week-long field course at the coast in which the most important littoral habitats are studied. Other relevant courses include arthropod biology, invertebrate and vertebrate zoology courses which have a large component of marine biology. At the postgraduate level the Department of Zoology with inputs from Botany, and Chemistry offers an M.Sc. programme in Hydrobiology, consisting of a first year taught course and a second year research leading to a thesis. Ph.D. candidates are trained by supervised research and thesis only.

Recent theses submitted have varied from fisheries (on various inshore finfish species as well as penaeid prawns) to studies of the rocky intertidal to plankton ecological studies in shallow waters. University lecturers and professors have also been involved in supervising researchers from overseas Universities. Much of this work has contributed significantly to our understanding of tropical biology and advanced knowledge in this area. Seasonality has been established as a significant phenomenon in tropical animals as opposed to the old oversimplified concept that seasonality was stricted to the higher latitudes. The study of rocky intertidal gastropods has broadened our understanding of zonation from that of a static distributional pattern to a more dynamic phenomenon. Recent research on fish in the Zoology Department has demonstrated the utility of microbands on the otoliths for an objective determination of growth parameters. The extent and significance of oocytic atresia in Siganus sutor has been determined. These are but a few examples of that show the type of work we are

doing.

This work has been based mostly at KMFRI, Mombasa, and in the majority of cases involved the training of KMFRI personnel. The access of Belgian experts and Belgian funded facilities to the Institute has benefited the research projects for the last three years.

University Academic staff from the Department of Zoology, Botany, and Meteorology in conjuction with KMFRI and Belgian academics have launched a programme of investigation into the total system functioning of the mangal. This involves a study of primary production (mangroves, benthic algae, sea-grasses, and phytoplankton): The fate of litter; secondary production with special emphasis on the macro-and meiobenthos, nutrient flow, and water movement in the creek. Initial funding for this work has been obtained from the Kenya National Council for Science and Technology (NCST). Further funding is being sought from the Commission of the European Communities under the Research Programme on "Science and Technology for Development: Tropical and Subtropical Agriculture". Work on the production of the mangrove trees and the fate of litter, as well as on the zoobenthos has already been started by University of Nairobi personnel. This multidisciplinary study should be a major contribution to our knowledge of the mangrove ecosystem and will be relevant not only to East Africa but also to all maritime tropical countries. The mangal was targeted not only because of its relative neglect by researchers, but also as being a major maritime wetland resource, which is fragile and threatened by development and population pressures.

The Department of Botany offers options in Aquatic Botany and Aquatic Ecology in its B.Sc. programmes, and at the postgraduate level the M.Sc. in Plant Ecology includes five units in Marine Botany. The Botany Department has a Marine Field Station in the South Coast of Kenya at Diani Beach.The Department of Chemistry offers an M.Sc. programme in Environmental Chemistry which includes consideration of various aquatic habitats.

The Geology Department offers a third-year one-unit option on the Geology of the Oceans at the Undergraduate level, and courses in Marine Geology, and Environmental Geology in the M.Sc. programme.

It is hoped that the cooperation between Universtity of Nairobi's Departments of Sciences, KMFRI and the Fisheries Department will expand and tackle more problems related to our National Development, goals and aspirations.

Work is starting on plankton in fish interactions in exploited and unexploited areas on the North Coast.

LIST OF UNIVERSITY OF NAIROBI ACADEMICS INVOLVED IN MANGROVE STUIDES

Prof. V. Jaccarini, M.A. (Oxon), Ph.D. (Lond) Littoral marine ecology

Mr. A.O. Oluoch, B.Sc., M.Sc. (Nairobi) Benthic ecology

Dr. F.M. Muthuri, B.Sc., M.Sc., Ph.D. (Nairobi) Tracheophyte primary production

Dr. J.I. Kinyamario, B.Sc. (Nairobi), M.Sc. (Texas) Plant physiology

Dr. J.K. Ng'ang'a, B.Sc. (Geneva), M.Sc. (N.Y.), Ph.D. (Nairobi) Dynamic oceanography

SOME OTHER STAFF WITH MARINE INTERESTS

Prof. S.K. Imbamba, B.A., M.Sc. (S. Illinois), Ph.D. (Minnesota) Photosynthesis.

Dr. K.M. Mavuti, B.Sc., Ph.D. (Nairobi) Zooplankton

Dr. W.M. Kudoja, B.Sc. (Dar.), Ph.D. (Liverpool) Chemical oceanography.

7.6.2. Priorities in Marine Research in Kenya

R.M. Nzioka

Marine research in Kenya addresses varies aspects to fisheries, aquatic biology environmental and ecological studies, and chemical and physical oceanography.

