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REPORT OF THE FINDINGS
OF THE
INTERNATIONAL CONFERENCE ON MARINE
RESOURCES DEVELOPMENT IN EASTERN AFRICA

UNIVERSITY OF DAR ES SALAAM

4-9 APRIL 1974

INTERNATIONAL CONFERENCE ON MARINE
RESOURCES DEVELOPMENT IN EASTERN AFRICA

TABLE OF CONTENTS

Purpose	iii
Rapporteurs' Report	1
Thursday, 4 April	3
Friday, 5 April	5
Monday, 8 April	9
Workshops and Steering Committee Reports	11
General Recommendations	11
Guideline Recommendations	15
Keynote Speeches from Tanzania	19
List of Participants	25
Programme	27

REPORT OF THE FINDINGS OF THE INTERNATIONAL CONFERENCE
ON MARINE RESOURCES DEVELOPMENT IN EASTERN AFRICA

UNIVERSITY OF DAR ES SALAAM, 4-9 APRIL 1974

Purpose

The purpose of this report is twofold: first, to present the rapporteurs' summary evaluation of the International Conference on Marine Resources Development in Eastern Africa; and second, to present the recommendations of the Steering Committee and Workshops formed to suggest guidelines for the implementation of a center for marine resource development at the University of Dar es Salaam. This summary of the results of the conference is advanced at this time to facilitate the formation of a center for marine resources development in Tanzania. The Proceedings of the conference, including this report, will be published by the University of Dar es Salaam with the cooperation of the University of Rhode Island.

INTERNATIONAL CONFERENCE ON MARINE
RESOURCES DEVELOPMENT IN EASTERN AFRICA

RAPPORTEURS' REPORT

D. Krause
UNESCO, Paris

W. B. Rudman
University of Dar
es Salaam

The University of Dar es Salaam hosted the conference on marine resources development during 4-9 April 1974 as a major step toward founding a centre for marine resources at the University which would provide essential research, advice and personnel needed for the development of Tanzanian marine resources and which could have strong co-operative ties with sister universities in Kenya and Uganda and with EAMFRO (East African Marine Fisheries Research Organisation). The core of the conference consisted of discussions between Tanzanian representatives and advisors led by Professor A.S. Msangi, Head of the Department of Zoology at the University of Dar es Salaam, and representatives of the University of Rhode Island (USA), the latter led by Professor Nelson Marshall, Director of the URI International Center for Marine Resource Development. The discussions concerned the application of the experience and expertise of the University of Rhode Island to evaluation of the Tanzanian resources and problems, both natural and human, and to recommendations for a centre to meet those problems.

The conference also provided a forum for the participation of representatives from other East African universities and governments, the Economic Commission for Africa (ECA), from United Nations specialised agencies such as the Food and Agriculture Organisation (FAO), Educational, Scientific and Cultural Organisation (UNESCO), Educational Program (UNEP), and from funding organisations of Canada and the USA.

The first two days of the conference (4-5 April 1974) consisted of the presentation of the status of Tanzanian marine resources, natural and human, followed by a presentation of the organisation and programs of the University of Rhode Island. The third day (8 April 1974) was devoted to workshops concerned with the establishment of the proposed centre. Finally, the last day (9 April 1974) was devoted to reports and recommendations.

Thursday, 4 April 1974

In the opening of the Conference the statement of the Honorable S. E. Chiwanga, Minister of National Education, emphasized that the key to converting Tanzania's potential wealth to improve the lot of her people was through the proper application and utilization of science and technology. He expressed hope that the conference would come up with a way to develop Tanzania's considerable marine resources to contribute to her economic stature.

The presentation of Tanzanian marine resources centered about its fisheries, described by Mr. John Kambona, Principal Secretary, Ministry of Information and former Principal Secretary, Ministry of Natural Resources and Tourism. Mr. J. E. Abura of the East African Harbours Corporation balanced the scene somewhat by showing a diversity of coastal resources and uses. The artisan fisheries of Tanzania are mainly concentrated on the well developed fringing coral reef and its "lagoon" that parallels most of the Tanzanian coast. Although the fringing reef is very productive, its area is small. Hence the fishing pressure is high with the result that unsound fisheries practices have developed, such as dynamiting which is very destructive to the reef. The reef fisheries consist of highly diverse fauna, and the artisan fishermen have evolved diverse and specialized techniques over a very long period of time.

Also, estuaries and mangrove forests are important in relation to marine productivity through food chains and by providing habitats for organisms which pass later life stages offshore.

A good prawn fishery has been established on the Rufiji River delta. The river is the largest in Tanzania and will soon be developed for hydroelectric power.

With the high fishing pressure on the reef and lagoon, simple modern improvements such as mechanisation by outboards will not greatly increase the catch. Hence the pelagic and demersal fisheries of the open but narrow shelf and beyond must be developed if the catch is to be greatly increased to provide protein for the national diet and to provide foreign exchange. At present the coastal fisheries provide much less fish than do the large inland lakes like Lake Victoria and Lake Tanganyika.

A deep-sea fishery for tuna in the Western Indian Ocean evidently exists but requires a highly technical operation for exploitation.

The potential of resources such as marine turtles and the dugong was emphasised. It was suggested that a survey of the status of these resources in Eastern Africa should be undertaken which would lead to programme of restoration, conservation, management and utilisation on a sustained yield basis.

The final fishery potential concerns mariculture. The coastal mangroves, estuaries and shallow lagoons and bays form good habitats for potential mariculture. C. Sankarankutty (University of Dar es Salaam) reported that a Japanese team has recommended two areas as initial experimental sites: viz., Udofu Creek near Tanga and Msinga Creek near Dar es Salaam.