The principal objectives of Kenya Marine and Fisheries Research Institute is to conduct and undertake research on aquatic resources and their environment with the aim of maximizing the exploitation of such resources. The Institute's activities are divided into marine and freshwater sectors, both of which are equally important.

At the beginning of 1981/82 a document was produced detailing the principal research interests of the Institute, indicating immediate Priorities against comprehensive background information. A document outling those programmes indicating their status and immediate objectives was produced in 1985. This document covers the past, current and projected research activities. It is hoped that the material will continue to provide useful information on the Institute's interests for national development and further catalyse collaborations and interaction both within Kenya and Internationally.

The main objectives of the marine sector situated at Mombasa is to collect and consolidate all available fishery resource data. In addition and with realization of the importance of environmental factors the Mombasa Laboratory carries out research programmes on the physico-chemical parameters, of particular importance is research on effects of pollutants of hydrocarbon origin on the environment and associated animal life.

Other research activities include coastal aquaculture, particularly cultivation of shrimp. This work includes Artemia production with aid from Belgium. The Biological Oceanography programme which a Kenya/Belgium Co-operation covers biological and chemical studies of the inshore waters, mangrove ecosystems as well as oyster culture in creeks.

Few major co-ordinated continental shelf programmes are being undertaken, yet these are the type of programmes that are important in making scientific advances and assisting the

management of near shore resources. Few deep - sea projects are being carried out because of lack of ocean-going research vessel.

A summary of the major research activities at Mombasa laboratory include the following projects :

(a) Completed Major Research Projects:

1. Biology and Fishery of the reef fish Scolopsis bimaculatus in Kenya - R.M. Nzioka (1981)

2. Investigations on the spiny lobster fishery W.B. Mutagyera (1982)

3. Population dynamics of commercial fish species Pomadasys opercularis around Malindi.
R.M. Nzioka 1982

4. Population dynamics of commercial fish species Drepane punctata around Malindi.
R.M. Nzioka (1982)

5. Aspects of ecology and biology of three gastropods: Nerita Plicata, N. undata and N. textilis (Prosobranchia; Neritacea) of the Kenya coast - R.K. Ruwa 1983

6. Oceanic features along the Kenya Coast: Implication for fisheries management - P.O. Ochumba (1983)

7. A study of the Oceanographic conditions off Somali Coast. - J.M. Kazungu (1984).

8. Artisanal fisheries of Kilifi coral reefs. - R.M. Nzioka (1984).

9. DDT and Endosoulfan residues in fish from Hola irrigation Scheme, Tana River Kenya. - D. Munga (1985).

10. Synchronous scanning fluorescence for characterizing oil samples. C.M. Nguta (1985)

11. Biology of Siganus suctor cought by artisanal fishesmen - T. De'Souza (1985)

12. The composition, distribution and seasonal abundance of

near surface zooplanliton in Tudor Creek. Mrs. M. Kimaro (1986).

13. Distribution and zonation of macroalage on rocluy clifts. - R.K. Ruwa and Mrs. H. Oyieke (1986)

14. Changes in Kenya coral community structure and function due to exploitation MS. N.A. Muthiga (1986))

15. Ecology of mangrove ecosystems. - R.K. Ruwa (1986)

16. Modelling of Estuarine Circulation : Numerical Modelling of the creeks around Mombasa Island. M.O. Odido (1987)

17. Analysis of some major and trace elements in the sediments of Gazi, Makupa and Tudor Creeks of the Kenya coast: A comparative investigation into the anthropogenic input levels. - D. Oteko (1987).

18. The determination of Transterence numbers of aqueus eletrolytes by Electromotive force measurements of concentration cells using mortar (Cement-Sand) membranes. E.O. Ochieng (1987).

19. The population dynamics and fishery of penaeid prawns in Tudor Creek Mombasa with special emphasis on Penaeus monodon Fabricius 1987. - E. Wakwabi (1987)

(b) CURRENT MAJOR RESEARCH PROJECTS

- Ecology of plankton communities in the inshore waters of Kenya.
- Primary productivity studies along Kenyan coast.
- The seasonal dsitribution of fish eggs and larvae in the inshore water of Kenya.
- Survery of the oyster potential within Kenyan coastline.
- Circulation in the inshore and adjacent offshore waters along Kenyan coast. - Analysis of ship" sea surface temperature data for Western Indian Ocean.
- The ecology of littoral invertebrates.
- The effects of the sabaki river on the growth abundance and
- distribution of hematypic corals in the Malindi Marine National Park, Kenya.
- Aquatic contamination with pesticide residues on the lower Tana river basin.
- Population dynamics of the inshore demersal fin fish.
- The population dynamics of the inshore pelagic fin fish.

- Population dynamics of the prawns within inshore waters Kenya.
- The distribution and feeding of mackerel larvae (Family Scombridge) inshore waters.
- Aspects of the population biology of the spanish mackerel (Nguru) Scomberomorus commersoni in Kenya.
- Aspects of the population biology of the Kingfish (Kanadi) Scomberomorus plurilineatus in Kenya.
- Recreational fisheries resources in Kenya.
- The distribution and status of the edible crabs in inshore waters of Kenya.
- Evaluation of spoilage in curred fish.
- Artemia cysts and biomass production.
- Studies on the maturation and larval rearing of the shrimps, Penaeus monodon and Penaeus indicus in the laboratory.
- Studies of the growth and survival of postlarval and juvenile shrimps in nursery system.
- Mariculture of some species of marine algae that are of economic importance.
- Study of the protein level in sea urchins along the Kenyan coast and the environmental factors affecting protein distribution in them.
- A study of the suitability of sea urchin eggs for human consumption.
- A study of the effects of different environmental factors on chitin and protein levels and the utilization of shellfish.

(C) Other priority areas

Include continuation of the current approved research programmes as well developing new research programmes as indicated below:-

- Ecology, production process and dynamics of the mangrove ecosystem.

- Relationship between particulate organic matter and dissolved oxygen distribution in estuaries.

- Identification of the water types using chemical indices in (Shimoni, Ungwana Bay, Lamu).

- The chemistry of metal complexes formed by some trace metals and organic ligands in the sea.

- To study the meterological parameters along Kenya coast.
- The water quality of River Ramisi, Sabaki, Tana and other estuaries.

- Applications of sedimentological studies on the Kenyan Coast.
- Marine erosion along Kenya coastline.
- Some aspects on the geology of Kenya continental shelf off Lamu.
- The biology and stock assessment of the skipjack Katsuwonus pelamis
- Assessment of the inshore commercial gill net fishery.
- The biology and population dynamics of the Wahoo Acanthocybium solandri in the inshore waters.
- Aspects of the population biology of the spiny lobster in Kenyan waters and the implication to the management of the fishery.
- The biology and ecology of the elasmobranchs in the Kenyan coastal waters.
- The study of the status of the Tuna species within Kenya waters.
- A study of the estuarine fish species in Kenya.
- Observations on the culture of the shrimps Penaeus monodon and Penaeus indicus in cages.
- A study of the protein content of the commercial sea cucumber.

7.6.3. KENYA NATIONAL RESEARCH COUNCIL

G.N.W. Thitai

LADIES AND GENTLEMEN

This being a workshop on Marine Ecology, it may not be necessary to go into all the details about the activities of the National Council for Science and Technology but because of the historical linkages between the council and Kenya Marine and Fisheries Research Institute, it is important to recapitulate on a few important events.

In 1977, through an Act of Parliament the National Council for Science and Technology NCST was established. This development ushered a new era in the history of Post Independent Kenya because an advisory machinery for matters pertaining to scientific, technological activities and research necessary for the proper development of the country had been created.

A few of the many functions assigned to the council were:-

(a) To determine priorities for scientific and technological activities in Kenya in relation to the economic and social policies of the Government and its international communities;

(b) To advise the Government on National Science Policy;

(c) To ensure application of results of scientific activities ....;

(d) To carry out independently or in co-operation with any appropriate person .... surveys and investigations as the council may consider necessary for its tasks;

Through an amendment of the same Act of Parliament, five Research Institutes were established as corporate bodies.

Among them was Kenya Marine and Fisheries Research Institute which was charged with the responsibility of carrying out research in Marine and fresh water fisheries including acquatic biology, ecological studies, chemical and physical oceanography.

Because of the above common ancestral point between the council and Kenya Marine and Fisheries Research Institute, the council has all along offered to the institute the necessary encouragement by being actively involved in policies formulation at the Board of Management meetings. In addition the council has been operating a modest research fund which is open to individual researchers (including those from Research Institute) who are interested in carrying out viable research projects.

As for the collaboration between the various public insitutions, the council has fostered strong links with the academicians from the Universities, the technocrats and accounting officers in various Government or Parastatal Organisations by acting as a catalyst in forums where exchange of ideas necessary for the development of Science and Technology takes place. The Council therefore supports the KEMFRI for its efforts in seeking co-operation with international research bodies within and outside Kenya where similar research is being undertaken. The NCST would like to encourage KEMFRI to launch a newsletter that would enable the researchers to exchange information on programmes currently going on. Such a newsletter would enable the scientists to identify common problems and to seek better ways of conservation and economic exploitation of marine resources. This being an important shared natural resource on the East African Coast, it is our hope that research cooperation will be strengthened and used to offset the impact of large costs of such activities.

I would therefore like to thank the organisers of this workshop and to wish them every success in the deliberations that will culminate in realising the objectives set for this workshop on Marine Ecology.