All of the above fishery resources and potentials require a base of research and personnel for exploitation and management. Examples of these follow. The reef fisheries are in urgent need of management; this not only requires a knowledge base that is lacking, but also requires new policies. The Marine Reserves, as presented by D. Bryceson (Director of National Parks), are an important aspect of that management, not only for conservation and tourism, but also for natural recruitment of fisheries stock. In the latter case, S. Saila (University of Rhode Island) emphasised that the reserves need only be a fraction of the total reef. S. Saila also presented a simplified equation, described in the Proceedings, to estimate the state of exploitation of the fisheries.

The hydroelectric project of the Rufiji River presents a strong probability of changing the sedimentational and hydrological regime of the delta and, hence, its prawn fishery; the environmental effects should be carefully investigated. The shelf and open sea fisheries are largely unknown and hence a thorough assessment is required to define how exploitation is to proceed. The habitats of the coastal area need to be thoroughly investigated in support of experiments in mariculture.

Fisheries development can go forward only in close harmony with fish processing and marketing. Much waste occurs through inadequate processing so that a real increase in available protein can occur through proper handling, storage, sterilisation, packaging, etc. However, great care must be maintained so that the price of the fish is not increased out of the reach of the general population. In this regard, H. Lampe (University of Rhode Island) pointed out that mariculture is not generally low-cost protein;

however, as noted by W.H.L. Allsopp (Vancouver) the next day, it does not require the amount of hard currency capital that a technical ocean fishery does and hence is especially appropriate to a developing nation.

The program for boat mechanisation and new boat construction is being done with a close eye on marketing and processing problems.

Finally, the coastal area has abundant other resources and uses such as harbors, beaches, sand and gravel, minerals, building sites, etc. The problems of pollution from petroleum (both local and high seas), sewage, industrial waste and dredge dumping need evaluation. All of the aspects require a knowledge base and personnel for exploitation and/or management.

Friday, 5 April 1974

Professor Marshall outlined the structure and operation of the marine resources programme at the University of Rhode Island. He emphasised that the URI program is broadly interdisciplinary cutting across the entire structure of the University, including such diverse disciplines as basic oceanography, fishermen training, resource economics, international law and sociology. This wide program gives the University a focus which would be difficult in a conventional university.

Different universities have found it necessary to adopt other models because of different local conditions. The most successful models are those with strong support from the given university. He felt that the URI model had numerous aspects which would seem relevant to the situation at the University of Dar es Salaam.

Professor Msangi, in reply on behalf of the University of Dar es Salaam, considered that three points would be essential in developing a sound marine sciences programme:

1. The adoption of an interdisciplinary approach drawing on staff from both inside and outside the University.
2. The strengthening of the co-operative relationship existing among the universities of East Africa through sharing of training and research facilities on marine sciences.
3. The development of mutually beneficial links with friendly institutions and universities in other parts of the world.

Mr. R. Morris (EAMFRO) welcomed the idea of strengthening co-operation between EAMFRO and the University of Dar es Salaam and offered to make ship time and other facilities available to University staff when possible.

In three interesting papers, Professors Marshall and Saila outlined how the marine centre at Rhode Island operated in the field of marine sciences, in particular marine biology, fisheries biology, marine experimental work and aquaculture.

In response, Professor Msangi outlined the present activities of the Kunduchi Marine Biological Station and outlined the four areas which have been considered of greatest concern: Plankton, Coral Reefs, Benthos, and Fisheries Biology.

Dr. Allsopp (International Development Research Center) again emphasised the importance of aquaculture in developing countries, because the development of this source of protein needs little foreign technology and little foreign exchange whereas open water fisheries development requires large scale foreign technology and large scale expenditure of foreign exchange.

Professor Saila's paper on Ocean and Environmental Engineering carried on well from Mr. Abura's (East African Harbours Corporation) paper presented on Thursday, 4 April 1974. Professor Saila divided the subject of Ocean and Environmental Engineering into four classes of problems:

1. Availability and Use of Resources
2. Design and Use of Structures and Machinery
3. Information Gathering and Transmission
4. Pollution

In response, Professor Bomboe (University of Dar es Salaam) outlined plans for developing the study of geology at the University and outlined some of the possible fields of exploitation of the marine environment in East Africa--in particular, oil exploration both offshore and inshore, and the mining of beach gravels and sands.

Professor H. Lampe (URI) outlined the importance of involving economists very early in the planning of any development program. He felt that it was not enough to call in the economist to show us where our program went wrong or to choose the best of two bad alternatives. The economist should be as much involved in the early planning of a programme as the biologists, engineers and sociologists.

Dr. Mascarenhas (BRALUP, University of Dar es Salaam) explained the position of an economist and planner working in Tanzania. Firstly, he felt that it is no use to have a scheme which needs a large team of trained manpower-- because they are not available. Therefore, he asked "What are our priorities?" In answer, he stated:

1. We need to have basic information. The days of exploration of our marine resources have just begun. Not only do we need to find new resources but we must know more about resources we are already aware of.
2. Research should be educative on both sides, that is, that both the research workers and those who benefit from the research should learn something.
3. We must use manpower in existing institutions.
4. Studies must be integrative.

Dr. Mascarenhas also felt that we must help fishermen to integrate their occupation with another, as fishing is no longer a full-time occupation; we must find ways of providing facilities and services to fishing communities; we must be aware of the potential deleterious effects which are almost certain to occur at the Rufiji Delta because of proposed inland developments; and that it is essential that "science" be made popular.

Mr. J. Griffin's (URI) discussion of coastal management emphasised its broad interdisciplinary nature, including the place of marine science in the structure. These matters are particularly dealt with under the URI Coastal Resources Center and the Marine Affairs Curriculum. He pointed out the relevance of these for Tanzania.

Mr. Libaba (Director, Fisheries Division, Tanzania) discussed coastal management in the context of Tanzania including pollution, exploitation of coastal resources, etc. He in turn pointed out the relevance of URI's experience.