8. Computer Section : An important tool for Research

In a Scientific Institution, a good running Computer Section is a very useful tool. Computers can be used not only for data storage and processing, but also for drawing graphs, typing reports and publishing Newsletters.

In the KMFRI, the Computer Section's tasks include Science as well as Administration.

= The Administrative duties include the Staff Payroll and the Accounts. Furthermore, important documents and financial reports are also handled by the Section.

= Scientific work includes storage of data (Data-bank), Statistics and Calculations, Graphics, Word-processing and Desktop Publishing.

In general, the Scientists are assisted from the definition of their Scientific problem till when they submit their work for publication.

First, the problem is discussed with the Statistician to determine the best possible sampling . After the collection of the data in the field, the data are then entered into a computer data-base. This enables calculations and a first rough analysis of the data. The data-base will also be used to enter the data into various statistical programs.

In a further stage, results can be represented by graphs. The Computer Section has a wide range of Graphic possibilities at it's disposal. In case the available software would not suit the Scientist's needs, then software will be especially written for the application (custom design).

After printing tables and plotting the graphs, reports can be typed and printed by the Section's typists. Graphs can be integrated in the text as if printed.

The Institute's Newsletter is set and printed in the Computer Section as well : Desktop Publishing software enables *on screen* lay-out of the pages, enabling insertion of graphs, drawing etc.

Workshop topics :

During the workshop, a detailed presentation will be given of the Scientist support . Demonstrations will be shown of the various possibilities offered by the Section to Scientists in the fields of Statistics, Graphic presentations, Word-Processing and Desktop Publishing.

For those who are interested a list of hard- and software, used at the KMFRI-KBP Computer Section is available.

A visit to the section is also planned.

Speaker : Mr. Peter Pissierssens, KMFRI-KBP Computer Section

9. Scientific Contributions

9.1. K.M.F.R.I.

9.1.1. Nutrients Regeneration in a typical Tropical Estuary (Tudor Creek. Mombasa. Kenya) during Long Rainy Season (1986)

J.M. Kazungu

Abstract

Nutrient distribution patterns for Tudor estuary indicates a very strong influence of river discharge into the estuary during the rainy season. The highest nutrient concentrations are recorded in May during the peak of the rainy season. As high as 186.0 µg-at Si/l, 22.6 µg-at $N-NO_3$/l and 2.0 µg-at P/l were recorded for silicate, nitrate and phosphate respectively during this month. All these high values were observed near the river mouth and decreased gradually towards the open sea. Analysis of the Nitrates/Salinity profiles for the estuary indicates that in the beginning of the rainy season (April), conservative mixing of the nitrates persist. However most of the points are found to fall above the theoretical dilution line indicating a positive offset. This positive offset is also noticed for phosphate (PO_4^{3-}) concentration during the same month. It is therefore suggested that though the rivers supply rich-nutrient fresh water into the creek, most of the organic matter carried into the creek is degradable and remineralization occurs once the organic matter has entered the creek. This suggestion is confirmed by the fact that during May no much positive offset is observed for NO^{3-} and PO_4^{3-} indicating that the first rains (April) had carried away to the creek most of the degradable organic matter on land. After the long rains, supply of nutrients into the creek is minimal and the Coast General Hospital's sewage system is identified as a possible local source.

9.1.2. The Distribution and Abundance of Hermatypic Corals along the Kenya Coast.

N. Muthiga

Abstract

A broad ranging survey of hermatypic corals of the Kenya coast was carried out using SCUBA and snorkeling. Various sites were visited including the Kiunga, Malindi-Watamu and Shimoni Marine parks and reserves. The unprotected sites included Kilifi, Vipingo, Nyali, Shelley, Kanamai, Tiwi, Diani and Msambweni reefs. Within these sites various biotopes were sampled ranging from intertidal reef flats and lagoons, reef slopes to submerged reef flats and slopes from depths of 1 m. to 20 m.

A total of 131 species were recorded from 62 genera, 23 species are new records for Kenya, an additional 13 species require positive identification. The dominant coral genera included *Acropora, Pocillopora, Montipora, Porites, Echinopora, Platygyra, Galaxea, Astreopora, Pavona, Goniastrea* and *Millipora.* A checklist was compiled and coral specimen were collected for reference purposes.

For a more detailed study of the community structure of Kenyan reefs, a transect study was started at North reef in the Malindi Marine National Park. This is an ongoing study which consists of recording coral cover (hard & soft coral) coral rubble, dead coral, sand and halimeda along 10 m. transect lines laid across the reef flat or slope. Eight sites including the northern and southern seaward reef slopes, reef flats and the coral garden lagoon were visited.

Coral cover was very variable ranging from 20 - 50 % for hard corals and 4 - 40% for soft corals. Dead coral cover was <5%. Again Acropora, Montipora, Galaxea, Platygyra and Pachyseris were well represented. No distinct zonation of coral genera was seen between 1 to 8m. depth.

9.1.3. Water Movement and Salinity Gradient in Tudor Inlet adjoining Mombasa Island

M.N. Mutua

Abstract

Hydrographic observations were carried out in lower and upper reaches of Tudor inlet in January through March 1987 for currents and in June 1987 for salinity and temperature. Drift measurements confirmed that the tidal currents dominated in the channel. Wind forced currents were found to be significant.

The tidal flow in the main channel was variable with speed range from 10 cm/sec to 80 cm/sec. During each tidal phase, the flow in the main channel was in one direction from the surface to the bottom, with maximum speed of 60-100 cm/sec on the surface one hour after flood. Maximum speed of 40 cm/sec occurred at the bottom one hour following the flood.

Along the sides of the inlet water particularly near the entrance, loops of Longshore current complicated the flow. A permanent formation of an anticlockwise loop formed during ebb off English point and degenerated into a small topographic captured eddy during flood. The plume from the rip-feeder was entrained in the main tidal stream further in the channel. The loop retained considerable concentration of floating debris and juvenile fish. Loops or cell circulation was seen to be a common feature near almost all the bends in the lowest reaches of the inlet and in the areas of washover channels in the mangroves. These looplets and the larger current cells were found to contain water with slightly different conditions than water in the main channel and suggested a key to parchness in the inlet.

Salinity values of 27 ‰ were observed in the lower reaches of Kombeni river. No significant estuarine conditions were observed in the shallow and wide upper reaches of the inlet probably due to scanty rains during the year. In this shallow area salinity rose to 29 ‰ in the narrow deeper channel and to 30.5 ‰ in the lower reaches indicating a longitudinal salinity gradient. A mild cross-inlet salinity gradient was also observed in the shallow area. Surface temperature was almost uniform 27 °C. Conductivity fell below 4900 µMHo and pH 7.8 in the upper wide area, but above this value to the west of the same and towards the mouth of the inlet. No appreciable cross-inlet gradients were observed near the entrance, although it was noted that plume appeared concentrated in the eastern side of the inlet. Actual fronts were not observed, however, a change in water color near Ras Juda indicated the presence of a mild boundary between the deeper parts of the channel near the entrance and the shallow backwater area. This boundary was associated with change in degree of mixing in the water column due to sudden shoaling of bottom topography.

9.1.4. Hydraulic modelling : Model of the Kilindini-Port Reitz Creek.

M.O. Odido

Abstract

Modeling is a formal expression of the relationship between entities in physical or mathematical terms. (Jeffreys, 1982). It provides a means of reducing complex natural systems to simple forms which can be manipulated with ease to check their reaction to changes.

Two different approaches are used:

Physical Models : Here the natural system is represented by another physical system. In hydraulics, scale models in which a scaled down version of the real system is built, and electrical analogues in which an electric circuit is used to represent the system (the current represents fluid flow, varying voltage represents tidal driving force etc.) are the most common.

Mathematical Models : These are mathematical expressions of the relationship between quantities and qualities to be studied. They can be deterministic (in which variables can be predicted) or stochastic (in which some of the variables are probability dependent e.g. measuring the recurrence frequency of paraseismic events, floods, and storm surges).

To develop a mathematical model we need to define the problem to be solved, bound the study area, identify variables and the initial and boundary conditions. Assumptions are then made in developing the mathematical relationship between the variables.
The ensuing equations are solved, either analytically or numerically depending on the type of equations involved and the geometry of the area.

Numerical Model of Kilindini-Port Reitz Creeks

This creek is situated to the west of Mombasa Island. We assume that wind and coriolis effect on the water flow is negligible. The basic hydraulic equations are averaged over time to remove short term turbulent fluctuations. We assume one-dimensional flow by averaging over cross section and depth.

The equations thus become :

$$\frac{\delta u}{\delta t} + u\frac{\delta u}{\delta x} = -g\frac{\delta h}{\delta x} - g\frac{u\,|u|}{c^2 R}$$

$$\frac{\delta A u}{\delta x} + b\frac{\delta h}{\delta t} = 0$$

These are solved numerically using finite difference approaches. The creek is discretized into segments of equal sizes.
There is reasonable agreement between the model results and data recorded at several points within the estuary.

Reference:

JEFFREYS, J.N.R. "Modeling", Chapman and Hall 1982

DRONKERS, J.J. "Tidal Theory and Computations", Advances in Hydroscience, vol. 10, Academic Press, New York, (pp 145-230). 1975

NORCONSULT, A.S. "Mombasa water Pollution and waste Disposal study vol. VI, Marine Investigations" 1977

ODIDO, M.O. "Modelling of Estuarine Circulation; Numerical Modelling of the Creeks around Mombasa Island", MSc Thesis VUB 1987.