Dr. Krause (UNESCO) emphasised the pertinence of the UNESCO report due in 1975 in response to its resolution 1802 (L V), which requests a plan for coastal area development.

Professor Constantinides (URI) gave a general review of the world food problem and outlined the relevance of the work of the University of Rhode Island. His main points were:

The world food problem is becoming more severe because of improper distribution, waste and improper utilisation. Many countries with severe malnutrition problems have an abundance of available animal protein in their seas. However, utilisation is either poorly developed or much of the protein is exported to the well-fed nations of the world.

URI, within the field of marine food science and technology, is studying the utilisation of marine species either for direct human consumption as fresh food or in a preserved form. The emphasis is on the problems of developing nations.

URI, through its International Center for Marine Resources Development (ICMRD), has joined with four other universities in a Consortium for the Development of Technology (CODOT). The activities of CODOT deal with developing the general area of food science and technology in developing nations. The other universities involved are: University of Washington, University of California, University of Wisconsin, and Michigan State University.

The Food Science Program at URI is interdepartmental, involving five departments interested in food and nutrition.

Dr. T. W. Maembe (Freshwater Fisheries Institute, Nyegzi) discussed nutrition and food technology in Tanzania. He reviewed some of the problems facing Tanzania in developing and utilising marine resources as sources of protein.

The major problems he felt were:

1. Lack of continuous supply of fish prevents consumers building the habit of eating fish.
2. The marketing and distribution system is very poor.
3. The quality of landed fish and their processing and preservation are poor.

As most of the participants to this conference are not sociologists, I hope I speak for all of us in saying that Dr. Pollnac's paper gave us an insight into a most important aspect of implementing any plans for the development of marine resources. His main theme is that without due regard to the people, their community structures and traditional methods, any programme of fisheries development will fail.

Dr. Allsopp, in supplementary comments, reinforced Dr. Pollnac's views by arguing that the "whole purpose of fisheries development is people, not fish." It is a problem in Africa that there are many sociological reasons why fishermen have not been willing to accept and use new innovations. It may be better when indigenous sociologists are able to carry out these projects. Dr. Allsopp felt that the ujamaa village co-operative system in Tanzania, unique in his experience, has a great chance of succeeding in implementing development projects.

Monday, 8 April 1974

The session was begun by a statement by The Honorable H. Makame, Minister of Natural Resources and Tourism. In this statement Mr. Makame strongly emphasised the importance the Government of Tanzania attaches to this conference and the topic under discussion. He thanked all participants for attending the conference and assured them that their expertise, advice and proposals would be considered seriously by the Government of Tanzania.

The Vice-Chancellor of the University at Dar es Salaam, Mr. P. Msekwa, outlined the importance the University attaches to the development and exploitation of the marine resources of Tanzania. He outlined the existing co-operative approach between the Kunduchi Marine Biology Station and other institutions (e.g., Fisheries Division, EAMFRO, and other East African universities) and expressed hope that such co-operation could be extended. The University, he said, fully supported the establishment of a marine resources centre and hoped it would be seriously considered for incorporation with the new United Nations University.

Mr. Morris stated that EAMFRO strongly favours the interdisciplinary approach. Mr. Morris questioned the need for a marine resources centre, stating that since such good co-operation already existed between all the relevant bodies, would it not be better just to strengthen these ties.

Mr. D. Bryceson (Director, National Parks, Tanzania) felt that Mr. Morris was moving away from what the conference was thinking. He said, "What we need is an institution set up under the auspices of the University-not another community organisation. What we need is an institute serving the needs of Tanzania, and I hope Kenya, and it should be established here in Dar es Salaam under the auspices of the University of Dar es Salaam."

Professor Marshall (URI) saw no conflict between a university's ambition and a fisheries research organisation's ambition: "They are complementary," he said.

Statements of support for the establishment of a centre for marine resources at the University of Dar es Salaam were given by:

Professor Wasawo (Economic Commission for Africa)
Mr. Bain (FAO)
Dr. Krause (UNESCO, Paris)
Professor Hyder (University of Nairobi)
Mr. Curry-Lindahl (UNEP)
Dr. Allsopp (Int. Dev. Research Centre)
Mr. Mbote (Ministry of Tourism and Wildlife, Kenya)
Mr. Morris (EAMFRO)

Professor Wasawo further emphasized the logical extension of such a centre for eventual regional applicability and as a candidate institution for affiliation with the United Nations University.

General Points

In summary the following general points have clearly arisen during the Conference:

1. The proposed centre should be multidisciplinary in approach.
2. It should be a centre of the University of Dar es Salaam.
3. It should maintain contacts and seek advice from interested bodies throughout the world.
4. The centre should probably start modestly as a national organisation and gradually develop into a regional organisation.
5. Aquaculture presents an opportunity for development beyond its apparent immediate productivity since it requires only a limited import of overseas technology and funds. Nevertheless the improvement of fishing technologies for exploiting near-shore and offshore fish stock will also provide increased protein production but will require substantial import of overseas technology and funds.
6. The conference urges the Government of the United Republic of Tanzania to recognise the danger existing to the coral reefs of Tanzania and to rapidly implement plans for the development of marine conservation areas.

INTERNATIONAL CONFERENCE ON MARINE
RESOURCES DEVELOPMENT IN EASTERN AFRICA

WORKSHOPS AND STEERING COMMITTEE REPORTS

Following presentation of papers, the participants in the Conference formed into four groups:

1. A Steering Committee
2. A Marine Affairs, Coastal Management, and Marine Advisory Services Workshop
3. A Resource Economics, Sociology, and Food and Nutrition Workshop
4. A Marine Sciences and Ocean Engineering Workshop

The function of these groups was to present general recommendations for the implementation of a centre for marine resources at the University of Dar es Salaam.