9.1.5. Planktonic Copepods from Coastal and Inshore Waters of Tudor Creek, Mombasa

E. Okemwa

Abstract

The samples were obtained using a Bongo net fitted with a flow meter.
The samples were collected from three stations in Tudor Creek from December, 1984 to March, 1985. Samples were taken only during the day time, once a month, between neap and spring tides.

The zooplankton is rich and abundant in the creek. Copepods were dominant and present in all stations sampled. From all stations, 73 species were identified belonging to 25 families. Fifty-three species were found at station 1 and 27 of those were specific for this station. In station 2, 44 species were found of which 10 were specific. In station 3 there were only 23 species found, of which 1 was specific for this station and this supports the gradient hypothesis. Apparently, there exists a gradient in diversity and each station has a more or less characteristic copepod fauna.

This appears to be the first systematic account of copepods reported from the coastal and inshore waters of Kenya. Six are new records for the Western Indian Ocean.

Information on the abiotic environment from the series of stations in Tudor Creek is given. These demonstrated increasing temperature and turbidity, and decreasing water depth, from the mouth to the uppermost stations of the creek, with salinity remaining more or less constant except for March 1985.

9.1.6. A Study of some Pigments from Sea Urchin Eggs: *Diadema setosum*

S. O'Omolo

Abstract

An extraction and investigation of the properties of orange-red pigment of sea urchin eggs *D. setosum* was carried out. This pigment is tightly bound to the egg contents. The orange-red pigment was extracted after an incubation with 40% NaOH for 4 hrs. After that, the pigment is readily soluble in some organic solvents. The pigment was partially soluble in CCl_4, benzene, chloroform, petroleum ether, ethyl acetate, CS_2 but quite soluble in pyridine, ethanol, methanol, acetic acid and acetone. With Carr-Price reagent, it forms white precipitate.

The pigment did not migrate in solvent of higher polarity like water or pyridine, but it moves quite well in solvents such as diethyl ether or ethyl acetate. In ethyl acetate and diethyl ether the estimated R.F. values of the pigment are 0.97 and 0.99 respectively.

Orange red pigment solubility behavior in thin layer chromatography (TLC) and visible absorption spectrum suggest that the pigment resembles echinochrome.

The color of the pigment changed when mixed with some solvents.

solvent	color
Petroleum ether	yellow
CCl_4	reddish
Benzene	reddish
Chloroform	reddish
Diethyl ether	orange
Ethyl acetate	orange
Pyridine	red orange
Methanol	Orange
Acetic Acid	Yellow
CS_2	red orange

Echinochromes were thought to be a controlling factor in the synthesis of other groups of pigments, to stimulate unfertilized eggs (Binyon, 1972), having vitamin K characteristics. The fact that this pigment is found in the egg points to a probable important role in the egg metabolism.

9.1.7. The Eulittoral Macrophytic Flora of the selected points. Kanamai, McKenzie Point and Gazi Bay along the Kenya Coast.

H.A. Oyieke

Abstract

A total of 131 species of marine Macrophytes are recorded from the eulittoral zones studied. Out of this number 10 are new records for Kenya; these are *Amansia dietrichiana*, *Desmia pulvinata*, *Hypnea nidifica*, *Galaxaura fasciculata*, *G. lenta*, *Laurencia collumellaris*, *L. venusta*, *Peyssonellia simulans*, *Pterocladia parva* and *Wurdemania miniata*. Of the three station studied McKenzie is the richest in benthic marine algal composition followed by Kanamai then Gazi Bay. On the other hand, Gazi is the richest in angiosperm species. The algal composition of the mangrove pneumatophores are similar to those found on the overhanging cliffs.

The stations studied showed a mixed algal community without any obvious dominance. The angiosperms, on the other hand, exhibited a pattern of zonation that *Thalassia hemprichii* is found from the upper eulittotal belt all the way to the reef platforms, whereas *Cymodocea ciliata* and *C. serrulata* tend to grow more luxurriantly towards the open sea. *Halodule wrightii* also commonly grows higher up on the shore.

9.1.8. THE EFFECTS OF HABITAT COMPLEXITY CREATED BY MANGROVES ON MACROFAUNAL COMPOSITION IN THE BRACKISH WATER INTERTIDAL ZONES IN KENYA.

R.K. Ruwa

Abstract

Comparisons of macrofaunal composition on brackish water beaches where mangroves have not yet grown, bare beaches where mangroves have been totally destroyed leaving the mangrove peat in the shore, creek mangroves, fringe mangroves and rocky cliffs were made.