General Recommendations

The Steering Committee made the following recommendations, which were accepted by participants in the Conference:

To foster a growing capability for developing the marine resources of the eastern coast of Africa, the University of Dar es Salaam should establish a centre for marine resource studies.

The centre should be established in response to the commitment by the University and by the Government of the United Republic of Tanzania to serve the region in marine resources studies of broad scope and to serve as an educational supporting unit for staff in marine resources research and administrative programs along the east coast.

While under the control of the University of Dar es Salaam, the centre for marine resource studies should be organised so as to

assure that neighboring institutions in the region, including universities and government departments, will participate in its activities.

The centre should be organised, within the University of Dar es Salaam, as a coalition of faculty participants from as many different departments as might be interested in, and capable of contributing to, the diverse aspects of marine resources studies. Further, the provisions for such participation should be opened so as to take advantage of expanding interests when funding support and opportunities permit. Initially, the University departments and faculties most concerned would be:

Botany	Chemistry	Sociology	Zoology	Law
Geology	Economics	Engineering	Geography	

A broader scope of faculty capability could, and should, be realised by establishing, under proper academic controls and in all cases attached to existing academic departments, adjunct or affiliate faculty positions for persons with needed expertise in the employ of programmes outside the University.

High priority should be given to developing the capability at the University to meet local needs in the marine resources area, but it will be necessary, in the beginning, to attain initial competence through a well conceived programme of training abroad in advanced studies and by having faculty members from abroad serving the University in advanced education and in local academic staff development.

It would be appropriate that the centre be headed by a Director who, with a staff, should have such responsibilities as:

Working through the Vice-Chancellor's office so as to refine and otherwise work out the details of the broader organisational concepts presented herewith;

Co-ordinating University departments, affiliates and visiting academicians;

Exerting leadership for curriculum and research program planning within the University so as to achieve the goals of the centre;

Promoting the overall development of the centre, its programmes and facilities.

The most efficient means of implementing this programme would be to amalgamate into the proposed centre all the marine facilities at Kunduchi. It is hoped that successful negotiations with the Fisheries Department could be undertaken as soon as possible. This would provide an ideal start-up physical plant, but it would still be necessary to provide an appropriate docking facility such as a pier or a jetty.

The Conference welcomes East African Marine Fisheries Research Organisation plans to set up a substation adjacent to the University's Kunduchi Marine Station. Expressed intentions that this substation would have aquaculture among its priorities would seem highly compatible with the priorities of the centre.

Such country planning documents as the upcoming five-year plan should incorporate the development of the centre.

Refinement of implementation suggestions should be the responsibility of a working group set up under the auspices of the University of Dar es Salaam. This group would work out a development programme based on the broad recommendations of the Conference and the submissions of the working groups, taking account of the facilities of buildings, equipment and manpower now available and likely to be available in the near future, including sources of assistance from outside.

The various workshops also presented general recommendations for the implementation of a marine resource development centre at the University of Dar es Salaam. Among these recommendations were the following:

It is recommended that the University of Dar es Salaam carry out an assessment of previous and ongoing research in marine resource development in Tanzania. This assessment should include information pertaining to all relevant areas (e.g., marine sciences, ocean engineering, marine affairs, coastal management, resource economics, food and nutrition, and sociology). This information is to be obtained from all relevant institutions and agencies.

It is recommended that the mechanisms of co-operation between the centre and other organisations such as the Fisheries Research

and Training Institute, The University of Nairobi, Makerere University, EAMFRO, the Indian Ocean Fisheries Commission, etc., be strengthened. Co-operation in this context means the exchange of scientific information among these various institutions and organisations.

It should be the function of the University of Dar es Salaam to catalyse the programs in training, research and extension in the field of marine sciences.

While the centre shall address itself to national problems, it would be useful to find out the extent to which neighbouring countries such as Somalia, Kenya and Uganda could participate in the programmes of the centre.

Recognising that long-term viability and success of the centre rests on the availability of and commitment by local staff, it is recommended to establish a programme to attract, recruit and train nationals, who will constitute the core personnel of the centre. Consequently the role of the expatriates will be to augment that of the local staff. Furthermore, it is suggested that facilities at the centre be made available to visiting scientists who, on their own funding, desire to work there.

The centre at the University should arrange national seminars to get all people involved in exchanging ideas and setting directions. The centre should also hold frequent seminars with fishermen.

It is recommended that the director of the centre and its advisory committee study the background papers presented in this Conference so as to extract useful and relevant information for the selection of the centre's activities.

All activities at all levels should be related to the goals of Tanzania.

Guideline Recommendations

The workshops made further recommendations pertaining to their specific areas of interest. These recommendations are to be viewed as guidelines and should not constrain any creative efforts on the part of the centre itself. Specific workshops made the following recommendations:

Marine Affairs, Coastal Management, and Marine Advisory Services Workshop

It was felt that a centre for marine resources at the University of Dar es Salaam would be useful for the following areas:

Marine Affairs. By undertaking research, providing training and giving advice to the government in sciences dealing with marine resources and adjacent subject areas, as for example fisheries, including ecological, economic, sociological and legal aspects thereof, utilisation of non-renewable natural resources and so forth. This advice could be a basis for the government to establish policies serving as guidelines for the conservation, management and utilisation of coastal and marine resources.

Coastal Management. By undertaking interdisciplinary coastal and marine surveys which would lead to rational utilisation of the renewable natural resources on sustained yield bases; and the exploitation of non-renewable resources as well as other development schemes compatible with the renewable ones.

The "coastal zone" as a resource covers interacting terrestrial and marine habitats including coastal plains, estuaries and mangrove forests. Moreover, river basins and their utilisation are of importance to the productivity of coastal and marine resources.

Management of coastal and marine resources includes restoration, conservation and utilisation programs dealing with these resources.

In addition to economic and sociological considerations in development planning of coastal and marine areas, ecological considerations have to be included with due regard to the relations between resources such as estuaries, mangroves and coral reefs on one side and pelagic and benthic living populations of marine organisms on the other, through food chains and the various habitats which these populations use during different life stages.

Marine Advisory Services. By disseminating all kinds of information derived from the work of the centre, through the appropriate channels.

Marine Sciences and Ocean Engineering Workshop

Suggested disciplines of development include, among others: fisheries biology and mariculture; chemical, biological, physical, and geological oceanography; and ocean and environmental engineering.

Resource Economics, Sociology, and Food and Nutrition Workshop

Economics. It is recommended that the centre pursue the following areas of research in development:

- (a) Production economics and various exploitation systems with a view of assessing the economic potential of all renewable and non-renewable marine resources.
- (b) Marketing technology and economics of marketing to identify marketing failures and required technology and development.
- (c) Social and economic infrastructure required to support marine resource development at the community level. It is important to recognise that all the above activities be integrated.

The development of marine resource potentials is at best a complex task. Whatever the immediate development objectives--improving fishermen's incomes, producing additional protein at low cost or earning hard currency through export--a fundamental appreciation of present systems is required. This appreciation must include information regarding the economic and social structure of the community inasmuch as the institutions and relations among groups must often be changed in the national or community interest. In addition, there are a host of economic parameters that, apart from institutional structures, must be known to permit effective criticism of practice as well as the evaluation of plans. Whatever the ultimate use of the information, it must encompass the spectrum of interest from the fundamental issues of local community interests to the largest corporate structures.

The training of the research workers to the M.Sc. level with specialties in agricultural economics would be a useful starting point.

The program of research should at the outset focus on either the marketing and distribution system or production and vessel operations. Both are in need of research effort. As time permits careful consideration needs to be given research into the social and economic infrastructure of marine related communities.

These studies could provide a factual basis for evaluating the prospect of change and its feasible directions in pinpointing technical shortcomings, institutional failures and human interests. Further, in assaying these aspects of the marine economy the researcher guards himself for the more difficult task of evaluating possible changes in the system.

It is after all our concern in development to make matters "better" in some sense consistent with aspirations of the people. Normally "more protein" is consistent with their interest and aspirations. However, such apparently straightforward objectives rarely prove tractable in any simple sense. The task of evaluating alternative ways of achieving such a goal is that of the social scientist in co-operation with his natural science colleagues; the final determination of policy by the nation or region hopefully gaining from the effort.

Food Science and Nutrition. A food science and technology department should be established at the University. Its role would be training, research and extension, and working closely with government and other agencies related to food and nutrition in the country.

Fish handling, processing, product development and marketing acceptability studies continue to take place in collaboration with the centre. High level manpower should be trained for co-ordinating, training and extension work in the field of food science and technology. Research priorities should be set in collaboration with agencies working in the same field. Research and training priorities in this field should follow the course indicated by Mr. Maembe in his paper at this Conference.

Sociology. It is recommended that socio-cultural studies be conducted in a wide range of marine-related communities (e.g., stratified on the basis of degree of involvement in fishing, success or failure of ujamaa projects, etc.). These socio-cultural studies should include assessments of:

- (a) General socio-cultural data such as age, sex, education, and occupation structure of the population;
- (b) Social structure (e.g., power relationships, communication networks, etc.);
- (c) Attitudes toward the present technology and technological change.

The existing data should be assessed as soon as possible and research should be initiated to provide relevant information that is not available. It is further suggested that these investigations be conducted during various stages of the developmental process to evaluate the factors associated with the success or failure of the specific programmes.

As noted above, these recommendations are to be understood as guidelines for the implementation of a marine resource development centre at the University of Dar es Salaam. Refinement of implementation suggestions should be the responsibility of a working group set up under the auspices of the University of Dar es Salaam.

INTERNATIONAL CONFERENCE ON MARINE
RESOURCES DEVELOPMENT IN EASTERN AFRICA

KEYNOTE SPEECHES FROM TANZANIA

Opening Speech by the Hon. S.E. Chiwanga, Minister of
National Education, United Republic of Tanzania

Ladies and Gentlemen,

Let me first of all extend to you all a most warm welcome to Tanzania and to Dar es Salaam. It is raining now, but all the same I do hope you will have an enjoyable stay in our country.

It gives me much pleasure to have the honour and privilege of opening this important conference organised by the University of Dar es Salaam in collaboration with the Ministry of Natural Resources and Tourism and with the co-operation of the University of Rhode Island. This kind of co-operation not only makes it possible for us to arrive at more balanced deliberations that would have been the case had we been working separately and independently, but it also cements the working relationship between intellectuals and academic communities.

I also see from the list of participants that there is a wide cross-section of interests and of geographical and institutional representation. Given the wide-ranging topics that will be discussed I have no doubt there will be a very thought-provoking exchange of ideas and at the end of it profound recommendations.

Let me say straight away that it is a happy coincidence that your conference is being held at a time when the question of exploitation of marine resources is a very live one here. The general cry in this country is why don't we have sufficient supplies of marine products. As you all must be aware, we in Tanzania are engaged in a great struggle of improving the lives of the lot of our people socially, culturally and healthwise. We know that we can only do this by raising the general standard of living of our people and that this in turn will depend on our being able to make full use of all of our economic resources to the best advantage. You have no doubt heard that this is one of the 25 poorest countries in the world. It should and must be understood that this statement is only true if one is talking in terms of available or fluid wealth

as opposed to potential wealth. So far as potential resources are concerned Tanzania is one of the better placed countries in Africa. We have rich agricultural land with a variety of climates which makes it possible for us to be able to grow almost any type of agricultural crop; we have extensive and rich grazing land; we have some mineral deposits; we have about the richest terrestrial wildlife, both in variety and in numbers, that you can get anywhere in the world; we have extensive and rich forests and we have numerous and extensive bodies of fresh water and a large area of ocean all abounding in natural resources. In short what I am saying is that although kinetically Tanzania is amongst the poorest countries, potentially it is undoubtedly one of the richest in the world. In other words we in Tanzania are in the paradoxical position of living in great poverty amidst plenty. It is our Government's resolve and determination to fight and remove this paradox at all costs. We also know that the only way to remove the paradox is by the proper application and utilisation of science and technology.