The observations showed that mangroves increase the species diversity in the brackish water intertidal zones. The beach with mangrove peat supported 22 species but the bare beach without mangroves or mangrove organic matter had 16 species. The creek mangroves supported 21 species whereas the fringe mangrove supported only 4 species. Further comparisons showed that the creek mangroves and the beach with mangrove peat had many species in common. The beach without mangroves had more species in common with the beach with mangrove peat than with the creek mangroves. It was notably observed that 8 species are confined to creek mangroves and total destruction of these forests could lead to their disappearance.

There was a tendency that the macrofauna restricted to the creek mangrove was mostly composed of species of grapsid, ocypodid and gecarcinid crabs but with only a few gastropod species. Contrastingly on beaches with and without mangrove peat the species restricted to these biotopes were mostly gastropod species but with only a few portunid and ocypodid species of crabs.

In relation to shore level, the number of species of macrofauna increases in a downward shore gradient. The pattern also follows closely with the changes of substrate quality from higher to lower shore levels. Substrate wise, sandymud supported 1[illegible] species; muddy, 15 species and muddy sand, 27 species. Being sandy mud biotopes the higher shore levels tend to support fewer species than the lower levels which are muddy or muddy sand biotopes. From this observation it can be predicted that if the lower shores are turned to sandy mud biotopes e.g. as a result of transport of sand from the dunes after excessive cutting of mangroves the species diversity will be drastically decreased. A little natural transport of sand to muddy shores which helps to create muddy sand shores is beneficial in encouraging increased species diversity. Excavations in the barren salty "inversa" flats led to increased species diversity. This increase in species diversity from a single species habitat after the inundation of these excavations with seawater brought through channels by tidal action can similarly be explained by the fact

that optimal benthic conditions favoring higher diversity resulted from simulation by lowering the shore level, maintaining muddy to muddy sand conditions and contribution of the mangrove peat in the channels and excavations.

Mangroves support many arboreal fauna which are frequently also found on intertidal rocky cliffs. Growing next to rocky cliffs, fringe mangroves support many species which are also found on rocky cliffs. It is worth noting, however, that with regard to the shell-fishery of oysters, cutting of the coveted mangroves *Rhizophora mucronata* and *Sonneratia alba* which support the heaviest settlement of oyster near the creek edges in channels need to be controlled. The cutting of these mangroves at edges of the channels should be prohibited and cutting within the entire forest be controlled to avoid any destruction which may cause speeding up of sediment transport, alteration and loss of habitat resulting in decrease in species diversity.

9.1.9. SETTLING POSTLARVAL AND JUVENILE PENAEIDS IN THE SHORE WATERS OF TUDOR CREEK.

E.O. Wakwabi

Abstract

Penaeid larvae spawned offshore arrive in the creek at the late mysis and early postlarval stages with the water currents. The changing winds and surface currents direction and strength with the monsoons is the possible mechanism of transport into the nearshore waters from where the tidal currents and local winds transport the planktonic larvae into and up the creek.

The settling postlarvae and juveniles favor specific bottom types. The three (3) common *Penaeus* species (*P. indicus, P. monodon* and *P. semisulcatus*) were most abundant in beach seine catches at the channel station (Stn IV) where the bottom was soft silty mud type with mud-mangrove banks and dense algal cover. *P. indicus* and *P. semisulcatus* caught in beach seines ranged between 1.5 mm carapace length and 21.5 mm carapace length. *P. monodon* had a size range of 1.5 mm to 29.5 mm carapace length. The three species therefore utilize the shore waters as nursery grounds and recruit in these waters in distinctive cohorts between August and March.

9.1.10. Seasonal Changes in Intertidal Marine Algae along the Kenya Coast

G.M. Wamukoya

Abstract

Vertical and horizontal distribution of intertidal marine algae was studied for a year using the belt transect method. The intertidal zone may conveniently be divided into two: Lower littoral zone, the region between the lowest levels to which the tides fall and the lowest high tide level. And, an upper littoral zone : the region between the lowest high tide levels and the highest high tide levels. The Intertidal marine algae extend from the high water level of neap tides to situations well beyond the reef in deep water. Some are exposed for considerable periods during spring tides while others, although situated high on the shore grow in pools and depressions where a certain amount of water is left by the receding tide. To the upper littoral region belong the mangrove roots i.e. the pneumatophores and the cliffs. *Bostrychia* sp., *Catenella* sp. and *Murayella* sp. are found on the roots and the cliffs. The lower littoral region is more luxurriantly rich in seaweeds depending upon the substratum type. Different zones appear such as those dominated by *Cystoseira*, *Ulva*, *Padina*, *Gracilaria* and seagrasses, thus showing horizontal zonation of algae. The sublittoral region is indicated by the various siphonales such as *Halimeda*, *Caulerpa*, and *Codium*.