Now let me turn to the subject of your main concern in this Conference, i.e., the development of marine resources in Eastern Africa. I must admit that I am not expert in this field, but from general experience and going by what I have been told by those who know, the East African inshore and offshore waters are from the fauna point of view among the richest in the world. Taking Tanzania as an example our marine resources are very extensive. The country has a coast line of about 500 miles. This gives an estimated surface area of 50,000 sq. miles or more. The biological resources alone contained in such a vast area of ocean must be very considerable. It is a regrettable fact however that because of a limitation of basic scientific knowledge concerning these resources and because of lack of the right technology and the means for its proper exploitation this vast wealth remains largely untapped. Having said that however I should add that our Government, with the limited financial resources at its disposal, has ambitious projects, some already operative, concerning the development of fisheries and marine resources in general. I have in mind such projects as ujamaa Village fishing schemes, the creation of marine reserves and the establishment of fishing corporations.

I would like to end these remarks by wishing you a fruitful and most successful conference. It is my hope that you will come up with concrete and practical ideas and suggestions as to how best we can apply new scientific ideas and technology for the fullest development of our considerable marine

resources to contribute to the economic development of these countries. Of course I am not blind to the need of developing marine parks and conservation of marine resources in general. I am sure the Conference will take care of both aspects. As I said at the beginning, perhaps our problem now is to harvest rather than to plant.

Short Address to Delegates by the Hon. Hasnu Makame,
Minister of Natural Resources and Tourism, Tanzania

Ladies and Gentlemen,

It is a great pleasure to me to have the honour of chairing this important meeting of yours this morning. I call it an important conference because we in Tanzania both in government and in this University regard it as such. Let me make it quite clear that this conference is being held at the request and wish of the Ministry of Natural Resources and Tourism and the University of Dar es Salaam and as such it has the fullest support of the Government of Tanzania. The participants in this conference were invited by us on the basis of their interest and potential capacity to help us in designing and developing means of exploiting our marine resources to the best advantage of our country. I would like at this juncture to thank all those who have favourably responded to our call and have come to attend this conference, especially those who have come from outside Tanzania.

I can assure you that your expertise, advice and proposals will be taken seriously by our Government.

The Role of the University of Dar es Salaam and the Relationship of
the Institute of Marine Sciences to the United Republic of Tanzania
and to the Region

by Pius Msekwa, Vice-Chancellor
University of Dar es Salaam

It should now be very clear from what has been said by several participants in this conference that there is need, indeed there is a great need, for the establishment of a centre for marine resources in Eastern Africa. Of all the natural resources in this part of the world the marine resources remain the least studied and the most unexploited. Yet it is known in a general

sort of way that the living part of these resources alone, i.e., the biological part, if fully exploited, could contribute very significantly to the economic development of these countries and to the solution of the notorious and widely occurring problem of protein malnutrition. It is also probable that the non-living part of the marine resources of this region, i.e., the mineral part, is of equally great potential. It is obvious however that full access to these resources cannot be had without a good scientific understanding of the nature, the extent of occurrence and the ecological and other factors influencing them. Such a scientific understanding of these resources can only come about as a result of the pursuance of a well planned research and training programme. The full utilisation of these resources will also depend on the development of efficient methods of exploitation or harvesting.

We in the University of Dar es Salaam have been more than aware of the need to concern ourselves with marine sciences studies for a long time, indeed since the establishment of a faculty of science in this University back in 1965. That is why in 1968 we established a Marine Biology Station at Kunduchi next door to the Fisheries Research and Training Institute of the Ministry of Natural Resources and Tourism. The Marine Biology Station started as a modestly sized laboratory which was modestly equipped, and it was at first used as a field and collecting station for our Zoology undergraduate students during their marine ecology field courses. From this modest beginning the station has made steady though still modest progress over the years and it was now a full-time scientific staff of its own engaged in ecological research and in the training of undergraduate and postgraduate students. To date three graduate students attached to the station have worked and obtained higher degrees of the University and currently there are two more students working for such degrees. We expect to take in more students for postgraduate studies in marine biology during the coming academic year.

Right from the time the Marine Biology Station was established the University's attitude in making use of its facilities has never been parochial and there have always been healthy and collaborative connections with the Fisheries Research and Training Institute of the Ministry of Natural Resources and Tourism, the other universities in East Africa and the East African Marine Fisheries Research Organisation. Examples of this healthy co-operation have been the organisation of undergraduate field courses in marine biology and the offering of postgraduate study facilities to students from the other

universities in East Africa (one of the students currently pursuing postgraduate studies in marine biology at the station is from Kenya); co-operation with the scientific staff of the East African Marine Fisheries Research Organisation in the supervision and examination of research students and the sharing of working space and equipment with the Fisheries Research and Training Institute. The station has offered research facilities to scientists from different parts of the world wanting to carry out studies in tropical marine biology. For example, only about ten weeks ago a team of Rumanian scientists completed a three months' intensive study of the benthic fauna of the shores around Dar es Salaam.