The substratum type on which they grow are specific : Rocky, sandy, silty and muddy. The presence of varied types of substrata was found to be one of the main factors that account for the rich flora of this region. Better growth of the algae was shown to be on the rocky substrate and with little growth on sandy substrate.

An analysis of the occurrence of the more common species as well as the R/C ratio in different seasons indicate that Rhodophytes are predominant amongst all other groups of algae. The total algal cover showed a peak during the South East monsoon period, when the climatic and environmental factors are most favorable for the growth of algae in general.

The principle environmental factors operating on this shore include light intensity, temperature, salinity and surf activity. They show definite variations and such variations affect the nature of the algal cover on the shore. The tidal factor was noted to be of fundamental importance, particularly in relation to the air exposure and submergence of algae with the chief effective principle in respect to exposure with the air being desiccation.

It was shown that during times when the lowest spring tides occurs during the night hours, (May-September) there was high

algae cover and high species diversity whilst during times when the lowest spring tides occur during the daylight hours (November- March) there was poor algal cover and low species diversity. The months of October and April came out significantly as the transition period, thence no marked changes were noted.

The Brown algae (Phaeophytes) tend to show the adaptation to cool climates, this explains why they are poorly represented in the intertidal zone and they come in abundance towards the end of South East monsoons (September); which is in conformity with the findings of Moorjani (1977), that Phaeophytes thrive well in cool conditions. Rao (1972) also found an abundance growth of Phaeophytes during the cooler North East monsoon period on the N.W. coast of India.
The Blue greens (Cyanophytes) are adapted to extreme dry conditions thus reaching the peak in February/March. Therefore, horizontal distribution of algae was found to be controlled by : nature of substratum, surf exposure, shore slope, salinity, temperature, light intensity and tide.

Although Kenya is rich in algal flora (Isaac and Isaac 1968), commercialization of seaweeds is presently non-existent. The only direct use to which the algae are put by fishermen is as fish baits (Personal observation).
From the foregoing it is evident that economic importance of seaweeds has been neglected, which means that a potential valuable resource remains unexploited. Therefore a need exists in Kenya for studies to be conducted towards the developing seaweed industries involving both farms and processing facilities. This would improve the welfare of the coastal fishermen, who often lead a subsistence type of life and would conserve foreign exchange through reduced importation of colloids.

In Kenya seasonal patterns alone make wild crop harvest undesirable since the standing crop of any species is so low during certain periods of the year. Thus, it is evident, that not only growth but also survival of such an industry will depend on the reliable and increasing source of raw material which the only lasting solution may be the development of mariculture procedures. Such procedures are now successful in the Far East (Philippines, Japan, Taiwan, Indonesia and China).
For preliminary evaluation of the mariculture potential in Kenya, Genera *Eucheuma* and *Gracilaria* have been chosen.

9.2. ETHIOPIA

VARIATION STUDIES OF QUANTITATIVE CHARACTERS IN *LUTAJINUS BOHR* COLLECTED FROM THREE SITES IN THE RED SEA.

Prof.Dr. E.Bekele (University of Asmara, Ethiopia)

Abstract

Significant variation between *Lutajinus bohr*'s population collected from three sites in the Red Sea was observed. A non-correspondance found between PCA and linear correlation coefficient of characters studied was considered to be due to the existence of high beta diversity that resulted from the migration of *Lutajinus bohr* between the various sites. The development of breeding techniques through the identification of correlated characters and their heritability estimates is considered to be taken during selection practices.

9.3. MADAGASCAR

PHYSICAL AND CHEMICAL WATER CONDITIONS INSIDE THE MANGROVE AREA OF AMBANORO (NoSY-BE,MADAGASCAR) FROM JUNE 1986 - JUNE 1987.

H. Razafindrainibe (CNRO, Madagascar)

Abstract:

Physical and chemical water parameters have been studied during a year period (June 1986 to June 1987) in the mangrove area of Ambanoro (Nosy-Be , Madagascar). Sampling was scheduled once a week at 10.00 a.m. along the river that crosses the forest at five stations dispatched from the mouth to the continental limit of the mangrove. Another series of samples was scheduled for daily variations each three hours from 6.00 a.m. to 18.00 p.m. Parameters are studied in account of tide variations and level of rainfall.

Water temperature is highly influenced by marine water at the mouth, but only by air temperature at the other station. Salinity depends mainly on tide in dry season, and rely on rain level in hot season. The level of material decomposition and the nature of the substrate cause a gradient of pH. The theoretical physics rules is followed inside the mangrove concerning the level of dissolved oxygen in contrary to the situation in the nearest marine water.