By these examples the University of Dar es Salaam is not boasting that it has done everything that needs to be done in planning for marine resources studies and development; rather the examples are given to show that both in philosophy and outlook the foundations so far laid are sufficiently flexible and broad-minded to allow for the development of an institute of marine sciences in this part of the world which is broad-based in its academic and applied activities and which can serve local, regional and even international needs. There is no doubt that our modest efforts in the past in the scope of research and training and in organisational structure have left much room for improvement and extension. One would hope that in its resolutions this conference will have among other things concrete proposals as to how such improvement and extension could be effected. We at this University realise our special responsibility to the country and to the region in developing the marine resources of this part of the world and we are willing to co-operate with institutions of goodwill in the region and in the world in discharging this responsibility. In this regard I was very interested to learn recently that the United Nations University to be established in October this year with headquarters in Tokyo, Japan, will have marine sciences among its priorities and that there will be an institute of marine sciences either affiliated to or as part of the U.N. University. In order that such an institute may make maximum contribution to man's knowledge of the marine environment and its potential, it would be very important for it to be located in an area where marine sciences are not so well developed; the East African region is one such area. If you gentlemen, as a group of experts in this field, consider it reasonable and appropriate I would like to suggest that the proposed Institute of Marine Sciences of the United Nations University be based at the University of Dar es Salaam.

Let me end these remarks by reiterating that we at this University will be looking forward to some concrete proposals from this conference as to how an institute of marine sciences of international standing could be established at the University of Dar es Salaam.

INTERNATIONAL CONFERENCE ON MARINE
RESOURCES DEVELOPMENT IN EASTERN AFRICA

LIST OF PARTICIPANTS

Dr. S.A.H. Abidi, Kunduchi Fisheries Institute
Mr. J.E. Abura, East African Harbours Corporation, Dar es Salaam
Dr. W.H.L. Allsopp, International Development Research Centre, Vancouver
Mr. C. Barnes, Economic Research Bureau, University of Dar es Salaam
Mr. K.H. Bain, FAO, Dar es Salaam
Professor P. Bomboe, Geology Department, University of Dar es Salaam
Mr. D. Bryceson, Director of National Parks, Dar es Salaam
Mr. I. Bryceson, Zoology Department, University of Dar es Salaam
Professor S.M. Constantinides, University of Rhode Island
Mr. K. Curry-Lindahl, UN Environment Programme, Nairobi
Professor R. Geigy, Swiss Tropical Institute, Basle
Mr. James J. Griffin, University of Rhode Island
Mr. J.J. Gwahaba, Makerere University, Kampala
Dr. K.N. Hirji, Zoology Department, University of Dar es Salaam
Mr. K.M. Howell, Zoology Department, University of Dar es Salaam
Professor M. Hyder, Zoology Department, University of Nairobi
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Mr. J.J. Kambona, Ministry of Information, Dar es Salaam
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Mr. M.G. Kayura, UNESCO National Commission, Dar es Salaam
Dr. D. Krause, UNESCO, Paris
Professor H.C. Lampe, University of Rhode Island
Mr. G. Libaba, Ministry of Natural Resources and Tourism, Dar es Salaam
Mr. T. Maembe, Ministry of Natural Resources and Tourism, Dar es Salaam
The Hon. H. Makame, Minister of Natural Resources and Tourism, Dar es Salaam
Dr. L. Marinelli, USAID, Arusha
Professor Nelson Marshall, University of Rhode Island
Dr. A. Mascarenhas, BRALUP, University of Dar es Salaam
Mr. H. Matthes, Kunduchi Fisheries Institute
Mr. W.N. Mbote, Ministry of Tourism and Wildlife, Nairobi

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Dr. T. Mcharo, Serengeti Research Institute, Arusha
Mr. R.E. Morris, EAMFRO, Zanzibar
Mr. J.F. Mpelumbe, Kunduchi Fisheries Institute
Professor A.S. Msangi, Zoology Department, University of Dar es Salaam
Mr. Pius Msekwa, Vice-Chancellor, University of Dar es Salaam
The Hon. D. Mwakawago, Minister of Information (for the Minister of Education)
Mr. I. Mwakipesile, Kunduchi Fisheries Institute
Mr. P. Mwombela, National Scientific Research Council, Dar es Salaam
Mr. M.O. Mzee, EAMFRO, Zanzibar
Mr. S. Ndawula-Kajumba, Sociology Department, University of Dar es Salaam
Dr. A.M. Nikundiwe, Zoology Department, University of Dar es Salaam
Dr. F. Nyahoza, Dean, Faculty of Science, University of Dar es Salaam
Dr. D.M. Pearson, Zoology Department, University of Dar es Salaam
Dr. R. Pollnac, University of Rhode Island
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Dr. W.B. Rudman, Zoology Department, University of Dar es Salaam
Dr. C. Sankarankutty, Zoology Department, University of Dar es Salaam
Professor S. Saila, University of Rhode Island
Mr. W.A.M. Sichone, Ministry of Natural Resources and Tourism, Dar es Salaam
Mr. S.B. Singh, Ministry of Natural Resources and Tourism, Dar es Salaam
Professor S. Tedla, Haile Selassie University, Addis Ababa
Dr. W.L.N. Tickell, Zoology Department, University of Nairobi
Professor D. Wasawo, ECA, Addis Ababa
Mr. U.N. Wijkstrom, Ministry of Natural Resources and Tourism, Dar es Salaam

Zoology Administrative staff who assisted with the conference:

Mr. M. Mkriti	Mr. H. Hassani
Mr. A. E. Jaffer	Mr. O.J. Msokwa
Mr. T. Rweyongeza	Mr. A.H. Issa

Mrs. M. Carman

INTERNATIONAL CONFERENCE ON MARINE
RESOURCES DEVELOPMENT IN EASTERN AFRICA

PROGRAMME

Thursday, 4 April 1974

Chairman: A.S. Msangi
Head, Department of Zoology
and Marine Biology
University of Dar es Salaam

- 0900 hrs Introduction of participants to one another
0910 hrs A word of welcome to participants by Mr. Pius Msekwa,
The Vice-Chancellor of the University of Dar es Salaam
0920 hrs Opening of the Conference by The Hon. S.E. Chiwanga,
Minister of National Education

I. Marine Resource Potential and Needs of Eastern Africa

Shore and Reef Fisheries

- 0930 hrs John Kambona, Principal Secretary, Ministry of Information and
former Principal Secretary, Ministry of Natural Resources and Tourism
0945 hrs Supplementary comments: Nelson Marshall, Professor of Oceanography,
University of Rhode Island
1000 hrs Discussion

Natural Areas and Park Concepts

- 1015 hrs Derek Bryceson, Director of National Parks, United Republic
of Tanzania
1030 hrs Supplementary comments: Saul B. Saila, Professor of Oceanography,
University of Rhode Island
1045 hrs Discussion

Coastal and Estuarine Aquaculture

- 1115 hrs C. Sankarankutty, Department of Zoology, University of Dar es
Salaam; H. Matthes, Fisheries Research; and T.I. Kunduchi
1130 hrs Supplementary comments: W.H.L. Allsopp, University of British
Columbia, Vancouver, Canada
1145 hrs Discussion

Shelf Fisheries

- 1200 hrs Robert Morris, East African Marine Fisheries Research Organisation
1215 hrs Supplementary comments: Saul B. Saila, University of Rhode Island
1230 hrs Discussion

Boats and Equipment

- 1430 hrs J. Meyer, Fisheries Division, Ministry of Natural Resources
and Tourism, Dar es Salaam
1445 hrs Supplementary comments: Harlan C. Lampe, University of Rhode Island
1500 hrs Discussion

Other Uses and Problems of the Coastal Area, including
Pollution and Port Development

- 1515 hrs J.E. Abura, East African Harbours Corporation
1530 hrs Supplementary comments: K.C. Lindahl, UN Environmental Centre,
Nairobi
1545 hrs Discussion

Marketing and Distribution, including Processing

- 1615 hrs U.N. Wijkstrom, Fisheries Division, Ministry of Natural Resources
and Tourism, Dar es Salaam
1630 hrs Supplementary comments: Harlan C. Lampe, Professor of Resource
Economics, University of Rhode Island
1645 hrs Discussion

Friday, 5 April 1974

Chairman: Nelson Marshall

Director, International Center for Marine
Resources Development

University of Rhode Island

- II. An Example of the Comprehensive Approach to the Marine Resource Needs:
Marine Resource Programs at the University of Rhode Island and Possible
Applicability to Program Development at the University of Dar es Salaam
and to the Eastern African Region

The Overall Program, Historical Background, Sea Grant, and
Related Concepts

- 0900 hrs Nelson Marshall, University of Rhode Island
0915 hrs Response for the region from Dar es Salaam, A.S. Msangi, Head,
Department of Zoology
0925 hrs Discussion

Marine Sciences

- 0940 hrs (a) Marine Biology - Nelson Marshall
1000 hrs (b) Fisheries Biology and Marine Experimental Work - Saul B. Saila,
Professor of Oceanography and Director, Marine Experiment
Station, University of Rhode Island
1040 hrs (c) Aquaculture - Saul B. Saila
1100 hrs Reply to marine sciences suggestions for the region from Dar es
Salaam, A.S. Msangi, Head, Department of Zoology
1115 hrs Discussion

Ocean and Environmental Engineering, including Pollution Problems

- 1130 hrs Saul B. Saila
1145 hrs Response for the region from University of Dar es Salaam,
P. Bomboc, Head, Department of Geology
1200 hrs Discussion

Marine Resource Economics, as Applied to Fisheries, Coastal
Utilisation, Port Development, etc.

- 1215 hrs Harlan C. Lampe
1230 hrs Response for the region from University of Dar es Salaam,
Economic Research Bureau--A. Mascarenhas
1245 hrs Discussion

Marine Affairs, Law of the Sea, Coastal Management

- 1430 hrs James J. Griffin, Executive Assistant, International Center for
Marine Resource Development, University of Rhode Island
1445 hrs Response for the region from Fisheries Division--G. Libaba
1500 hrs Discussion

Nutrition and Food Technology as Applied to Fisheries Products

- 1515 hrs Spiros M. Constantinides, Professor of Food and Nutritional
Sciences and Biochemistry, University of Rhode Island
1530 hrs Response for the region from Fisheries Division--T. Maembe
1545 hrs Discussion

Sociology and Anthropology as Applied to Coastal Communities

- 1615 hrs Richard B. Pollnac, Assistant Professor of Anthropology,
University of Rhode Island
- 1630 hrs Response for the region from University of Dar es Salaam -
S. Ndawula-Kajumba

Summary: Program Synthesis; Training and Advisory Services

- 1700 hrs Nelson Marshall
- 1715 hrs Discussion

Sunday, 7 April 1974

Organiser: Derek Bryceson
Director of National Parks

Boat excursions to the coral reefs around Dar es Salaam.

Monday, 8 April 1974

Chairman: Hon. H. Makame
Minister of Natural Resources and Tourism

III. Planning an Institute for Marine Sciences for Eastern Africa

(a) Scope: The Role of the University of Dar es Salaam and the
Relationship of the Institute to the United Republic
of Tanzania and to the Region

- 0900 hrs The Vice-Chancellor, University of Dar es Salaam
- 0915 hrs Group Response and Discussion
- from
- 1015 hrs (b) Implementation: Working of Sub-groups in the Following Areas:
1. Marine Affairs, Coastal Management, Marine Advisory Services
 2. Resource Economics, Sociology, Food and Nutrition
 3. Marine Sciences, Ocean Engineering
- to
- 1700 hrs

A Steering Committee to work with the sub-groups was
comprised as follows: A. S. Msangi (Chairman)
Nelson Marshall
Derek Bryceson
James J. Griffin

Tuesday, 9 April 1974

0900 hrs Report by Steering Committee

1100 hrs IV. Conference Summary by Rapporteurs